

- [54] **PROCESS OF PRODUCING CAPSULE-COATED SHEETS**
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- [73] Assignee: **Fuji Photo Film Co., Ltd.**, Minami-Ashigara, Japan
- [22] Filed: **Jan. 2, 1974**
- [21] Appl. No.: **430,015**

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Related U.S. Application Data

- [63] Continuation of Ser. No. 203,302, Nov. 30, 1971, abandoned.

Foreign Application Priority Data

Nov. 30, 1970 Japan..... 45-105586

- [52] U.S. Cl..... **427/358; 427/369**
- [51] Int. Cl..... **B44d 1/44**
- [58] Field of Search.... 117/36.2, 64 R, 65.2, 111 H, 117/154; 252/316

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Primary Examiner—Michael R. Lusignan

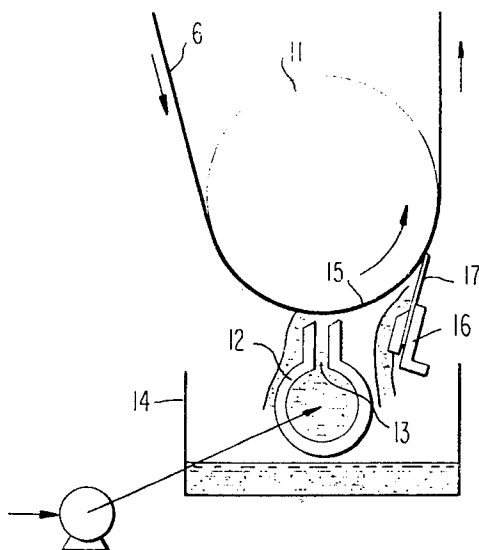
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57]

ABSTRACT

Microcapsule coated sheets can be efficiently produced by a process wherein excess microcapsule coating composition is removed from a running base sheet by a mechanical tool which by shear force meters and levels the microcapsule coating composition, if the microcapsule coating composition has a solids content of about 20 to 80 weight percent and a viscosity of 50 to 50,000 c.p.

3 Claims, 8 Drawing Figures



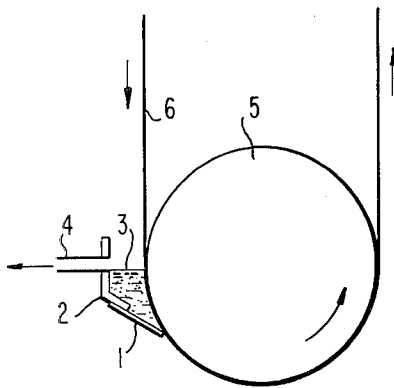


FIG. 1

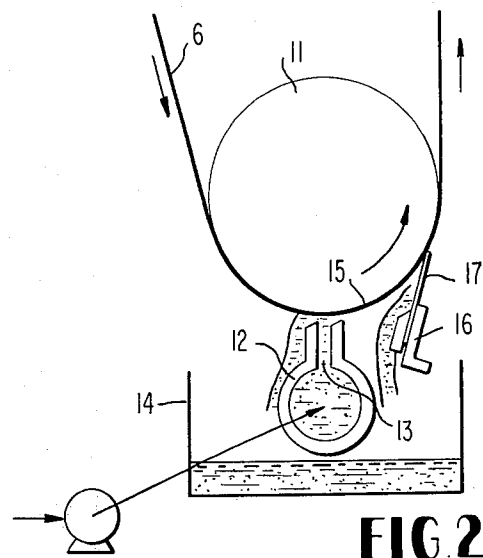


FIG. 2

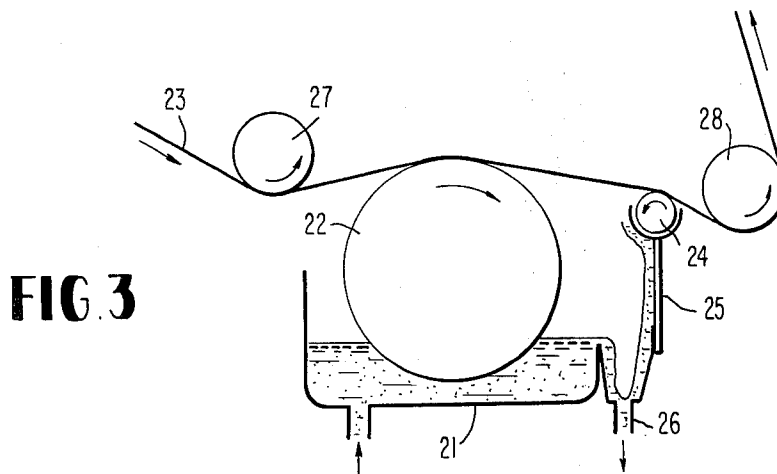


FIG. 3

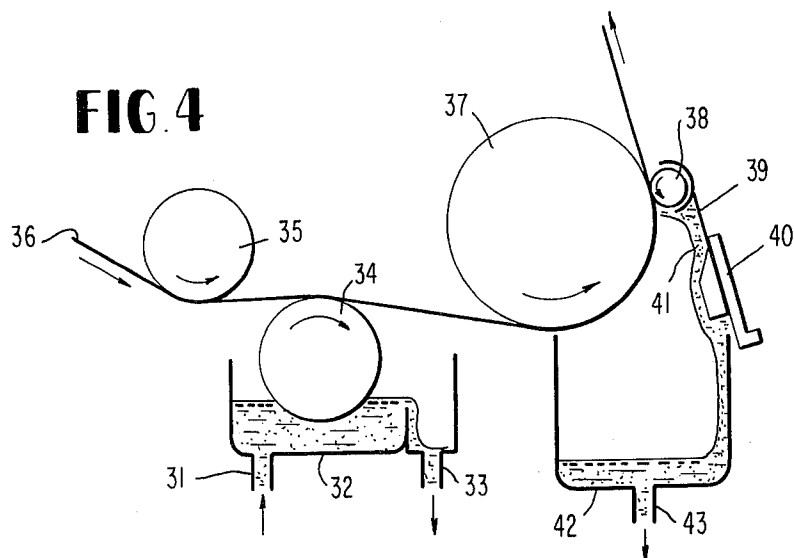


FIG. 4

FIG. 5a

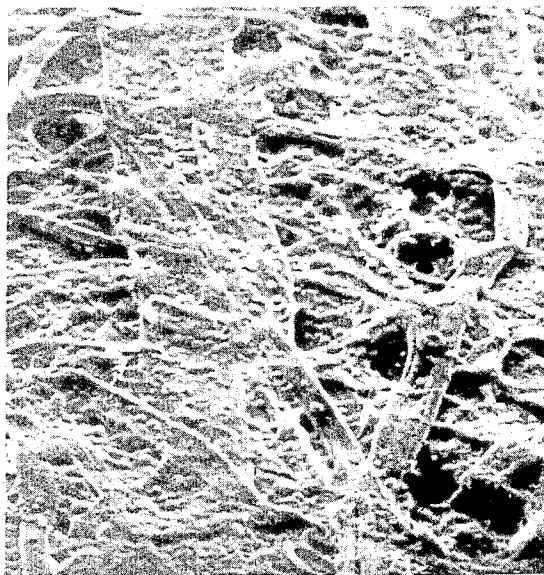


FIG. 5b

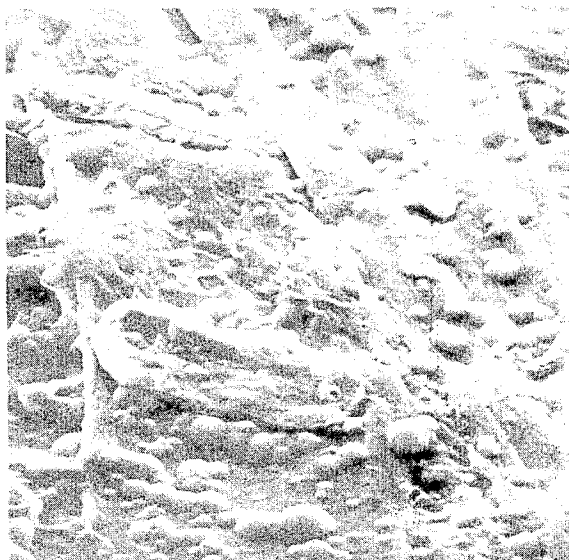


FIG. 6a



FIG. 6b



PROCESS OF PRODUCING CAPSULE-COATED SHEETS

This is a continuation of application Ser. No. 203,302, filed Nov. 30, 1971, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a process for producing capsule-coated sheets, and more particularly it relates to a process and apparatus for applying a coating composition consisting of minute capsules onto moving support.

2. Description of the Prior Art

The minute capsules constituting capsule-coated sheets are easily broken by pressure, so that an air doctor coater in which pressure is not directly applied to such capsule has been used as the coating means for coating microcapsules compositions onto moving supports e.g., see U.S. Patent Specification Nos. 3,186,861; 3,472,674 and British Patent Specification No. 1,176,469.

However, with such conventional coating apparatus, low-solids content, low-viscosity coating compositions must be used so that when metering by blowing off excess coating composition with air jet blow the air doctor coater, the coating composition is blown off in the form of fine particles. These particles contaminate the tip end of the air doctor blade and lead to coating stripes being produced on the coated surface. In order to prevent this, frequent cleaning is necessary which requires interrupting the coating operation so that the rate of production decreases considerably.

As will be further described later, although it is desirable to increase the solids content of the coating composition, the viscosity of the coating composition increases by increasing the solids content of the coating composition, so that in order to meter a predetermined quantity of coating, it is necessary to increase the wind pressure of the air jet which increases the spattering of the excess coating composition contaminating the doctor blade whereby more frequent cleaning becomes necessary. This prevents increasing the solids content of the coating composition, and a low-solids content coating composition has to be used. Accordingly, a large drying device is required to remove a large quantity of water, which in turn requires a large space and excessive equipment cost and operating cost. Furthermore, since the drying device is large, the path of the support is long during running and a great amount of support material is lost due to breakage thereof, with a decrease in production rate.

SUMMARY OF THE INVENTION

The present invention overcomes the above-mentioned disadvantages, and is characterized in that it uses a coating apparatus comprising a coating tool for applying a surplus amount of coating composition onto a support and a doctor blade or metering bar acting to measure the coating composition and to equalize it to thus apply a coating composition consisting of minute capsules onto a running support.

One object of the present invention is to provide a method and apparatus for applying a high-density, high-viscosity capsule coating composition onto a support.

Another object of the present invention is to provide a coating apparatus for a capsule coating composition

which does not spatter the coating composition by the spraying of an air jet, whereby a continuous coating operation can be effected.

Still another object of the present invention is to provide a coating apparatus for a capsule coating composition which uses a small drying device, and thus the space required for installation of the machine becomes small, and therefore the costs of equipment and operation can be remarkably reduced.

Other objects of the present invention will be made clear from the following description as well as from the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 through 4 show embodiments of apparatus appropriate for carrying out the process of the present invention.

FIGS. 5A, 5B, 6A and 6B are microscopic photographs showing micro-capsule coating surfaces produced in accordance with the present invention taken by scanning electron microscope FIGS. 5B and 6B are of a higher magnification than FIGS. 5A and 6A.

DETAILED DESCRIPTION OF THE INVENTION

According to the present invention it has been found that the above and the other objects are attained by using a coating apparatus provided with a coating tool for applying an excess of coating composition on a support when the coating composition, which comprises fine particles, is applied onto a running support, the coating tool being used in combination with a doctor blade or a metering bar.

In general, the coating apparatus known as blade coaters or metering bar coaters involve the operation of scraping off the excess coating composition on the support by pressing a mechanical tool directly on the coating composition applied on the running support. These devices can be adapted to use high-concentration, high-viscosity coating composition, but the blade coater and the metering bar coater give an excessive shearing stress on the coating composition at the process of metering excessive amounts of coating composition. Such apparatus is thus not used as coating apparatus for coating compositions consisting of fine capsules which are readily broken by pressure, thus air knife coaters, which have the many drawbacks mentioned above, are extensively used.

The inventors have found that it is possible to apply a predetermined quantity of coating composition without breaking the minute particles onto a running support despite the high shearing force exerted by blade coaters and metering bar coaters.

In using a coating composition comprising rupturable particles in the present invention, to obtain a most favorable coating adaptability it is necessary that the solids content in the capsule coating composition be from about 20 to about 80 %, and the viscosity be in the range of 50 to 50,000 c.p. Examples of processes of producing such fine capsular composition will be enumerated below, but the present invention should not be limited thereto (all viscosities measured at 25°C). It shall be understood that there is no special criticality to the exact microcapsule size selected, but those skilled in the art will appreciate such are preferably of a size, usually expressed as diameter, less than about 100 μ , preferably about 10 μ to about 50 μ .

1. Phase separation method from aqueous solution (U.S. Patent Specification Nos. 2,800,457 and 2,800,458 with the one most generally used utilizing coacervation of hydrophilic colloid sols.

2. Interfacial polymerization (Japanese Patent Publication Nos. 19,574/1963, 446/1967, 771/1967, British Patent Specification Nos. 867,797; 950,443; 989,264; 1,091,076).

The capsule wall film is initially formed in the presence of a monomer of initial condensate (which is the first wall film forming substance) in an oily liquid which is to be contained therein. The completed polymer to form the wall film substance of the micro-capsules is not present in the first stage. Then a second wall film forming substance which can react with said first wall film forming substance is dissolved in a polar solvent which does not mix with the oily liquid, whereafter polymerizing the first wall film forming substance and the second wall film forming substance at the interface of the oil drops of the oily liquid and the polar solvent is conducted to form a wall film.

3. Method comprising the polymerization of monomer in oil drops. (Japanese Patent Publication No. 9168/1961).

After dissolving compounds having double bonds such as acryl compounds, styrene, vinyl acetate, in oil drops, a radical polymerization is conducted using peroxides as the catalyst to produce oil-insoluble polymers.

4. Fusion-dispersion cooling process (British Patent Specification Nos. 952,807 and 965,074).

A stabilizing substance which is a solid at normal temperature, and a liquid under heat, is utilized as the capsule wall film. A wax or thermoplastic resin is usually used.

5. Spray drying process (U.S. Patent Specification No. 3,111,407, British Patent Specification No. 930,422).

Solid particles or liquids are emulsified and dispersed in a polymer solution which is introduced in a spray dryer. At the instant the dispersed liquid is driven out in the form of minute particle from the atomizer the substances contained therein are surrounded by the polymer.

6. Internal accumulation process (Japanese Patent Application Nos. 38087/1968, 69448/1969).

In these processes, the same or different kinds of compounds which produce, by mutual reaction, oil-insoluble, high-molecular substances are dissolved in an oily liquid in the presence of a low-boiling solvent or a polar liquid forming a continuous phase and a polar solvent compatible therewith, and after dispersing and emulsifying the product in the polar liquid forming the continuous phase, the system is heated to transfer the wall film forming substance onto the surface of the oil particles, whereafter the high molecular weight material forming reaction at the surface of the oil granules proceeds to form the wall film.

The microcapsule coating liquid obtained by the abovedescribed processes is regulated so as to have a solids content of from about 20 to about 80 %, and a viscosity of 50 to 50,000 c.p. by concentration, centrifugal separation, spray drying, dilution, a combination of such processes, and if necessary, by adding a viscosity intensifier.

In this case, it is also possible to increase the coating adaptability of the capsule coating composition by add-

ing water-soluble binder, synthetic resin emulsion etc.

The present invention is characterized by applying a coating composition of microcapsules prepared as described above on a running support by means of a coating apparatus comprising a coating tool for applying a surplus of coating composition on the support and a doctor blade or metering bar for metering and equalizing the coating composition.

The coating apparatus the present invention will now be described with reference to the accompanying drawings.

FIG. 1 is a schematic view showing a pond-type blade coater which is a representative blade coater. The pond-type blade coater comprises a rubber-coated backing roll 5 holding support sheet to be coated, a coater consisting of a flexible blade 1 and a supporting frame 2 which holds coating composition by forming a reservoir between blade 1 and backing roll 5 (or the running support 6 when present), and a conduit 4 for supplying coating composition comprising the microcapsules in liquid reservoir 3 formed the coater and the running support held by the backing roll 5. Conduit 4 can also serve as an overflowing to keep the liquid level of the liquid reservoir 3 constant. The mechanism is so arranged that the running support sheet 6 which is coated by liquid pressure produced at the coating composition reservoir 3, and a predetermined coating amount is obtained by the shearing force produced by pressing the blade 1 which forms the coater onto the support sheet 6.

Another type of blade coater is shown in FIG. 2, and this is one type of fountain blade coater.

Referring now to FIG. 2, a coating composition consisting of microcapsule is supplied to a coating tool 12 at the position to be coated by applying pressure by a pump, whereby a surplus of coating composition which is formed of uniform, minute microcapsules is extruded through slit 13 of coating tool 12 under pressure, whereafter the coating liquid is applied onto running support sheet 6 held by rubber-coated backing roll 11. The coating liquid over-flown from the coating tool 12 enters into a coating-composition pan 14, and is recovered. The coating composition applied on running sheet 6 by the coating tool 12 is metered by pressing a flexible blade 17 held by supporter 16 (placed next to the coating tool 12) against a running support sheet 15 to be coated held by a backing roll 11, thus a uniformly coated surface is obtained.

In addition to the pond-type blade coater and the fountain blade coater, there are a number of blade coaters of another types such as the "Flexiblade" coater, the "Flooded nip blade" coater and the blade coater in the coating apparatus of the present invention is intended to include such devices as they are all characterized by the common operation of applying a surplus of coating composition comprising microcapsules onto a running support sheet and pressing a blade fixed transversely to the support sheet against the coated surface of the support sheet which has been coated with coating composition, whereby the coating composition is metered and rendered of uniform thickness.

Although the coating quantity can be regulated by adjusting the shearing force applied onto the coating composition on the support sheet, the shearing force applied on the microcapsule constituting the coating composition must be of such a degree of force that it will not break the microcapsules. The shearing force to

be applied to the coating composition can be varied according to the running speed of the support sheet, the thickness and the quality of the blade material, the length of the blade, the holding angle of the blade and the hardness of the backing roll, and furthermore, by varying the solids content and the viscosity of the microcapsule coating composition. The conditions which will not break the microcapsules can be determined easily in a manner known to the art. In this regard, the size of the microcapsule is not restricted, but is preferably below 100 microns.

Another coating apparatus in accordance with the present invention will now be described which relates to a metering bar coater in which a round bar fixed to extend transverse to the direction of the running sheet is applied onto the coating surface of the running support sheet coated with a coating composition of microcapsules. Such an apparatus also operates to provide metering and equalization of the coating surface as in the case of doctor blades.

FIG. 3 one type of metering bar coater, wherein a microcapsule coating composition is introduced into a liquid reservoir 21, a metering bar 24 having a small diameter and supported by a supporter 25 located next to an applicator roll 22 is applied to the coated surface of the support sheet, the metering bar 24 rotating in a direction reverse to that of the running direction of the support sheet 23, whereby surplus coating composition is scraped off and the coated surface is metered and equalized. The capsule coating composition scraped off by the metering bar 24 enters a liquid reservoir 21 and is recovered from delivery outlet 26. A roll 27 arranged in front of the applicator roll 22 is a backing roll which serves to bring the support sheet into contact with the applicator roll 22.

The roll 28 positioned at the back of the metering bar 24 serves to determine the contact angle between the support sheet and the metering bar 24. Metering bar 24 can be a round bar having a diameter less than 50 mm coated with smooth, hard chromium surface, particularly a bar having a diameter between 3 and 15. Further, the metering bar is preferably wound with wire, and it is possible to change the quantity of coating by selecting the size of the wire.

FIG. 4 shows another type of metering bar coater, in which a coating composition of microcapsules is introduced into the liquid reservoir 32 through coating liquid feeding inlet 31 and removed via outlet 33. The coating composition is picked up by applicator roll 34 immersed in the coating composition, and by lowering a backing roll 35, the running support sheet 36 is made to contact on the applicator roll 34, transferring a surplus amount of microcapsule coating composition onto the sheet. The surplus coating composition is metered by a metering bar 38 arranged to contact the microcapsule coated surface of the support sheet while it is supported by a back up roll 37 positioned next to the applicator roll 34. Metering bar 38 is preferably a round bar having a diameter less than 50 mm coated with smooth, hard chromium layer, especially a round bar having a diameter of 3 - 15 mm. Further, the metering bar is preferably wound with wire to permit an even more uniform coating and it is possible to vary the amount of coating by selecting the size of wire wound. The metering bar 38 may be fixed, but it is especially effective for metering and equalizing when it is rotated in the direction opposite to the running direction of the support

sheet 36. The metering bar 38 is supported by a flexible blade holder 39 fixed transversely to the support sheet, the blade 39 being fixed by a holding frame 40. By moving supporting frame 40 it is possible to change the pressure of the metering bar 38 on the coating liquid on the sheet supported by backing roll 37. The coating composition 41 of capsules scraped off by metering bar 38 is collected in a liquid accumulator 42, and recovered via outlet 43.

As is clear from the above explanation, the metering bar coater is one type of coating apparatus used in the present invention wherein a surplus of microcapsule coating composition is coated on a running support sheet and, by pressing a metering bar there against which is provided at a position extending transversely of the support sheet, excess coating composition is metered therefrom and the coated surface is made uniform. The shearing force applied on the microcapsules can be varied by changing the diameter of the metering bar, the rotating speed, the construction of the blade holder, the pressure of the metering bar on the support sheet, the size of wire wound around the metering bar, and further, by altering the solids content of the coating composition.

As stated with respect to one type of coating apparatus used in the present invention, it is so arranged that a coating tool is directly brought into contact with the coated microcapsule composition on the running support sheet, and by scraping off excess microcapsule coating composition metering and equalizing of the coated composition are effected. It is evident that an extremely large shearing force is applied onto the microcapsule particles when compared with the metering action effected by a conventional air-knife coater used for producing capsule coated sheets.

Accordingly, although the prior art would lead one to conclude that the microcapsules might be broken, the inventors have found that the capsules are not broken by applying a tool directly onto the coating liquid and by scraping off excess coating composition.

In the case where a thinner coating layer of capsules is to be produced by applying an especially large shearing force using such coating tools, by using a coating composition of microcapsules with a synthetic high molecule weight polymer as the wall film as shown in following Examples 2, 3 and 6 metering is effected by applying the coating tool directly onto a running support sheet on which the microcapsule coating is applied, as described previously. It is thus possible to obtain high coating adaptability, and furthermore a uniformly coated surface can be obtained. This is because microcapsules with synthetic high molecular weight polymer wall films, e.g., polyurea polyurethanes, are capable of forming microcapsules having a more uniform shape as compared to capsules having a natural product as the wall film. The physical strength of such synthetic capsule wall films is of course, very high.

In some cases, in order to increase the anti-wear property of the capsule, the support sheet is coated with a microcapsule coating composition having incorporated therein cellulose flocks or the like, but when a blade coater is used which applies a coating composition consisting of microcapsules and meters by a shearing force generated by pressing the blade against the coated support sheet supported by a backing roll, cellulose flocks having a large particle size adhere to the blade and may produce scratches on the coating

support sheet. However, it was found that by adapting a metering bar coater which meters a microcapsule coating composition to rotate the bar (as shown in FIGS. 3 and 4) in the direction reverse to the running direction of the support sheet it was possible to scrape off material such as cellulose flocks so that the possibility scratches was much reduced.

It will be understood that in the present application the term "excess" implies an amount of microcapsule composition greater than that desired in the final product.

Accordingly, the object of the present invention can easily be attained by applying a coating composition consisting of microcapsules having a synthesized high molecular weight polymer wall film onto support sheet using a coating device employing a metering bar coater, and thus it is possible to obtain a capsule-coated sheet having very thin films.

EXAMPLE 1

1.0 part of crystal violet lactone is dissolved into 50 parts of diphenyl chloride, and the product added to an aqueous solution consisting of 60 parts of 40°C water and gum arabic so as to form an oil-in-water emulsion of 6 - 10 micron size oil drops. An aqueous solution formed by dissolving 10 parts of acid-treated gelatin having an isoelectric point of 7.8 in 80 parts of water having a temperature of 40°C was added thereto followed by 50% acetic acid under constant agitation so as to provide a pH of 4.2. 250 parts of 40°C water were then added to cause coacervation. A thick liquid film consisting of gelatin and gum arabic formed around the oil particles which had dissolved color former thereon. The thick liquid films were then cooled for gellation down to 10°C, and 4 parts of 37% formaldehyde solution added to harden the wall films. At this stage, 40 parts of a 10% aqueous solution of the sodium salt of carboxymethyl cellulose was added, followed by dropwise adding a 10% aqueous solution of sodium hydroxide to increase the hardening of the films with increasing the pH up to 9.5 and the water temperature to 50°C.

Centrifuging and concentrating the capsule liquid thus obtained resulted in a solids content of 42%. The capsule liquid thus prepared had a viscosity of 1,500 C.P.

The capsule liquid thus obtained was applied onto a base sheet using the fountain blade coater shown in FIG. 2. The coating was effected at a rate of 100 m/min as follows: The backing roll was a rubber coated roll having a diameter of 960 mm with a hardness of 60° Shore, the blade was 0.25 mm thick and made of steel, the 20 mm long blade being flexible and not fixed to the support frame, the blade angle to the backing roll was 50°, and the blade pressure was 10 kg/cm². The blade scraped the excess from the support. After drying, a pressure-sensitive color-forming copy sheet was obtained.

When the pressure-sensitive color-forming copy sheet thus obtained was superposed on a commercial pressure-sensitive copying clay paper, a blue, clear colored image was obtained on the clay paper by copying thereon.

After said color forming sheet was heated at 100°C for 10 hrs. in an air drying box, it was superposed on a clay paper, and when it is used for typewriting, no decrease in concentration of the colored image was found

as compared to prior to the thermal test. Thus, the capsules have excellent heat resistance.

Photographs of the capsule coated surface taken by a scanning electron microscope as shown in FIG. 5, and it was found that the capsules were not broken entirely.

EXAMPLE 2

4 parts of 3-diethylamino-7-dibenzylaminofluorane was dissolved in 40 parts of diisopropyl-biphenyl and 10 parts of chlorinated normal paraffine with 14 carbon atoms. To this product there was added and mixed a solution of 10 parts of toluylenediisocyanate, 6 parts of bisphenol A, 0.5 parts of lead octylate and 20 parts of methylene chloride to obtain a primary solution.

10 parts of gum arabic was dissolved in 40 parts of water at 30°C. The primary solution was added thereto and the system emulsified with a homogenizer, the resulting oil-in-water emulsion having an oil-drop diameter of 10 - 15 microns.

The above emulsion was added to 40 parts of water at 50°C, and the temperature of the system raised to 80°C while stirring. This temperature was maintained for 30 minutes to polymerize the toluylene diisocyanate and bisphenol A to form the capsule walls. 10 parts of cellulose flocks were added thereto.

The solid contents of the capsule composition thus obtained was 51%. 10 parts of a 5% aqueous solution of sodium alginate was added thereto as a viscosity intensifier to provide a viscosity of 5,300 C.P.

The capsule solution thus prepared was coated on a base sheet using the metering bar coater shown in FIG. 4. The backing roll was a rubber coated roll having a diameter of 960 mm with a hardness of 50° Shore, the metering bar was stainless steel and plated with chromium and 6 mm in diameter. As for the applicator roll, a roll of 150 mm diameter plated with hard chromium was used, and rotated at 20 revolutions per minute. The coating speed was 120 m/min and an excess amount of capsule composition was coated onto the running base sheet. The metering bar was supported on an elastic stainless steel blade 50 mm long which could be operated flexibly, and was rotated at 15 revolutions per minute in the direction opposite to the running direction of the base sheet. The application pressure of the blade was controlled by adjusting a bolt holding the blade support so as to provide a coating quantity of 5 g/m². After drying, a pressure-sensitive, color-forming copy sheet was obtained.

Superposing the thus obtained pressure-sensitive, color-forming copy sheet on a pressure-sensitive copying clay paper and applying pressure thereto, a clear, black-greenish image was obtained.

A thermal test was carried out as in the Example 1, and it was found that the capsules had excellent thermal resistance.

The coated surface is shown in FIG. 6 by photographs taken by a scanning electron microscope. It was found that the capsules were not broken at all.

EXAMPLE 3

Instead of the 3-diethylamino-7-dibenzylaminofluorane used in Example 2, emerald jasmine Y-1514E (a trade name for a perfume manufactured by Ogawa Koryo KK) was used, and capsules containing the perfume were obtained without adding 10 parts of cellulose flocks. Treating this capsule composition with an atomizing dryer (Nitro Atomizer:

Minor Unit Type 53, Danish made), provided a perfume-containing capsule powder. The obtained capsule powder was redispersed in an aqueous solution in which starch had been dissolved (5% solution) adjusted its solid content to 75% and the viscosity to 34,000 C.P.

The capsule composition thus prepared was coated onto a Q-kote film (the trade name of a polyethylene film manufactured by Nihon Goseishi KK) using a pond-type blade coater as shown in FIG. 1. The backing roll was a rubber coated roll having a diameter of 960 mm with a hardness of 60° Shore. The blade was made of steel, with a thickness of 0.25 mm and a length of 15 mm. The blade was operated flexibly and not fixed to the supporting frame. The blade angle to the backing roll was 42°, and the coating was effected at 90 m/min under a blade pressure of 15 kg/cm². After drying, a perfume incorporated capsule sheet was obtained.

After leaving this capsule for 1 or 2 months, there was a fragrant smell of jasmin when the capsule layer was rubbed by hand.

It is thus clear that the capsules are kept sufficiently normal even when they are applied by a blade coater.

EXAMPLE 4

The same treatment as in Example 1 was effected to except that the color forming oil consisting of 50 parts of chlorinated diphenyl and 1.0 part of crystal violet lactone was substituted with 40 parts of Araldite 6020 (the trade name of an epoxy resin having an epoxy equivalent of 210, produced by Ciba Limited) whereby the capsule composition was obtained. As in the cited Example, the composition was adjusted to have a solids content of 25% and a viscosity of 200 C.P.

The capsule composition thus obtained was coated onto a base sheet using a metering coater as shown in FIG. 3. The metering bar was made of stainless steel plated with hard chromium, and had a diameter of 10 mm. As for the applicator roll, a roll 150 mm in diameter and hard chromium plated was used, and rotated at a speed of 20 rev/min with a coating speed of 100 m/min. A surplus amount of capsule composition was coated onto a running support sheet. The metering bar was rotated in direction opposite to the running sheet at a rate of 15 rev/min, and the lap angle of the metering bar to the support sheet was adjusted to 5°. The coating rate was 8 g/m². After drying, an adhesive capsule sheet was obtained.

After leaving the capsule sheet for 1 - 2 months, a sheet of paper was placed on the capsule surface, and upon pressing the paper by rubbing with a hand, the two sheets adhered to each other, thus showing a sufficient adhesive property. From this, it is evident that the capsules are normal even when applied with a metering bar coater.

EXAMPLE 5

The capsule composition having a solids content of 42% and a viscosity of 1500 C.P. obtained in Example 1 was coated onto a base sheet utilizing a metering bar coater as shown in FIG. 4. The backing roll was a rubber covered roll having a diameter of 960 mm and a hardness of 50° Shore. The metering bar was made of stainless steel and plated with chromium. The diameter was 6 mm. The applicator roll had a diameter of 150 mm and was plated with hard chromium. The rotating speed thereof was 18 rev/min. The coating speed was

110 m/min. A surplus of capsule composition was coated on the running base sheet. The metering bar was supported by an elastic steel blade having a length of 55 mm which operated flexibly. The metering bar was rotated in a direction opposite to the running base sheet at a speed of 15 rev/min. The pressure applied by the metering bar was controlled by adjusting a bolt holding the blade supporting frame to provide a coating quantity of 4.5 g/m². After drying, pressure-sensitive, color forming copysheet was obtained.

Superposing the thus obtained pressure-sensitive, color-forming copy sheet on a pressure-sensitive copying clay paper, a clear, blue image was obtained upon copying.

A thermal test was carried out as in the Example 1, and it was found that the capsules had excellent thermal resistance.

EXAMPLE 6

In Example 2, 3-diethylamino-7-dibenzylaminofluorane was replaced by emerald jasmin Y-1514 (trade name of a perfume produced by Ogawa Koryo KK) to provide a capsule composition containing perfume. This capsule composition was treated in an atomizing dryer (Niro Atomizer: Miner Unit Type 53, Danish made), to provide a perfume-incorporated capsule powder. Redispersing the obtained capsule powder in an aqueous solution to which casein has been dissolved (6% solution) adjusted its solids content to 67% and the viscosity to 11,000 C.P.

The capsule composition prepared as above was applied onto a base sheet utilizing a metering bar coater as shown in FIG. 4. The backing roll was a rubber coated roll having a diameter of 960 mm and a hardness of 50° Shore. The metering bar was made of chromium plated steel 8 mm in diameter. As the applicator roll, a hard chromium plated roll having a diameter of 150 mm was used which rotated at 20 rev/min. The coating speed was 105 m/min and a surplus amount of capsule composition was coated onto the running base sheet. The metering bar was 0.7 mm thick and supported on an elastic steel blade having a length of 40 mm which could be flexibly moved. The elastic steel blade was rotated in a direction opposite to the running direction of the base sheet at a speed of 15 rev/min.

Leaving the obtained capsule sheet for one or two months, when the capsule layer was rubbed with a knife there was a fragrant smell of jasmin.

As a result, it was again made clear that the capsules were in a normal condition even when they were applied by a metering bar coater.

What is claimed is:

1. A process of producing a capsule-coated sheet characterized by the steps of applying an excess of a coating composition containing microcapsules and having solids content of from about 20 to about 80 weight % and a viscosity of 50 to 50,000 C.P. to a running base sheet and thereafter applying a shearing force by means of a blade or metering bar to the coating composition by directly pressing thereagainst said blade or bar to remove excess coating composition from said base sheet and spread said composition uniformly over said running base sheet, said shearing force being insufficient to break said microcapsules.

2. The process of claim 1 wherein said microcapsules have a size less than about 100 μ .

3. The process of claim 1 wherein said microcapsules have a size in the range of from about 10 μ to about 50 μ .

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