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(54) **Method and apparatus for multi layer coating a support**

Verfahren und Vorrichtung zur Bildung von Mehrschichtenüberzügen auf einem Träger

Méthode et dispositif pour préparer un revêtement multicouche sur un support

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(73) Proprietor: **Fuji Photo Film B.V.**
5047 TK Tilburg (NL)

(72) Inventors:
- **Gandasasmita, Iskandar**
  5045 KZ Tilburg (NL)
- **van der Pluijm, Anton Petrus Maria**
  4941 AZ Raamsdonksveer (NL)

(74) Representative:
Prins, Adrianus Willem, Mr. Ir. et al
Vereenigde,
Nieuwe Parklaan 97
2587 BN Den Haag (NL)

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Description

[0001] The invention relates to a method for multi layer coating of a support, for forming photographic material.

[0002] US 4 297 396 discloses a method and apparatus for applying multi layer coating on a support, comprising supplying means in the forms of pumps, pipes, and supply nozzle connected to slotlike cavities. A support to be coated, for example a flexible support or web, is conveyed around a rotating drum. The surface of the coating head is sloping downward into the direction of said drum. In the coating head the slotlike cavities extend over approximately its full width. The coating head has more than two slots positioned parallel to each other. A supply nozzle is attached to each cavity for supplying a coating material, which is forced out of said slot and onto the surface of the coating head. Said coating material forms a layer on said surface, streaming downward into the direction of said drum. The coating material emerging from a slot positioned higher on said sloping surface flows down and over a layer of coating material emerging from a slot positioned lower on said surface. Thus a stream of multi layer coating material flows onto said drum, that is, onto a support positioned on said drum. Such coating apparatus is shown in and discussed with respect to Figs. 1 and 2.

[0003] In this known method each cavity is connected to a nozzle for introducing into said cavity one coating material, thus resulting in a number of layers of coating material on the support which corresponds to the number of slots provided in said surface. This means that for each extra layer of coating material desired a new slot with nozzle and supply means has to be provided, which is time consuming and relatively expensive.

[0004] US 5,186,754 discloses an extruder for coating magnetic layers onto electromagnetic recording tape, which is provided with two reservoirs and two outlet channels so as to permit simultaneous coating of two layers. Two outlet channels are provided, merging into a slotlike cavity which opens upwardly. A tape to be coated is moved over the slot such that the coating materials are supplied directly onto said tape, forming a meniscus between the tape and the head. This extruder is used for coating materials having a high viscosity and is known as "slot coating".

[0005] JP 63-164022 discloses a similar "slot coating" type extruder for coating with coating materials having a high viscosity brought directly onto a support from a coating cavity.

[0006] One object of the present invention is to provide a method for multi layer coating of a support as discussed in the introduction, in which the drawbacks of the known method as discussed hereabove are avoided, maintaining the advantages thereof. This main object is reached according to the present invention by providing a method having the features of claim 1.

[0007] With a method according to claim 1 a number of layers to be brought onto said support can be chosen, generally irrespective of the number of slots provided. By the use of a nozzle means which provides at least two separate streams of coating materials, each layer forming of coating material enables to provide a number of coating layers being at least one higher than the number of slots provided. This makes it possible to expand the number of layers of coating material without the necessity of increasing the number of slots. A further advantage is that depending on the product to be made the number of layers can be chosen at will, starting with the same number of slots.

[0008] In a first further advantageous embodiment a method according to the present invention is further characterized by the features of claim 3.

[0009] By providing at least three different coating materials, introduced to said at least one nozzle, a relatively large number of layers of different coating materials can be formed with a relatively small number of slots.

[0010] The invention further relates to a device for multi layer coating of a support, especially for forming photographic material, characterized by the features of claim 11.

[0011] Such device has the advantage that it can be of a relatively simple and economical design, offering the possibility to provide a relatively large number of layers carried on a support, the layers being positioned on top of each other without the necessity of providing a number of slots which is the same as the number of layers. Such device is especially suitable for use with a method according to the present invention.

[0012] The novel means provided in a device according to the present invention preferably comprises a number of aeparate nozzles, one for each cavity, which nozzles are preferably interchangeable or nozzles having a different number of compartments, that is intended for introducing a different number of separate streams of coating materials into the cavity attached thereto. This provides the possibility of rearranging the device depending on the number of layers to be obtained and the coating materials to be used. Each nozzle is attached to the cavity preferably from the right hand or left hand side of the coating head.

[0013] By providing relatively narrow slots in the coating head layers can be provided having a relatively small thickness. By introducing two or more separate streams of coating material through one of these slots, layers of said coating material can be provided having even smaller thickness. It will be clear that said thickness can be adjusted by adjustment of the velocity of the stream.

[0014] In a preferred embodiment a device according to the present invention is further characterized by the features of claim 13.

[0015] By providing said at least two compartments at least beside each other a good flow pattern of said streams of coating material from said nozzle through

said cavity and onto the coating head can be obtained, substantially without any mixing or blending of the different materials.

[0016] The invention further relates to a nozzle for use in a device for multi layer coating of a support, characterized by the features of claim 16.

[0017] With such nozzle a series of layers of coating material can be provided from one single slot. Such nozzle is used with a device according to the present invention. Such nozzle can also replace a nozzle of the known type, thus changing a device according to the prior art into a device according to the present invention.

[0018] Further, advantageous embodiments of a method and device according to the present invention are given in the subclaims. In order to further elucidate the present invention, embodiments of a method, device and nozzle are described hereafter, with reference to the drawings. These show:

Fig. 1 shows, in cross-section, schematically a conventional coating apparatus;
Fig. 2 discloses in perspective view part of an apparatus according to Fig. 1;
Fig. 3 in front and side view a nozzle for use in an apparatus according to the present invention in a first embodiment;
Fig. 4 in front and side view a nozzle for use in an apparatus according to the present invention in a second embodiment;
Fig. 5 in front and side view a nozzle for use in an apparatus according to the present invention in a third embodiment;
Fig. 6a-c in cross section schematically a coating head according to the invention, during use;
Fig. 7a-7c schematically experimental results.

[0019] An apparatus according to Figs. 1 and 2 is generally known as a 'multi layer slide bead coating apparatus'. Such apparatus comprises a drum 1 around which a supportlike photographic paper or -film to be coated is guided in the direction of the arrow S. A coating head 3 is positioned close to said drum 1. Said coating head 3 has a sloping surface 4, the lower end of which extends parallel to the axis R of rotation of the drum 1. The coating head 3 is provided with three slotlike cavities 5, 6, 7, in this case parallel to each other and to the axis of rotation R of the drum 1, extending over the full width of the surface 4 of the coating head 3. Each cavity 5, 6, 7 is at its lower end connected to nozzle means 8, 9, 10. 17 is a pressure reducing chamber connected to a section blower 16. In Fig. 2 a conventional nozzle 10 is shown, screwed into the right hand side opening of the lower end of the cavity 7, which nozzle comprises attachment means 11, for example for bolting said nozzle 10 to the coating head 3 and a feed pipe 12 to be connected to supply means 13, comprising pump means 14 and a supply pipe 15. During use the pump means 14 is connected to an appropriate source of coating material, not shown. In Fig. 2, the further nozzles are schematically showns as arrows 8, 9.

[0020] In a conventional coating apparatus each nozzle 8, 9, 10 comprises only one compartment within the feed pipe 12, such that through each of these nozzles 8, 9, 10 only one coating solution can be supplied to the cavity 5, 6, 7 to which each of said nozzles 8, 9, 10 is attached respectively. During use through each of the cavities 5, 6, 7 a coating material is forced onto the surface 4, each coating solution forming a free flowing stream over said surface into the direction of and onto the support 2 provided on the drum 1. The stream of coating solution flowing from the middle cavity 6 will flow on top of the coating solution provided through the lower cavity 5, the coating solution flowing from the upper cavity 7 will flow onto the coating solution flowing from the middle cavity 6. Thus, a three layered coating will be provided on the support 2. In such conventional coating apparatus therefore a number of layers can be provided on a support at most equal to the number of cavities 5, 6, 7 provided in the coating head 3.

[0021] This problem has been solved by the present invention by providing at least one nozzle with at least two compartments, each compartement designed for supplying a specific coating solution to the cavity to which the nozzle is attached, such that the number of layers which can be provided onto a support 2 can be at least one higher than the number of cavities. Exemplary embodiments of nozzles according to the present invention are presented in Figs. 3-5, which however should not be considered as limiting the scope of the present invention.

[0022] Fig. 3 shows a nozzle 109, in side and front view, comprising attachment means 111, such as a flange provided with a number of through bores for bolting said nozzle 109 to a coating head 3 in a conventional manner. The nozzle 109 further comprises a feed pipe 112, which is devided into two compartments 117, 118 by a dividing wall 121 which, during use, extends in a plane, approximately vertical and parallel to the cavity 6 to which the nozzle 109 is to be connected. The first end 122 of the compartments 117, 118 is open to be connected to said cavity. The opposite second end 123 of the first compartment 118 is connected to a first adaptor 124 having first connecting means 125 for connection to a first supply pipe 115 (not shown in Figs. 3-5) for supply of a coating solution. The second end 123 of the second compartment 117 is connected to a second adapter 126 provided with second connecting means 127 for connection to a second supply pipe 115 for a further coating solution. The first adaptor 125 is elbow shaped, the second adaptor 126 being straight, such that sufficient room is provided for connecting said supply pipes 115 to said connecting means 125, 127 respectively. The dividing wall 121 extends through the full length of the feed pipe 112, such that the adaptors 124, 126 and the compartments 117, 118 are strictly separated, as are coating solutions provided therethrough.

[0023] Fig. 6a shows, by way of example, the use of a nozzle 109 connected to the middle cavity 6 of a coating head 3. A first coating solution I is provided on the surface 4 by the lower cavity 5, a second II and third III coating solution by the middle cavity 6 and a fourth coating solution IV by the upper cavity 7. To this end, the second coating solution II is introduced through the second compartment 118, the third coating soluting III through the first compartment 117 when the nozzle 109 is connected to said cavity 6 at the right hand side, seen from the lower end of the coating head 3,

[0024] Fig. 4 shows a second embodiment of a nozzle 209 according to the present invention having attachment means 211 comparable to Fig. 3. In this embodiment the feed channel 212 is divided into three compartments 217, 218, 219, by two dividing walls 221a, 221b. Said dividing walls 221a, 221b can be parallel or not parallel to each other. These two walls can be curved such that the compartment 218 has a special shape of cross section. Said dividing walls are extended during use, to the cavity 6 to which the nozzle 209 is attached. A first adaptor 224 having first connecting means 225 for a first supply pipe 15 is elbow shaped and is connected to the second end 223 of the first compartment 217 and the third compartment 219, for supplying the same coating solution through both compartments 217, 219. A second adaptor 226, having second connection means 227 is connected to the second end 223 of the second, middle compartment 218, for supplying a further coating solution through said middle compartment. The first end 222 of the compartments 217, 218, 219 is during use connected to one of the cavities of a coating head 3.

[0025] When a nozzle 209 is connected to the middle cavity 6 of a coating head 3, conventional nozzles 8, 10 being connected to the lower and upper cavities 5, 7, five layers of coating solution can be brought onto the surface 4 and onto the support 2. This is, by way of example, shown in Fig. 6b. A first coating solution I is supplied through the lower cavity 5, a second coating solution II and third coating solution III are supplied through the middle cavity 6 and a fourth coating solution IV is supplied through the upper cavity 7. To supply the second and third coating solutions II, III the second coating solution is supplied through the first adaptor 224 and the first, outer compartments 217, 219, the third coating solution III through the second adaptor 226 and the second, middle compartment 218 of the nozzle 209. Thus, with a coating head 3 having three cavities, five layers can be provided on a support 2, the first layer 31 made of solution I, the second layer 32 of solution II, the third layer 33 of solution III, the fourth layer 34 agains of solution II and the fifth layer 35 of solution IV.

[0026] Fig. 5 shows a third embodiment of a nozzle 309, comparable to the nozzle 209 as shown in Fig. 4. However, in this embodiment the compartments 317, 318, 319 are, at the second end 323 of the feed pipe 312 connected to individual adaptors. The first compartment 317 is connected to a first adaptor 324 with first connecting means 325, the second, middle compartment 318 is connected to a second adaptor 326 having second connecting means 327, whereas the third compartment 319 is connected to a third adaptor 328 having third connecting means 329. The nozzle 309 is once again provided with attachment means 311 as discussed before. The first 324 and third 328 adaptors are elbow-shaped, the second 326 is straight.

[0027] In Fig. 6c the result of the use of a nozzle 309, connected to the middle cavity 6 is shown, conventional nozzles being connected to the further cavities. A first coating solution I is provided onto the surface 4 through the lower cavity 5, second II, third III and fourth IV coating solutions through the middle cavity 6. A fifth coating solution V is provided through the upper cavity 7. To this end, the second coating solution is introduced through the first compartment 319, the third coating solution III through the second, middle compartment 318, the fourth coating solutin IV through the third compartment 317 when the nozzle 309 is connected to the coating head at the right hand side, seen from the lower end of the coating head 3. Thus, a first layer 41 is made of the first solution I, the second layer 42 is made of the second solution II, a third layer 43 is made of the third solution III, a fourth layer 44 is made of the fourth solution IV, a fifth layer 45 of the fifth solution V.

[0028] In the embodiments as shown and discussed hereabove, the coating head 3 has three cavities, a nozzle according to the present invention being attached to the middle cavity. It will be understood that a different number of cavities , for example more than four, can be provided, whereas a nozzle according to the present invention, as for example shown in Figs. 3, 4 and 5 could be connected to any one of said cavities. Thus, a different number and/or of layers of coating solution could be provided by an appropriate selection of the number of cavities and the nozzles used. Moreover, nozzles could be provided having a different number of compartments, for example four or more, similar to the two or three compartment nozzles as shown.

[0029] By way of example, coating tests will be discussed, referring to Figs. 7a-c.

[0030] A coating apparatus as shown in Figs. 1 and 2 adapted according to the present invention was used for multi layer coating on polyethylene resin laminated paper for photographic purposes. The resin contained white pigment (TiO_2) and blue dye (ultramarine). Conventional nozzles 8, 10 were connected to the lower and upper cavities 5, 7, a nozzle 209 according to Fig. 4 was connected to the middle cavity 6, at the right hand side, seen from the lower end of the coating head 3. This resulted in a multi layer structure as schematically shown in Fig. 6b.

[0031] A first, colourless coating solution I was provided as underlayer 31. The second 32 and fourth layer 34, provided through the first and third compartments 217, 219 were a gelatine coating solution, containing cyan dye, the third coating solution III, provided through

the second, middle compartment 218 contained magenta dye, whereas the fifth coating solution V was again colourless, and provided for a protective layer 35. The colouring dyes were introduced in the various layers (31, 32, 33) in order to establish whether the desired multi layer coating structure was accomplished or not. When said multi layer coating structure is accomplished over the full width of the support, the surface colour of the coated support would be homogenous, whereas when said multi layer structure is not appropriately achieved over the full width of said support the surface colour of the side edges of said support would be different from the surface colour near the center thereof.

[0032] A number of tests were run, varying the flow ratio of the third coating solution relative to the second coating solution and/or of the third coating solution relative to the fourth coating solution and the viscosities of the second, third and fourth coating solutions. Depending on the flow ratio and/or viscosity, as will be discussed hereafter, different colourings of the layer structure were observed. At the side edges of the support a magenta band could be observed when the desired multi layer structure was not reached, the width of said magenta band being an indication of the disturbance of the streams of second II and third III coating solutions. The wider said magenta band, the higher said disturbance. Said magenta band is the result of the absence of or at least insufficient covering of the third, middle layer 33 by the second coating solution, containing cyan dye. The width of the magenta band does indicate an unevenness of thickness of said coated layers. By adjusting the viscosity and/or the flow ratio of said coating solutions the width of the magenta band could be minimized meaning optimisation of the multi layer structure. The influence of the flow ratio between the third 33 and fourth layers 34 on the width of the magenta bands (centimeters) is shown in Fig. 7a. The influence of the viscosity of the third coating solution III on said width of the magenta band (centimeters) is shown in Fig. 7b, whereas the influence of the viscosity of the second coating solution II (second 32 and fourth layer 34) on said width of the magenta band (centimeters) is shown in Fig. 7c. The viscosities are measured in cP.

[0033] An optimum result was reached using a second coating solution II for the second 32 and fourth layer 34 having a viscosity of more than 130cP, the viscosity of the third coating solution III (third layer 33) being less than 40 cP. Also an optimum result was reached when the flow ratio between the coating solutions II, III for the third 33 and second layer 32 and 33 the flow ratio between the coating solutions II, III for the third and fourth layer 34 was chosen less than 0.5. This resulted in photographic paper having a multi layer structure with layers 31-35 having good evenness of thickness of each of the layers over the full width of said paper support 2. Experiments showed that the ratio between viscosities of the third coating solution III and the second coating solution II and/or fourth coating solution II, (in the embodiment of Fig. 6b or IV (in the embodiment of Fig 6c) should preferably be less than 0.5, whereas very good results were reached when said ratio was about 0.25 or less. Similar experiments showed that the flow ratio between the third and second coating solutions (III and II) and/or third and fourth coating solutions (III and II in the embodiment of Fig. 6b) (III and IV in the embodiment of Fig 6c) should preferably be less than 0.75, whereas best results were reached when said ratio was less than 0.5, as indicated above.

[0034] The present invention is by no means limited to the embodiments as shown and discussed hereabove. Many variations should be considered as falling within the scope of the present invention as defined by the accompanying claims.

[0035] In a coating head according to the present invention, different numbers of cavities and nozzles can be used, at least one of said nozzles being according to the present invention. Moreover, said nozzles can have a different number of compartments, chosen appropriately with respect to the number of layers desired. The nozzles could have a different but similar design and could for example be connected to both sides of a cavity. Moreover, the or each dividing wall of said nozzle could extend beyond the attachment means 111, 211, 311, during use, into the lower end of the cavity to which the nozzle is attached, such that during use the compartments extend into said cavity. A nozzle, preferably according to the present invention, could be attached to the underside of the cavity, providing for a more straight path of travel of the coating solutions. Different attachment means and supply means could be provided, depending on for example the coating solutions to be used. A similar coating head could also be used with different means for supplying the support to be multi layer coated, as long as the coating solutions can flow onto said support.

Claims

1. Method for forming photographic material by multi layer coating of a support (2) in which a number of layers I-V of coating material is positioned on a support (2) by supplying said coating materials through nozzles (8, 9, 10; 109, 209; 309) into slot-like (5, 6, 7) cavities, wherein the coating materials are forced out of said cavities (5, 6, 7) onto a sloping surface (4) of a coating head (3), forming a stream of multi layer coating material which flows onto said support (2), **characterised in that** at least one of the nozzles (9, 109, 209, 309) is provided with means for introducing at least two separate streams (II, III, IV) of coating material for forming at least two separate layers to a cavity (6) attached thereto, such that a number of layers (I-V) is brought onto said surface (4) of said coating head (3) and onto said support (2) being at least one higher than the number of

slots provided.

2. Method according to claim 1, wherein through said at least one nozzle (309) at least three separate streams of coating material are introduced into the cavity attached thereto.

3. Method according to claim 2, wherein at least three different coating materials are introduced through said at least one nozzle (309).

4. Method according to any one of the preceding claims, wherein streams of coating material are provided through at least three subsequent slots (5, 6, 7), wherein through at least one slot (6), positioned between the slots (5, 7) being first and last in the row of subsequent slots, at least two separate streams of coating material are provided.

5. Method according to any one of the preceding claims, wherein three layers (II, III, IV) are provided by one nozzle (309), of which a middle layer is made of a material having a viscosity being low relative to the viscosity of one of the coating materials of the layers next thereto.

6. Method according to claim 5, wherein the ratio of viscosities between the middle layer and one of the layers next to it of said three layers is less than 0.5.

7. Method according to claim 6, wherein the ratio of viscosities between the middle layer and one of the layers next to it of said three layers is less than 0.25.

8. Method according to any one of the preceding claims, wherein at least three layers are provided by one nozzle, wherein the ratio of velocity between the middle layer and one of the layers next thereto of said three layers is less than 1.

9. Method according to claim 8, wherein said ratio is less than 0,75.

10. Method according to claim 9, wherein said ratio is less than 0,5.

11. Device for forming photographic material by multi layer coating a support (2), comprising a number of slot-like cavities (5, 6, 7), nozzle means (8, 9, 10, 109, 209, 309) being connected to each cavity (5, 6, 7), through which coating material can be forced through said cavity (5, 6, 7) attached thereto, wherein a coating head (3) is provided having a sloping surface (4) for guiding said coating materials from said cavities (5, 6, 7) onto a support (2), **characterized in that** at least one of said nozzle means (9, 109, 209, 309) is provided with at least two separate compartments (117, 118; 217, 218,219; 317, 318, 319) connected to one cavity, at least one of said compartments being connectable to supply means for a first coating material, at least one further compartment being connectable to supply means for a second coating material, such that at least two separate streams of coating materials (I-V) can be introduced from said nozzle, through the cavity (5, 6, 7) attached thereto and onto said support (2).

12. Device according to claim 11, wherein at least two cavities (5, 6, 7) are provided, separate nozzles being provided for each cavity.

13. Device according to any one of claims 11 or 12, wherein said at least one nozzle means (109, 209, 309) is provided with at least two compartments (117, 118; 217, 218, 219; 317, 318, 319) positioned at least beside each other seen in a direction perpendicular to the direction of outflow of said nozzle.

14. Device according to any one of claims 11-13, wherein said at least one nozzle (109, 209, 309) has at least two flow channels (117, 118; 217, 218, 219; 317, 318, 319) with a elliptical or rectangular cross section, at least two supply channels being connected to the first ends of said flow channels, the opposite ends thereof being open.

15. Device according to claim 14 wherein said at least one nozzle (109, 209, 309) has at least one dividing wall (121, 221, 321) extending vertically.

16. Nozzle for use in a device for forming photographic material by multi layer coating a support according to any one of claims 11-15, said nozzle having at least two flow channels and at least two supply channels being connectable to the first ends of said flow channels, wherein said flow channels (117, 118; 217, 218, 219; 317, 318, 319) have a first end (122, 222, 322) connectable to a cavity (5, 6, 7) of a coating head (3), the direction of flow through said first end being parallel to the longitudinal direction of said cavity.

Patentansprüche

1. Verfahren zum Erzeugen von fotografischem Material durch mehrschichtiges Überziehen eines Trägers (2), indem eine Anzahl von Schichten (I-V) von Beschichtungsmaterial auf einem Träger (2) abgeschieden wird, indem die Beschichtungsmaterialien durch Düsen (8, 9, 10; 109, 209; 309) zu schlitzähnlichen Hohlräumen (5, 6, 7) zugeführt werden, worin die Beschichtungsmaterialien aus den Hohlräumen (5, 6, 7) auf eine geneigte Oberfläche (4) eines Beschichtungskopfes (3) gedrückt werden, und dabei

einen Strom von Mehrschichtüberzugsmaterial erzeugen, das auf den Träger (2) fließt, **dadurch gekennzeichnet, dass** mindestens eine der Düsen (9, 109, 209, 309) mit einem Mittel zum Zuführen von mindestens zwei separaten Strömen (II, III, IV) von Beschichtungsmaterial ausgestattet ist, um mindestens zwei separate Schichten auf einem Hohlraum (6), der daran angebracht ist, auszubilden, so dass eine Anzahl von Schichten (I-V) auf die Oberfläche (4) des Beschichtungskopfes (3) und auf den Träger (2) gebracht wird, so dass sie zumindest um eins mehr als die Anzahl der bereitgestellten Schlitze ist.

2. Verfahren nach Anspruch 1, worin durch die mindestens eine Düse (309) mindestens drei separate Ströme von Beschichtungsmaterial in den Hohlraum, der daran angebracht ist, zugeführt werden.

3. Verfahren nach Anspruch 2, worin die mindestens drei verschiedenen Beschichtungsmaterialien durch die mindestens eine Düse (309) zugeführt werden.

4. Verfahren nach einem der vorherigen Ansprüche, worin Ströme von Beschichtungsmaterial durch mindestens drei aufeinanderfolgende Schlitze (5, 6, 7) bereit gestellt werden, worin durch mindestens einen Schlitz (6), der zwischen den Schlitzen (5, 7), die der erste und der letzte in der Reihe von aufeinanderfolgenden Schlitzen sind, liegt, mindestens zwei separate Ströme von Beschichtungsmaterial bereitgestellt werden.

5. Verfahren nach einem der vorherigen Ansprüche, worin drei Schichten (II, III, IV) durch eine Düse (309) bereitgestellt werden, wovon eine mittlere Schicht aus einem Material mit einer Viskosität gemacht ist, die niedrig relativ zur Viskosität von einem der Beschichtungsmaterialien der nächsten Schichten ist.

6. Verfahren nach Anspruch 5, worin das Verhältnis der Viskositäten zwischen der mittleren Schicht und einem der nächsten Schichten der drei Schichten kleiner als 0,5 ist.

7. Verfahren nach Anspruch 6, worin das Verhältnis der Viskositäten zwischen der mittleren Schicht und einem der nächsten Schichten der drei Schichten kleiner als 0,25 ist.

8. Verfahren nach einem der vorherigen Ansprüche, worin mindestens drei Schichten durch eine Düse bereitgestellt werden, worin das Verhältnis der Geschwindigkeit zwischen der mittleren Schicht und einem der nächsten Schichten der drei Schichten kleiner als 1 ist.

9. Verfahren nach Anspruch 8, worin das Verhältnis kleiner als 0,75 ist.

10. Verfahren nach Anspruch 9, worin das Verhältnis kleiner als 0,5 ist.

11. Vorrichtung zum Erzeugen von fotografischem Material durch mehrschichtiges Überziehen eines Trägers (2), die eine Anzahl von schlitzähnlichen Hohlräumen (5, 6, 7) und Düsen (8, 9, 10, 109, 209, 309) umfasst, die mit jedem Hohlraum (5, 6, 7) verbunden sind, durch die Beschichtungsmaterial durch den Hohlraum (5, 6, 7), der daran angebracht ist, gedrückt werden kann, worin ein Beschichtungskopf (3) mit einer geneigten Oberfläche (4) zum Führen des Beschichtungsmaterials von den Hohlräumen (5, 6, 7) auf einen Träger (2) bereitgestellt ist, **dadurch gekennzeichnet, dass** mindestens eine der Düsen (9, 109, 209, 309) mit mindestens zwei separaten Teilen (117, 118; 217, 218, 219; 317, 318, 319), die mit einem Hohlraum verbunden sind, ausgestattet ist, wobei mindestens eines der Teile mit dem Versorgungsmittel für ein erstes Beschichtungsmäterial verbindbar ist, wobei mindestens ein weiterer Teil mit einem Versorgungsmittel für ein zweites Beschichtungsmaterial verbindbar ist, so dass mindestens zwei separate Ströme von Beschichtungsmaterialien (I-V) aus der Düse durch den Hohlraum (5, 6, 7), der daran angebracht ist, auf den Träger (2) zugeführt werden kann.

12. Vorrichtung nach Anspruch 11, worin mindestens zwei Hohlräume (5, 6, 7), bereitgestellt sind, wobei getrennte Düsen für jeden Hohlraum bereitgestellt sind.

13. Vorrichtung nach einem der Ansprüche 11 oder 12, worin mindestens eine Düse (109, 209, 309) mit mindestens zwei Teilen (117, 118; 217, 218, 219; 317, 318, 319) bereitgestellt sind, die Seite an Seite angeordnet sind, wenn man sie in einer Richtung sieht, die senkrecht zur Ausflussrichtung der Düse ist.

14. Vorrichtung nach einem der Ansprüche 11-13, worin mindestens eine Düse (109, 209, 309) mindestens zwei Fließkanäle (117, 118; 217, 218, 219; 317, 318, 319) mit einem elliptischen oder rechtekkigen Querschnitt aufweist, wobei mindestens zwei Versorgungskanäle mit den ersten Enden der Fließkanäle verbunden sind, wobei die gegenüberliegenden Enden offen sind.

15. Vorrichtung nach Anspruch 14, worin mindestens eine Düse (109, 209, 309) mindestens eine Trennwand (121, 221, 321) aufweist, die sich vertikal erstreckt.

16. Düse zur Verwendung in einer Vorrichtung zur Erzeugung von fotografischem Material durch mehrschichtiges Überziehen eines Trägers gemäß einem der Ansprüche 11-15, wobei die Düse mindestens zwei Fließkanäle und mindestens zwei Versorgungskanäle aufweist, die mit den ersten Enden der Fließkanäle verbindbar sind, worin die Fließkanäle (117, 118; 217, 218, 219; 317, 318, 319) ein erstes Ende (122, 222, 322) aufweisen, die mit einem Hohlraum (5, 6, 7) eines Beschichtungskopfes (3) verbindbar sind, wobei die Fließrichtung durch das erste Ende parallel zur longitudinalen Richtung des Hohlraums ist.

Revendications

1. Procédé pour former un matériau de surface sensible photographique par application multicouche d'un support (2) dans lequel un nombre de couches I à V de matériau de revêtement est positionné sur un support (2) en fournissant lesdits matériaux de revêtement à travers des buses (8, 9, 10 ; 109, 209 ; 309) dans des cavités en forme de fentes (5, 6, 7), dans lequel les matériaux de revêtement sont forcés de sortir desdites cavités (5, 6, 7) jusque, sur une surface en pente (4) d'une tête d'enduction (3), formant un courant de matériau de revêtement multicouche qui coule jusque sur ledit support (2), **caractérisé en ce qu'**au moins une des buses (9, 109, 209, 309) est pourvue de moyens pour introduire au moins deux courants séparés (II, III, IV) de matériau de revêtement pour former au moins deux couches séparées dans une cavité (6) attachée à celle-ci, de sorte qu'un nombre de couches (1 à 11) est amené jusque sur ladite surface (4) de ladite tête d'enduction (3) et jusque sur ledit support (2) étant au moins un de plus que le nombre de fentes prévues.

2. Procédé selon la revendication 1, dans lequel à travers ladite au moins une buse (309) au moins trois courants séparés de matériau de revêtement sont introduits dans la cavité attachée à celle-ci.

3. Procédé selon la revendication 2, dans lequel au moins trois matériaux de revêtement différents sont introduits à travers ladite au moins une busc (309).

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel des courants de matériau de revêtement sont fournis à travers au moins trois fentes (5, 6, 7), dans lequel à travers au moins une fente (6), positionnée entre les fentes (5, 7) étant les première et dernière dans le rang de fentes successives, au moins deux courants séparés de matériau de revêtement sont fournis.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel trois couches (II, III, IV) sont fournies par une buse (309), parmi lesquelles une couche médiane est réalisée à partir d'un matériau ayant une viscosité étant inférieure par rapport à la viscosité d'un des matériaux de revêtement des couches à côté de celle-ci.

6. Procédé selon la revendication 5, dans lequel le rapport de viscosités entre la couche médiane et une des couches à côté de celle-ci parmi lesdites trois couches est inférieur à 0,5.

7. Procédé selon la revendication 6, dans lequel le rapport de viscosités entre la couche médiane et une des couches à côté de celle-ci parmi lesdites trois couches est inférieur à 0,25.

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel au moins trois couches sont fournies par une buse, dans lequel le rapport de vélocité entre la couche médiane et une dès couches à côté de celle-ci parmi lesdites trois couches est intérieur à 1.

9. Procédé selon la revendication 8, dans lequel ledit rapport est inférieur à 0,75.

10. Procédé selon la revendication 9, dans lequel ledit rapport est inférieur à 0,5.

11. Dispositif pour former un matériau de surface sensible photographique en appliquant un revêtement multicouche sur un support (2) comprenant un nombre cavités en forme de fente (5, 6, 7), des moyens de buse (8, 9, 10, 109, 209, 309) étant raccordés à chaque cavité (5, 6, 7), à travers lesquels le matériau de revêtement peut être forcé à travers ladite cavité (5, 6, 7) attachée à celle-ci, dans lequel une tête d'enduction (3) est fournie ayant une surface en pente (4) pour guider lesdits matériaux de revêtement à partir desdites cavités (5, 6, 7) jusque sur un support (2), **caractérisé en ce qu'**au moins un desdits moyens de buse (9, 109, 209, 309) est pourvu d'au moins deux compartiment séparés (117, 118 ; 217, 218, 219 ; 317, 318, 319) raccordés à une cavité, au moins un desdits compartiment pouvant être raccordé à des moyens d'alimentation pour un premier matériau de revêtement, au moins un autre compartiment pouvant être raccordé à des moyens d'alimentation pour un second matériau de revêtement, de sorte qu'au moins deux courants séparés de matériaux de revêtement (I à V) peuvent être introduits à partir de ladite buse, à travers la cavité (5, 6, 7) attachée à celle-ci et jusque sur ledit support (2).

12. Dispositif selon la revendication 11, dans lequel au

moins deux cavités (5, 6, 7) sont fournies, séparées des buses étant fournies pour chaque cavité.

13. Dispositif selon l'une quelconque des revendications 11 ou 12, dans lequel ledit au moins un moyen de buse (109, 209, 309) est pourvu d'au moins deux compartiment (117, 118 ; 217, 218, 219 ; 317, 318, 319) positionnés au moins à côté l'un de l'autre vus dans une direction perpendiculaire à la direction de sortie de ladite buse.

14. Dispositif selon l'une quelconque des revendications 11 à 13, dans lequel ladite au moins une buse (109, 209, 309) a au moins deux canaux d'écoulement (117, 118 ; 217, 218, 219 ; 317, 318, 319) avec une section transversale elliptique ou rectangulaire, au moins deux canaux d'alimentation étant raccordés aux premières extrémités desdits canaux d'écoulement, les extrémités opposées de ceux-ci étant ouvertes.

15. Dispositif selon la revendication 14 dans lequel ladite au moins une buse (109, 209, 309) a au moins une paroi de séparation (121, 221, 321) s'étendant verticalement.

16. Buse destinée à être utilisée dans un dispositif pour former un matériau de surface sensible photographique en appliquant un revêtement multicouche sur un support selon l'une quelconque, des revendications 11 à 15, ladite buse ayant au moins deux canaux d'écoulement et au moins deux canaux d'alimentation pouvant être raccordés aux premières extrémités desdits canaux d'écoulement, dans laquelle lesdits canaux d'écoulement (117, 118 ; 211, 218, 219 ; 317, 318, 319) ont une première extrémité (122, 222, 322) pouvant être raccordée à une cavité (5, 6, 7) d'une tête d'enduction (3), la direction d'écoulement à travers ladite première extrémité étant parallèle à la direction longitudinale de ladite cavité.

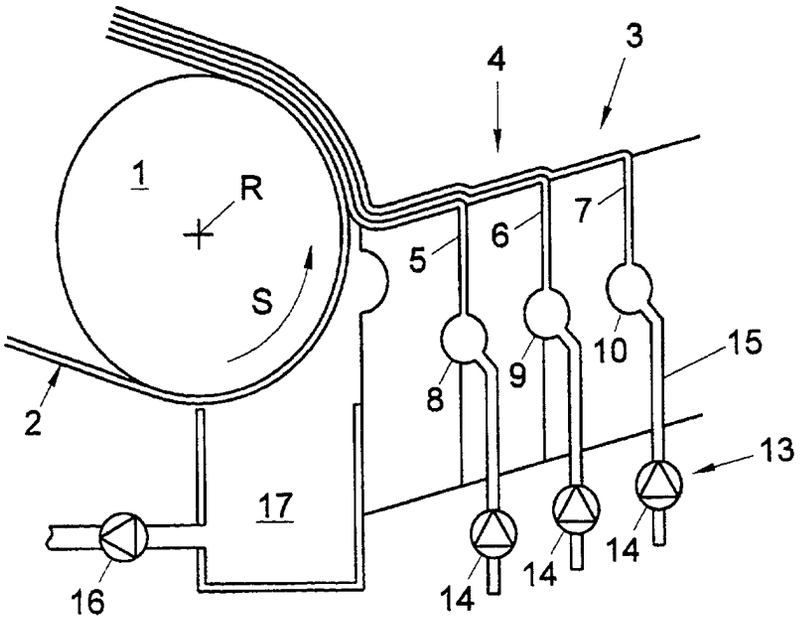


Fig. 1

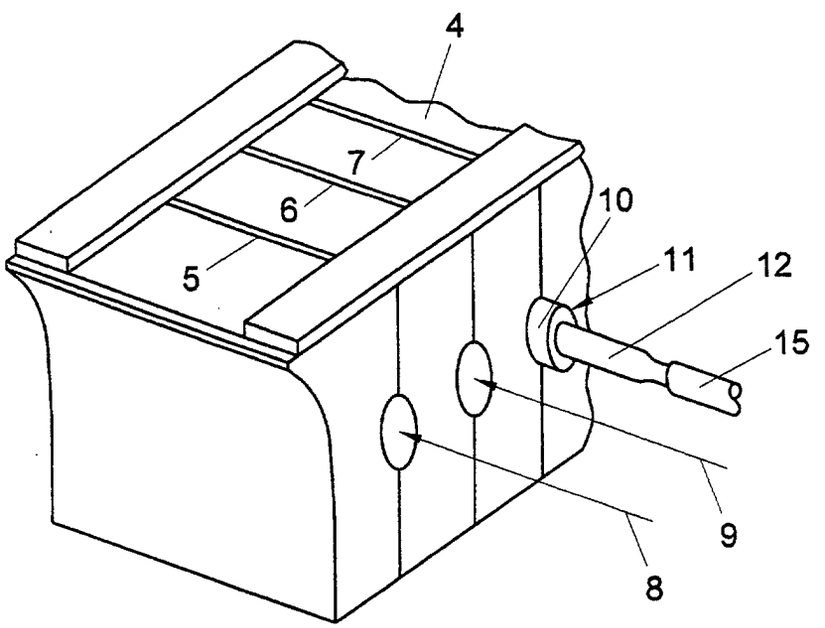


Fig. 2

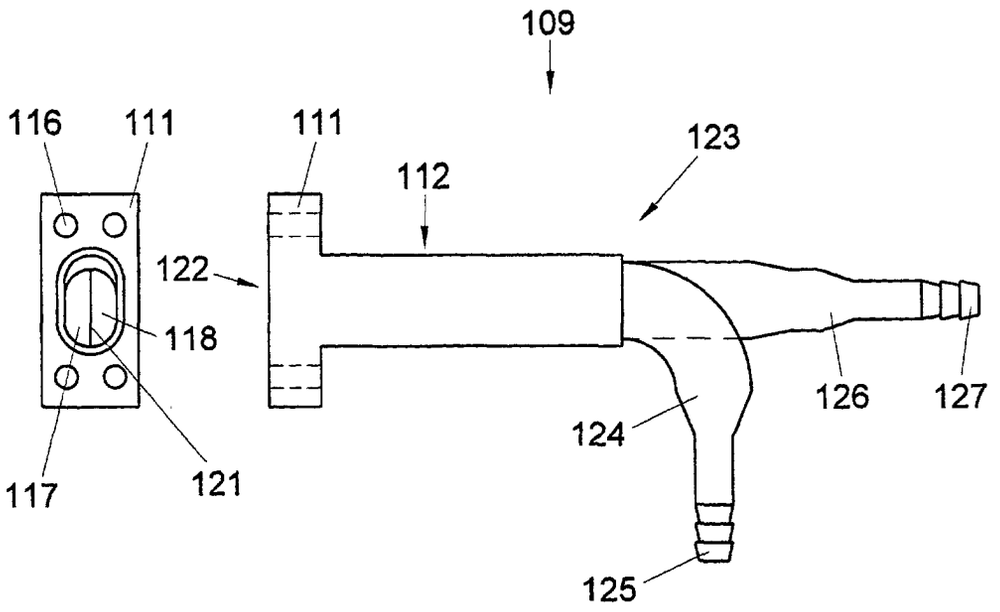
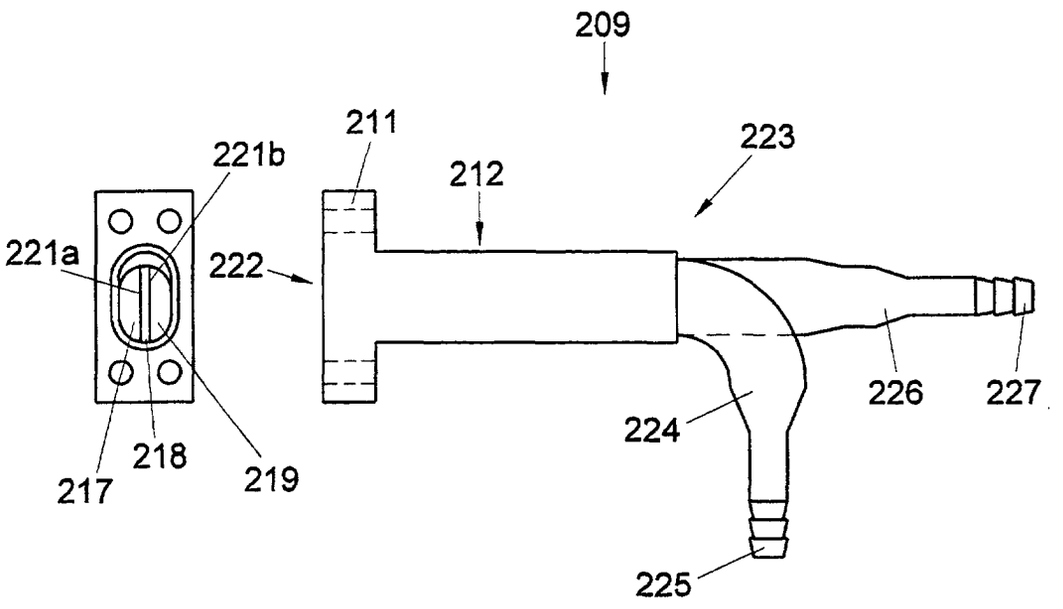

109
116
111
111
123
112
122
118
126
127
124
117
121
125

Fig. 3


209
211
221b
223
212
221a
222
226
227
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217
218
219
225

Fig. 4

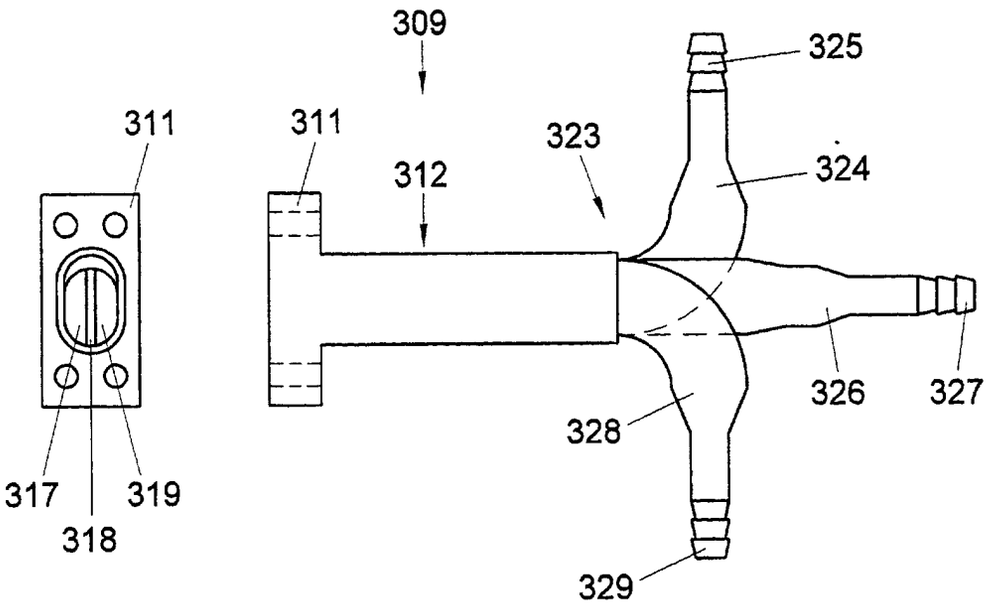

Fig. 5

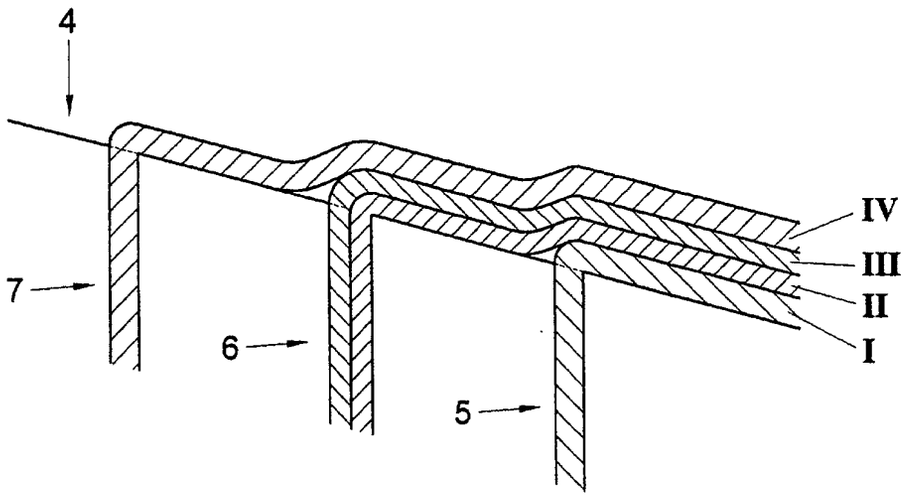

Fig. 6a

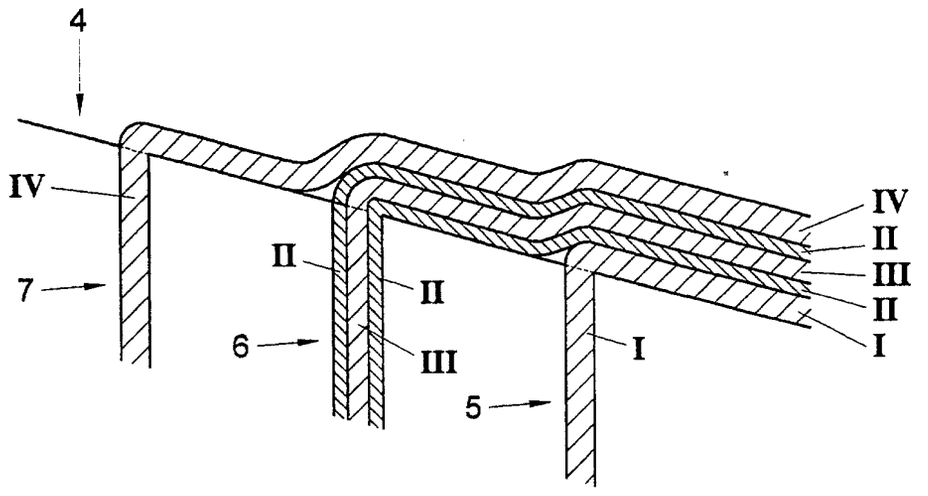

Fig. 6b

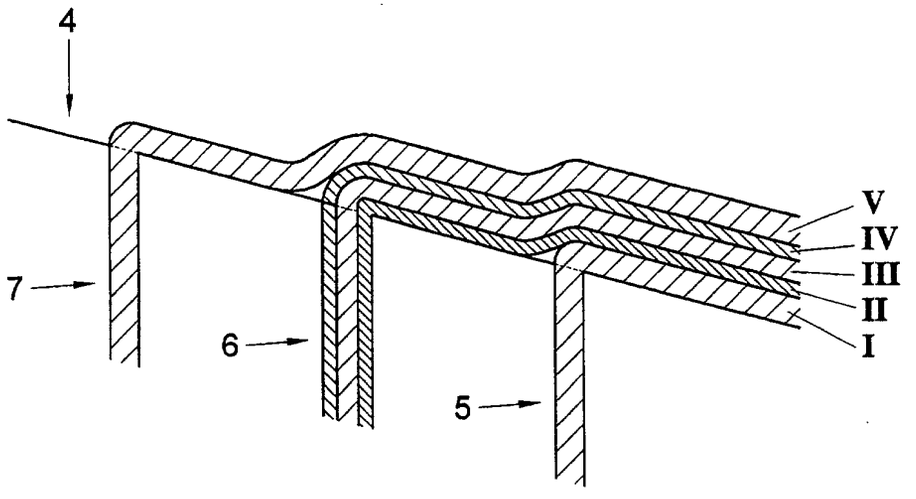

Fig. 6c

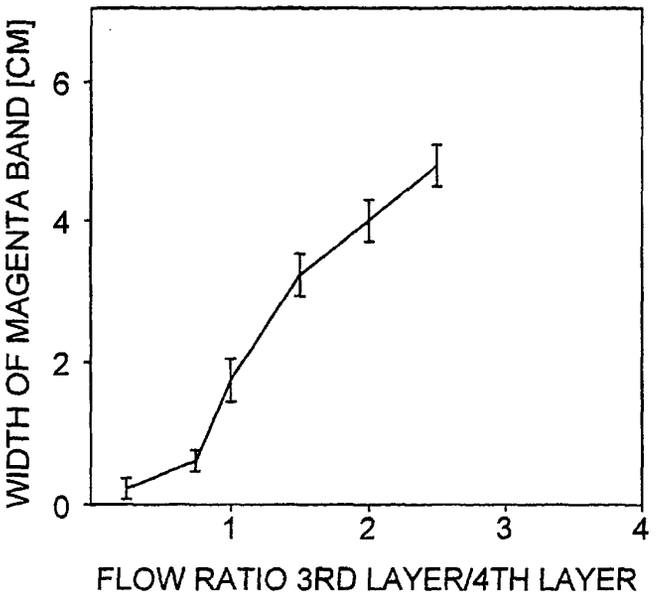

Fig. 7a

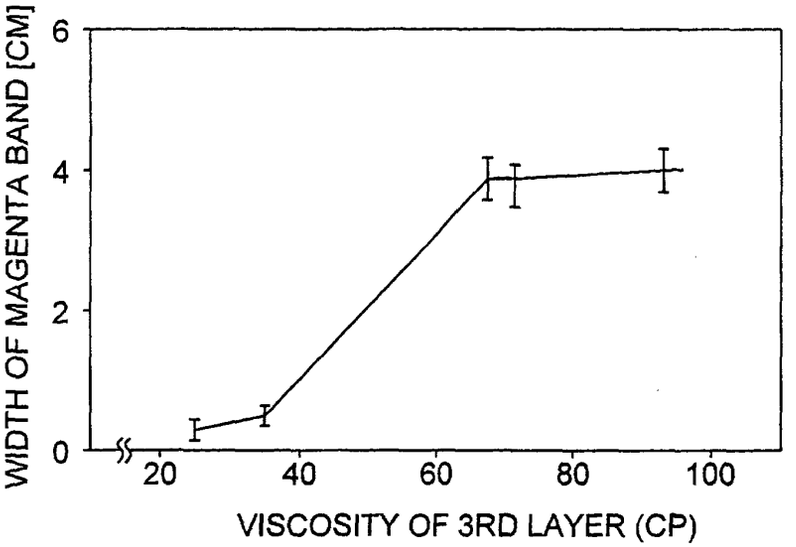

Fig. 7b

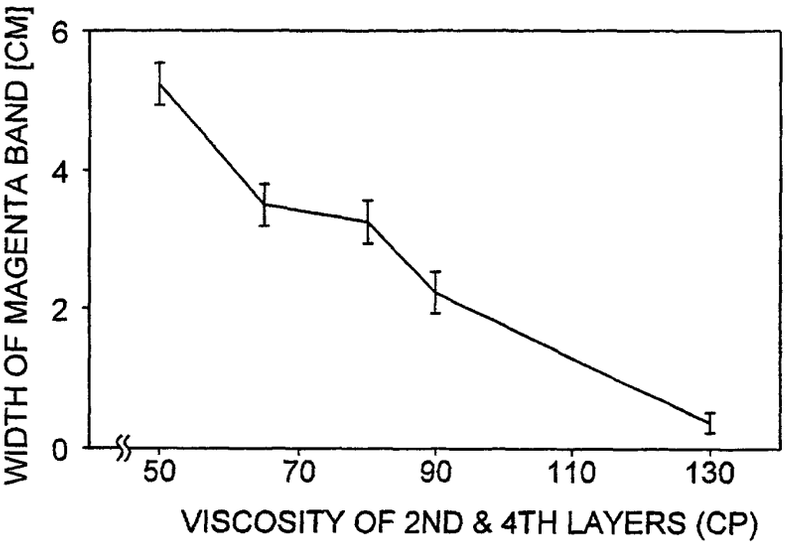

Fig. 7c