

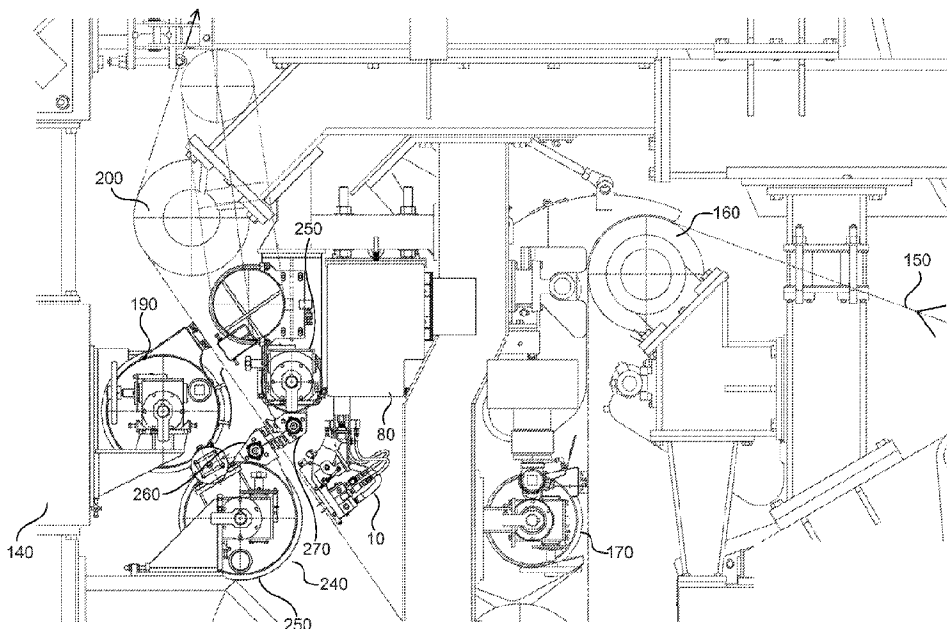


(86) Date de dépôt PCT/PCT Filing Date: 2013/03/21
 (87) Date publication PCT/PCT Publication Date: 2013/10/17
 (45) Date de délivrance/Issue Date: 2020/01/14
 (85) Entrée phase nationale/National Entry: 2014/07/30
 (86) N° demande PCT/PCT Application No.: US 2013/033216
 (87) N° publication PCT/PCT Publication No.: 2013/154802
 (30) Priorités/Priorities: 2012/04/11 (US61/622,622);
 2013/03/13 (US13/799,721)

(51) Cl.Int./Int.Cl. *D21F 1/32* (2006.01)
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(54) Titre : TRAITEMENT DE NETTOYAGE D'UNE COURROIE DE TRANSPORT SERVANT A LA FABRICATION D'UNE BANDE DE PAPIER

(54) Title: A PROCESS FOR CLEANING A TRANSPORT BELT FOR MANUFACTURING A PAPER WEB



(57) Abrégé/Abstract:

The disclosure relates to a continuous cleaning method for cleaning a moving fabric in a paper machine. The method uses one or more cleaning stages. In one embodiment, one cleaning stage applies steam to heat and soften contaminants on the fabric followed by the application of water, preferably superheated water, to remove the contaminants. Another cleaning stage may apply hot water, steam and/or superheated water via an encapsulated shower and evacuation chamber making it possible to clean the width of the fabric without substantial rewet.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau(10) International Publication Number
WO 2013/154802 A1(43) International Publication Date
17 October 2013 (17.10.2013)

- (51) International Patent Classification:
D21F 1/32 (2006.01)
- (21) International Application Number:
PCT/US2013/033216
- (22) International Filing Date:
21 March 2013 (21.03.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/622,622 11 April 2012 (11.04.2012) US
13/799,721 13 March 2013 (13.03.2013) US
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- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report (Art. 21(3))

(54) Title: A PROCESS FOR CLEANING A TRANSPORT BELT FOR MANUFACTURING A PAPER WEB

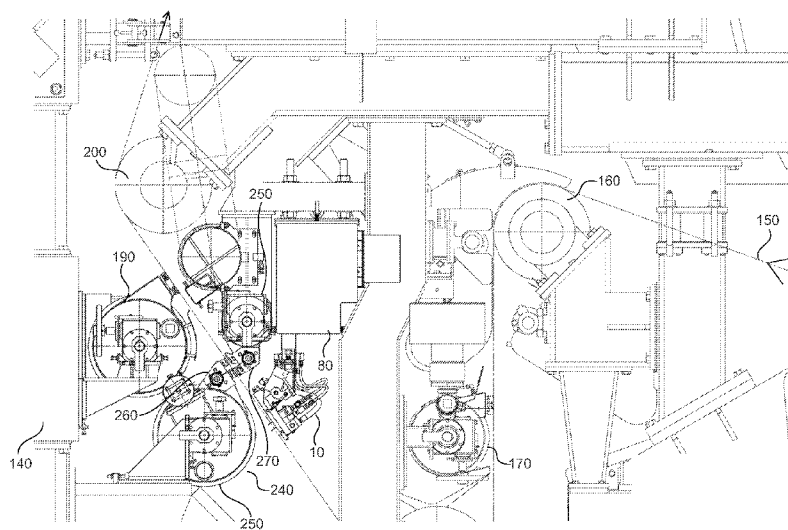


Fig. 1

(57) Abstract: The disclosure relates to a continuous cleaning method for cleaning a moving fabric in a paper machine. The method uses one or more cleaning stages. In one embodiment, one cleaning stage applies steam to heat and soften contaminants on the fabric followed by the application of water, preferably superheated water, to remove the contaminants. Another cleaning stage may apply hot water, steam and/or superheated water via an encapsulated shower and evacuation chamber making it possible to clean the width of the fabric without substantial rewet.

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A PROCESS FOR CLEANING A TRANSPORT BELT FOR MANUFACTURING A PAPER WEB

BACKGROUND OF THE INVENTION

5 Cleaning systems for papermaking fabrics are known in the art. Most suffer from issues of insufficient cleaning or an inability to run during paper machine operation due to issues with damage to or rewet of the fibrous structure that is being produced. Prior art configurations vary, but they generally use a pressurized cleaning solution that is applied to the fabric via a nozzle. Known systems include, for example, shower
10 bars, rotating nozzles and angled nozzles all in an attempt to improve fabric cleaning. Prior art systems have struggled to find a cleaning method which adequately cleans the fabric without undue wear and tear or damage to the fabric. Contamination, water holes and fabric wear have also impeded the development of continuous cleaning methods. The cleaning method and equipment as described herein provide a number
15 of advantages over the known cleaning systems.

BRIEF DESCRIPTION OF THE INVENTION

This disclosure relates to cleaning equipment and methods for cleaning a moving fabric used in the manufacture of paper webs. This disclosure further relates to
20 cleaning equipment and methods for continuous cleaning of a moving fabric in a paper machine. Still further, this disclosure relates to cleaning equipment and a method for continuous cleaning of a moving fabric in a paper machine which minimizes rewet.

More particularly, this disclosure relates to a cleaning system including both an initial
25 cleaning shower and a second cleaning shower. The disclosed dual cleaning arrangement results in a continuous cleaning system that does not suffer from areas of residue contamination that can result in poor fabric performance. The disclosure relates to an improved initial cleaning shower that provides enhanced contaminant removal and exceptional residual water uptake. Further, the disclosure relates to an

improved second cleaning shower that also provides enhanced contaminant removal and further prevents residual water uptake by the fabric.

5 Still more particularly, this disclosure relates to the application of steam to a moving fabric in a paper making machine to thereby heat and soften contaminants in the fabric making them easier to remove by subsequent water showers. This disclosure further relates to the application of steam to a moving fabric to heat and soften contaminants followed by the application of superheated, i.e., pressurized water to remove the contaminants. In one embodiment, the steam and superheated water are applied in the
10 initial cleaning shower. In another embodiment, the steam and superheated water are applied in both the initial cleaning shower and in the second cleaning shower.

This disclosure also relates to a cleaning method that can use only water without the need for additional chemical additives to achieve appropriate fabric cleaning. Finally,
15 this disclosure relates to a method for cleaning a moving fabric used in the manufacture of paper webs that enhances the removal of cleaning media from the fabric to minimize web rewet.

BRIEF DESCRIPTION OF THE DRAWINGS

20 **FIGURE 1** is a side view of a cleaning system of the present invention, mounted on a papermaking machine for cleaning a moving fabric.

FIGURE 2A is a front cut-away view of a standard initial traversing cleaning shower for use with the present invention.

25

FIGURE 2B is a front perspective view of a standard initial traversing cleaning shower for use with the present invention.

FIGURE 2C is a side cut-away view of a standard traversing cleaning shower for use with the present invention.

FIGURE 3 is a side view of an encapsulated second cleaning shower that eliminates
5 mist.

DETAILED DESCRIPTION OF THE INVENTION

The present disclosure describes a method and equipment for cleaning a papermaking fabric. Wires, felts and belts used on papermaking machines are subjected to
10 conditions that cause an accumulation of contaminants, including fibers, clay and foreign matter, to build up on them. The accumulation of contaminants can be exacerbated when recycle or other low grade fibers are introduced. These accumulations, if not removed, can create significant operational issues, from mild inefficiencies to requiring that the machine be shut down until the accumulation can be
15 removed.

The present disclosure describes cleaning equipment and methods for cleaning a moving fabric that achieve significant improvements over prior cleaning systems when used to clean a moving fabric in a papermaking machine. These improvements may
20 include, but are not limited to, improved contaminant removal; reduced loss due to machine down time since the papermaking machine need not cease operation to apply this cleaning method; improved water removal resulting in minimal rewet of the paper structure that may be on the fabric; and reduced cost since it requires no cleaning solutions. Further, because the process of the present invention doesn't require
25 cleaning agents, it can be free of volatile organic compounds ("VOCs"). As used herein, "fabric" refers to any circulating web or belt used in a papermaking machine to convey a paper web. Examples of these fabrics are forming wires, press belts, transfer fabrics, and dryer fabric(s). According to one embodiment, the cleaning as disclosed may be carried out on transfer fabric(s) carrying a nascent web to the drying section of

the paper machine. According to another embodiment, the cleaning method as disclosed may be used to clean drying fabrics in the drying section of the paper machine.

5 The continuous cleaning method according to the present invention includes two cleaning stages and assemblies. As used herein “continuous” cleaning method refers to a cleaning process that can be carried out on the fabric while the machine is producing a product and without ceasing that product production. As used herein “initial cleaning shower” refers to the first cleaning assembly that the fabric encounters and “initial
10 cleaning stage” refers to the period of contact between the fabric and the initial cleaning shower. The term “second cleaning shower” refers to the second cleaning assembly that the fabric encounters and the term “second cleaning stage” refers to the period of contact between the fabric and the second cleaning shower. As will be readily apparent to the skilled artisan, additional cleaning assemblies may be included
15 before or after the second cleaning shower if they are considered necessary to achieve the desired cleaning result.

According to one embodiment, the initial cleaning shower reduces the overall contaminant load on the fabric making it possible for the second cleaning shower to
20 continuously clean the fabric to a level that does not require costly shut downs of the machine. The operation of each cleaning shower has been modified over that which was known in the prior art. These changes provide substantial improvements in each of the cleaning stages and together create a very effective continuous cleaning system.

25 The initial cleaning shower may have any art recognized configuration. It may include a shower or nozzle or series of showers or nozzles that are stationary or that reticulate or traverse the cross-machine direction width of the papermaking fabric. In one embodiment, the initial cleaning shower may be a series of nozzles or a shower bar that allows application of cleaning media to the entire width of the papermaking fabric
30 simultaneously. According to another embodiment, the initial cleaning shower is a

traversing shower that reticulates back and forth across the papermaking fabric. The nozzles may move, e.g., rotate, or be stationary. The specific configuration of the shower or nozzles can vary, including for example, in size, shape, type, or geometry without impacting the effectiveness of the disclosed method.

5

Optimal settings including nozzle type, cleaning media, cleaning media pressure and temperature, and distance between the cleaning assembly and the fabric to be cleaned are routinely selected based upon the nature of the fabric to be cleaned and the number and size of the nozzles. Correlations are generally provided by the manufacturer of such nozzles and shower systems. According to one embodiment, when superheated pressurized water is the selected cleaning media, the distance between the fabric and the nozzle should be reduced as the jet of pressurized water will break earlier than a regular water jet.

10

15

As used herein cleaning media includes but is not limited to water, steam, superheated water, cleaning solutions, and non-water based solvents with low vapor pressures. An example of a non-water based solvent with low vapor pressure would be Novec™ Fire Protection Fluid manufactured by 3M.

20

The initial cleaning shower and method of using the initial cleaning shower include the application of steam to a moving fabric in a paper making machine to thereby heat and soften contaminants on and in the fabric, making them easier to remove by subsequent water showers. Contaminants that are typically found on paper making fabrics include fibers, pitch, particles, dirt, and adhesives. As discussed above, additional cleaning stages may be included, as desired. The present disclosure contemplates the application of steam followed by superheated water in a single stage or in multiple stages spaced along the fabric in the machine direction.

25

30

According to one embodiment, the steam is applied in a superheated state. As used herein “superheated steam” refers to steam, not in contact with its own liquid, heated to

beyond its saturation point at a given pressure. Steam is applied at a temperature of from about 105°C to about 150°C, such as from about 110°C to about 135°C.

Following the application of steam which heats and softens contaminants is at least one
5 application of superheated water to remove the softened contaminants. At least one nozzle in the initial cleaning shower directs water, preferably at a temperature of greater than 100°C, to the surface of the fabric. As discussed above for the application of steam, the specific configuration of the shower or nozzles can vary. While the present invention is discussed in terms of the application of superheated water, the
10 temperature of the water following the steam application can be from room temperature upward. The hotter the water the better the cleaning will be. Therefore, while hot water can be used, water close to or above 100°C is preferred.

According to one embodiment, the superheated water may be at a temperature between
15 100°C and 135°C, such as between 105°C and 120°C. As used herein “superheated water” refers to water that has been heated to above its boiling point without vaporization. The superheated, and thus pressurized, water can be at a pressure of from 20 bar to 55 bar, such as from 25 bar to 35 bar.

20 As with steam, the superheated water may be applied to the paper making fabric through a nozzle or series of nozzles that are stationary or that reticulate or traverse the width of the papermaking fabric. According to one embodiment of the present disclosure, the steam applicator and superheated water applicator are contained in the same traversing shower. As with the steam, the water may be a single application or
25 may include introduction in more than one location along the machine direction of the fabric.

Not wishing to be bound by theory, it is believed that the release of the pressurized water and its subsequent conversion to steam provides better penetration of the water
30 into the fabric and provides improved lifting and removal of contaminants that have

already been heat softened by the earlier steam application. Further, it is believed that the additional heat in the fabric assists in more effectively removing water after cleaning.

5 The steam and superheated water may be produced using any art recognized method. According to one embodiment, water is contacted with an electrical heating element to produce either steam or superheated water. According to another embodiment, the steam and/or superheated water are heated by contact with a heat exchanger. According to still a further embodiment, steam is removed from another point in the
10 papermaking process and used in the disclosed cleaning process.

The described cleaning method, according to one embodiment, includes a debris collection source for removing excess steam, condensed water, and the effluent carrying the contaminants from the fabric. Such a debris collection source can include
15 any suction device, for example, a vacuum box, an air knife or an air shower. A typical debris collection source includes at least one vacuum source. Appropriate placement of the debris collection source(s) will be readily apparent to the skilled artisan based upon the arrangement and location of the steam and water applicators. In one embodiment, a vacuum source is a single source that runs the width of the
20 papermaking fabric. According to another embodiment, a vacuum source is associated with, or is integral with, a traversing cleaning shower. According to a still further embodiment, the debris collection source includes both a vacuum source and an air knife.

25 According to one embodiment, the debris collection source is integral with the steam and water application sources to minimize the amount of water or steam that cascades to other parts of the papermaking machine. According to one embodiment, the debris collection source is at least one vacuum source that is proximal to, and in the same housing with, the steam and water application sources.

30

While the majority of contaminants accumulate on the sheet side of the fabric, the cleaning method as described can be applied to one or both sides of the fabric to be cleaned. According to one embodiment, the cleaning is carried out on the sheet side of the fabric. According to another embodiment, the cleaning is carried out on the non-
5 sheet side of the fabric. According to yet another embodiment, the cleaning method is carried out on both sides of the fabric to be cleaned. According to this embodiment, both steam and superheated water may be applied to both sides of the fabric. According to this embodiment, steam may be applied to the sheet side of the fabric and superheated water may be applied to the non-sheet side of the fabric.

10

The continuous cleaning method as described includes a second cleaning shower. The second cleaning shower may have any art recognized configuration. It may include a shower or nozzle or series of showers or nozzles that are stationary or that reticulate or traverse the cross-machine direction width of the papermaking fabric. In one
15 embodiment, the second cleaning shower may be a series of nozzles or a shower bar that allows application of cleaning media to the entire width of the papermaking fabric simultaneously. The nozzles may move, e.g., rotate, or be stationary. The specific configuration of the shower or nozzles can vary, including for example, in size, shape, type, or geometry without impacting the effectiveness of the disclosed method.

20

According to one embodiment, the second cleaning shower is an encapsulated shower that spans the width of the fabric to be cleaned. As used herein, “encapsulated” refers to any shower arrangement that applies cleaning media and is configured in a manner that causes the applied cleaning media to be withdrawn without significant deposition
25 on the papermaking machine. Such encapsulation systems generally include both sheet side and non-sheet side application/collection assemblies. According to one embodiment, the sheet side includes an application shower that extends the width of the papermaking fabric and the non-sheet side includes an elimination assembly. According to another embodiment, the sheet side includes both application showers

and elimination assemblies and the non-sheet side, likewise, includes both application showers and elimination assemblies.

5 The elimination assembly for the second cleaning shower removes water, excess steam, and the effluent carrying the contaminants from the fabric. Such an elimination source can include any suction device, for example, a vacuum box, air knife or an air shower. A typical elimination assembly includes one or more vacuum sources. Appropriate placement of the elimination assembly will be readily apparent to the skilled artisan based upon the arrangement and location of the application nozzles in
10 the associated application shower. In one embodiment, the vacuum source is a single source that runs the width of the papermaking fabric. According to another embodiment, the vacuum source includes a plurality of sources associated with each application nozzle or group of nozzles.

15 According to one embodiment, the second cleaning shower includes the application of one or more of steam and superheated water as described above. Further, the steam and superheated water can be produced by the methods and applied at the temperatures and pressures described. According to another embodiment, the second cleaning shower includes one or more heated water application(s). The cleaning water may be
20 from room temperature upward, however, the hotter the water the better the cleaning will be. Therefore, while hot water can be used, water close to or above 100°C is preferred. The water in the second cleaning shower can be applied at a temperature of from about 20°C to about 100°C, such as from 80°C to about 100°C.

25 According to one embodiment, the second cleaning shower applies cleaning media to the sheet side of the fabric. According to another embodiment, the second cleaning shower applies cleaning media to the non-sheet side of the fabric. According to yet another embodiment, the cleaning method is carried out on both sides of the fabric to be cleaned. According to this embodiment, both steam and superheated water may be
30 applied to both sides of the fabric. According to this embodiment, steam may be applied

to the sheet side of the fabric and superheated water may be applied to the non-sheet side of the fabric.

The elimination source for the encapsulated shower may also include means for
5 confining and eliminating the mist that may be generated by the application of cleaning
media. According to one embodiment, such a mist eliminator includes a cover portion
that runs the length of the papermaking fabric. According to another embodiment of
the disclosure, the mist eliminator housing is in close proximity to the papermaking
10 fabric, thereby capturing what is thrown off during the application of the cleaning
media, including but not limited to, mist, water droplets, steam, and effluent. The gap
between the mist eliminator and the moving papermaking fabric is from about 0.25 cm
to about 2.54 cm, such as about 0.60 cm to about 1.30 cm.

According to one embodiment, either or both of the mist elimination assemblies that
15 make up the encapsulated shower may be mounted on pivoting brackets to allow them
to be moved away from the papermaking fabric should either assembly require
cleaning and/or repair. The units are fitted with handles allowing them to swing in a
counterclockwise manner away from the papermaking fabrics.

20 This cleaning method as disclosed may be used to clean a moving fabric on a
papermaking machine that has ceased producing product, however, the continuous
cleaning method as described has the advantage that it may be carried out on a moving
fabric during a production run. When cleaning must be carried out on a machine that
has ceased production, the down time associated with cleaning is from 30 minutes to 1
25 hour. In the average production of tissue, the production must be stopped and the
fabrics cleaning on the order of once every 8 hours. Thus, the presently disclosed
cleaning method can result in 6 to 12% improved production over prior art cleaning
methods.

Surprisingly, the cleaning method as described allows cleaning of the fabric without substantial rewet of the nascent paper web. The amount of water remaining in the fabric after the second cleaning shower is less than about 0.5 g/m², such as less than about 0.4 g/m², such as less than 0.3 g/m².

5

Further, the mounting of the encapsulated showers on pivoting brackets, which when driven by a rotation mechanism, e.g., a rotator and gearbox, allows the showers to be rotated away from the paper making fabric, while the machine is still in production. This “on-the-run” rotational capability allows the cleaning unit to be quickly repaired,
10 cleaned or unclogged without any machine down time and with little build-up of contaminants on the papermaking fabric.

The system of the present invention may also include one or more additional application stations depending upon the fabric to be cleaned and the configuration of
15 the cleaning system used. These additional application stations may include for example, an air knife or a fabric treatment applicator. In one embodiment, the one or more application stations includes at least one air knife which may be positioned before one or more of the showers to remove loose contaminants, or positioned after one or more of the showers to remove residual water from the fabric after cleaning.
20 Additionally, an application station may be used for applying a cleaning solution or other chemical agent to assist in the cleaning of the contaminants, e.g., applying a chemical cleaning solution to pre-treat the fabric. The placement of these additional application stations before, integral with, or after the cleaning showers will be readily discernible based upon the desired function and anticipated outcome.

25

According to one embodiment, the cleaning method of the present invention includes at least one cleaning or conditioning agent added during either the initial cleaning stage or the second cleaning stage via the steam application, during the water application or via a separate applicator before, during or after the steam and water

application. According to one embodiment, the at least one conditioning agent is added to the fabric in superheated water.

According to another embodiment, release agents are added to condition the fabric.

5 Release agents may be added in the superheated water application. In one embodiment, release oil is added during the application of the superheated water. The addition of release oils and conditioning agents during fabric cleaning may result in extended roll cover life and easier sheet release from the clothing.

10 The cleaning method of the present invention reduces the wear on machine rolls. Prior art systems that were periodic in nature, e.g., every 8 hours, caused the fabrics to run dry increasing friction wear. The average life of a papermaking transfer roll prior to the present invention was about 25 days. With the cleaning system of the present
15 invention can significantly extend the life of papermaking rolls by continually lubricating them so that they do not run with increased friction loads.

The cleaning method of the present disclosure will now be described with respect to one system embodiment. Deviations from this system and alternatives to the proposed
20 system would be readily apparent to the skilled artisan.

A fabric cleaning apparatus attached to a paper machine **140** including both a traversing shower **10** and an encapsulated shower assembly **240** is illustrated in **FIGURE 1**. As can be seen from the directional arrow, the fabric **150** travels over roll
25 **160** and contacts vacuum box **170** which removes any loose debris and/or residual water from the fabric **150** prior to cleaning. The fabric **150** then travels around another roll (not seen) and contacts traversing shower **10**. The traversing shower **10** reticulates in beam assembly **80**. Traversing shower **10**, contacts the fabric **150** first with steam and then with superheated water. An air knife **50 (FIGURE 2B)** then uses pressurized

air to remove any residual water from the fabric **150** and prevent mist and droplets from escaping from the traversing shower assembly **10**.

The fabric **150** then travels between the upper and lower boxes **260, 270** of the
5 encapsulated shower assembly **240**. Heated water and/or steam is applied to both surfaces of the moving fabric **150** and the effluent is removed via vacuum sources **250**. The fabric **150** continues on, passes air knife (not numbered), and contacts vacuum box **190** before passing over roll **200** on its return to its web pick up location.

10 A typical traversing shower **10** as illustrated in **FIGURE 1** is expanded in **FIGURES 2A-2C**. As seen in **FIGURE 2B**, the shower **10** includes a nozzle assembly **20** and a collection chute **30**. The traversing shower **10** contacts the fabric to be cleaned via surface **40**. When used in accordance with the present disclosure, steam and
superheated water may be introduced via inlets **25** on nozzle assembly **20** and effluent
15 is collected via vacuum applied through collection chute **30**. Air knife **50**, causes an air jet to impinge upon the surface of the fabric and further remove water from the fabric. The moisture removed by the air knife will either go into the surrounding environment or will be removed by vacuum if the air knife includes an associated collection chute. Steam may be applied via a steam slot **60** and superheated water may
20 be applied via water nozzles **70**, as seen in **FIGURE 2A**. The used steam and water, along with the released contaminants are picked up by collection chute **30** as illustrated in **FIGURE 2C**.

The mist eliminator **210** illustrated in **FIGURE 3** forms part of the encapsulated
25 shower assembly **240** as illustrated in **FIGURE 1**. The fabric **150** travels between deckle strips **220** on upper and lower boxes **260, 270** (**FIGURE 1**). Cleaning media applicators **230** apply cleaning media to the fabric while waste is removed by vacuum sources **250** (not shown) via conduits **235**.

While a continuous cleaning method has been described primarily in terms of two types of cleaning stages, a traversing shower stage and an encapsulated shower stage, the method can be practiced with one of the two stages or with multiple stages of a single type, e.g., just an encapsulated stage, two encapsulated stages may be used or
5 alternatively two traversing stages may be used.

As used herein, “about” is meant to account for variations due to experimental error. All measurements are understood to be modified by the word “about”, whether or not “about” is explicitly recited, unless specifically stated otherwise. Thus, for example,
10 the statement “a fiber having a length of 2 mm” is understood to mean “a fiber having a length of about 2 mm”.

The details of one or more non-limiting embodiments of the invention are set forth in the examples below. Other embodiments of the invention should be apparent to those
15 of ordinary skill in the art after consideration of the present disclosure.

EXAMPLES

EXAMPLE 1

20 A transfer fabric on an operating tissue paper machine was continuously cleaned in accordance with the present invention by the application of steam and a water shower at 80°C to the structured paper fabric in an initial traversing cleaning shower. The transfer fabric was then passed through a second encapsulated shower which also applied steam and water at 80°C. The cleaning was continued for 30 hours and
25 provided marked improvement in the fabric hygiene. Improvement was judged visually by observing the amount of external contamination that remained on the fabric. Concrete indicators of the improved fabric hygiene included achieving adequate cleaning without the need for cleaning component to be added to the water

and a 50% reduction in the release chemistry that was added to the fabric to prevent contaminants from sticking.

EXAMPLE 2

5 A transfer fabric on an operating tissue paper machine was continuously cleaned in accordance with the present disclosure by the simultaneous application of steam and water at 80°C to the structured paper fabric in an initial cleaning shower. Steam was added through a full width steam shower, while water was applied through a traversing cleaning shower. The transfer fabric was then passed through a second encapsulated
10 shower which also applied steam and water at 80°C. The cleaning was continued for 3.5 hours and provided results consistent with those seen in Example 1.

EXAMPLE 3

15 A transfer fabric on an operating tissue paper machine was continuously cleaned in accordance with the present invention by the application of steam to the structured paper fabric in an initial traversing cleaning shower. The transfer fabric was then passed through a second encapsulated shower which also applied water at 80°C. The cleaning was continued over a 6 month period and provided marked improvement in the fabric hygiene, fabric wear, roll life, and machine down time. Improvements in
20 fabric hygiene and fabric wear were judged visually by observing the fabric while roll life was confirmed by physical measurements.

EXAMPLE 4

25 A transfer fabric or a drying fabric on a paper machine is continuously cleaned in accordance with the present invention by the application of steam and superheated water at a temperature of greater than 100°C, in an initial traversing cleaning shower. The transfer fabric is then passed through a second encapsulated shower which also

applies steam and superheated water. The cleaning is carried out continuously and indefinitely.

A number of embodiments have been described. Nevertheless, it will be understood
5 that various modifications may be made without departing from the spirit and scope of
the disclosure. Accordingly, other embodiments are within the scope of the following
claims.

CLAIMS:

1. A method for continuous cleaning of a papermaking fabric comprising:
 - subjecting a fabric to be cleaned to an initial cleaning stage, wherein the initial cleaning stage includes the application of a cleaning medium comprising either steam, water, or both, at a temperature of greater than 80°C from an initial cleaning shower that allows application of the cleaning medium to the entire width of the fabric to be cleaned;
 - subjecting the fabric to be cleaned to a second cleaning stage, wherein the second cleaning stage includes the application of a cleaning media comprising either steam, water, or both at a temperature of greater than 80°C, and wherein the second cleaning stage includes a second cleaning shower that allows application of the cleaning media to the entire width of the fabric to be cleaned;
 - wherein the paper machine production is not interrupted during cleaning.
2. The method of claim 1, wherein the water in the initial shower is superheated water.
3. The method of claim 2, wherein the superheated water is applied to a surface of the fabric after the application of steam.
4. The method of claim 1, wherein the initial cleaning shower is a traversing cleaning shower.
5. The method of claim 1, further comprising, an air stream from an air knife to the fabric surface after the initial cleaning stage.
6. The method of claim 1, wherein the second cleaning shower is an encapsulated cleaning shower.
7. The method of claim 1, wherein superheated water is applied during the second cleaning stage.

8. The method of claim 1, wherein both steam and water are applied during the initial cleaning stage.

9. The method of claim 1, wherein steam is applied during the second cleaning stage.

10. The method of claim 1, wherein both steam and superheated water are applied during the second cleaning stage.

11. The method of claim 10, wherein both steam and superheated water are applied to both sides of the fabric during the second cleaning stage.

12. The method of claim 1, wherein the amount of water from the initial cleaning shower and the second cleaning shower remaining in the fabric after the cleaning process is less than 0.5 g/m^2 .

13. The method of claim 1, wherein the second cleaning stage is an encapsulated cleaning stage comprising an encapsulated shower; and
wherein the encapsulated shower further includes vacuum sources on both sides of the fabric to be cleaned.

14. The method of claim 1, wherein the initial cleaning stage includes the application of a cleaning medium comprising both steam and superheated water at a temperature of greater than 100°C from an initial cleaning shower; and
the second cleaning stage includes the application of a cleaning medium comprising both steam and superheated water from a second cleaning shower.

15. The method of claim 1, wherein at least one of the initial cleaning stage and the second cleaning stage comprises a cleaning shower comprising a series of nozzles or a shower bar that allows the application of the cleaning medium to the entire width of the fabric to be cleaned simultaneously.

16. The method of claim 1, wherein at least one of the initial cleaning stage and the second cleaning stage comprises a cleaning assembly comprising a series of nozzles or a shower bar that allows application of the cleaning medium to the entire width of the fabric to be cleaned by reticulating back and forth across the width of the papermaking fabric.

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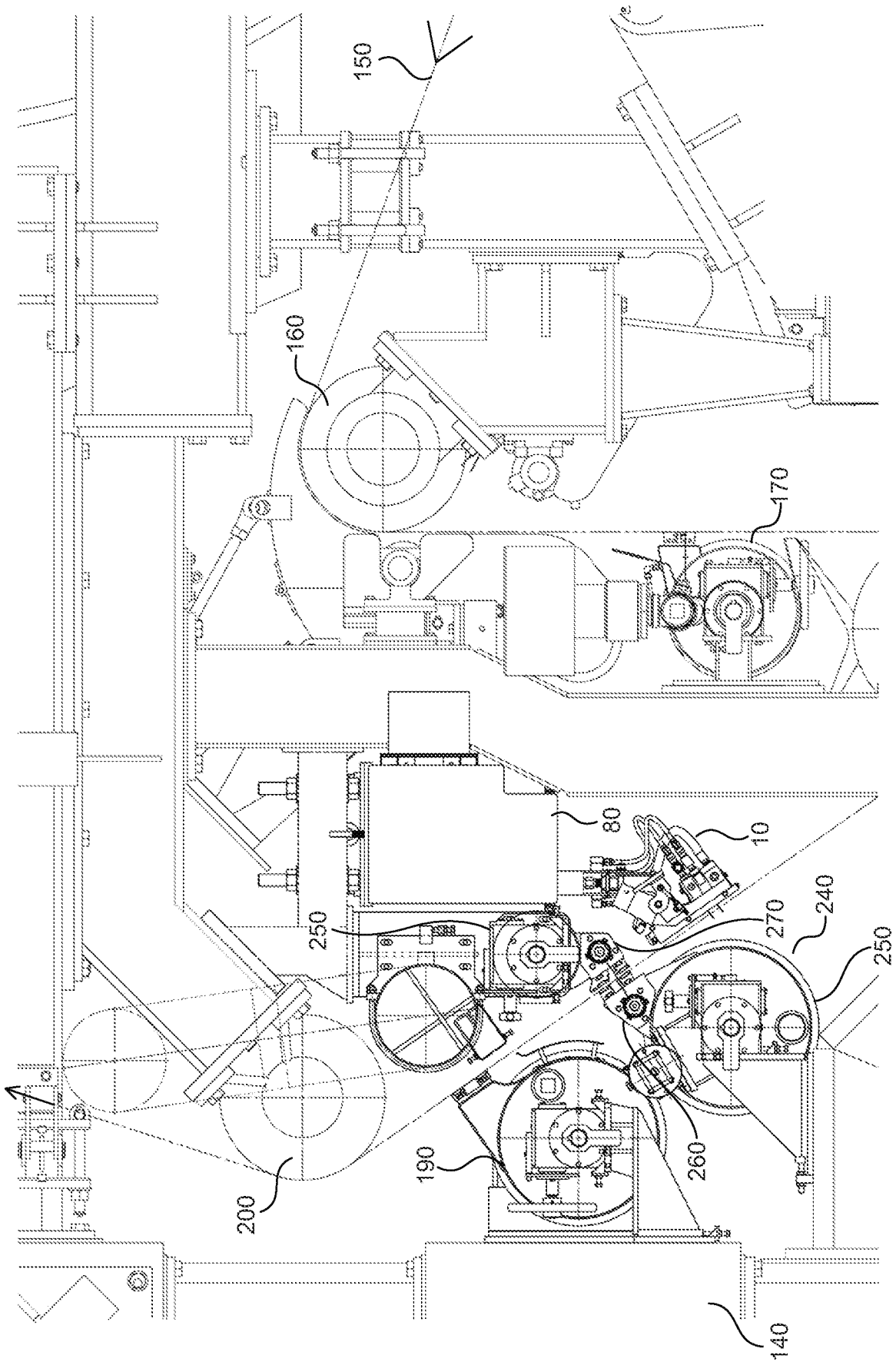


Fig. 1

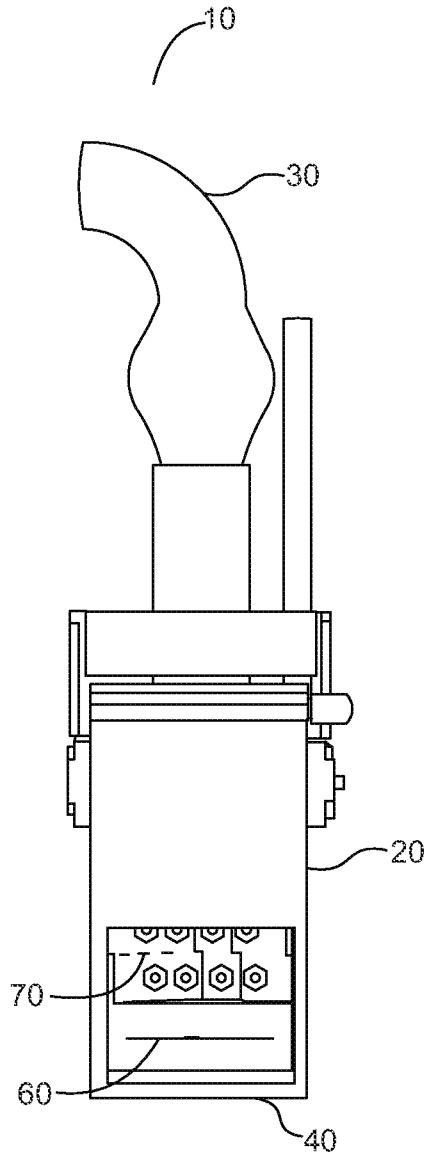


Fig. 2A
(Prior Art)

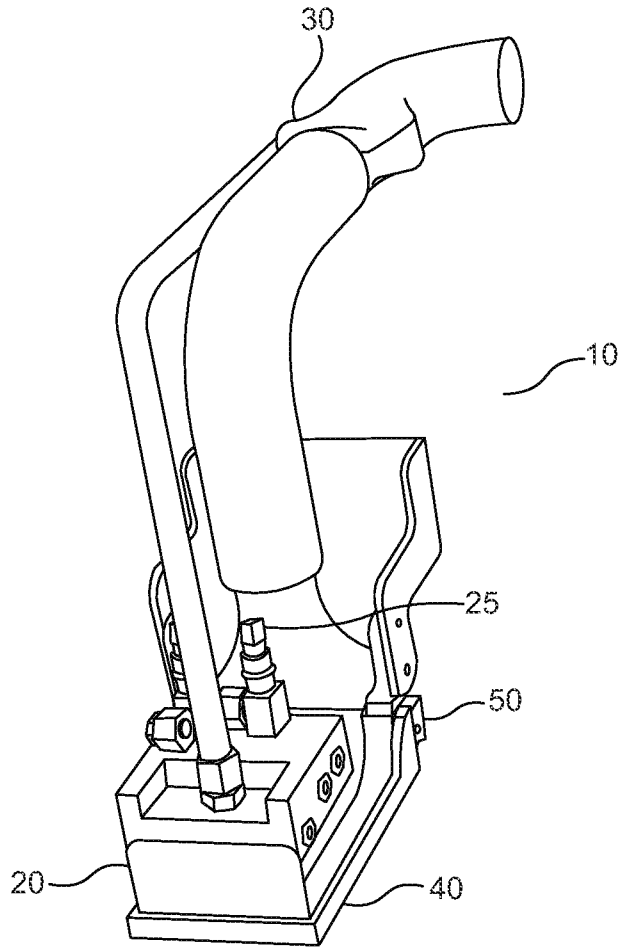


Fig. 2B
(Prior Art)

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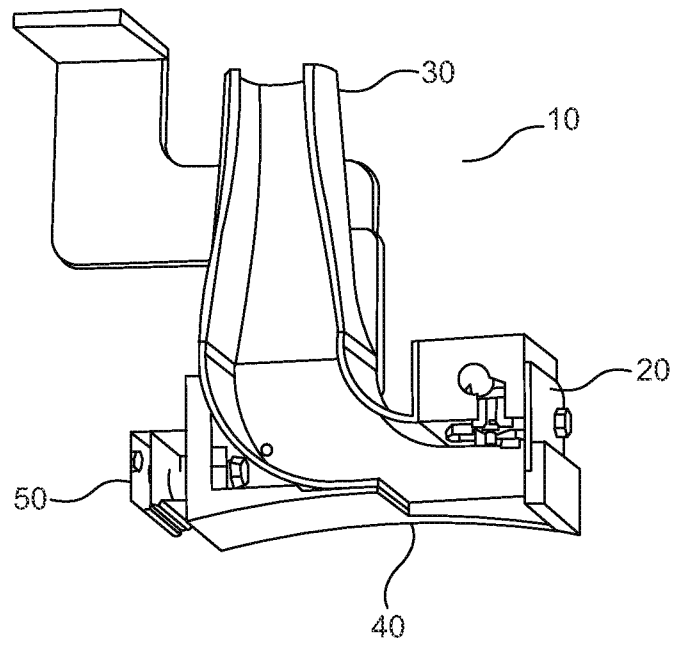


Fig. 2C
(Prior Art)

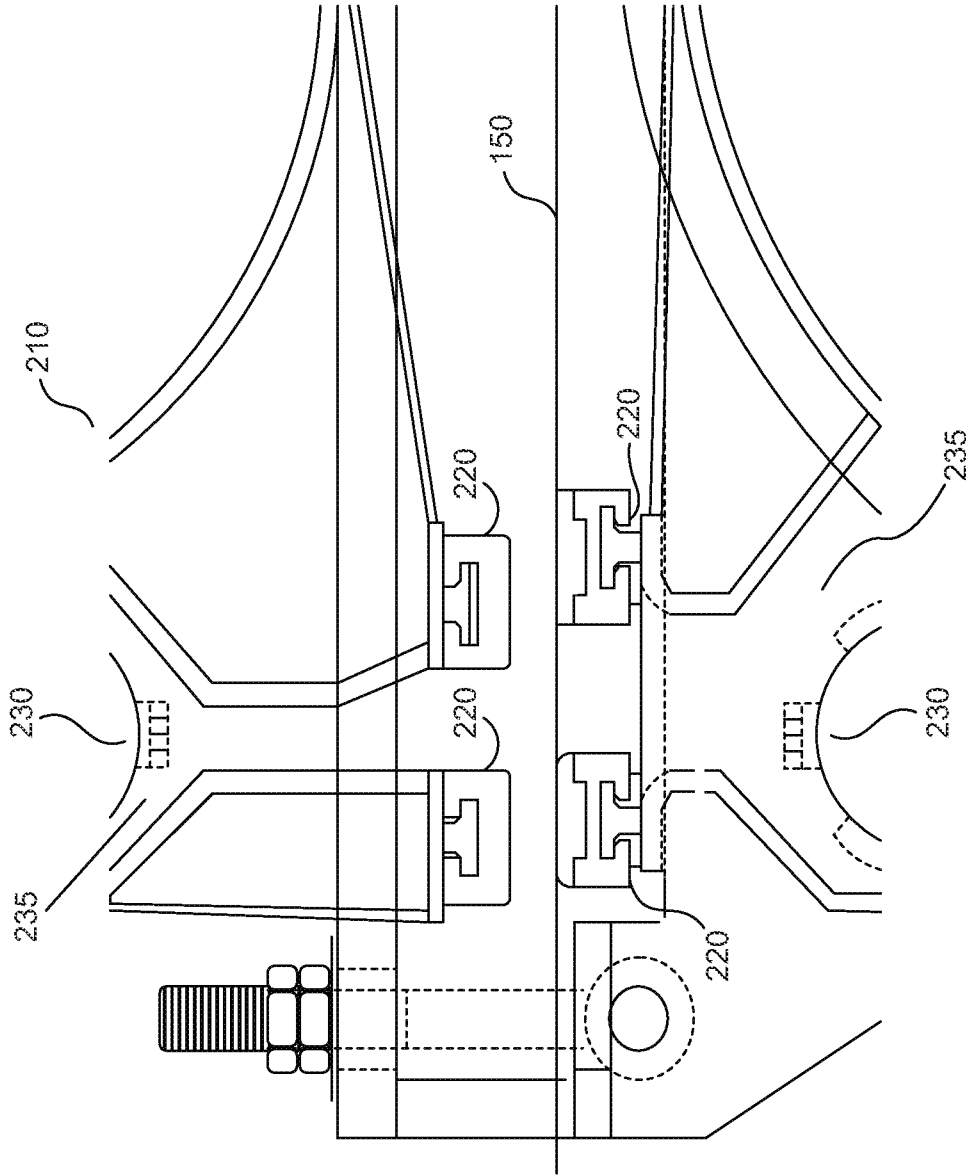


Fig. 3

