

Description

The present invention relates to an image fixing apparatus according to the preamble of claim 1.

A roller fixing apparatus for an image forming apparatus is known wherein rollers are press-contacted to each other to form a nip therebetween, through which an image supporting member for supporting an unfixed toner image is passed, by which the toner image is fixed.

Figure 5 shows an example of such an image fixing apparatus. The apparatus comprises a fixing roller 10 containing a heater H therein and a pressing roller press-contacted thereto.

The toner image supporting member is passed through the nip with its toner image supporting side contacted to the fixing roller, and the unfixed toner image is fixed by heat and pressure.

Separating pawl 12 functions to prevent the image supporting member from wrapping around the fixing roller 1, and it is rotatably supported on a rotational shaft 13, and is press-contacted to the fixing roller 10 by a spring 14.

Designated by reference numerals 15 and 16 are inlet guides, and 17 is an outlet guide.

However, such an apparatus involves the following problems. First, the roller is easily damaged because the edges of the separating pawls 12 are press-contacted to the fixing roller. In addition, the toner off-set to the fixing roller is scraped by the separating pawls 12, and the toner is gradually accumulated on the edges of the separating pawls 12. The accumulated toner is solidified thereon, and it contaminates the image supporting member, or the image supporting member is not properly separated from the roller. If the fixing roller is damaged, a stripe or stripes appear on the image, which is not preferable. Furthermore, since the edges of the separating pawls are contacted to the roller, a jam clearance operation is difficult with the possibility of damaging the separating pawls, if the image supporting member is jammed by wrapping on the roller or the like.

In view of the above, it is considered that the image supporting member is separated from the roller without use of the separating pawl by using a reduced outside diameter of the fixing roller, thus increasing the curvature of the roller surface in an attempt to increase the resilient repelling force of the supporting member beyond the adhering force of the toner. However, if only the resilient force of the supporting member is used to separate it from the roller, the separating force is small with the result that the image supporting member is sometimes wrapped on the roller, when the supporting member is a thin sheet having small resilient force as in the case of a sheet having basis weight of 60 g/m², when the toner adhering force is large as in the case of a large toner area on the sheet (solid black image, for example), or when the parting property of the fixing roller relative to the toner is deteriorated due to long term use.

The above described fixing apparatus is provided with an inlet guide and outlet guide to guide the image supporting member. The positional relation between these guides and the roller is very important from the standpoint of preventing occurrence of wrinkle and curl of the image supporting member, and therefore, the guide has to be positioned very accurately.

According to document JP-A-53 081241, there is known an image fixing apparatus according to the preamble of claim 1. This generic apparatus comprises spacer means provided at each of the longitudinal end portions of a blade and serving as a separation guiding means. The blade is such arranged that it contacts the fixing roller by means of abutment members serving as spacer means, so that a clearance is established between the roller and the blade. According to this construction the toner image supporting material is separated from the fixing roller by the separating blade closely arranged with the small clearance or gap relative to the fixing roller.

It is the object of the present invention to provide an image fixing apparatus by which the image supporting member is prevented from being wrapped on the fixing rotatable member even if a maximum size image-supporting material is used.

This object is achieved by means of the features defined in the characterizing part of new claim 1. According to these features the spacer means are provided at each of the longitudinal end portions of the rotatable member and are overlapped by the lateral edges of an image supporting material having a maximum usable size.

These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiment of the present invention taken in conjunction with the accompanying drawings.

Figure 1 is a partial top sectional view of an image fixing apparatus according to an embodiment of the present invention.

Figure 2 is a partial top sectional view of an image fixing apparatus according to a further embodiment of the present invention.

Figure 3 is a sectional view of an image fixing apparatus according to another embodiment of the present

invention.

Figure 4 is a top sectional view of an image fixing apparatus similar to a generic apparatus known in the prior art.

Figure 5 is a sectional view of a conventional image fixing apparatus.

Figure 6 is a top plan view of an image on a recording material in the embodiment.

An image fixing apparatus similar to the above-mentioned generic apparatus will be described in conjunction with the accompanying drawing in Figure 4. The apparatus comprises a heating roller (fixing roller) 1 having a fluorinated resin surface layer with good parting properties, a separating guide (guiding means) for preventing an image supporting material P such as paper for supporting a toner image, screws 3 for resiliently supporting the separating guide 2, and spacers 4 for stably providing a small gap g disposed adjacent end portions of the heat roller 1 and the separating guide 2. In this known apparatus, they are fixed on the separating guide 2 and is made of heat resistive material exhibiting good sliding properties. It further comprises a projection 5 for providing a pivot for pivotal movement of the separating guide 2, a spring 6 for resiliently supporting the separating guide 2, a halogen heater (heating means) 7 for supplying heat to the heat roller 1, bearings 8 for supporting the heat roller, and a gear 9 for driving the heating roller 1, which is driven by an unshown driving mechanism. A stopper 7 functions to limit movement of the heat roller 1 in its longitudinal direction. A pressing roller 20 is press-contacted to the heating roller 1 and is provided with an elastic layer made of silicone rubber. The pressing roller 20 rotates together with the heating roller 1.

The heating roller 1 and the pressing roller 20 function as fixing rotatable members for fixing the toner image on the image supporting material. Of these rollers, the heating roller 1 is contactable to the toner image supporting side of the image supporting material.

The apparatus further comprises inlet guides for guiding reception of the toner image supporting member by the rollers, an outlet guide for guiding discharge of the supporting material therefrom, and frames 18.

Figure 1, shows an apparatus according to an embodiment of the present invention, wherein the spacer 41 is provided at the heating roller side.

Figure 2 shows an apparatus according to a further embodiment of the present invention, wherein a part of the surface layer of the heating roller 1 is made thicker (1a), and the thick portion 1a is in contact with the separating guide 2 to assure the small gap.

When the fine gap g provided by the spacer is small, there is a liability that the off-set toner is accumulated, and if, on the contrary, it is large, the separating power decreases.

Therefore, the fine gaps g preferably 0.1 - 0.6 mm. The separating guide is preferably formed such that the fine gap g extends in parallel with the longitudinal direction of the heating roller 1, that is, the direction of the generating line of the roller 1.

An embodiment is particularly effective in the case of a small diameter heating roller such as the roller having a diameter not more than 30 mm.

When, however, the roller is worn to a certain great extent, the small gap g changes.

To avoid this, it is preferable that the surface layer having the good parting properties, particularly, fluorinated resin layer is formed at the portion of the heating roller 1 where the spacers are provided.

Figure 3, shows an image fixing apparatus according to a yet further embodiment. A heat fixing roller comprises an aluminum hollow core metal having a thickness of 2 mm and an outer diameter of 18 mm, and a resin layer made of PFA or the like coated on the core metal in a thickness of several tens microns. Within the fixing roller 1, there is a halogen heater to heat the fixing roller and to maintain the constant temperature thereof using an unshown temperature detecting element such as a thermister.

A pressing roller 20 comprises a stainless steel core metal having a diameter of 9 mm, and a silicone rubber layer having a thickness of 3.5 mm, the silicone rubber layer having good heat-resistive and parting property.

A separating guide 2 functions to guide the recording material P (image supporting material). The separating guide 2 is out of contact with the fixing roller 1. The separating guide 2 prevents the recording material from wrapping on the fixing roller. Between an edge 2a and the fixing roller 1, there is formed a small gap g. The small gap g extends along the length of the fixing roller 1.

The edge 2a of the guiding member is positioned 55 degrees (θ) away from a line connecting the center O of the fixing roller and the center O' of the pressing roller about the center O of the fixing roller toward downstream with respect to the rotational direction of the fixing roller.

Table 1 shows the difference in the separating effect due to the difference of the small gap g. The relation among the gap g, the leading margin and the number of jam occurrences is shown when 100 sheets having the solid black image shown in Figure 6 were processed. The angle θ was fixedly 55 degrees.

Table 1

		Small Gap g (mm)							
		1.0	0.8	0.7	0.6	0.5	0.4	0.2	0.1
	0	100	60	30	15	8	4	0	0
	1	95	50	20	2	1	1	0	0
	2	90	40	15	0	0	0	0	0
	3	90	40	10	0	0	0	0	0
	4	85	35	4	0	0	0	0	0
	5	85	30	2	0	0	0	0	0
	6	80	30	2	0	0	0	0	0
	7	80	30	1	0	0	0	0	0

Generally, the leading margin is not less than 2 mm, and therefore, it is understood that the jam (wrapping of the recording material) hardly occurs if the gap g is larger than zero and not more than 0.6 mm.

Table 2 shows the difference in the separating effect due to the difference in the angle θ . The relation among the angle θ , the leading margin and the number of jam occurrences is shown when 100 sheets having the solid black image as shown in Figure 16 were processed for the image fixing. Here, the gap g was fixedly 0.6 mm.

Table 2

	Angle θ										
	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°
0	100	60	30	15	8	4	0	0	0	4	8
1	95	50	20	2	1	1	0	0	0	1	2
2	90	40	15	0	0	0	0	0	0	1	1
3	90	40	10	0	0	0	0	0	0	0	0
4	85	35	4	0	0	0	0	0	0	0	0
5	85	30	2	0	0	0	0	0	0	0	0
6	80	30	2	0	0	0	0	0	0	0	0
7	80	30	1	0	0	0	0	0	0	0	0

Leading
Margin
(mm)

Generally, the leading margin is not less than 2 mm, and therefore, the angle θ is preferably not less than 40 degrees. If the angle θ is larger than 90 degrees, the separating point between the recording material and the fixing roller is shifted upstream beyond the guiding member with respect to the rotational direction of the roller with the result that the sheets are not smoothly discharged, so that some sheets were jammed. Therefore, the angle θ is preferably not less than 40 degrees and not more than 90 degrees.

The stickiness of the toner on the recording material tends to wrap the recording material on the fixing roller. The present invention utilizes the tendency of the repelling force of the recording material against the stickiness of the toner, and the instance when the leading edge of the recording material is slightly separated from the

fixing roller is utilized to separate the recording material from the fixing roller with the aid of the separating guide 2. Therefore, when the separating guide is disposed at the portion where the repelling force of the recording material is produced, the separating operation will be stabilized.

As described in the foregoing, the stabilized separating function can be accomplished by maintaining the small gap g between the guiding member and the fixing roller and the angle θ , independently from the configuration and material of the guiding member.

As described in the foregoing, the gap g should be adjusted accurately, and in order to meet this, it is preferable that the spacing means contacted to the guiding member and the fixing roller is used to assure the clearance.

As described in the foregoing, according to the present invention, the toner image supporting material is separated from the fixing roller by the guiding means such as a separating guide closely disposed with the small gap relative to the fixing rotatable member such as a fixing roller or belt.

The non-contact guiding member is particularly effective for the separation of the toner image supporting member from the rotatable member when it is used with a small diameter fixing rotatable member.

The present invention is applicable to the case where one or both of the rollers are crowned or reversely crowned, and in these cases the minimum and maximum gaps are maintained not less than 0.1 millimetres and not more than 0.6 millimetres.

Claims

1. An image fixing apparatus comprising a fixing rotatable member (1) for fixing a toner image on an image supporting material (P), separation guiding means (2), disposed in a direction of a generating line of said fixing rotatable member (1), for guiding said image supporting material (P) to separate it from said fixing rotatable member, and spacer means (41; 1a) disposed outside the maximum image formation area to form a predetermined gap between the surface of said fixing rotatable member (1) and said separation guiding means (2),
characterized in that
said spacer means (41; 1a) are provided at each of the longitudinal end portions of said rotatable member and are in use overlapped by the lateral edges of an image supporting material having a maximum usable size.
2. An image fixing apparatus according to claim 1, characterized in that said spacer means (41; 1a) are provided with a parting surface layer.
3. An image fixing apparatus according to claim 2, characterized in that said parting surface layer is of fluorinated resin.
4. An image fixing apparatus according to claim 1, characterized in that said fixing rotatable member (1) is contactable to an unfixed toner image.
5. An image fixing apparatus according to claim 4, characterized in that said rotatable member (1) is heated by heating means (H).
6. An image fixing apparatus according to claim 1, characterized in that said predetermined gap is 0.1 - 0.6 mm.
7. An image fixing apparatus according to any one of claims 1 to 6, characterized in that said image fixing apparatus further comprises another fixing rotatable member (20), said rotatable member (1, 20) forming a nip therebetween, through which said image supporting material (P) supporting an unfixed toner image is passed, wherein a free end portion of said separating guide (2) is disposed within a range between 40 - 90 degrees from a line connecting the centers (O, O') of said rotatable members (1, 20) about the center (O) of said rotatable member (1) downstream with respect to a rotational direction of said rotatable member (1).
8. An image fixing apparatus according to claim 1, characterized in that said rotatable member (1) has a diameter of not more than 30 mm.



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As described in the foregoing, the gap g should be adjusted accurately, and in order to meet this, it is preferable that the spacing means contacted to the guiding member and the fixing roller is used to assure the clearance.

As described in the foregoing, according to the present invention, the toner image supporting material is separated from the fixing roller by the guiding means such as a separating guide closely disposed with the small gap relative to the fixing rotatable member such as a fixing roller or belt.

The non-contact guiding member is particularly effective for the separation of the toner image supporting member from the rotatable member when it is used with a small diameter fixing rotatable member.

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characterized in that
said spacer means (41; 1a) are provided at each of the longitudinal end portions of said rotatable member and are in use overlapped by the lateral edges of an image supporting material having a maximum usable size.
2. An image fixing apparatus according to claim 1, characterized in that said spacer means (41; 1a) are provided with a parting surface layer.
3. An image fixing apparatus according to claim 2, characterized in that said parting surface layer is of fluorinated resin.
4. An image fixing apparatus according to claim 1, characterized in that said fixing rotatable member (1) is contactable to an unfixed toner image.
5. An image fixing apparatus according to claim 4, characterized in that said rotatable member (1) is heated by heating means (H).
6. An image fixing apparatus according to claim 1, characterized in that said predetermined gap is 0.1 - 0.6 mm.
7. An image fixing apparatus according to any one of claims 1 to 6, characterized in that said image fixing apparatus further comprises another fixing rotatable member (20), said rotatable member (1, 20) forming a nip therebetween, through which said image supporting material (P) supporting an unfixed toner image is passed, wherein a free end portion of said separating guide (2) is disposed within a range between 40 - 90 degrees from a line connecting the centers (O, O') of said rotatable members (1, 20) about the center (O) of said rotatable member (1) downstream with respect to a rotational direction of said rotatable member (1).
8. An image fixing apparatus according to claim 1, characterized in that said rotatable member (1) has a diameter of not more than 30 mm.



Patentansprüche

1. Bildfixiergerät mit einem drehbaren Fixierelement (1) zum Fixieren eines Tonerbildes auf einem Bildträgermaterial (P), einer Trennführungseinrichtung (2), angeordnet in einer Richtung der Erzeugungslinie des drehbaren Fixierelementes (1) zum Führen des Bildträgermaterials (P) und zum Abtrennen dieses von dem drehbaren Fixierelement (1), und eine Abstandseinrichtung (41; 1a), angeordnet außerhalb des maximalen Bilderzeugungsbereichs, um einen vorbestimmten Spalt zwischen der Oberfläche des drehbaren Fixierelementes (1) und der Trennführungseinrichtung (2) auszubilden, **dadurch gekennzeichnet, daß** die Abstandseinrichtung (41; 1a) an jedem der Längsendabschnitte des drehbaren Elements vorgesehen ist und im Gebrauch von den seitlichen Kanten eines Bildträgermaterials, das die maximal benutzbare Größe hat, überlappt wird.
2. Bildfixiergerät nach Anspruch 1, **dadurch gekennzeichnet, daß** die Abstandseinrichtung (41; 1a) mit einer Oberflächentrennschicht versehen ist.
3. Bildfixiergerät gemäß Anspruch 2, **dadurch gekennzeichnet, daß** die Oberflächentrennschicht aus flouriniertem Harz besteht.
4. Bildfixiergerät nach Anspruch 1, **dadurch gekennzeichnet, daß** das drehbare Fixierelement (1) mit dem nichtfixierten Tonerbild in Kontakt bringbar ist.
5. Bildfixiergerät nach Anspruch 4, **dadurch gekennzeichnet, daß** das drehbare Element (1) mittels einer Heizeinrichtung (H) beheizt wird.
6. Bildfixiergerät nach Anspruch 1, **dadurch gekennzeichnet, daß** der vorbestimmte Spalt 0,1 - 0,6 mm ist.
7. Bildfixiergerät nach einem der Ansprüche 1 - 6, **dadurch gekennzeichnet, daß** das Bildfixiergerät weiterhin ein weiteres drehbares Fixierelement (20) umfaßt, und die drehbaren Fixierelemente (1, 20) einen Spalt zwischen sich ausbilden, durch den das Bildträgermaterial (P), das ein nicht fixiertes Tonerbild trägt, gefördert wird, wobei ein freier Endabschnitt der Trennführung (2) innerhalb eines Winkelbereichs von 40 bis 90 Grad um den Mittelpunkt (O) des drehbaren Elements (1) stromunterhalb bezüglich einer Drehrichtung des drehbaren Elements (1) angeordnet ist, ausgehend von einer Linie, die die Mittelpunkte (O, O') der drehbaren Elemente (1, 20) verbindet.
8. Bildfixiergerät nach Anspruch 1, **dadurch gekennzeichnet, daß** das drehbare Element (1) einen Durchmesser von nicht mehr als 30 mm aufweist.

Revendications

1. Appareil de fixation d'images comportant un élément rotatif (1) de fixation destiné à fixer une image en toner sur un support d'image (P), un moyen (2) de guidage de séparation, disposé dans la direction d'une génératrice dudit élément rotatif (1) de fixation, destiné à guider ledit support d'image (P) pour le séparer dudit élément rotatif de fixation, et un moyen d'écartement (41 ; 1a) disposé à l'extérieur de la zone de formation d'image maximale pour former un intervalle prédéterminé entre la surface dudit élément rotatif (1) de fixation et ledit moyen (2) de guidage de séparation, **caractérisé en ce que** lesdits moyens d'écartement (41 ; 1a) sont prévus à chacune des parties extrêmes longitudinales dudit élément rotatif et sont recouverts, pendant l'utilisation, par les bords latéraux d'un support d'image ayant un format maximal utilisable.
2. Appareil de fixation d'images selon la revendication 1, caractérisé en ce que lesdits moyens d'écartement (41 ; 1a) sont pourvus d'une couche superficielle de séparation.
3. Appareil de fixation d'images selon la revendication 2, caractérisé en ce que ladite couche superficielle de séparation est en résine fluorée.
4. Appareil de fixation d'images selon la revendication 1, caractérisé en ce que ledit élément rotatif (1) de



fixage peut entrer en contact avec une image en toner non fixée.

5. Appareil de fixage d'images selon la revendication 4, caractérisé en ce que ledit élément rotatif (1) est chauffé par un moyen chauffant (H).
- 5 6. Appareil de fixage d'images selon la revendication 1, caractérisé en ce que ledit intervalle prédéterminé est de 0,1 - 0,6 mm.
- 10 7. Appareil de fixage d'images selon l'une quelconque des revendications 1 à 6, caractérisé en ce qu'il comporte en outre un autre élément rotatif (20) de fixage, lesdits éléments rotatifs (1, 20) formant entre eux une zone de serrage dans laquelle passe ledit support d'image (P) supportant une image en toner non fixée, une partie extrême libre dudit guide (2) de séparation étant disposée dans une plage comprise entre 40-90 degrés à partir d'une ligne reliant les centres (O, O') desdits éléments rotatifs (1, 20) autour du centre (O) dudit élément rotatif (1) vers l'aval par rapport au sens de rotation dudit élément rotatif (1).
- 15 8. Appareil de fixage d'images selon la revendication 1, caractérisé en ce que ledit élément rotatif (1) a un diamètre ne dépassant pas 30 mm.

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