Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention.)
The present invention relates to a web guidance system and in particular to a web guidance system capable of web cleaning.

It is known in production processes to make use of webs which require to be cleaned (EP 0 568 397). Such webs are thin, generally plastic materials and web guidance systems are well known in the art. Webs are prone to run off track easily and the web guidance systems are used to keep the web on a desired track.

Web cleaning systems are also known in the art, these cleaning systems being used to remove particulates from at least one surface of the web. It is the case, in particular, of the contact fuser assembly for use in electrostatic reproducing apparatus disclosed in the document US 4,018,555 and of the electrographic apparatus disclosed in the document US 4,572,417.

In the past it has been the practice to use separate web cleaning systems and web guidance systems. The surface of a cleaning roller is formed of elastomeric material which is compressible. This compressibility means that when the web is placed in tension over the cleaning roller the web can deviate from track, and this factor has caused cleaning rollers to be thought not to be suitable for use also as guidance rollers which has inhibited the development or use of combined cleaning/guidance systems.

According to invention, there is provided a web guidance system which incorporates web cleaning means, the system comprising at least one guiding roller controllable to effect guiding of the web, and at least a first cleaning roller, characterised in that the web is fed between said guiding roller and said first cleaning roller, in that said first cleaning roller has an outer surface coated with a material having a degree of tackiness capable of removing particulates from a surface of the web, and in that the guiding roller has a surface hardness greater than that of the first cleaning roller.

The guiding roller may be also a cleaning roller having an outer surface coated with a material having a degree of tackiness capable of removing particulates from the other surface of the web.

Preferably, the or each cleaning roller is provided with a respective backup roller arranged to engage the cleaning roller and having a surface coated with a material having a degree of tackiness greater than that of the cleaning roller for removing particulates from the cleaning roller.

In preferred embodiments, the several rollers are mounted for rotation about parallel roller rotation axes in a common frame, the frame being rotatable about a frame rotation axis which is perpendicular to said roller rotation axes; and the system suitably includes a feedback control loop which comprises an edge sensor for sensing the position of the web edge at a location downstream of the rollers, and an actuator arranged to rotate said frame about the frame rotation axis in response to the output of the edge sensor.

Cleaning may take place at an upstream side or at a downstream side of the system.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic isometric view of a web guidance system as known in the art;
Fig. 2 is a schematic isometric view of one embodiment of the present invention; and
Fig. 3 is a schematic isometric view of an embodiment outside the scope of the claims; and
Figs.4 to 9 are views similar to fig. 2 of alternative embodiments of the invention.

Fig. 1 illustrates web guiding apparatus 10 as is known in the art. The web guiding apparatus 10 comprises a mounting plate 11 on which a first guiding roller 12 and a second guiding roller 13 are mounted for rotation about spaced horizontal axes. A web 15 is placed in tension over the first and second guiding rollers 12 and 13. The web guiding apparatus 10 further comprises an edge sensor 14 for detecting the edge of the web and ensuring that the web 15 is running on track. When the sensor 14 detects that the web 15 is moving off track then a suitable control system is activated. The control system comprises a feedback loop 16A driving a linear actuator 16 which is arranged to rotate the mounting plate 11 about a central vertical axis. Thus, the linear actuator 16 causes the axes of the guiding rollers 12 and 13 to swivel in a horizontal plane, in order to cause the web 15 to track in the desired direction. The feedback loop 16A continues to operate the linear actuator 16 until the sensor 14 detects that the web 15 is in the desired location.

Referring to Fig. 2, there is illustrated one embodiment of a web guidance system 20 in accordance with the present invention, which includes web cleaning apparatus for cleaning both the upper and lower surfaces of the web 25. The system 20 comprises a feedback loop 16A driving a linear actuator 16 which is arranged to rotate the mounting plate 11 about a central vertical axis. Thus, the linear actuator 16 causes the axes of the guiding rollers 12 and 13 to swivel in a horizontal plane, in order to cause the web 15 to track in the desired direction. The feedback loop 16A continues to operate the linear actuator 16 until the sensor 14 detects that the web 15 is in the desired location.

The web 25 is fed over the input roller 22 then between the upper and lower cleaning rollers 23A and 23B. The web then passes an anti-static device 26, which removes static built up through the system. An edge sensor 14, feedback loop 16A and linear actuator 16 are provided which operate as in the prior art system to keep the web 25 on the desired track.
[0014] As will be evident, the lower cleaning roller 23B also acts as a web guiding roller equivalent to the web guiding roller 12 of the prior art design shown in Fig. 1. In order for the web guidance aspect of this embodiment to operate efficiently, the web 25 must be in tension over the guiding roller 23B.

[0015] Normally, cleaning rollers, by their nature, are not as hard as guiding rollers, because the cleaning rollers generally use elastomeric materials and have a degree of "give". This means that when the web 25 is put in tension over the lower cleaning roller 23B, it is compressed and the web guiding system may not operate effectively.

[0016] However, in this present embodiment, the surface of the lower cleaning roller 23B is harder than the surface of the upper cleaning roller 23A. Therefore, the lower cleaning roller 23B has less "give" than the upper cleaning roller 23A thus allowing the guidance aspect of the embodiment to function properly.

[0017] The web cleaning system operates in a manner that is well known in the prior art, that is, having upper and lower cleaning rollers 23A and 23B respectively, both having first degrees of adhesive tackiness to remove particulates from the upper and lower surfaces of the web 25, respectively. These upper and lower cleaning rollers 23A and 23B engage first and second backup rollers 24A and 24B, respectively. These first and second backup rollers 24A and 24B have second degrees of adhesive tackiness for removing the particulates from the upper and lower cleaning rollers 23A and 23B.

[0018] In Fig. 3 in an embodiment not within the scope of the claims, a mounting plate 11 is pivoted on a support 30. Two rollers are rotatably carried by the mounting plate 11: a cleaning roller 23A at the input side, and a guiding roller 13 at the output side.

[0019] Alternative embodiments will now be described with reference to Figs. 4 to 9. In these Figures like parts are denoted by like reference numerals, and the anti-static device 26 and the edge detector 14 and feedback system 16, 16A have been omitted but operate as before.

[0020] In Fig. 4, the mounting plate 11 carries guiding rollers 12 and 13, the guiding roller 13 at the output end having associated therewith a cleaning roller 23A and adhesive backup roller 24A. Fig. 5 is similar, but the cleaning roller 23A and backup roller 24A are positioned at the input end.

[0021] The embodiments of Figs. 4 to 5 are therefore suitable for cleaning only one side of the web. The embodiments shown in Figs. 6 to 9 clean both sides of the web.

[0022] Fig. 6 is similar to Fig. 5, but the input end guiding roller is replaced by a second cleaning roller 23B and backup roller 24B.

[0023] Fig. 7 shows an arrangement in which the web 25 passes through the system substantially linearly, supported by non-steerable infeed and outfeed rollers 70 and 71. Upper and lower cleaning rollers 23A and 23B and backup rollers 24A and 24B are rotatably mounted, as shown only schematically, on a carrier 72 to form an assembly 73 which can be rotated about a vertical axis on a base 74. The assembly 73 is rotated under feedback control as before to correct the track of the web.

[0024] Fig. 8 shows an assembly 73 similar to that of Fig. 7, but mounted within a mounting plate 11 which also carries guiding rollers 12 and 13. Fig. 9 is similar functionally to Fig. 8, but the assembly 73 is secured by readily accessible bolts 90 into a modified mounting plate 91 such that the assembly 73 can readily be removed and replaced in a modular manner.

[0025] Modifications and improvements may be made to the foregoing within the scope of the present invention as claimed.

Claims

1. A web guidance system (20) which incorporates web cleaning means, the system comprising at least one guiding roller (12,13,23B) controllable to effect guiding of the web (25), and at least a first cleaning roller (23A), characterised in that the web (25) is fed between said guiding roller (12,13,23B) and said first cleaning roller (23A), in that said first cleaning roller (23A) has an outer surface coated with a material having a degree of tackiness capable of removing particulates from a surface of the web (25), and in that the guiding roller (23B) has a surface hardness greater than that of the first cleaning roller (23A).

2. A web guidance system according to claim 1, wherein the guiding roller (23A) is a cleaning roller having an outer surface coated with a material having a degree of tackiness capable of removing particulates from the other surface of the web (25).

3. A web guidance system according to one of claims 1 or 2, wherein the web is fed between said guiding roller (23B) and said first cleaning roller (23A) substantially linearly.

4. A web guidance system according to any preceding claim, in which the or each cleaning roller (23A, 23B) is provided with a respective backup roller (24A, 24B) arranged to engage the cleaning roller (23A, 23B) and having a surface coated with a material having a degree of tackiness greater than that of the cleaning roller (23A, 23B) for removing particulates from the cleaning roller (23A, 23B).

5. A web guidance system according to any preceding claim, in which the several rollers (23A, 23B, 24A, 24B) are mounted for rotation about parallel roller
rotation axes in a common frame (11, 21A, 21B),
the frame being rotatable about a frame rotation ax-
is which is perpendicular to said roller rotation axes.

6. A web guidance system according to claim 5,
including a feedback control loop (16A) which com-
prises an edge sensor (14) for sensing the position
of the web (25) edge at a location downstream of
the rollers (23A, 23B, 24A, 24B), and an actuator
(16) arranged to rotate said frame (21A, 21B) about
the frame rotation axis in response to the output of
the edge sensor (14).

7. A web guidance system according to any preceding
claim, in which cleaning takes place at an upstream
side of the system.

8. A web guidance system according to any of claims
1 to 6, in which cleaning takes place at a down-
stream side of the system.

Patentansprüche

1. Ein Bahnführungssystem (20), das Bahnreini-
gungsmittel einschließt, wobei das System minde-
stens eine Führungswalze (12, 13, 23B), die steu-
erbar ist, um die Führung der Bahn (25) durchzu-
führen und mindestens eine erste Reinigungswalze
(23A) beinhaltet, dadurch gekennzeichnet, dass
die Bahn (25) zwischen die Führungswalze (12, 13,
23B) und die erste Reinigungswalze (23A) einge-
führt wird, dass die erste Reinigungswalze (23A) ei-
eine äußere Oberfläche aufweist, die mit einem Ma-
terial mit einem Grad an Haftvermögen, das Partikel
t von einer Oberfläche der Bahn (25) entfernen kann,
brschichtet ist, und dass die Führungswalze (23B)
eine Oberflächenhärte aufweist, die größer als die
der ersten Reinigungswalze (23A) ist.

2. Bahnführungssystem gemäß Anspruch 1, wobei
die Führungswalze (23A) eine Reinigungswalze ist,
die eine äußere Oberfläche aufweist, die mit einem Material mit einem Grad an Haftvermögen, das Parti-
tikel von einer Oberfläche der Bahn (25) entfernen kann, beschichtet ist.

3. Bahnführungssystem gemäß einem der Ansprüche
1 oder 2, wobei die Bahn zwischen die Führungs-
walze (23B) und die erste Reinigungswalze (23A)
im Wesentlichen linear eingeführt wird.

4. Bahnführungssystem gemäß einem der vorherge-
henden Ansprüche, in dem die oder jede Reini-
gungswalze (23A, 23B) mit einer jeweiligen Stützwalze (24A, 24B), die angeordnet ist, um in die
Reinigungswalze (23A, 23B) eingzugreifen und die
eine Oberfläche aufweist, die mit einem Material mit

5. Bahnführungssystem gemäß einem der vorherge-
henden Ansprüche, in dem die verschiedenen Wal-
zen (23A, 23B, 24A, 24B) zum Drehen um parallele
Walzendrehachsen in einem gemeinsamen Rah-
men (11, 21 A, 21 B) montiert sind, wobei der Rah-
men um eine Rahmendrehachse, die sich senk-
recht zu den Walzendrehachsen befindet, drehbar
ist.

6. Bahnführungssystem gemäß Anspruch 5, das eine
Rückkopplungsschleife (16A) umfasst, die einen
Kantensensor (14) zum Abtasten der Position der
Bahn(25)-Kante an einer von den Walzen (23A,
23B, 24A, 24B) nach unten gerichteten Stelle und
ein Stellglied (16), das angeordnet ist, um den Rah-
men (21 A, 21 B) um die Rahmendrehachse als Re-
aktion auf die Ausgabe des Kantensensors (14) zu
drehen, beinhaltet.

7. Bahnführungssystem gemäß einem der vorherge-
henden Ansprüche, in dem das Reinigen an einer
nach oben gerichteten Seite des Systems stattfin-
det.

8. Bahnführungssystem gemäß einem der Ansprüche
1 bis 6, in dem das Reinigen an einer nach unten
gerichteten Seite des Systems stattfindet.

Revendications

1. Un système de guidage de bande (20) qui incorpore
un moyen de nettoyage de bande, le système com-
portant au moins un rouleau guideur (12,13,23B)
pouvant être commandé pour effectuer le guidage
de la bande (25), et au moins un premier rouleau
de nettoyage (23A), caractérisé en ce que la ban-
de (25) est introduite entre ledit rouleau guideur
(12, 13, 23B) et ledit premier rouleau de nettoyage
(23A), en ce que ledit premier rouleau de nettoyage
(23A) a une surface externe enduite d’une matière
ayant un degré de pégosité capable de retirer des
matières particulières d’une surface de la bande
(25), et en ce que le rouleau guideur (23B) a une
dureté de surface supérieure à celle du premier rou-
leau de nettoyage (23A).

2. Un système de guidage de bande selon la revendi-
cation 1, dans lequel le rouleau guideur (23A) est
un rouleau de nettoyage ayant une surface externe
enduite d’un matériau ayant un degré de pégosité
capable de retirer des matières particulières de
l’autre surface de la bande (25).
3. Un système de guidage de bande selon l'une des revendications 1 ou 2, dans lequel la bande est introduite entre ledit rouleau guideur (23B) et ledit premier rouleau de nettoyage (23A) de façon substan-tiellement linéaire.

4. Un système de guidage de bande selon n'importe quelle revendication précédente, dans lequel le ou chaque rouleau de nettoyage (23A, 23B) est pourvu d'un rouleau-support respectif (24A, 24B) agencé pour engager le rouleau de nettoyage (23A, 23B) et ayant une surface enduite d'une matière ayant un degré de pégosité supérieur à celui du rouleau de nettoyage (23A, 23B) pour retirer des matières particulières du rouleau de nettoyage (23A, 23B).

5. Un système de guidage de bande selon n'importe quelle revendication précédente, dans lequel la pluralité de rouleaux (23A, 23B, 24A, 24B) sont montés pour tourner autour d'axes de rotation de rouleaux parallèles dans un cadre commun (11, 21A, 21B), le cadre étant rotatif autour d'un axe de rotation de cadre qui est perpendiculaire auxdits axes de rotation de rouleaux.

6. Un système de guidage de bande selon la revendication 5, comprenant une boucle de commande à rétroaction (16A) qui comporte un capteur de bord (14) pour capter la position du bord de bande (25) à un emplacement en aval des rouleaux (23A, 23B, 24A, 24B), et un actionneur (16) agencé pour faire tourner ledit cadre (21A, 21B) autour de l'axe de rotation de cadre en réponse à la sortie du capteur de bord (14).

7. Un système de guidage de bande selon n'importe quelle revendication précédente, dans lequel le nettoyage a lieu au niveau d'un côté en amont du système.

8. Un système de guidage de bande selon n'importe quelles des revendications 1 à 6, dans lequel le nettoyage a lieu au niveau d'un côté d'aval du système.