EUROPEAN PATENT SPECIFICATION

Date of publication of patent specification: 14.06.95 Bulletin 95/24

Int. Cl.6: G03G 21/00

Application number: 91302523.5

Date of filing: 22.03.91

Cleaning blade and producing method thereof.

Priority: 24.03.90 JP 74208/90

Date of publication of application: 02.10.91 Bulletin 91/40

Publication of the grant of the patent: 14.06.95 Bulletin 95/24

Designated Contracting States:
DE FR GB IT

References cited:
EP-A-0 435 342
DE-A-2 324 749
DE-A-2 410 842

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DESCRIPTION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a cleaning blade for use in an image forming apparatus such as an electrophotographic copier, a printer, a facsimile apparatus or the like, and more particularly to a cleaning blade to be maintained in contact with the surface of an image bearing member to be cleaned thereby removing the toner remaining on said surface, and a producing method therefor.

Related Background Art

In an image forming apparatus designed to repeat a process of transferring a toner image, formed on the surface of an image bearing member, onto a transfer material such as paper, it is desirable to completely eliminate the untransferred toner remaining on said member after each transfer process, in order to prevent the smearing of the image by the remaining or residual toner at the next transfer process. For this purpose there is widely employed so-called blade cleaning method in which an edge of high precision formed with rubber elastomer is maintained in uniform contact with the surface of the image bearing member to slide on said member, thereby removing the toner remaining thereon. Said rubber elastomer is generally composed of urethane rubber, and thermosetting liquid urethanes are particularly preferred in consideration of the superior abrasion resistance thereof.

However, the cleaning blade composed of urethane rubber generates, because of a high friction coefficient of the urethane rubber, a very high friction force between the blade and the image bearing member in the initial stage of sliding motion when the toner is absent therebetween. Consequently the cleaning blade of urethane rubber may be inducted as indicated by broken lines in Fig. 3 or may bounce on the image bearing member in the initial stage of sliding motion, thereby becoming unable to remove the remaining toner.

In consideration of such situation, there has been proposed and employed a method of reducing the frictional force between the urethane rubber and the image bearing member in the initial stage of the sliding motion, by coating the end portion of the cleaning blade of urethane rubber or the surface of the image bearing member with lubricating powder of fluorinated resin such as polyvinylidene fluoride (PVDF) or polytetrafluoroethylene (PTFE) (hereinafter represented as "lubricant"). However, excessive use of such lubricant may result in smearing of the developing unit or the charging unit, or may deteriorate the image quality because of electrical properties of such lubricant. It is therefore necessary to obtain uniform coating with a minimum possible amount, but such coating is technically difficult to realize and the obtained blade cannot be fully reliable with respect to blade inversion or bouncing, due for example to fluctuation in the coating.

In order to resolve this drawback, Japanese Laid-open Patent No. 81-48881 proposes to disperse the lubricant in the urethane rubber material. However, in a simple dispersion system, the lubricant only appears locally on the surface as shown in Fig. 4, and the inversion or bouncing of the blade cannot be completely prevented as the urethane rubber used as the matrix considerably influences the behavior. Besides this, thermosetting liquid urethanes are unsuitable for mass production, since they require a long reaction time for thermosetting and have high reactivity with moisture in the air.

On the other hand, a rubber material of low friction resistance and short reaction time, for example silicone rubber with satisfactory stability in ambient conditions, is effective for preventing blade inversion or bouncing and is suitable for mass production. However silicone rubber is easily abraded and cannot be used for a long time, since the blade edge is abraded by the friction with the image bearing member or with the toner.

Cleaning blades comprising coated rubber members are described in DE-A-2410842 and DE-A-2324749. These include blades of silicone rubber material and coatings including epoxy resin, polyvinylidene fluoride, or other resins.

Cleaning blades comprising rubber material and dispersed resin are described in EP-A-0435342 and EP-A-0384354, each of which is mentioned with reference to Article 54(3)EPC. In particular, EP-A-0435342 describes blades of silicone rubber which may include a fine organic resin powder such as polyethylene, nylon, or fluorine-type resin. A process is described in which an inorganic silicon powder filler is mixed with rubber material, which is then moulded and cured. EP-A-0384354 describes cleaning blades of polyurethane rubber containing a dispersion of graphite fluoride powder. These are compared with blades of polyurethane rubber containing fluorocarbon resin. The latter are prepared by mixing fluorocarbon resin powder in heat melted urethane prepolymers, adding curing agents, casting in a mould and curing by heating.
SUMMARY OF THE INVENTION

The present invention is intended as a solution to the problems aforesaid. In accordance with a first aspect of the present invention there is provided a cleaning blade comprising:

- a base member of rubber in which a resin powder is dispersed;
- characterised by:
  - a resin layer disposed on at least the end face and contact face of said base member, which resin layer consists of said resin powder fused at the surface of said base member.

In accordance with a second aspect of the present invention there is provided a method for producing the cleaning blade of claim 1, which method comprises the following steps:

(a) dispersing resin powder in a rubber material;
(b) moulding said rubber material containing dispersed resin powder; and
(c) vulcanising the moulded rubber material;

which method is characterised in that:

- said step (c) of vulcanising the moulded rubber material is performed at a temperature higher than the melting point or the softening point of said resin powder thereby to produce a resin layer of resin powder fused at the surface of the moulded rubber.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of a cleaning blade embodying the present invention;
Fig. 2 is a chart showing the relationship between the contact pressure of the blade and the friction resistance thereof;
Fig. 3 is a schematic view showing an inversion phenomenon of the blade;
Fig. 4 is a schematic view showing fine particles dispersed in the blade; and
Fig. 5 is a schematic view showing a contacting part between the blade and the image bearing member.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now the present invention will be clarified in detail by preferred embodiments thereof.

The present inventors have found that the friction coefficient between the contacting surface of the image bearing member with the cleaning blade and an edge forming surface of said blade has a significant influence on the aforementioned inversion or bouncing of the blade, and also on the abrasion or chipping-off of the edge of the blade. More specifically, referring to Fig. 5, if an edge portion 20 of the cleaning blade tends to be turned over while the image bearing member 1 is in motion, a face 22 adjacent to a contacting face 21 of said blade comes into direct contact with said image bearing member 1, thus leading to blade inversion or blade bouncing. Also abrasion or chipping-off of the edge 20 is principally caused by stress concentration on the face 22 showing such turning-over. Consequently, in order to prevent inversion, bouncing, abrasion and chipping-off of the blade, in addition to the prevention of the above-mentioned turning-over phenomenon by a reduction in the friction coefficient of the contact face 21, it is also very effective to reduce the friction coefficient of the face 22 which comes into contact with the image bearing member when the blade tends to be turned over.

The present invention is based on the novel concept mentioned above.

In an embodiment of the present invention, fine particles of lubricating resin, which is not mutually soluble with rubber, are dispersed in a normally liquidous rubber material, and then a rubber member of a desired shape is produced from said rubber material by moulding the same in a mould. Said moulding of the rubber material is conducted in a condition where said fine particles are not molten but remain dispersed, under a temperature condition T1 < T10 < T2, wherein T1 is the primary vulcanizing temperature at which the moulding is conducted, T2 is the heat resistance of the rubber member (corresponding to the decomposition temperature of the constituent molecules, determined in DSC (differential scanning calorimetry) measurement), and T10 is the melting point or softening point (measured by ring-ball method) of the fine particles. The condition T1 < T10 is preferred for maintaining the uniformly dispersed state of the resin particles in the rubber at the molding operation, since, if the rubber moulding temperature T1 is selected equal to or higher than T10, the fine particles dispersed in the rubber material are fused at the moulding operation so that the mixing state becomes undefined for example depending on stress during the moulding operation.

Thus a moulded rubber member, containing fine particles dispersed therein, can improve the abrasion resistance when said member is composed of easily abraded silicon rubber. Therefore improved cleaning ability can be achieved in comparison with the case without such fine particles.

Then thus obtained rubber member is subjected to a secondary vulcanizing, by heating in an oven at a
temperature T20, satisfying a condition T10 < T20 < T2. In this operation, the fine particles 30 dispersed at
the surface or in the vicinity thereof are fused, thus covering the surface as shown in Fig. 1 because of the
lack of mutually solubility with the rubber material, and form a surfacial layer 25 upon subsequent cooling.

As a sufficiently thick resinous coating layer is formed particularly on the face 22' which comes into contact
with the image bearing member when the blade starts to turn-over, abrasion or chipping-off of the blade can
be prevented even if the blade does turn over.

As the surface coating of the cleaning blade is achieved by the fine particles present therein as explained
above, it is possible to form a sufficiently thick coating also on the edge portion, which is most difficult to coat
when instead the coating is formed from outside.

In Fig. 1, three faces of the blade are coated by the fine particles 30, but practically acceptable performance
can be obtained if the coating is formed at least on the face 21' contacting the image bearing member and the
face 22' adjacent thereto.

In such a cleaning blade 20, the surface characteristics are principally governed by the properties of the
initially dispersed fine particles as shown in Fig. 1, so that inversion, bouncing, abrasion and chipping-off of
the blade can be prevented by the selection of suitable lubricating particles. On the other hand, the elasticity
of the entire blade is ensured by the rubber material constituting the matrix. The matrix rubber material, not
coming into direct contact with the image bearing member, can be arbitrarily selected from various materials,
and can be composed of silicone rubber which is superior in mass producibility and in elastic property.

If the cleaning blade is cut, after the removal thereof from the mould at the edge position (portion to contact
the image bearing member) in order to improve the precision of the edge, there will be obtained a section face
on which is exposed a number of fine particles dispersed uniformly in the rubber material. Thus there is securely
obtained a thicker coating layer so that the cleaning operation can be achieved in improved manner.

In the following there are shown and evaluated examples of the present invention and reference examples
for comparison.

[Example 1]

Rubber material: addition type liquid silicone rubber
Fine particles: PVDF (particle size 10 µm or less) (melting point 170°C), 50 parts by weight to 100
moulding conditions: Moulding was conducted in a rubber injection moulder which was inserted a sup-
port member subjected in advance to an adhesion treatment:
Moulding temperature: 140°C
Moulding time: 150 seconds
After removal from the mould the edge portion was cut in a shape shown in Fig. 4, and the secondary
vulcanizing was conducted under the following conditions:
Secondary vulcanizing temperature: 200°C
Secondary vulcanizing time: 4 hours
moulded product: rubber hardness JISA 73.

The surfaces were covered with PVDF as shown in Fig. 1, particularly thicker in the cut portion (heat re-

tenance of rubber material: ca. 270°C).

[Example 2]

Moulding, removal from the mould and cutting of edge portion were conducted with the same materials
and conditions as in the example 1.
Then the secondary vulcanizing was conducted by heating for 60 seconds at 250°C, and then for 4 hours
at 200°C.
moulded product: rubber hardness JIS 73

Because of the treatment at high temperature (250°C), the PVDF particles present relatively deep in the
surficial area emerged to the surface and contributed to the formation of layer, so that the obtained PVDF
layer was thicker than in the example 1.

[Example 3]

Rubber material: addition type liquid silicone rubber (same as in the example 1).
Fine particles: crystalline polypropylene; 50 parts by weight to 100 parts by weight of rubber
(melting point: 145°C).
Moulding conditions: Moulding was conducted in a rubber injection moulder in which was inserted a support member subjected in advance to an adhesion treatment:
Moulding temperature: 120°C
Moulding time: 10 minutes
After the removal from the mould, the edge portion was cut in the same shape as in example 1, and the secondary vulcanizing was conducted under the following conditions:
Secondary vulcanizing temperature: 200°C
Secondary vulcanizing time: 4 hours
moulded product: rubber hardness JISA 71
A polypropylene layer was formed on the surface in a similar manner as in the example 1.

[Example 4]
Rubber material: same as in the example 3
Fine particles: same as in the example 3
moulding conditions: Moulding was conducted in a rubber injection moulder in which was inserted a support member subjected in advance to an adhesion treatment:
Molding temperature: 170°C
Molding time: 60 seconds
After the removal from the mould the edge portion was cut in the same shape as in the example 3, and the secondary vulcanizing was conducted under the following conditions:
Secondary vulcanizing temperature: 200°C
Secondary vulcanizing time: 4 hours.
Molded products: rubber hardness JISA 71
Because the molding temperature was higher than the melting point of the fine particles, the dispersion state thereof became unstable, and the obtained surfacial polypropylene layer showed fluctuation in thickness.

[Reference example 1]
Rubber material: thermosetting liquid urethane rubber
Fine particles: none
Moulding conditions: Moulding temperature: 130°C  
Moulding time: 30 minutes
Secondary vulcanizing temperature: 130°C
Secondary vulcanizing time: 4 hours
After secondary vulcanizing, the edge portion was cut in the same shape as in the foregoing examples.
Moulded product: rubber hardness JISA 65

[Reference example 2]
Rubber material: same as in the example 1
Fine particles: none
Moulding conditions: same as in the example 1
Moulded product: rubber hardness JISA 62.

[Evaluation conditions]
The blades obtained in the foregoing examples and reference examples were mounted in a copying machine, and subjected to the evaluation of inversion, bouncing, cleaning ability and abrasion resistance under the following conditions:
Image bearing member: organic photosensitive member
Process speed: 50 mm/sec.
Performance was evaluated by a durability test of 5,000 copies.
With respect to blade inversion in the initial stage, since reliability cannot be evaluated in several tests, there was conducted a measurement of the friction resistance between each blade and the organic photosensitive member.
[Result of evaluation]

Table 1 summarizes the results of evaluation, and Fig. 2 summarizes the results of measurement of friction resistance.

<table>
<thead>
<tr>
<th></th>
<th>Ex.1</th>
<th>Ex.2</th>
<th>Ex.3</th>
<th>Ex.4</th>
<th>Ref.Ex.1</th>
<th>Ref.Ex.1</th>
<th>Ref.Ex.2</th>
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</thead>
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<tr>
<td><strong>Inversion</strong></td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>X</td>
<td>○</td>
<td>○</td>
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<tr>
<td><strong>Cleaning ability</strong></td>
<td>○</td>
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<td>○</td>
<td>△</td>
<td></td>
<td>○</td>
<td>X</td>
</tr>
<tr>
<td><strong>Abrasion</strong></td>
<td>50μm²</td>
<td>25μm²</td>
<td>80μm²</td>
<td>4500μm²</td>
<td>ca.0μm²</td>
<td>6000μm²</td>
<td></td>
</tr>
<tr>
<td><strong>Edge chipping-off</strong></td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>present but fewer than in Ref.Ex.2</td>
<td>none</td>
<td>many</td>
<td></td>
</tr>
<tr>
<td><strong>Initial imaging ability</strong></td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>X</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) Inversion ○ no inversion; X inversion observed;

2) Cleaning ability ○ cleaning satisfactory

△ cleaning slightly unsatisfactory

X cleaning unsatisfactory

3) Initial imaging ability ○ satisfactory

X image defective due to smearing of charger or developing unit

4) Abrasion area of abraded part on the section of blade

As shown in Table 1, the examples 1 to 4 exhibit satisfactory initial imaging ability, and are improved in the durability.

However, the example 4 showed fluctuation in the thickness of the surficial resin layer, with locally thin parts, so that the improvement in durability is less than that in the examples 1 to 3. Consequently the rubber molding temperature should preferably satisfy the condition T1 < T10 as explained before.

On the other hand, in the reference example 1, absence of lubricant on the blade or on the photosensitive member caused inversion of blade, while use of excessive lubricant caused smearing of the charger or the developing unit, leading to a defective image. Also the reference example 2 exhibited frequent abrasion or chippings of the blade, resulting in unsatisfactory cleaning.

The reliability of the blade with respect to inversion can be judged from the friction resistance shown in
Fig. 2, which shows the friction resistance between the blade and the organic photosensitive member in ordinate, as a function of contact pressure in abscissa. The friction resistance in ordinate is represented by a relative value in arbitrary scale.

In Fig. 2, the reference example 1 "without lubricant" corresponds to a level of causing inversion, as will be apparent from the above-explained results. On the other hand, the reference example 1 "with excessive lubricant" employs a large amount of lubricant for preventing inversion, thus causing defects in the image.

The examples 1, 2 and 3 are comparable to the reference example 1 with excessive lubricant, indicating that they are sufficiently reliable with respect to blade inversion.

The friction resistance of the example 4 is higher than that of the examples 1, 2 and 3 but is lower than that of reference example 1 (no lubricant) or reference example 2.

Reference example 2 showed a lower friction resistance than in reference example 1 without lubricant and did not show inversion during evaluation, but reliability cannot be said to be sufficient.

The fine particles of resin to be dispersed need not necessarily be crystalline but can be those with a sharp molecular weight distribution having a well defined softening point. Nevertheless crystalline particles having a melting point are preferable. In case crystalline resin powder is employed, the rubber moulding temperature is preferably selected lower than the melting point and the vulcanizing temperature is preferably selected higher than said melting point as in the foregoing examples. In case non-crystalline resin powder is employed, the rubber moulding temperature is preferably selected lower than the softening point of said resin, and the vulcanizing temperature is preferably selected higher than said softening point.

The fine particles in the foregoing examples are composed of PVDF or polypropylene, but there may also be employed other materials such as polyethylene or polyester.

Also the rubber material is not limited to silicone rubber, but there may be employed any other rubber material on which surface coating is possible by the secondary vulcanizing. Nevertheless silicone rubber is preferred in consideration of superior mass producibility and elastic characteristics.

The content of the resin particles is preferably within a range from 20 to 80 parts by weight with respect to 100 parts by weight of the rubber, since an amount less than 20 parts leads to an excessively thin surface coating, while an amount in excess of 80 parts will deteriorate the elasticity of the rubber matrix.

The present invention has been explained by examples thereof, but the present invention is not limited by such examples and is subject to any variation within the scope of the invention as defined by the appended claims.

Claims

1. A cleaning blade comprising:
   a base member (3) of rubber in which a resin powder (30) is dispersed;
   characterised by:
   a resin layer (25) disposed on at least the end face (22') and contact face (21') of said base member (3), which resin layer (25) consists of said resin powder (30) fused at the surface of said base member (3).

2. A cleaning blade according to claim 1, wherein said rubber is a silicone rubber.

3. A cleaning blade according to claims 1 or 2, wherein said resin layer (25) is of fluorinated resin.

4. A cleaning blade according to any of claims 1 to 3 wherein said resin powder (30) is crystalline.

5. A cleaning blade according to claim 3 wherein said resin layer (25) is of polyvinylidene fluoride.

6. A cleaning blade according to any preceding claim wherein said base member (3) comprises 100 parts by weight of rubber and 20 to 80 parts by weight of resin powder (30).

7. Use of a cleaning blade according to any one of claims 1 to 6 for removing toner remaining on an image bearing member (1) for bearing toner image, wherein said resin layer (25) is arranged in contact with said image bearing member (1).

8. A method for producing the cleaning blade of claim 1, which method comprises the following steps:
   (a) dispersing resin powder (30) in a rubber material;
   (b) moulding said rubber material containing dispersed resin powder; and
(c) vulcanising the moulded rubber material;
    which method is characterised in that:
    said step (c) of vulcanising the moulded rubber material is performed at a temperature higher
    than the melting point or the softening point of said resin powder (30) thereby to produce a resin layer
    (25) of fused resin powder (30) at the surface of the moulded rubber.

9. A method according to claim 8 wherein said moulded rubber produced in step (b) is cut at one end prior
    to performing step (c).

10. A method according to either claim 8 or 9 wherein said moulding is performed at a temperature
    which is lower than the softening point or the melting point of said resin powder (30).

11. A method according to any preceding claim 8 to 10 wherein said rubber material is a silicone rubber.

12. A method according to any preceding claim 8 to 11 wherein said resin powder (30) is crystalline.

13. A method according to claim 12 wherein said resin powder (30) is of polyvinylidene fluoride.

14. A method according to any preceding claim 8 to 13 wherein in step (a) 20 to 80 parts by weight of said
    resin powder (30) is dispersed in 100 parts by weight of said rubber material.

Patentansprüche

1. Reinigungsklinge, die aufweist:
    einen Grundkörper (3) aus Gummi, in dem ein Harz pulver (30) dispergiert ist, gekennzeichnet durch:
    eine Harzschicht (25), die zumindest an der Endfläche (22') und der Kontaktfläche (21') des Grundkörpers
    (3) ausgebildet ist, wobei die Harzschicht (25) aus dem Harz pulver (30) besteht, das an der Oberfläche
    des Grundkörpers (3) aufgeschmolzen ist.

2. Reinigungsklinge nach Anspruch 1, wobei der Gummi ein Silikon gummi ist.

3. Reinigungsklinge nach Anspruch 1 oder 2, wobei die Harzschicht (25) fluoriertes Harz ist.

4. Reinigungsklinge nach den Ansprüchen 1 bis 3, wobei das Harz pulver (30) kristallin ist.

5. Reinigungsklinge nach Anspruch 3, wobei die Harzschicht (25) Polyvinylidenfluorid ist.

6. Reinigungsklinge nach den vorhergehenden Ansprüchen, wobei der Grundkörper (3) 100 Gewichtsteile Gummi
    und 20 bis 80 Gewichtsteile Harz pulver (30) aufweist.

7. Verwendung einer Reinigungsklinge nach einem der Ansprüche 1 bis 6 zur Entfernung des auf einem Bild-
    träger (1) zur Bewahrung des Toner bildes verbliebenen Toners, wobei die Harzschicht (25) in Kontakt mit
    dem Bildträger (1) gebracht wird.

8. Verfahren zur Herstellung der Reinigungsklinge nach Anspruch 1, wobei das Verfahren die folgenden
    Schritte aufweist:
    (a) Dispergieren des Harzpulvers (30) in einem Gummi material,
    (b) Formgebung des Gummi materials, das das dispergierte Harz pulver enthält, und
    (c) Vulkanisation des geformten Gummi materials, wobei das Verfahren gekennzeichnet ist durch:
    den Schritt (c) mit der Vulkanisation des geformten Gummi materials, ausgeführt bei einer Tempe-
    ratur, die höher ist als der Schmelzpunkt oder der Erweichungspunkt des Harzpulvers (30), um eine Harz-
    schicht (25), bestehend aus geschmolzenem Harz pulver (30), an der Oberfläche des geformten Gummis
    auszubilden.

9. Verfahren nach Anspruch 8, wobei der geformte Gummi, hergestellt im Schritt (b), an einem Ende be-
    schnitten wird, bevor die Ausführung von Schritt (c) erfolgt.

10. Verfahren nach einem der Ansprüche 8 oder 9, wobei der Schritt (b) der Formgebung bei einer Temperatur
    ausgeführt wird, die niedriger als der Erweichungspunkt oder der Schmelzpunkt des Harzpulvers (30) ist.
11. Verfahren nach einem der vorhergehenden Ansprüche 8 bis 10, wobei das Gummiaterial ein Silikon-gummi ist.

12. Verfahren nach einem der vorhergehenden Ansprüche 8 bis 11, wobei das Harzpulver (30) kristallin ist.

13. Verfahren nach Anspruch 12, wobei das Harzpulver (30) Polyvinylidenfluorid ist.

14. Verfahren nach einem der vorhergehenden Ansprüche 8 bis 13, wobei im Schritt (a) 20 bis 80 Gewichtsteile Harzpulver (30) in 100 Gewichtsteilen Gummiaterial dispersiert sind.

Revendications

1. Lame de nettoyage comportant :
   un élément de base (3) en caoutchouc dans lequel une poudre de résine (30) est dispersée ;
   caractérisée par :
   une couche (25) de résine disposée sur au moins la face extrême (22') et la face de contact (21')
   dudit élément de base (3), laquelle couche de résine (25) est constituée de ladite poudre de résine (30)
   fondue à la surface dudit élément de base (3).

2. Lame de nettoyage selon la revendication 1, dans laquelle ledit caoutchouc est un caoutchouc de silicone.

3. Lame de nettoyage selon la revendication 1 ou 2, dans laquelle ladite couche (25) de résine est en résine fluorisée.

4. Lame de nettoyage selon l'une quelconque des revendications 1 à 3, dans laquelle ladite poudre (30) de résine est cristalline.

5. Lame de nettoyage selon la revendication 3, dans laquelle ladite couche (25) de résine est en polyfluorure de vinylethène.

6. Lame de nettoyage selon l'une quelconque des revendications précédentes, dans laquelle ledit élément de base (3) comprend 100 parties en poids de caoutchouc et 20 à 80 parties en poids de poudre (30) de résine.

7. Utilisation d'une lame de nettoyage selon l'une quelconque des revendications 1 à 6 pour éliminer du toner restant sur un élément (1) porteur d'image destiné à former une image en toner, dans laquelle ladite couche (25) de résine est disposée de façon à être en contact avec ledit élément (1) porteur d'image.

8. Procédé pour produire la lame de nettoyage selon la revendication 1, lequel procédé comprend les étapes suivantes :
   (a) on dispose d'une poudre (30) de résine dans une matière du type caoutchouc ;
   (b) on moule ladite matière du type caoutchouc contenant en dispersion ladite poudre de résine ; et
   (c) on vulcanise la matière du type caoutchouc moulée ;
   lequel procédé est caractérisé en ce que :
   ladite étape (c) de vulcanisation de la matière du type caoutchouc moulée est effectuée à une
   température supérieure au point de fusion ou au point de ramollissement de ladite poudre (30) de résine,
   afin de produire une couche (25) de résine formée de poudre de résine fondue (30) à la surface du caoutchouc moulé.

9. Procédé selon la revendication 8, dans lequel ledit caoutchouc moulé produit dans l'étape (b) est coupé
   à une extrémité avant que l'étape (c) soit réalisée.

10. Procédé selon la revendication 8 ou 9, dans lequel ladite étape (b) de moulage est effectuée à une tempé-
   rature qui est inférieure au point de ramollissement ou au point de fusion de ladite poudre (30) de résine.

11. Procédé selon l'une quelconque des revendications 8 à 10, dans lequel ladite matière du type caoutchouc
    est un caoutchouc de silicone.

12. Procédé selon l'une quelconque des revendications 8 à 11, dans lequel ladite poudre (30) de résine est
cristalline.

13. Procédé selon la revendication 12, dans lequel ladite poudre (30) de résine est du polyfluorure de vinyleidène.

14. Procédé selon l’une quelconque des revendications 8 à 13, dans lequel, dans l’étape (a), on disperse 20 à 80 parties en poids de ladite poudre (30) de résine dans 100 parties en poids de ladite matière du type caoutchouc.