



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.07.2010 Bulletin 2010/27

(51) Int Cl.:
B65H 20/02 (2006.01) B65H 23/24 (2006.01)

(21) Application number: **08846122.3**

(86) International application number:
PCT/JP2008/068735

(22) Date of filing: **16.10.2008**

(87) International publication number:
WO 2009/057454 (07.05.2009 Gazette 2009/19)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

• **OZAKI, Koji**
Hino-shi
Tokyo 191-8511 (JP)
• **FUKUDA, Kazuhiro**
Hino-shi
Tokyo 191-8511 (JP)

(30) Priority: **02.11.2007 JP 2007286284**

(74) Representative: **Gille Hrabal Struck Neidlein Prop Roos**
Brucknerstrasse 20
D-40593 Düsseldorf (DE)

(71) Applicant: **Konica Minolta Holdings, Inc.**
Tokyo 100-0005 (JP)

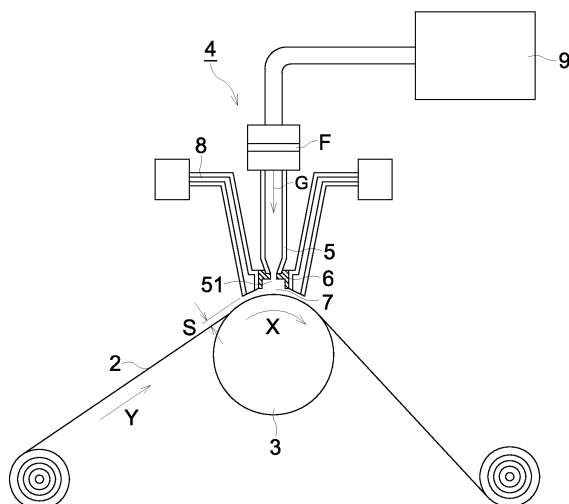
(72) Inventors:
• **MIZUNO, Wataru**
Hino-shi
Tokyo 191-8511 (JP)

(54) **NIP DEVICE AND NIP METHOD**

(57) A nip device and a nip method which enable a reduction in gas consumption without causing scratches and the like when an object to be treated (such as a band-shaped film) is pressed against a support (such as a roll).

A gas storage chamber for storing gas with atmospheric pressure higher than outside atmospheric pressure is provided at a position facing a film. The band-shaped film is carried while being pressed against the roll with a low consumption of gas.

FIG. 1



Description

FIELD OF THE INVENTION

[0001] The present invention relates to a nip apparatus and a nip method which press a material such as a band-shaped film to be treated on a supporting member such as a roll.

TECHNICAL BACKGROUND

[0002] In a nip apparatus which a band-shaped film is conveyed while being supported on a rotating roll, when the film is provided on the roll, a part of air is enclosed in a film, the enclosed air forms air bubbles causes a partial elevation of film. The partial elevation of the film changes a gap between the film surface and a post-processing device through which the film is subjected to post-processing such as coating or plasma processing, causing problem of resulting in incapability of uniform post-processing.

[0003] In order to solve such a problem, there is proposed a method in which a film supported on a roll (referred to as a supporting roll) is pressed against the roll at an appropriate pressure employing a roll with elasticity (referred to as an elastic roll), thereby bringing the film into close contact with the supporting roll.

[0004] However, in the technique employing the elastic roll, dirt on the elastic roll surface is transferred to the film, since the elastic roll is in contact with the film. Further, the technique employing the elastic roll has problem in that since the elastic roll rotates while deforming along the outer circumference of the supporting roll, microscopic slippage takes place at the interface between the film and the elastic roll, producing scratches due to slippage on the film surface.

[0005] In order to prevent the dirt transfer or scratches due to slippage as described above, a technique is disclosed in, for example, Patent Document 1, in which compressed air is jetted onto a band-shaped film supported on a supporting roll, thereby improving contact between the film and the roll without employing an elastic roll.

[0006] A technique is disclosed in Patent Document 2 in which air present between a film and a supporting roll having numerous minute holes in the surface is sucked through the minute holes, thereby improving contact between the film and the roll.

Patent Document 1: Japanese Patent O.P.I. Publication No. 59-92856

Patent Document 2: Japanese Patent O.P.I. Publication No. 2003-171044

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0007] However, in the technique disclosed in Patent Document 1, it is necessary that the compressed air is

continuously jetted on the film surface while maintaining a pressure higher than outside atmospheric pressure and consumption of the air is too large. The technique, when expensive gas such as a nitrogen gas needs to be employed as air to be compressed, increases the gas cost, and therefore, is not considered to be useful.

[0008] The technique disclosed in Patent Document 2 has problem in that scratches due to edges of the numerous minute holes are produced on the surface on the side facing the roll of the film.

[0009] An object of the invention is to provide a nip apparatus and a nip method which reduce consumption of gas used without scratches which are produced when a material to be treated (such as a band-shaped film and the like) is pressed against a support (such as a roll and the like).

MEANS FOR SOLVING THE ABOVE PROBLEMS

[0010] The above object of the invention can be attained by any one of the following constitutions.

1. A nip apparatus which presses a material to be treated provided on a supporting member against the supporting member by jetting gas onto the surface of the material, the nip apparatus comprising:

a gas jetting device with a jetting opening disposed in a position facing the supporting member, the material being provided between the jetting opening and the supporting member,

wherein the gas jetting device comprises a gas introduction pipe for introducing gas to the jetting opening and a gas storage chamber with a jetting opening, connecting the gas introduction pipe and having a sectional area greater than that of the gas introduction pipe, the jetting opening being a constituent of the gas storage chamber.

2. The nip apparatus of item 1, wherein the gas storage chamber stores gas with a pressure higher than outside atmospheric pressure.

3. The nip apparatus of item 1 or 2, further comprising a gas discharge device which sucks gas and discharges the sucked gas in the vicinity of a gap between the supporting member and the jetting opening.

4. The nip apparatus of any one of items 1 through 3, wherein the supporting member is a rotatory roll and the material to be treated is a band-shaped film, the film being supported on the rotatory roll.

5. A nip method which presses a material to be treated provided on a supporting member against the support member by jetting gas onto the surface of the material, the nip method comprising the steps of:

introducing gas into a gas introduction pipe with a specific diameter; and

discharging gas from a gas storage chamber with a jetting opening, wherein the gas storage chamber connects the gas introduction pipe and has a sectional area greater than that of the gas introduction pipe.

EFFECTS OF THE INVENTION

[0011] In the invention, a gas storage chamber, which stores gas with a pressure higher than outside atmospheric pressure, is disposed at a position facing a film, and a band-shaped film can be conveyed while being pressed against a roll with a reduced consumption of gas.

BRIEF DESCRIPTION OF THE DRAWING

[0012]

Fig. 1 is a schematic drawing showing the structure of the nip apparatus 1 in the invention.

EXPLANATION OF SYMBOLS

[0013]

1. Nip apparatus
2. Film
3. Roll
4. Gas jetting device
5. Jetting nozzle
6. Surrounding wall
7. Gas storage chamber
8. Gas discharge device

PREFERRED EMBODIMENT OF THE INVENTION

[0014] The preferred embodiment of the invention will be explained below. The present invention will be explained employing the embodiment illustrated but the present invention is not limited thereto. A definite explanation of the preferred embodiment of the invention made below shows the best mode of the invention but does not limit the terms or technical scope described.

[0015] Next, the present invention will be explained, referring to the drawing.

[0016] Fig. 1 is a schematic drawing showing the structure of the nip apparatus 1 in the invention. In the drawing, the nip device 1 comprises a roll 3 and a gas jetting device 4, a band-shaped film 2 being supported on the roll 3 and the gas jetting device jetting gas onto the band-shaped film 2 supported on the roll 3.

[0017] In the gas jetting device 4, a jetting nozzle 5 as a gas introduction pipe is disposed at a position facing the film 2. A surrounding wall 6 is disposed at the tip end of the jetting nozzle 5, the surrounding wall connecting the jetting nozzle 5 and extending to the vicinity of the surface of the film 2. The surrounding wall 6 has a port diameter greater than the pipe diameter of the jetting nozzle 5, constituting a gas storage chamber 7. The gas storage chamber, which has a diameter (or a sectional area) greater than a pipe diameter (or a sectional area) of the gas introduction pipe, and is not completely opened, makes it possible to jet a high pressure gas onto an area broader than an area onto which a nozzle jets the gas, providing an excellent nip effect and reducing gas consumption amount. Namely, the nip apparatus has a structure that the stream diameter (or sectional area) of the gas stream increases in the gas storage chamber but a relatively high pressure of the gas is maintained.

[0018] The gas storage chamber comprises a gas jetting port and jets gas onto the film 2, whereby the film 2 can be pressed against the roll 3. Herein, the jetting nozzle 5 and the surrounding wall 6 are explained as being different members but they may be integrated into one body.

[0019] The roll 3 rotates in the direction as shown by an arrow Y, and the band-shaped film moves in the direction as shown by an arrow X. Gas jetted by the gas jetting device is temporarily stored in a space formed from the surrounding wall, the end surface of the jetting nozzle and the surface of the film 2. This space forms a gas storage chamber 7. Gas G, which is ejected from the gas jetting device 4 and has a pressure higher than outside atmospheric pressure, is stored in the gas storage chamber 7. The gas G with higher pressure is discharged from the gas storage chamber 7 through a gap S between the surrounding wall 6 and the film 2. The gas, G discharged from the gas storage chamber 7, accumulates in the nip apparatus 1 unless any processing is carried out, and when the accumulated gas leaks from the device, the leaked gas has problem in that it may be harmful to human body due to kinds of gas used. Accordingly, a gas discharge device 8, which sucks the gas G and discharges the gas toward a predetermined section, is provided in the vicinity of the gap S so as not to allow extra gas to accumulate in the nip apparatus 1. In this case, it is preferred that the amount of the sucked gas is larger than the jetting amount of gas jetted by the gas jetting device.

[0020] In the gas jetting device 4, a filter F for removing impurities in the gas G is provided in a path through which the gas G passes. In the embodiment of the invention, the filter is provided between the gas jetting device 4 and a compressor 9 which compresses the gas G. In this drawing, the gas jetting device 4 is explained as pressing gas against one portion of the band-shaped film surface. Plural gas jetting device may be provided in the width direction (from the front of the page to the back of the page) of the band-shaped film 4, thereby linearly applying uniform pressure to the surface in the width direction of the film.

[0021] The gas jetting device can be a gas jetting device in the form of a slit capable of linearly jetting gas onto the entire surface in the width direction of the film. In this case, it is necessary that the jetting port of the gas storage chamber (the sectional area of the gas storage

chamber is larger than the tip port of the slit (the sectional area of the gas introduction pipe).

[0022] After the film is pressed against the roll, a step may be carried out in which the pressed film is subjected to post-treatment such as coating, UV irradiation or plasma on that roll.

[0023] The difference in gas pressure GF (hPa) of the gas jetted by the gas jetting device 4 between the device of the invention with the gas storage chamber 7 and a conventional device without the gas storage chamber 7 was determined in the experiment. The results are shown below.

[0024] The experiment was carried out under the following conditions.

$S = 1 \text{ mm}$

$W = 1000 \text{ mm}$

$V = 500 \text{ mm/sec.}$

wherein S (mm) represents a gap between the surrounding wall 6 and the upper surface of the film 2, W (mm) represents the width of the film 2, and v (mm/sec.) represents a take-up speed at which the film 2 is taken-up.

[0025] The gas pressure GF was 1200 hPa in the device of the invention with the gas storage chamber 7, while the gas pressure GF was 2000 hPa in the conventional device without the gas storage chamber 7.

[0026] In summary, the nip apparatus of the invention with the gas storage chamber 7 enabled to convey the film 2 while pressing the film against the roll 3 without causing scratches due to film slippage at a gas pressure GF of about 1.1 times the atmospheric pressure 1013 (hPa). This shows that the gas in the gas storage chamber 7 uniformly presses the film surface.

[0027] In contrast, the conventional nip apparatus required a gas pressure GF of about 2 times the atmospheric pressure, in order to obtain the same performance as described above.

[0028] Thus, the nip apparatus of the invention comprising a gas storage chamber 7, which stores gas with a pressure higher than outside atmospheric pressure, enables to convey while pressing a band-shaped film against a roll in a reduced amount of gas.

connecting the gas introduction pipe and having a sectional area greater than that of the gas introduction pipe.

2. The nip apparatus of claim 1, wherein the gas storage chamber stores gas with a pressure higher than outside atmospheric pressure.
3. The nip apparatus of claim 1 or 2, further comprising a gas discharge device which sucks gas and discharges the sucked gas in the vicinity of a gap between the supporting member and the jetting opening.
4. The nip apparatus of any one of claims 1 through 3, wherein the supporting member is a rotatory roll and the material to be treated is a band-shaped film, the film being supported on the rotatory roll.
5. A nip method which presses a material to be treated provided on a supporting member against the support member by jetting gas onto the surface of the material, the nip method comprising the steps of:

introducing gas into a gas introduction pipe with a specific diameter; and

discharging gas from a gas storage chamber with a jetting opening, wherein the gas storage chamber connects the gas introduction pipe and has a sectional area greater than that of the gas introduction pipe.

Claims

1. A nip apparatus which presses a material to be treated provided on a supporting member against the supporting member by jetting gas onto the surface of the material, the nip apparatus comprising:

a gas jetting device with a jetting opening disposed in a position facing the supporting member, the material being provided between the jetting opening and the supporting member,

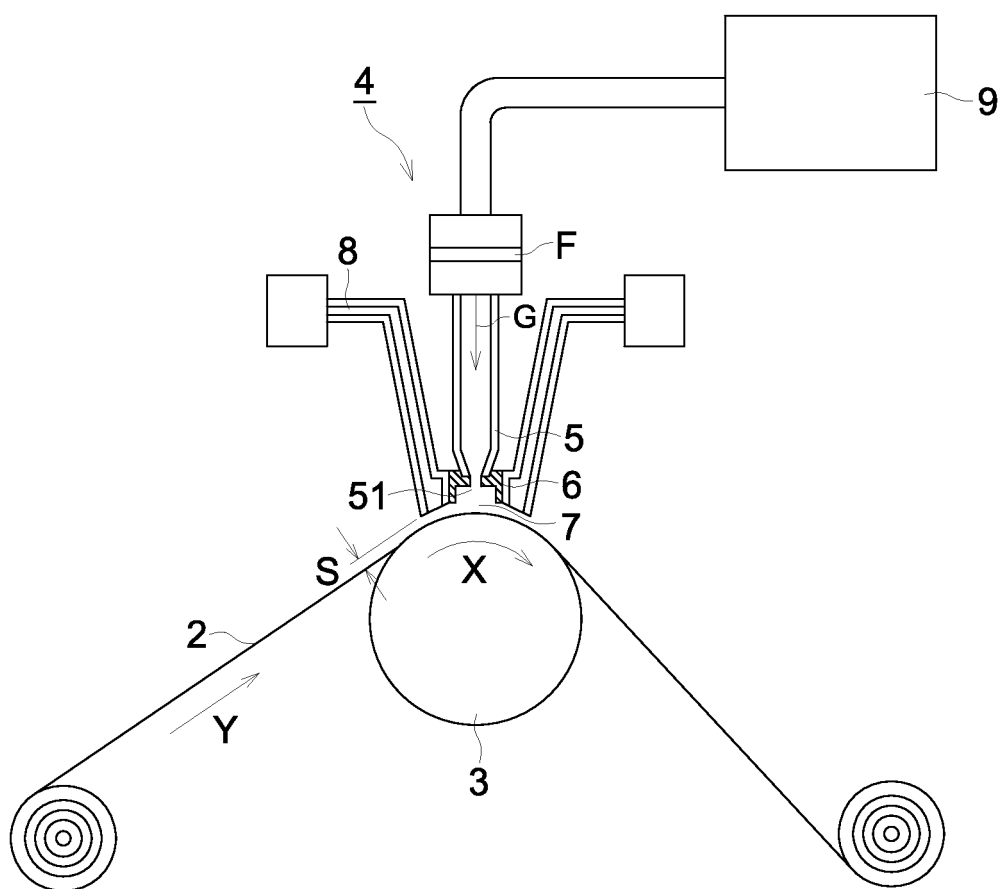
wherein the gas jetting device comprises a gas introduction pipe for introducing gas to the jetting opening and a gas storage chamber with a jetting opening,

45

50

55

FIG. 1



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/068735

A. CLASSIFICATION OF SUBJECT MATTER

B65H20/02 (2006.01) i, B65H23/24 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65H20/00-20/40, B65H23/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho

1922-1996

Jitsuyo Shinan Toroku Koho

1996-2008

Kokai Jitsuyo Shinan Koho

1971-2008

Toroku Jitsuyo Shinan Koho

1994-2008

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 59-92856 A (Matsushita Electric Industrial Co., Ltd.), 29 May, 1984 (29.05.84), Page 2, upper left column, line 1 to lower left column, line 12 (Family: none)	1-5
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 29252/1989 (Laid-open No. 123307/1990) (Kawasaki Steel Corp.), 11 October, 1990 (11.10.90), Description, page 7, line 5 to page 12, line 9; Figs. 1 to 2 (Family: none)	1-5

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
30 October, 2008 (30.10.08)Date of mailing of the international search report
11 November, 2008 (11.11.08)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/068735

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-263456 A (Fuji Photo Film Co., Ltd.), 29 September, 2005 (29.09.05), Column 3, line 16 to column 8, line 14; Figs. 1 to 5 (Family: none)	1-5
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 171800/1984 (Laid-open No. 86350/1986) (Kobe Steel, Ltd.), 06 June, 1986 (06.06.86), Full text; Fig. 3 (Family: none)	1-5
A	JP 2005-84542 A (Noritsu Koki Co., Ltd.), 31 March, 2005 (31.03.05), Full text; Figs. 1 to 2 (Family: none)	1-5

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 59092856 A [0006]
- JP 2003171044 A [0006]