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Description

The present invention relates to improvements in high speed image reproduction. More particularly, the invention is concerned with an improved method and system for reproducing an image by the electro-coagulation of an electrolytically coagulable colloid.

Applicant has already described in his U.S. Patent No. 3,892,645 of July 1, 1975 an electric printing method and system in which a thin layer of a liquid composition containing a colloid such as gelatin or albumin, water and an electrolyte is interposed between at least one pair of opposite negative and positive electrodes spaced from one another to define a gap which is filled by the liquid composition. In one embodiment, there is a plurality of electrically-insulated juxtaposed negative electrodes and selected ones thereof are electrically energized to pass electric pulses through the layer at selected points to cause point by point selective coagulation and adherence of the colloid on the positive electrode directly opposite each energized negative electrode, thereby forming imprints.

It is very important that the gap between the negative and positive electrodes be uniform throughout the active surfaces of the electrodes since otherwise there will be a variation in the thickness of the layer and thus a corresponding variation of the electrical resistance thereof at different locations between the electrodes, which will result in a non-uniform image reproduction as the thickness of the coagulated colloid is proportional to the amount of current passed through the layer. Since this gap is of the order to 50 µ, its uniformity is of course very difficult to control. Moreover, where the negative electrodes are energized more than once in the reproduction of an image, these become polarized resulting in a gas generation and accumulation at the negative electrodes, which adversely affect the image reproduction.

It is therefore an object of the present invention to overcome the aforementioned drawbacks and to provide a method and system for reproducing an image by the electro-coagulation of a colloid, which do not necessitate a critical control of the electrode gap nor cause electrode polarization which may hinder the image reproduction.

According to one aspect of the invention, there is provided a method of reproducing an image by electro-coagulation of an electrolytically coagulable colloid, which comprises the steps of:

a) providing a plurality of negative and positive electrolytically inert electrodes electrically insulated from one another and arranged to define a matrix of dot-forming elements, the negative and positive electrodes of each matrix element having respective planar active surfaces with the negative electrode active surface extending in the same plane as the positive electrode active surface and in close proximity thereto;

b) applying a layer of a substantially liquid colloidal dispersion over the negative and positive electrode active surfaces of the matrix elements whereby the negative and positive electrode active surfaces are disposed on the same side of the layer of colloidal dispersion, the colloidal dispersion containing an electrolytically coagulable colloid, a liquid dispersing medium and a soluble electrolyte and having a substantially uniform temperature throughout the layer;

c) generating an electrical field between the negative and positive electrodes of selected ones of the matrix elements, the electrical field extending substantially parallel to the planar active surfaces of the negative and positive electrodes, whereby to cause selective coagulation and adherence of the colloid onto the positive electrode active surfaces of the selected matrix elements, thereby forming a series of corresponding dots representative of a desired image; and

d) removing any remaining non-coagulated colloid.

The invention also provides, in a further aspect thereof, a system for reproducing an image by electro-coagulation of an electrolytically coagulable colloid, which comprises:

a plurality of negative and positive electrolytically inert electrodes electrically insulated from one another and arranged to define a matrix of dot-forming elements, the negative and positive electrodes of each matrix element having respective planar active surfaces with the negative electrode active surface extending in the same plane as the positive electrode active surface and in close proximity thereto, the electrode active surfaces being adapted to receive thereover a layer of a substantially liquid colloidal dispersion containing an electrolytically coagulable colloid, a liquid dispersing medium and a soluble electrolyte and having a substantially uniform temperature throughout the layer; and

means for electrically energizing the negative and positive electrodes of selected ones of the matrix elements to cause selective coagulation and adherence of the colloid onto the positive electrode active surfaces of the selected matrix elements and to thereby form a series of corresponding dots representative of a desired image.

Thus, according to the invention, since the active surfaces of the negative and positive electrodes are no longer disposed opposite one another in different planes, but rather extend in substantially the same plane, there is no longer any necessity of having to control in precise manner the thickness of the layer of colloidal dispersion applied. Also, since the electrodes of each dot-forming matrix element are energized only once in the reproduction of an image, there are barely any electrode polarization and resulting gas accumulation that may hinder the image reproduction.

In a preferred embodiment of the invention, the negative and positive electrodes of the matrix comprise respectively first and second sets of mutually electrically-insulated band-like electrode

members disposed in parallel side-by-side relation, the negative electrode members of the first set extending transversely of the positive electrode members of the second set and being formed with a plurality of protruding conductive elements which are spaced along the length thereof and each have a planar active end surface. The protruding elements of each negative electrode member extend through corresponding bores formed in the positive electrode members to terminate flush therewith such that the planar active end surface of each protruding element and a planar active surface portion of each positive electrode member adjacent each bore extend in a substantially common plane whereby to define the aforesaid matrix elements. Thus, the electrical energizing of the negative and positive electrodes of selected matrix elements may be effected by sequentially energizing the electrode members of one set and concurrently energizing selected ones of the electrode members of the other set. Preferably, the positive electrode members are sequentially energized while selected ones of the negative electrode members are concurrently energized.

The concurrent selective energizing of the electrode members of the other set is advantageously effected by sweeping such electrode members and transmitting electrical pulses to selected ones thereof during sweeping. These electrical pulses can be varied either in voltage or time from one electrode member to another so as to correspondingly vary the amount of coagulated colloid adhered onto the positive electrode active surfaces of the selected matrix elements. This enables one to form dots of varying intensities and thus to reproduce the half-tones of an image.

The colloid generally used is a linear colloid of high molecular weight, that is, one having a molecular weight comprised between about 10,000 and about 1,000,000, preferably between 100,000 and 500,000. Examples of suitable colloids include animal proteins such as albumin, gelatin and casein, vegetable proteins such as agar and synthetic copolymers such as polyacrylic acid, polyacrylamide, polyvinyl alcohol and derivatives thereof. Water is preferably used as the medium for dispersing the colloid to provide the desired colloidal dispersion.

The colloidal dispersion also contains a soluble electrolyte which enables the water to have a greater conductivity; the water is believed to migrate under direct current towards the negative electrode and thereby cause the colloidal dispersion to dry out, resulting in coagulation of the colloid and adherence thereof onto the positive electrode. Examples of suitable electrolytes include chlorides and sulfates, such as potassium chloride, sodium chloride, calcium chloride, nickel chloride, lithium chloride, ammonium chloride, and manganese sulfate. Since the speed of electrocoagulation is affected by temperature, the layer of colloidal dispersion must be maintained at a substantially constant temperature, for instance by using a thermostatic water jacket, in order to ensure a uniform image reproduction.

After coagulation of the colloid, any remaining non-coagulated colloid is removed by any suitable means, such as by washing off, airjet or wiping to fully uncover the coagulated colloid.

The applications of the invention are basically the same as those mentioned in Applicant's U.S. Patent No. 3,892,645. For example, the coagulated colloid can be colored with a hydrotypic pigment which is absorbed thereby and the colored coagulated colloid may then be transferred onto an end-use support, such as paper. The coagulated colloid can also be set or hardened chemically or by irradiation so as to be used for offset lithographic printing. Moreover, it is possible to produce several differently colored images of coagulated colloid which can be transferred onto an end-use support in superimposed relation to provide a polychromatic image.

Further features and advantages of the invention will become more readily apparent from the following description of preferred embodiments thereof as illustrated by way of examples in the accompanying drawings, in which:

Figure 1 schematically illustrates an image reproduction system according to the invention, the dot matrix printer of which is shown partially cut away;

Figure 2 is fragmentary exploded view of the dot matrix printer shown in Fig. 1;

Figure 3 is a sectional view taken along line 3-3 of Fig. 1;

Figure 4 is another sectional view taken along line 4-4 of Fig. l;

Figure 5 is a top view of a matrix element of the dot matrix printer shown in Fig. 1; and

Figure 6 is a view similar to Fig. 5 but showing a different type of matrix element.

The image reproduction system illustrated in Fig. 1 includes a dot matrix printer which is generally designated by reference numeral 10 and comprises two superimposed sets of electrically-insulated negative and positive band-like electrode members 12 and 14 disposed in parallel side-by-side relation, the negative electrode members 12 extending transversely of the positive electrode members 14 to define at their intersections a plurality of dot-forming matrix elements 16. Each negative electrode member 12 is electrically connected to a sweeping device 18 which is connected to the negative terminal of a direct current power supply 20 via a modulator 22 coupled to an electronic counter 24 operative to transmit electrical pulses to selected ones of the electrode members 12 during the sweeping thereof by the device 18. The modulator serves to vary the electrical pulses either in voltage or time. Each positive electrode member 14, on the other hand, is electrically connected to another sweeping device 18' which is connected to the positive terminal of the power supply 20. Thus, the electrodes of selected ones of the matrix elements 16 are electrically energized by sequentially energizing the positive electrode members 14 with the sweeping device 18' and concurrently sweeping the negative electrode members 12 with the device

18 while transmitting with the counter 24 electrical pulses to selected electrode members 12, which are modulated either in voltage or time by the modulator 22.

As shown in Figs. 2-4, the negative and positive electrode members are electrically insulated from one another by means of a layer of insulating material 26 having a thickness of about 10 μ. The negative electrode members 12 are also electrically insulated from one another by a layer of insulating material 28 having a thickness of about 25 μ. The positive electrode members 14 are similarly insulated by means of a layer of insulating material 30 having a thickness of about 10 to 25 μ, preferably 10 μ. Each negative electrode member 12 is formed with a plurality of protruding conductive elements 32 of circular cross-section which are spaced along the length thereof and each have a planar active end surface 34. The protruding elements 32 of each negative electrode 12 extend through corresponding bores 36 formed in the positive electrode members 14 to terminate flush therewith such that the planar active end surface 34 of each element 32 and a planar active surface portion 38 of a positive electrode member 14 adjacent a bore 36 extend in a common plane. Each protruding element 32 is of course electrically insulated from its adjacent positive electrode member 14 by means of a layer of insulating material 40 such as silicon monoxide, having a thickness of about 5 to 10 μ, preferably 10 μ.

Thus, the planar end surface 34 of each protruding element 32 and the planar surface portion 38 of each positive electrode member 14 adjacent each element 32 constitute the electrode active surfaces of each dot-forming matrix element 16. Each matrix element preferably has a square surface area of about 125 μ x 125 μ, the protruding element 32 of each matrix element 16 being disposed centrally thereof and having a diameter of about 25 to 50 μ; the elements 32 are therefore invisible to the naked eye. The dot matrix printer 10 comprises about 40,000 of such matrix elements 16 per square inch.

The negative electrode members 12 can be made of any metal, copper or stainless steel being preferred. However, the positive electrode members 14 must be made of a metal that will resist electrolytic attack and enhance electro-coagulation, such as stainless steel, aluminum, nickel, chromium or tin, these metals being electronegative with respect to hydrogen. The surfaces 38 of the positive electrode members 14 are advantageously unpolished to enhance the adherence of the coagulated colloid thereon. The electrode members 14 can be produced by ion sputtering and can thus be as thin as 10 μ.

In order to reproduce an image with the system just described, a layer of a liquid colloidal dispersion containing a colloid such as gelatin or albumin, water and an electrolyte such as potassium chloride, and having a substantially uniform temperature throughout the layer, is applied over the surface of the dot matrix printer 10. The sweeping devices 18 and 18' and the counter 24 are then activated so as to electrically energize the electrodes of selected ones of the matrix elements 16 and thereby cause selective coagulation and adherence of the colloid onto the positive electrode active surfaces 38 of the selected matrix elements, the coagulated colloid 42 forming a series of corresponding dots representative of the desired image.

The layer of insulating material 30 between the positive electrode members 14 should be as thin as possible so as to provide a continuous image and not one which is streaked. The layer of insulating material 40 surrounding each protruding element 32 should also be as thin as possible since the thinner the layer 40 the faster is the speed of electro-coagulation.

Instead of having matrix elements 16 each formed with a single centrally disposed protruding element 32 as shown in Fig. 5, it is of course also possible to provide matrix elements 16' each formed with a plurality of spaced-apart elements 32 as represented in the embodiment illustrated in Fig. 6. Such an arrangement enables one to produce an image having a more uniform tone repartition.

With the image reproduction system described above, it has been observed that the power required to produce coagulation over a square surface area of about 125 μ x 125 μ is the charge of an electrolytic capacitor of 2 micro farads at 50 volts. In other words, using a power generator of 25 watts (50 V, 500 mA), one can produce about 100,000 dots per second.

Although the dot matrix printer 10 has been illustrated as having a planar display surface, it is apparent that the whole surfaces of the positive electrode members 14 which constitute the display surface of the printer 10 need not be planar, provided however that the electrode active surfaces of each matrix element be planar and extend in a substantially common plane. Thus, for example, a cylindrical dot matrix printer could be designed in which each matrix element would have the required characteristic just mentioned.

Claims

1. A method of reproducing an image by electro-coagulation of an electrolytically coagulable colloid, characterized in that it comprises the steps of:

a) providing a plurality of negative (12) and positive (14) electrically inert electrodes electrically insulated from one another and arranged to define a matrix of dot-forming elements, (16) the negative and positive electrodes of each said matrix element having respective planar active surfaces with the negative electrode active surface (34) extending in the same plane as the positive electrode active surface (38) and in close proximity thereto;

b) applying a layer of a substantially liquid colloidal dispersion over the negative and positive electrode active surfaces of said matrix

elements whereby the negative (34) and positive electrode active surfaces (38) are disposed on the same side of the layer of colloidal dispersion, said colloidal dispersion containing an electrolytically coagulable colloid, a liquid dispersing medium and a soluble electrolyte and having a substantially uniform temperature throughout said layer;

c) generating an electrical field between the negative and positive electrodes of selected ones of said matrix elements, said electrical field extending substantially parallel to the planar active surfaces of said negative and positive electrodes, whereby to cause selective coagulation and adherence of said colloid onto the positive electrode active surfaces (38) of said selected matrix elements, thereby forming a series of corresponding dots representative of a desired image; (42) and

d) removing any remaining non-coagulated colloid.

2. A method according to claim 1, characterized in that the negative and positive electrodes of said matrix comprise respectively first and second sets of mutually electrically-insulated band-like electrode members disposed in parallel side-by-side relation, the negative electrode members of said first set extending transversely of the positive electrode members of said second set and being formed with a plurality of protruding conductive elements (32) which are spaced along the length thereof and each have a planar active end surface, (34) the protruding elements of each said negative electrode member extending through corresponding bores (36) formed in said positive electrode members to terminate flush therewith such that the planar active end surface of each said protruding element (34) and a planar active surface portion (38) of each said positive electrode member adjacent each said bore extend in a substantially common plane whereby to define said matrix elements, and wherein step (c) is effected by sequentially energizing the electrode members of one set and concurrently energizing selected ones of the electrode members of the other set.

3. A method according to claim 2, characterized in that step (c) is carried out by sequentially energizing said positive electrode members and concurrently energizing selected ones of said negative electrode members.

4. A method according to claim 2, characterized in that the concurrent selective energizing of the electrode members of the other set is effected by sweeping said electrode members and transmitting electrical pulses to selected ones thereof during sweeping.

5. A method according to claim 4, characterized in that said electrical pulses are varied in voltage or time from one electrode member to another whereby to correspondingly vary the amount of coagulated colloid adhered onto the positive electrode active surfaces of said selected matrix elements.

6. A method according to claim 1, characterized in that it further includes the steps of coloring the coagulated colloid and transferring the colored coagulated colloid onto an end-use support.

7. A method according to claim 1, characterized in that it further includes the step of hardening the coagulated colloid whereby to use the hardened coagulated colloid for offset lithographic printing.

8. A method according to claim 1, characterized in that said colloid is a linear colloid having a molecular weight of about 10,000 to about 1,000,000.

9. A method according to claim 8, characterized in that said colloid has a molecular weight comprised between about 100,000 and about 500,000.

10. A method according to claim 8, characterized in that said colloid is selected from the group consisting of animal and vegetable proteins and synthetic copolymers.

11. A method according to claim 8, characterized in that said colloid is a synthetic copolymer selected from the group consisting of polyacrylic acid, polyacrylamide, polyvinyl alcohol and derivatives thereof, said dispersing medium is water and said electrolye is selected from the group consisting of potassium chloride, sodium chloride, calcium chloride, nickel chloride, lithium chloride, ammonium chloride, copper chloride and manganese sulfate.

12. A system for reproducing an image by electro-coagulation of an electrolytically coagulable colloid, characterized in that it comprises:

a plurality of negative (12) and positive (14) electrolytically inert electrodes electrically insulated from one another and arranged to define a matrix of dot-forming elements, (16) the negative and positive electrodes of each said matrix element having respective planar active surfaces with the negative electrode active surface (34) extending in the same plane as the positive electrode active surface (38) and in close proximity thereto, said electrode active surfaces being adapted to receive thereover a layer of a substantially liquid colloidal dispersion containing an electrolytically coagulable colloid, a liquid dispersing medium and a soluble electrolyte and having a substantially uniform temperature throughout said layer; and

means (20,22,18,18') for electrically energizing the negative and positive electrodes of selected ones of said matrix elements to cause selective coagulation and adherence of said colloid onto the positive electrode active surfaces of said selected matrix elements and to thereby form a series of corresponding dots representative of a desired image.

13. A system according to claim 12, characterized in that the negative (12) and positive electrodes (14) of said matrix comprise respectively first and second sets of mutually electrically-insulated band-like electrode members disposed in parallel side-by-side relation, the negative electrode members of said first set extending transversely of the positive electrode members of said second set and being formed with a plurality of protruding conductive elements (32) which are

spaced along the length thereof and each have a planar active end surface, (34) the protruding elements of each said negative electrode member extending through corresponding bores (36) formed in said positive electrode members to terminate flush therewith such that the planar active end surface (34) of each said protruding element and a planar active surface portion of each said positive electrode member adjacent (38) each said bore extend in a substantially common plane whereby to define said matrix elements, and wherein said electrical energizing means include means for sequentially energizing the electrode members of one set (18, 20, 22, 24) and means for concurrently energizing selected ones of the electrode members of the other set (18', 20).

14. A system according to claim 13, characterized in that said sequential energizing means comprises a sweeping device 18' connected to a positive terminal of a direct current power supply 20 and adapted to sweep said positive electrode members, and wherein said selective energizing means comprises a further sweeping device (18) connected to a negative terminal of said power supply (20) for sweeping said negative electrode members and a counting device (24) coupled to said further sweeping device for transmitting electrical pulses to selected ones of said negative electrode members during operation of said further coupling device.

15. A system according to claim 14, characterized in that it further includes modulating means (22) for varying said electrical pulses in voltage or time from one negative electrode member to another whereby to correspondingly vary the amount of coagulated colloid adhered onto the positive electrode active surfaces of said selected matrix elements.

16. A system according to claim 13, characterized in that each said matrix element (16) comprises a single said protruding element (32) disposed substantially centrally thereof.

17. A system according to claim 13, characterized in that each said matrix element (16) comprises a plurality of said protruding elements (32) arranged in spaced-apart relation to provide an image having a uniform tone repartition.

18. A system according to claim 16, characterized in that each said matrix element (16) has a square surface area of about 125 µ x 125 µ and wherein said single protruding element is circular in cross-section and has a diameter of about 25 to 50 µ.

19. A system according to claim 13, characterized in that each said protruding element (32) is electrically insulated from its adjacent positive electrode member by means of a layer of insulating material (26) having a thickness of about 5 to 10 µ.

20. A system according to claim 13, characterized in that said positive electrode members are electrically insulated from one another by means of a layer of insulating material (30) having a thickness of about 10 to 25 µ.

21. A system according to claim 20, characterized in that said layer of insulating material (30) has a thickness of about 10 µ.

22. A system according to claim 12, characterized in that said matrix comprises about 40,000 dot-forming matrix elements per square inch.

Patentansprüche

1. Verfahren zur Reproduktion eines Bildes durch Elektrokoagulation eines elektrolytisch koagulierbaren Kolloides, dadurch gekennzeichnet, daß es folgende Schritte umfaßt:

(a) Vorsehen einer Vielzahl von negativen (12) und positiven (14) elektrolytisch inerten Elektroden, die elektrisch voneinander isoliert und angeordnet sind, um eine Matrix (16) von punktbildenden Elementen zu bilden, wobei die negativen und positiven Elektroden jedes genannten Matrixelementes jeweilige planare aktive Flächen aufweist und sich die aktive Fläche (34) der negativen Elektrode in der gleichen Ebene wie die aktive Fläche (38) der positiven Elektrode und nahe zu dieser erstreckt;

(b) Aufbringen einer Schicht einer im wesentlichen flüssigen kolloidalen Dispersion über die gesamten aktiven Flächen der positiven und negativen Elektroden der genannten Matrixelemente, wodurch die aktiven Flächen (34) der negativen Elektroden und die aktiven Flächen (38) der positiven Elektroden auf der gleichen Seite der Schicht von kolloidaler Dispersion angeordnet sind und die genannte kolloidale Dispersion ein elektrolytisch koagulierbares Kolloid, ein flüssiges Dispergiermittel und einen löslichen Elektrolyten enthält und eine im wesentlichen gleichmäßige Temperatur über die gesamte genannte Schicht aufweist;

(c) Erzeugen eines elektrischen Feldes zwischen den negativen und positiven Elektroden ausgewählter der genannten Matrixelemente, wobei sich das elektrische Feld im wesentlichen parallel zu den planaren aktiven Flächen der genannten negativen und positiven Elektroden erstreckt, wodurch eine selektive Koagulation und Adhäsion des genannten Kolloides auf den aktiven Flächen (38) der positiven Elektroden des genannten ausgewählten Maxtrixelementes bewirkt wird und dadurch eine Reihe von entsprechenden Punkten bildet, die ein gewünschtes Bild (48) darstellen; und

(d) Entfernen gegebenenfalls zurückgebliebenen, nichtkoagulierten Kolloides.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die negativen und positiven Elektroden der genannten Matrix jeweils erste und zweite Sätze von gegenseitig elektrisch isolierten bandartigen Elektrodenelementen umfassen, die parallel und Seite an Seite zueinander angeordnet sind, wobei sich die negativen Elektrodenelemente des genannten ersten Satzes quer zu den positiven Elektrodenelementen des genannten zweiten Satzes erstrecken und mit einer Vielzahl von hervorragenden leitfähigen Elementen (32) ausgebildet sind, die im Abstand über die Länge

des Elementes angeordnet sind und von denen jedes eine planare aktive Endfläche (38) aufweist, wobei sich die hervorragenden Elemente jedes genannten negativen Elektrodenelementes durch entsprechende Bohrungen (36) in den genannten positiven Elektrodenelementen erstrecken, um auf gleicher Höhe mit diesen abzuschließen bzw. zu enden, sodaß die planare aktive Endfläche jedes genannten hervorragenden Elementes (34) und ein planarer aktiver Endabschnitt (38) jedes genannten positiven Elektrodenelementes angrenzend an jede Bohrung in einer im wesentlichen gemeinsamen Ebene erstrecken, wodurch sie die genannten Matrixelemente begrenzen, und worin der Schritt (c) durchgeführt wird, indem aufeinanderfolgend die Elektrodenelemente eines Satzes erregt und gleichzeitig ausgewählte Elektrodenelemente des anderen Satzes erregt werden.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß Schritt (c) durchgeführt wird, indem aufeinanderfolgend die genannten positiven Elektrodenelemente erregt und gleichzeitig ausgewählte der genannten negativen Elektrodenelemente erregt werden.

4. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß die gleichzeitige selektive Erregung der Elektrodenelemente des anderen Satzes durch Abtasten der genannten Elektrodenelemente und Obertragen von elektrischen Impulsen auf ausgewählte derselben während des Abtastens durchgeführt wird.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß die genannten elektrischen Impulse in bezug auf Spannung oder Zeitdauer von einem Elektrodenelement zum anderen variiert werden, um dadurch entsprechend die Menge an auf den aktiven Flächen der positiven Elektroden der genannten ausgewählten Matrixelemente haftendem, koaguliertem Kolloid zu variieren.

6. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß es weiters die Schritte des Färbens bzw. Kolorierens des koagulierten Kolloides und der Obertragung des gefärbten koagulierten Kolloides auf einen Endverwendungsträger umfaßt.

7. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß es weiters den Schritt des Härtens des koagulierten Kolloides umfaßt, wodurch das gehärtete koagulierte Kolloid für die Verwendung zum lithographischen Offsetdruck geeignet ist.

8. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das genannte Kolloid ein lineares Kolloid mit einem Molekulargewicht von etwa 10000 bis etwa 1000000 ist.

9. Verfahren nach Anspruch 8, dadurch gekennzeichnet, daß das genannte Kolloid ein Molekulargewicht zwischen etwa 100000 und etwa 500000 aufweist.

10. Verfahren nach Anspruch 8, dadurch gekennzeichnet, daß das genannte Kolloid aus der Gruppe gewählt ist, die aus tierischen und pflanzlichen Proteinen und synthetischen Copolymeren besteht.

11. Verfahren nach Anspruch 8, dadurch gekennzeichnet, daß das genannte Kolloid ein synthetisches Copolymer ist, das aus der Gruppe gewählt ist, die aus Polyacrylsäure, Polyacrylamid, Polyvinylalkohol und Derivaten derselben besteht, das genannte Dispergiermittel Wasser ist und der genannte Elektrolyt aus der Gruppe gewählt ist, die aus Kaliumchlorid, Natriumchlorid, Calciumchlorid, Nickelchlorid, Lithiumchlorid, Ammoniumchlorid, Kupferchlorid und Mangansulfat besteht.

12. System zur Bildreproduktion durch Elektrokoagulation eines elektrolytisch koagulierbaren Kolloides, dadurch gekennzeichnet, daß es umfaßt:

eine Vielzahl von negativen (12) und positiven (14) elektrolytisch inerten Elektroden, die elektrisch voneinander isoliert und angeordnet sind, um eine Matrix (16) von punktbildenden Elementen zu begrenzen, wobei die negativen und positiven Elektroden jedes genannten Matrixelementes jeweilige planare aktive Flächen aufweisen und sich die aktive Fläche (34) der negativen Elektrode in der gleichen Ebene wie die aktive Fläche (38) der positiven Elektrode und nahe zu dieser erstreckt und die genannten aktiven Elektrodenflächen dazu ausgebildet sind, eine Schicht einer im wesentlichen flüssigen kolloidalen Dispersion darüber aufgetragen zu erhalten, die ein elektrolytisch koagulierbares Kolloid, ein flüssiges Dispergiermittel und einen löslichen Elektrolyt enthält und eine im wesentlichen gleichmäßige Temperatur über die gesamte genannte Schicht aufweist; und

Einrichtungen (20, 22, 18, 18') zum elektrischen Erregen der negativen und positiven Elektroden ausgewählter der genannten Matrixelemente, um die selektive Koagulation und Adhäsion des genannten Kolloides an den aktiven Flächen der positiven Elektroden der genannten ausgewählten Matrixelemente zu bewirken und dadurch eine Reihe von entsprechenden Punkten zu bilden, die ein gewünschtes Bild darstellen.

13. System nach Anspruch 12, dadurch gekennzeichnet, daß die negativen (12) und positiven (14) Elektroden der genannten Matrix jeweils erste und zweite Sätze von gegenseitig elektrisch isolierten bandartigen Elektrodenelementen umfassen, die parallel Seite an Seite zueinander angeordnet sind, wobei sich die negativen Elektrodenelemente des genannten ersten Satzes quer zu den positiven Elektrodenelementen des genannten zweiten Satzes erstrecken und mit einer Vielzahl von hervorragenden leitfähigen Elementen (32) versehen sind, die entlang der Länge des Elementes im Abstand voneinander angeordnet sind und jeweils eine planare aktive Endfläche (34) aufweisen und sich die hervorragenden Elemente jedes der genannten negativen Elektrodenelemente durch entsprechende Bohrungen (36) erstrecken, die in den genannten positiven Elektrodenelementen ausgebildet sind, um auf gleicher Höhe mit diesen zu enden, sodaß die planare aktive Endfläche (34) jedes der genannten hervorragenden Elemente und ein planarer aktiver Oberflächenabschnitt (38) jedes der genannten positiven Elektrodenelemente

angrenzend an jede der genannten Bohrungen sich in einer im wesentlichen gemeinsamen Ebene erstrecken, um dadurch die genannten Matrixelemente zu begrenzen, und worin die genannten elektrisch erregenden Einrichtungen (18, 20, 22, 24) zum aufeinanderfolgenden Erregen der Elektrodenelemente eines Satzes und Einrichtungen (18',20) zum gleichzeitigen Erregen ausgewählter Elektrodenelemente des anderen Satzes umfassen.

14. System nach Anspruch 13, dadurch gekennzeichnet, daß die genannten Einrichtungen zum aufeinanderfolgenden Erregen eine Abtastvorrichtung (18') umfassen, die mit einer positiven Anschlußklemme einer Gleichstromquelle (20) verbunden und dazu ausgebildet ist, die genannten positiven Elektrodenelemente abzutasten und worin die genannte selektive Erregungseinrichtung eine weitere Abtastvorrichtung (18) umfaßt, die mit einer negativen Anschlußklemme der genannten Stromzufuhr (20) verbunden ist, um die genannten negativen Elektrodenelemente abzutasten und eine Zählvorrichtung (24) mit der genannten weiteren Abtastvorrichtung gekoppelt ist, um während des Betriebes der genannten zweiten Abtastvorrichtung elektrische Impulse an ausgewählte der genannten negativen Elektrodenelemente zu übertragen.

15. System nach Anspruch 14, dadurch gekennzeichnet, daß es weiters eine Modulationseinrichtung (22) zum Variieren der genannten elektrischen Impulse in bezug auf Spannung oder Zeitdauer von einem negativen Elektrodenelement zum anderen umfaßt, um dadurch entsprechend die Menge an koaguliertem Kolloid zu variieren, die auf den aktiven Flächen der positiven Elektroden der genannten ausgewählten Matrixelemente haftet.

16. System nach Anspruch 13, dadurch gekennzeichnet, daß jedes der genannten Matrixelemente (16) ein einzelnes der genannten hervorragenden Elemente (32) aufweist, das im wesentlichen mittig darin angeordnet ist.

17. System nach Anspruch 13, dadurch gekennzeichnet, daß jedes Matrixelement (16) eine Vielzahl der genannten hervorragenden Elemente (32) aufweist, die im Abstand voneinander angeordnet sind, um ein Bild mit einer gleichmäßigen Toneverteilung zu schaffen.

18. System nach Anspruch 16, dadurch gekennzeichnet, daß jedes der genannten Matrixelemente (16) einen quadratischen Oberflächenbereich von etwa 125 µm × 125 µm aufweist und worin das genannte hervorragende Element einen kreisförmigen Querschnitt und einen Durchmesser von etwa 25 bis 50 µm aufweist.

19. System nach Anspruch 13, dadurch gekennzeichnet, daß jedes der genannten hervorragenden Elemente (32) mittels einer Schicht von Isoliermaterial (26) mit einer Dicke von etwa 5 bis 10 µm elektrisch von seinem angrenzenden positiven Elektrodenelement isoliert ist.

20. System nach Anspruch 13, dadurch gekennzeichnet, daß die genannten positiven Elektrodenelemente mittles einer Schicht von Isoliermaterial (30) mit einer Dicke von etwa 10 bis 25 µm voneinander isoliert sind.

21. System nach Anspruch 20, dadurch gekennzeichnet, daß die genannte Schicht von Isoliermaterial (30) eine Dicke von etwa 10 µm aufweist.

22. System nach Anspruch 12, dadurch gekennzeichnet, daß die genannte Matrix etwa 40000 punktbildende Matrixelemente pro Quadratzoll aufweist.

Revendications

1. Procédé pour reproduire une image par électrocoagulation d'un colloïde coagulable électrolytiquement, caractérisé en ce qu'il comporte les étapes suivantes:

a) la disposition d'une pluralité d'électrodes négatives (12) et positives (14) électrolytiquement inertes, électriquement isolées les unes des autres et disposées de façon à définir une matrice d'éléments (16) de formation de points, les électrodes négatives et positives de chacun desdits éléments de matrice ayant des surfaces actives planes respectives, la surface active (34) de l'électrode négative s'étendant dans le même plan que la surface active (38) de l'électrode positive et à forte proximité de celle-ci;

b) l'application d'une couche d'une dispersion colloïdale substantiellement liquide sur les surfaces actives des électrodes négatives et positives desdits éléments de matrice, grâce à quoi les surfaces actives (34) des électrodes négatives et les surfaces actives (38) des électrodes positives sont disposées sur le même côté de la couche de dispersion colloïdale, ladite dispersion colloïdale contenant un colloïde coagulable électrolytiquement, un moyen de dispersion de liquides et un électrolyte soluble et ayant une température substantiellement uniforme dans toute ladite couche;

c) la génération d'un champ électrique entre les électrodes négative et positive d'éléments sélectionnés desdits éléments de matrice, ledit champ électrique s'étendant substantiellement parallèlement aux surfaces actives planes desdites électrodes négatives et positives, afin de provoquer par conséquent la coagulation et l'adhérence sélectives dudit colloïde sur les surfaces actives (38) des électrodes positives desdits éléments de matrice sélectionnés, en formant par conséquent une série de points correspondants représentatifs d'une image désirée (42); et

d) le retrait de tout colloïde non-coagulé restant.

2. Procédé selon la revendication 1, caractérisé en ce que les électrodes négatives et positives de ladite matrice comportent respectivement des premier et deuxième jeux d'éléments d'électrodes en forme de bandes mutuellement isolés électriquement, disposés en relation côte-à-côte parallèle, les éléments d'électrodes négatives dudit premier jeu s'étendant transversalement par rapport aux éléments d'électrodes positives dudit deuxième jeu et étant formés d'une pluralité d'éléments conducteurs saillants (32) qui sont

espacés le long de la longueur de ceux-ci et en ce que chacune possède une surface d'extrémité active plane (34), les éléments saillants de chacun desdits éléments d'électrodes négatives s'étendant à travers des trous correspondant (36) formés dans lesdits éléments d'électrodes positives de façon à s'achever au même niveau que ceux-ci, de telle sorte que la surface d'extrémité active plane de chacun desdits éléments saillants (34) et une partie de surface active plane (38) de chacun desdits éléments d'électrodes positives voisins de chacun desdits trous s'étende dans un plan substantiellement commun, de façon à définir lesdits éléments de matrice, et dans lequel l'étape (c) est effectuée en mettant séquentiellement sous tension les éléments d'électrodes d'un jeu et en mettant en même temps sous tension des éléments sélectionnés des éléments d'électrodes de l'autre jeu.

3. Procédé selon la revendication 2, caractérisé en ce que l'étape (c) est effectuée en mettant séquentiellement sous tension lesdits éléments d'électrodes positives et en mettant en même temps sous tension des éléments sélectionnés parmi lesdits éléments d'électrodes négatives.

4. Procédé selon la revendication 2, caractérisé en ce que la mise sous tension sélective simultanée des éléments d'électrodes de l'autre jeu est effectuée en balayant lesdits éléments d'électrodes et en transmettant des impulsions électriques à des éléments sélectionnés parmi ceux-ci durant le balayage.

5. Procédé selon la revendication 4, caractérisé en ce que lesdites impulsions électriques varient en tension ou en durée d'un élément d'électrode à l'autre, afin de faire varier de façon correspondante la quantité de colloïde coagulé adhérant sur les surfaces actives de l'électrode positive desdits éléments de matrice sélectionnés.

6. Procédé selon la revendication 1, caractérisé en ce qu'il comporte de plus les étapes de coloration du colloïde coagulé et de transfert du colloïde coagulé coloré sur un support d'utilisation final.

7. Procédé selon la revendication 1, caractérisé en ce qu'il comporte de plus l'étape de durcissement du colloïde coagulé, afin d'utiliser par conséquent le colloïde coagulé durci pour l'impression lithographique offset.

8. Procédé selon la revendication 1, caractérisé en ce que ledit colloïde est un colloïde linéaire ayant un poids moléculaire compris entre environ 10.000 et environ 1.000.000.

9. Procédé selon la revendication 8, caractérisé en ce que ledit colloïde a un poids moléculaire compris entre environ 100.000 et environ 500.000.

10. Procédé selon la revendication 8, caractérisé en ce que ledit colloïde est sélectionné parmi le groupe composé des protéines animales et végétales et des copolymères synthétiques.

11. Procédé selon la revendication 8, caractérisé en ce que ledit colloïde est un copolymère synthétique sélectionné parmi le groupe composé de l'acide polyacrylique, du polyacrylamide, de l'alcool polyvinylique et des dérivés de celui-ci, ledit moyen de dispersion est de l'eau, et ledit électrolyte est sélectionné parmi le groupe composé du chlorure de potassium, du chlorure de sodium, du chlorure de calcium, du chlorure de nickel, du chlorure de lithium, du chlorure d'ammonium, du chlorure de cuivre et du sulfate de manganèse.

12. Système pour reproduire une image par électrocoagulation d'un colloïde coagulable électrolytiquement, caractérisé en ce qu'il comporte:

une pluralité d'électrodes négatives (12) et positives (14) électrolytiquement inertes, isolées électriquement les unes des autres et disposées de façon à définir une matrice d'éléments de formation de points (16), les électrodes négatives et positives de chacun desdits éléments de matrice ayant des surfaces actives planes respectives, la surface active (34) de l'électrode négative s'étendant dans le même plan que la surface active (38) de l'électrode positive et à forte proximité de celle-ci, lesdites surfaces actives des électrodes étant adaptées de façon à recevoir sur celles-ci une couche d'une dispersion de colloïde substantiellement liquide contenant un colloïde électrolytiquement coagulable, un moyen de dispersion liquide et un électrolyte soluble et ayant une température substantiellement uniforme dans toute ladite couche; et

des moyens (20, 22, 18, 18') pour mettre électriquement sous tension les électrodes négatives et positives d'éléments sélectionnés desdits éléments de matrices afin de provoquer la coagulation sélective et l'adhérence dudit colloïde sur les surfaces actives des électrodes positives desdits éléments de matrice sélectionnés et afin de former par conséquent une série de points correspondants représentatifs d'une image désirée.

13. Système selon la revendication 12, caractérisé en ce que les électrodes négative (12) et positive (14) de chaque matrice comportent respectivement des premier et deuxième jeux d'éléments d'électrodes en forme de bande électriquement isolés les uns des autres, disposés en relation côte-à-côte parallèle, les éléments d'électrodes négatives dudit premier jeu s'étendant transversalement par rapport aux éléments d'électrodes positives dudit deuxième jeu et étant formés avec une pluralité d'éléments conducteurs saillants (32) qui sont espacés le long de la longueur de ceux-ci et qui ont chacun une surface d'extrémité active plane (34), les éléments saillants de chacun desdits éléments d'électrodes négatives s'étendant à travers des trous correspondants (36) formés dans lesdits éléments d'électrodes positives de façon à s'achever au même niveau que ceux-ci, de telle sorte que la surface d'extrémité active plane (34) de chacun desdits éléments saillants et une partie de surface active plane de chacun desdits éléments d'électrodes positives (38) adjacent à chacun desdits trous s'étende dans un plan substantiellement commun, afin de définir par conséquent lesdits éléments de matrice, et dans lequel lesdits moyens de mise sous tension électrique comportent des moyens pour mettre séquentiellement sous tension les éléments d'électrodes d'un jeu

(18, 20, 23, 24) et des moyens pour mettre simultanément sous tension des éléments d'électrodes sélectionnés parmi les éléments d'électrodes de l'autre jeu (18', 20).

14. Système selon la revendication 13, caractérisé en ce que lesdits moyens de mise sous tension séquentielle comportent un dispositif de balayage (18') connecté à une borne positive d'une alimentation en courant continu (20) et adapté pour balayer lesdits éléments d'électrodes positives, et dans lequel lesdits moyens de mise sous tension sélective comportent un autre dispositif de balayage (18) connecté à une borne négative de ladite alimentation (20) pour balayer lesdits éléments d'électrodes négatives et un dispositif de comptage (24) couplé audit autre dispositif de balayage pour transmettre des impulsions électriques aux éléments sélectionnés desdits éléments d'électrodes négatives durant le fonctionnement dudit autre dispositif de couplage.

15. Système selon la revendication 14, caractérisé en ce qu'il comporte de plus des moyens de modulation (22) pour faire varier lesdites impulsions électriques en tension ou en durée d'un élément d'électrode négative à l'autre afin de faire varier de façon correspondante la quantité de colloïde coagulé adhérant sur les surfaces actives de l'électrode positive desdits éléments de matrice sélectionnés.

16. Système selon la revendication 13, caractérisé en ce que chacun desdits éléments de matrice (16) comporte un seul desdits éléments saillants (32) disposé substantiellement au centre de celui-ci.

17. Système selon la revendication 13, caractérisé en ce que chacun desdits éléments de matrice (16) comporte une pluralité desdits éléments saillants (32) disposés en relation d'espacement mutuel afin de procurer une image ayant une répartition de tons uniforme.

18. Système selon la revendication 16, caractérisé en ce que chacun desdits éléments de matrice (16) a une surface carrée d'environ 125 µ × 125 µ et dans lequel ledit élément saillant unique a une section transversale circulaire et a un diamètre compris entre environ 25 et 50 µ.

19. Système selon la revendication 13, caractérisé en ce que chacun desdits éléments saillants (32) est électriquement isolé de son élément d'électrode positive adjacent au moyen d'une couche de matériau isolant (26) ayant une épaisseur comprise entre environ 5 et 10 µ.

20. Système selon la revendication 13, caractérisé en ce que lesdits éléments d'électrodes positives sont électriquement isolés les uns des autres au moyen d'une couche de matériau isolant (30) ayant une épaisseur comprise entre environ 10 et 25 µ.

21. Système selon la revendication 20, caractérisé en ce que ladite couche de matériau isolant (30) a une épaisseur de 10 µ environ.

22. Système selon la revendication 12, caractérisé en ce que ladite matrice comporte environ 40.000 éléments de matrices de formation de points par pouce carré (6200 éléments par centimètre carré).

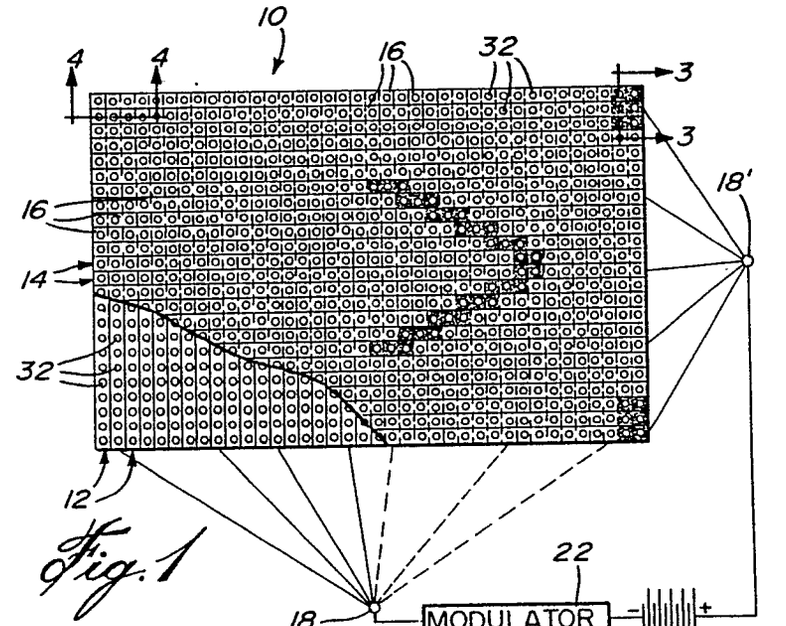


Fig. 1

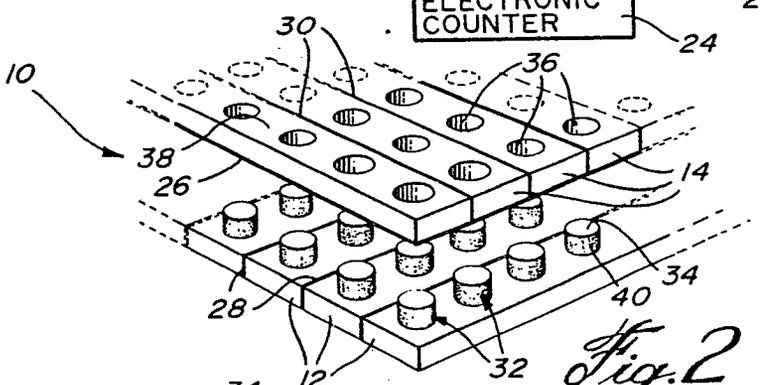


Fig. 2

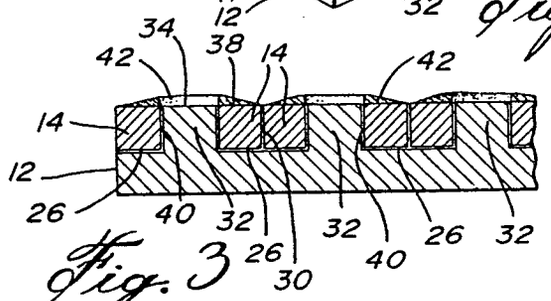


Fig. 3

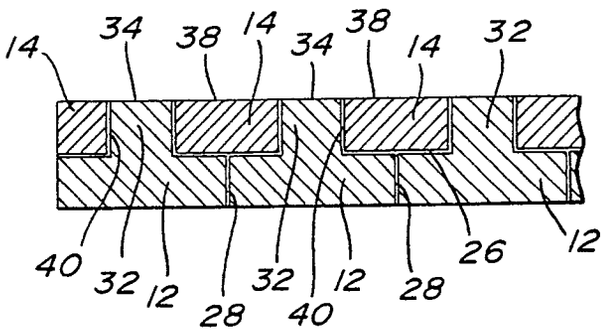
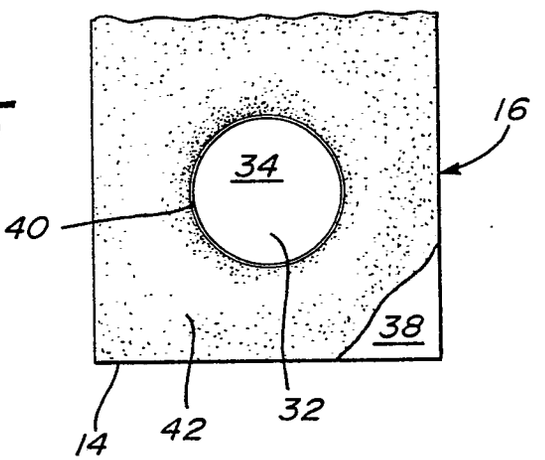


Fig. 4

Fig. 5



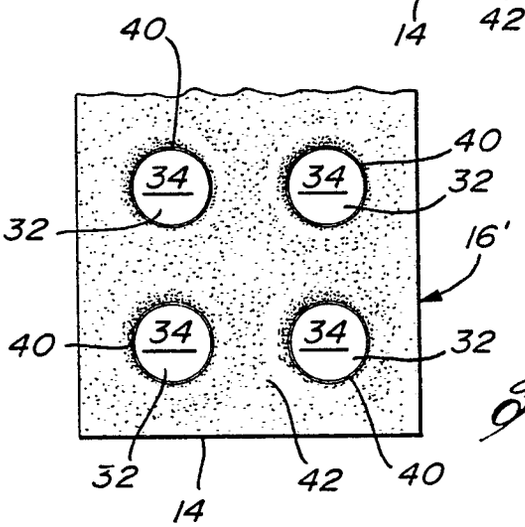


Fig. 6