

(54) Title of the Invention: Arrangements for securing cylinder jackets

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updated as appropriate

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Other: **None**

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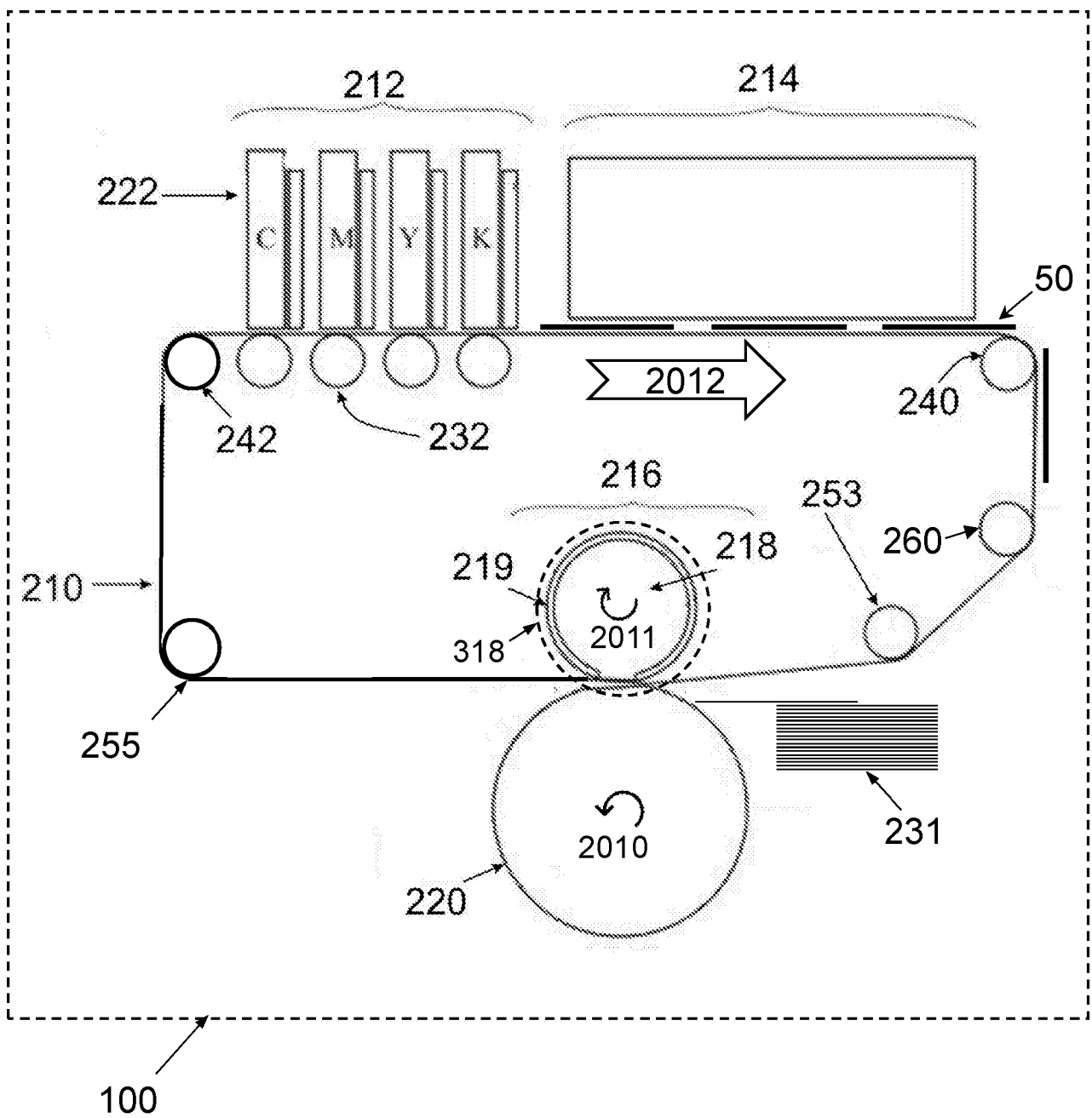


FIG. 1

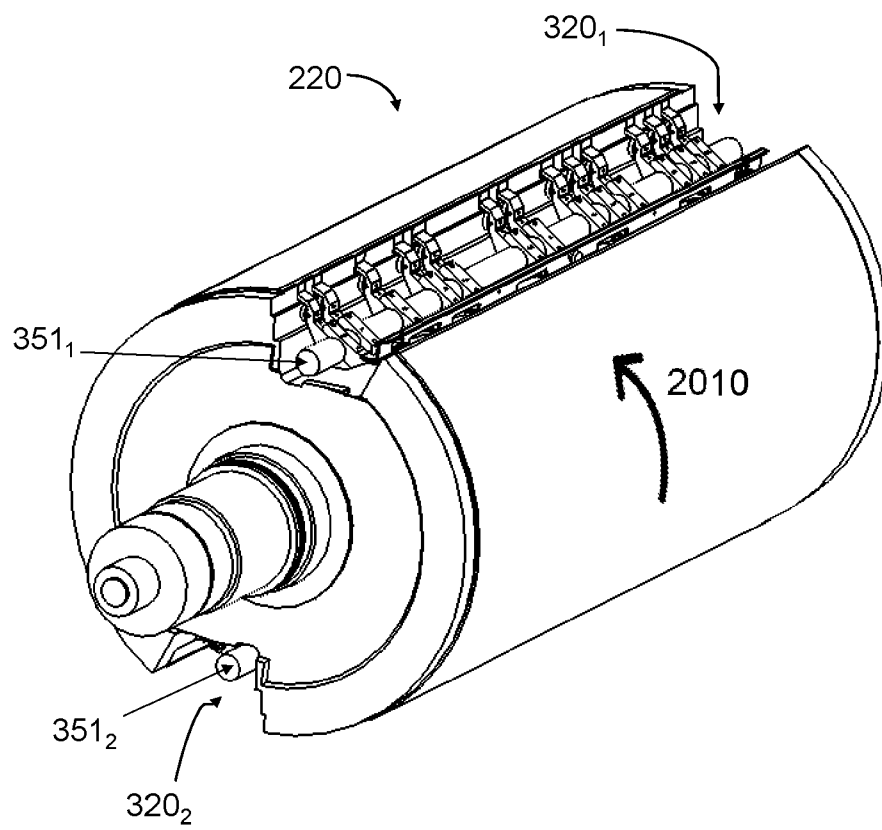


FIG. 2

CROSS-SECTION
ELEVATION VIEW

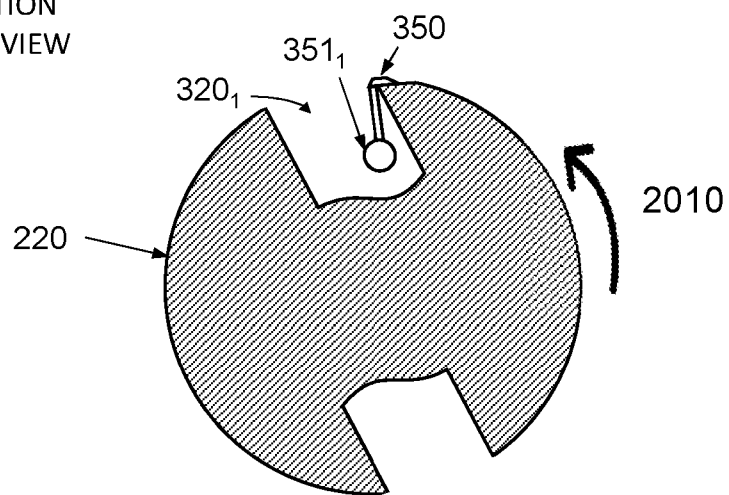


FIG. 3A

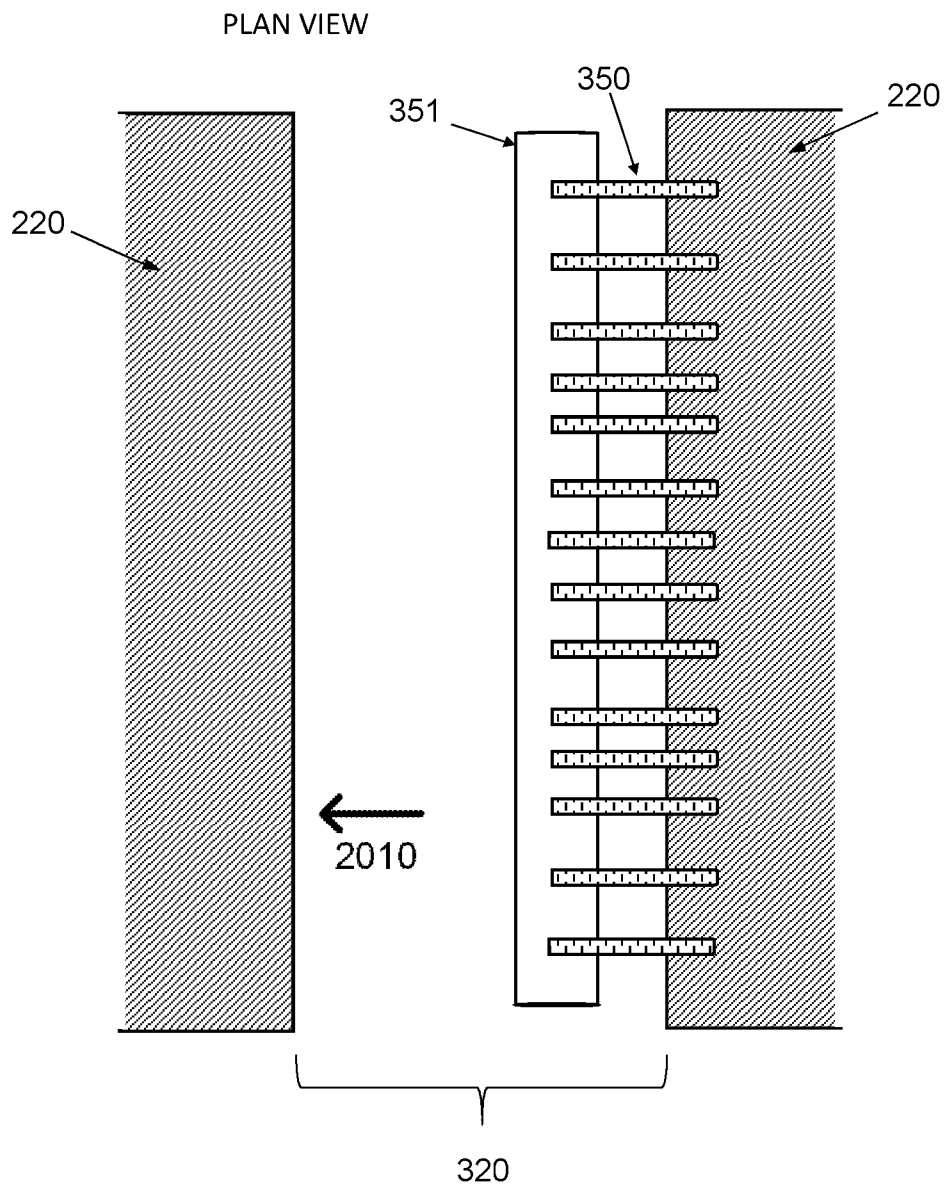


FIG. 3B

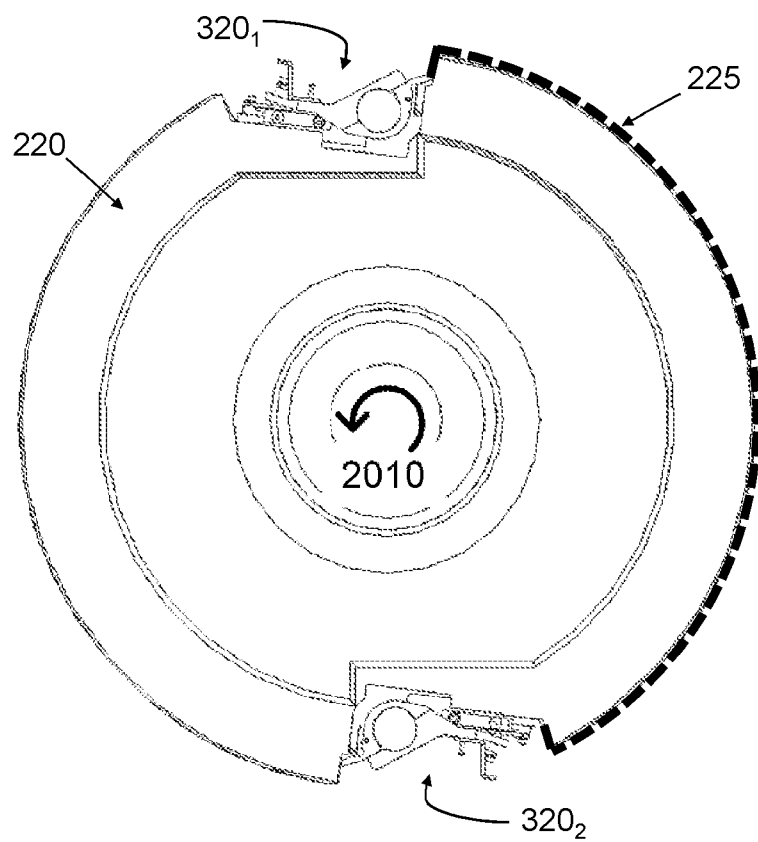


FIG. 4

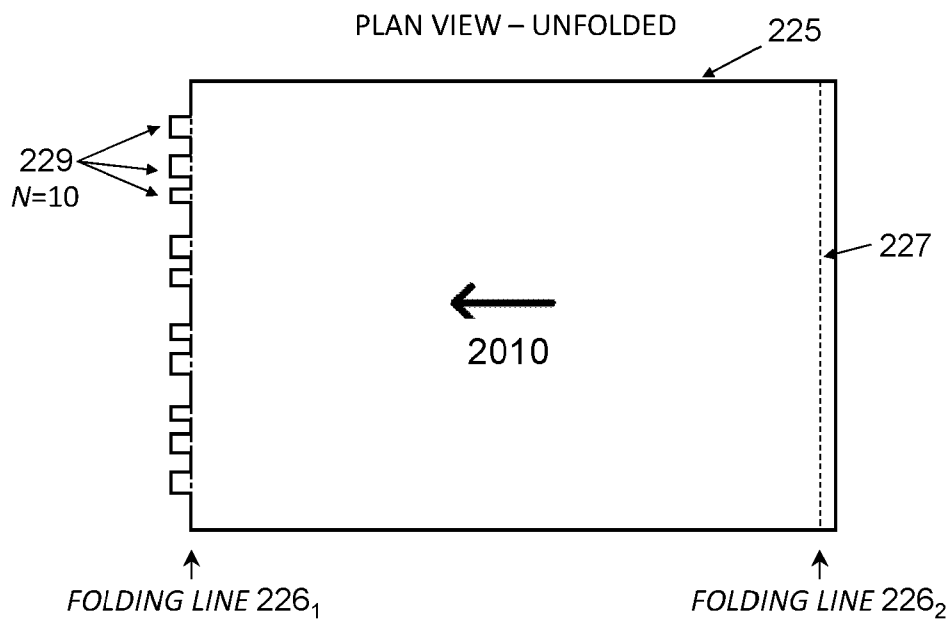


FIG. 5A

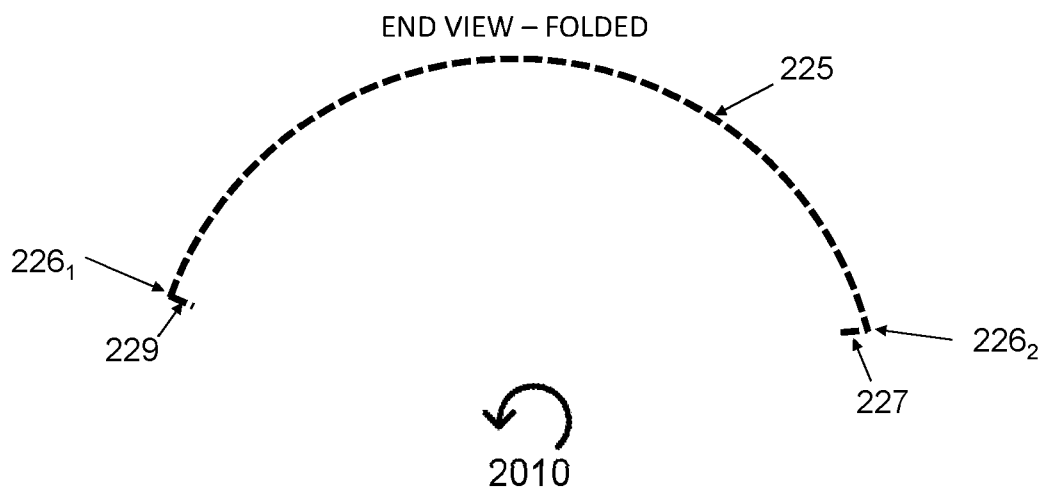


FIG. 5B

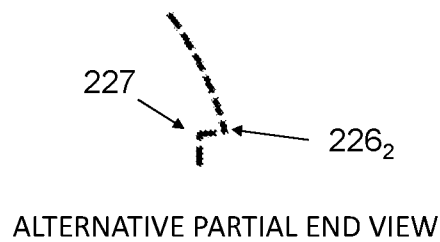


FIG. 5C

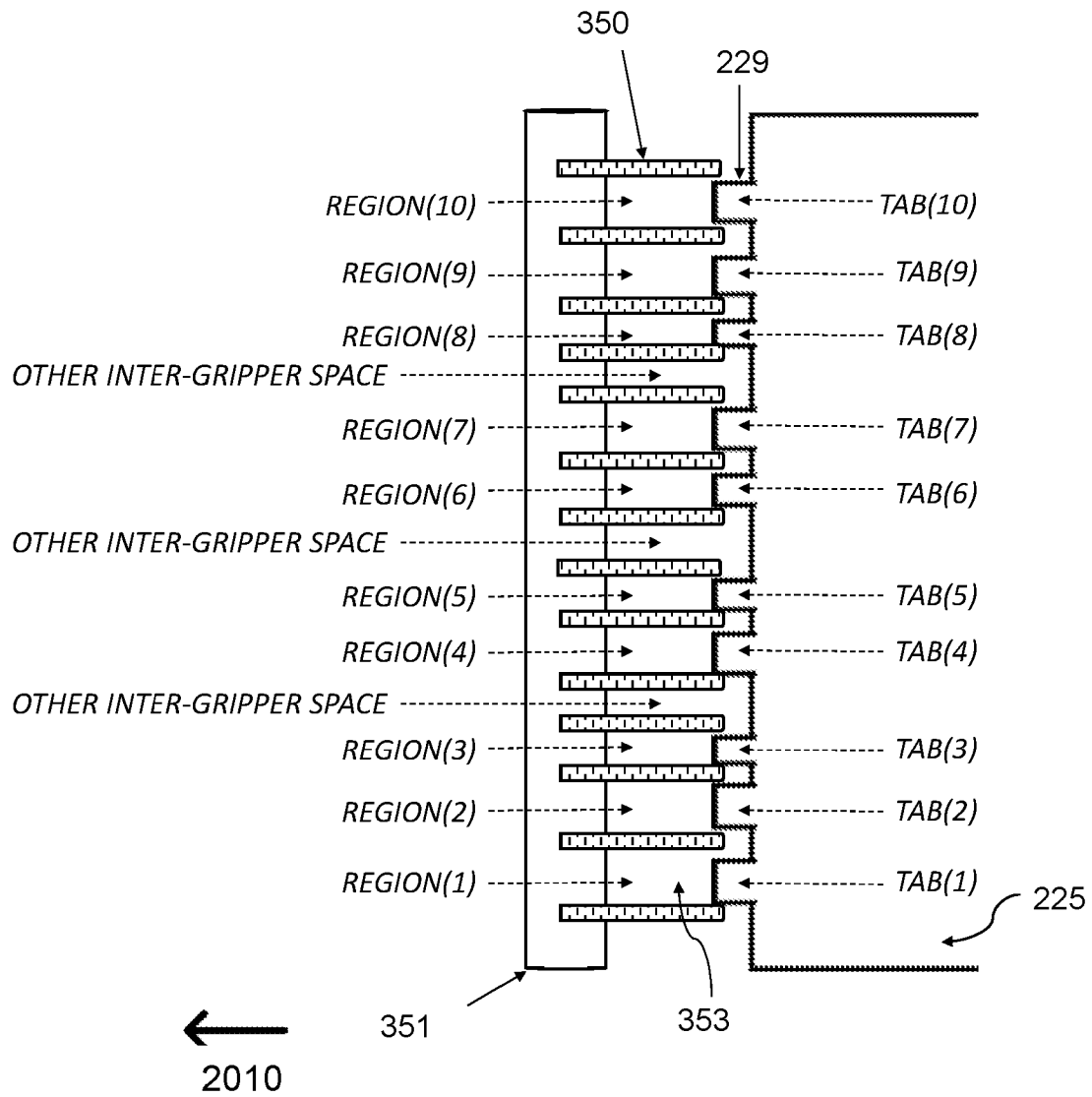
$$N=10$$


FIG. 6

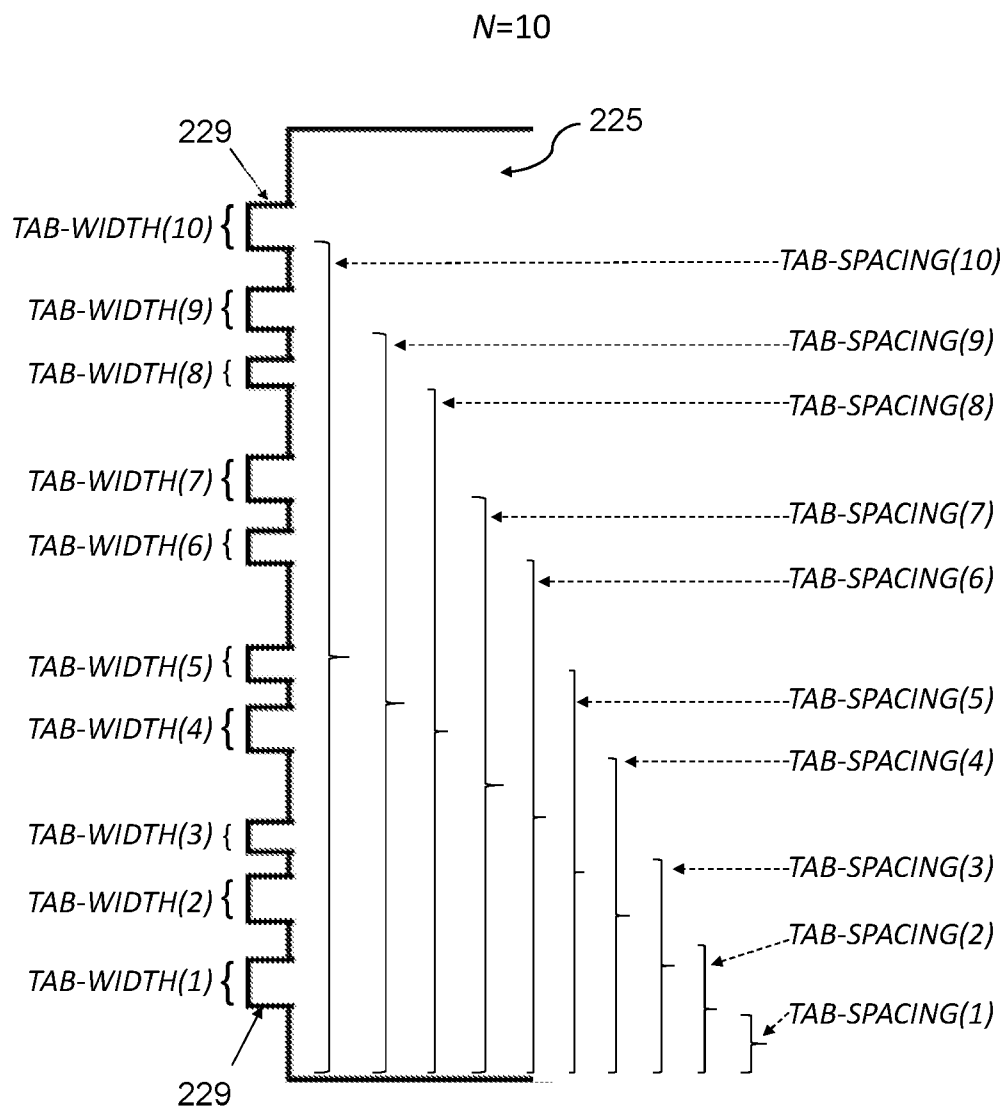


FIG. 7

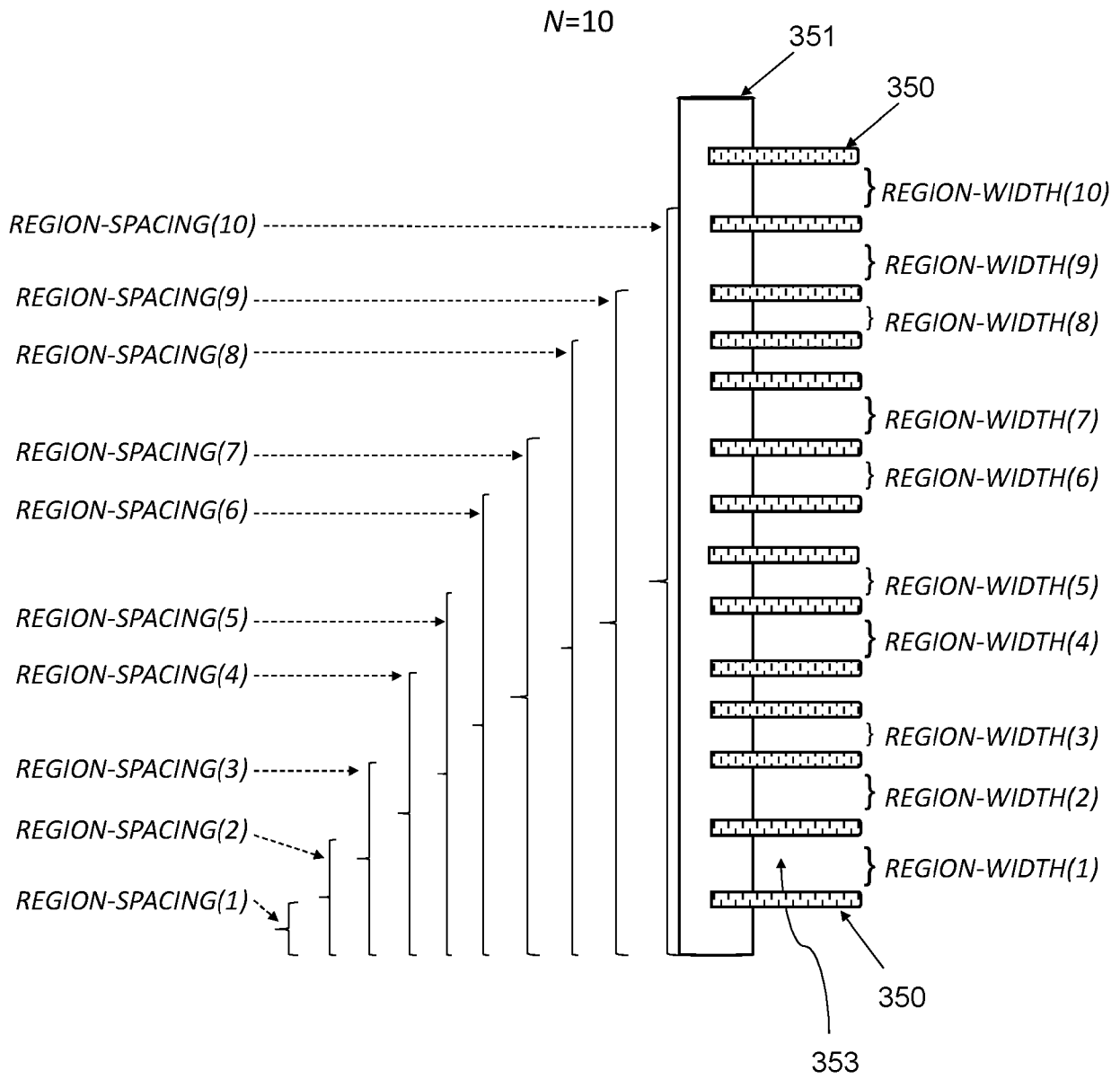
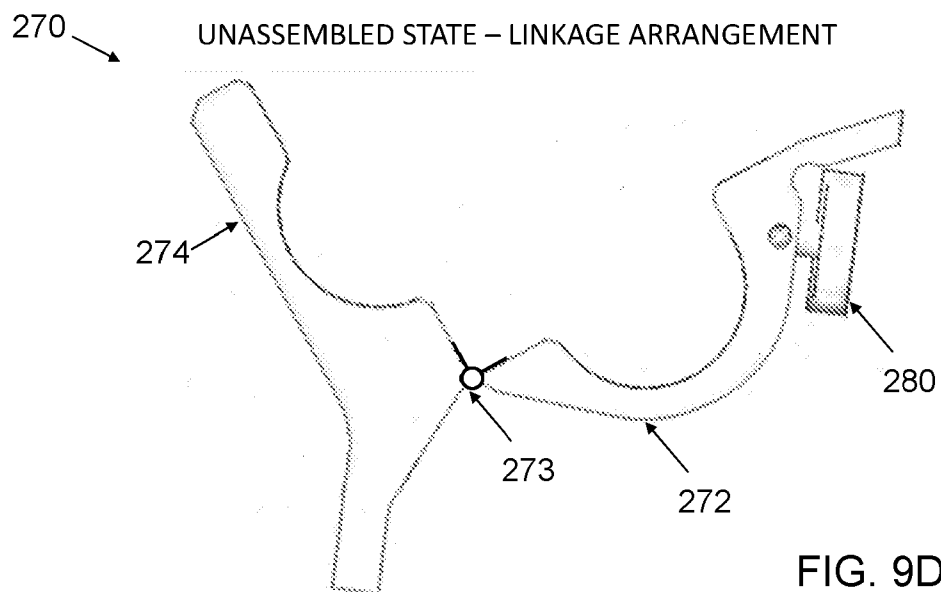
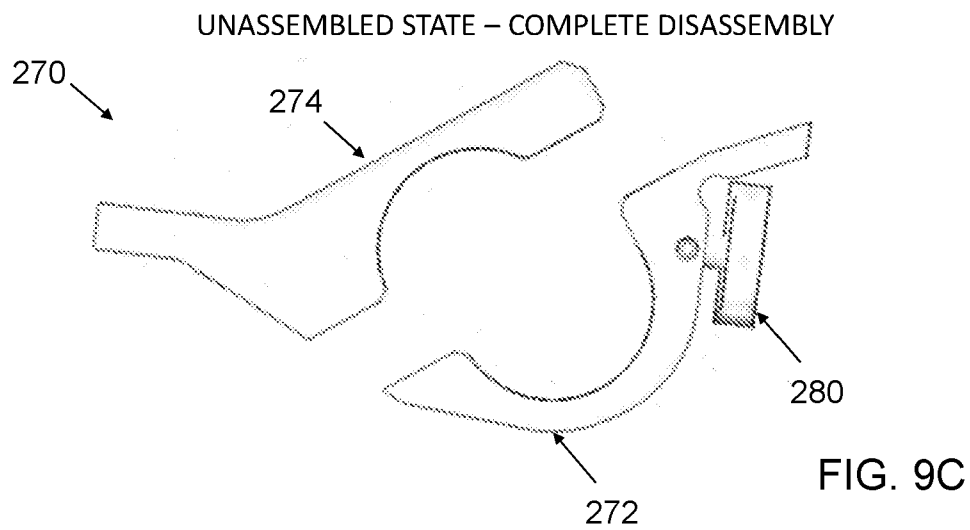
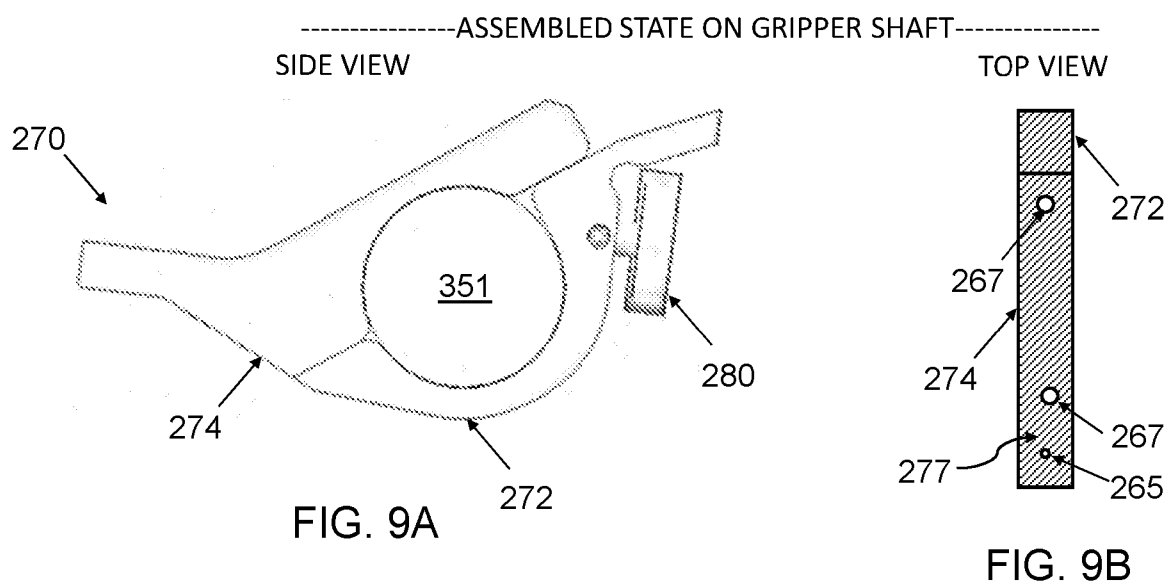


FIG. 8



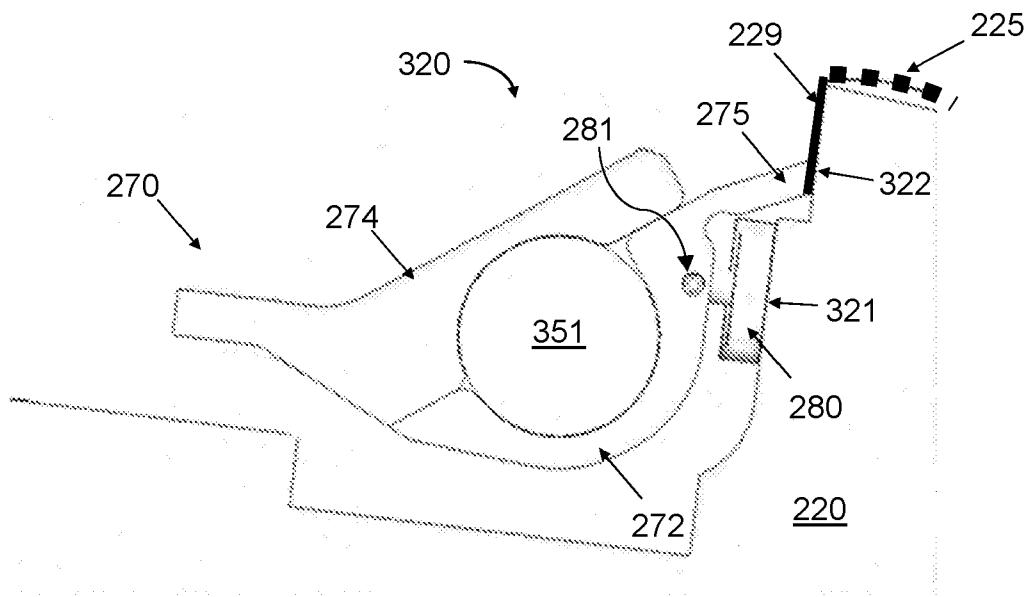


FIG. 10A

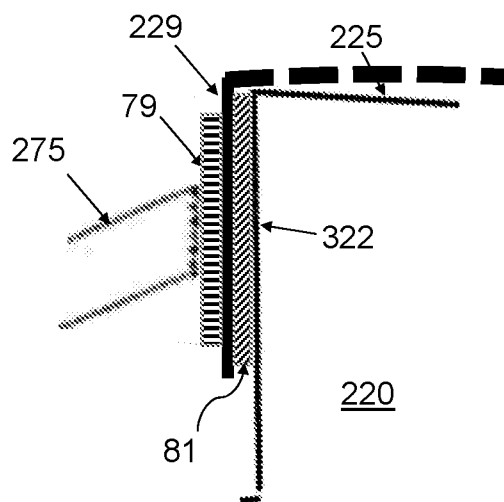


FIG. 10B

11/17

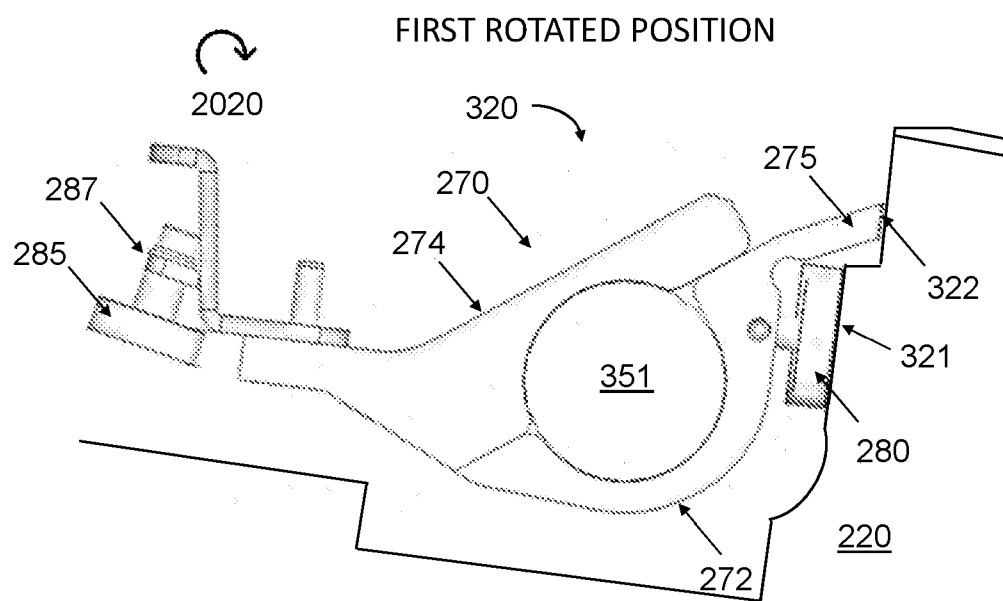


FIG. 11A

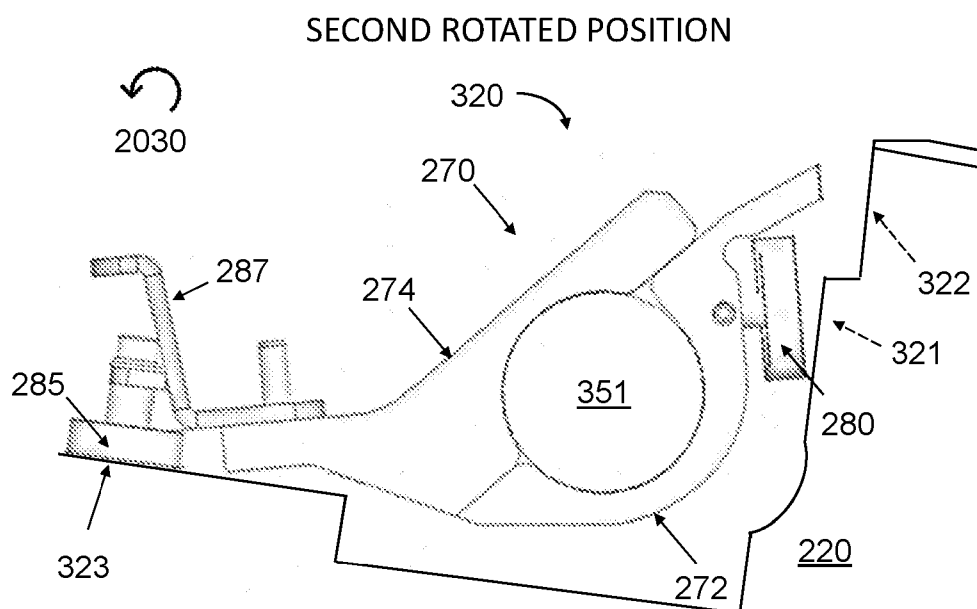


FIG. 11B

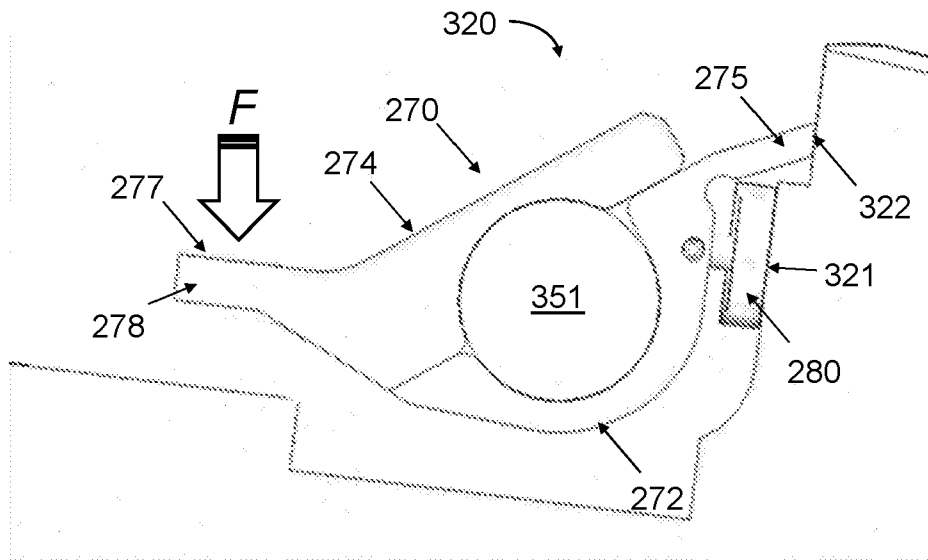


FIG. 12

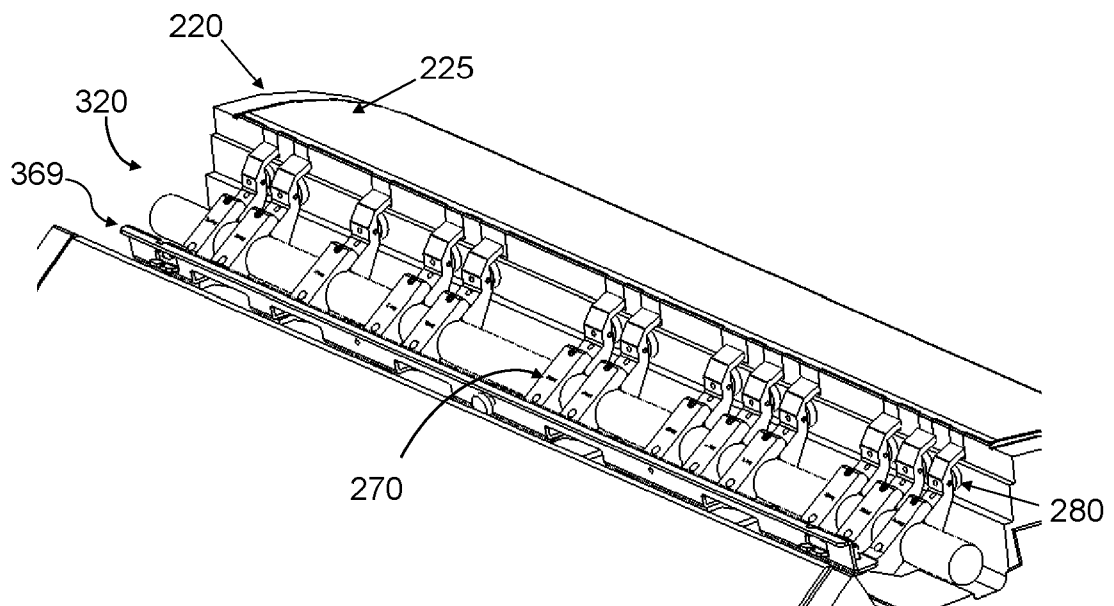


FIG. 13

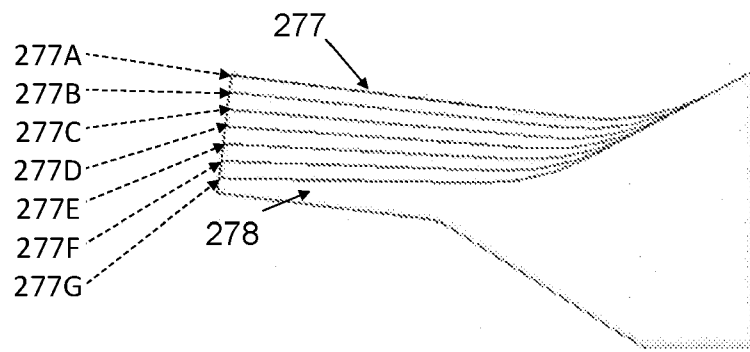


FIG. 14A

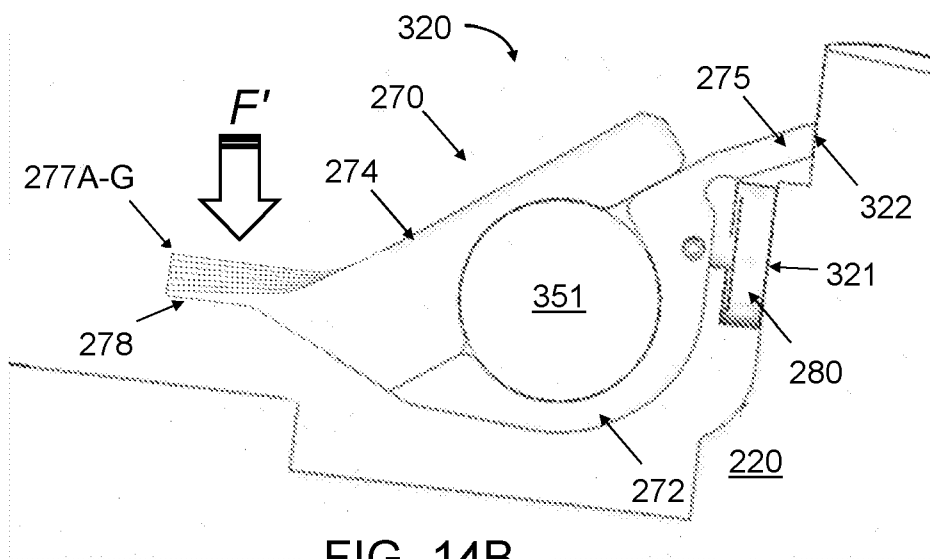


FIG. 14B

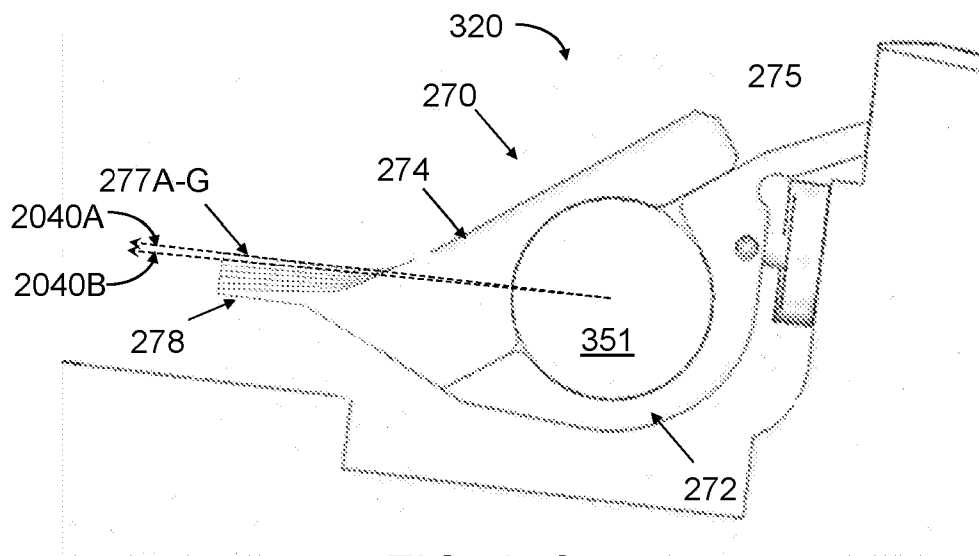
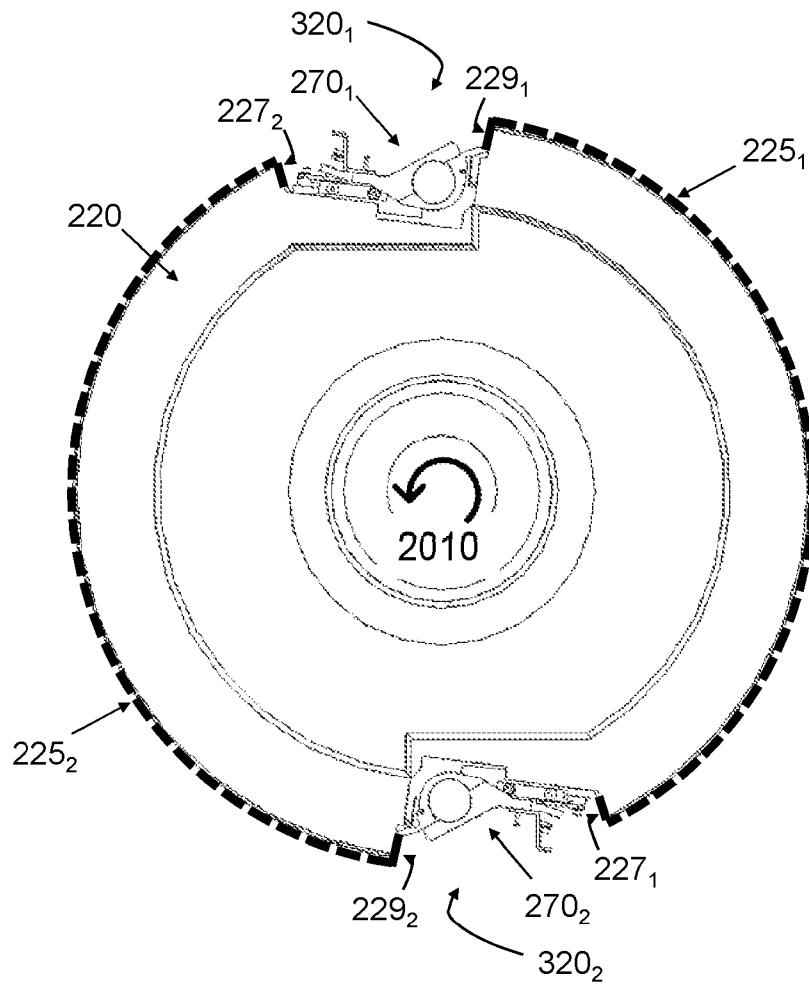


FIG. 14C



1rd
Impression -

FIG. 15

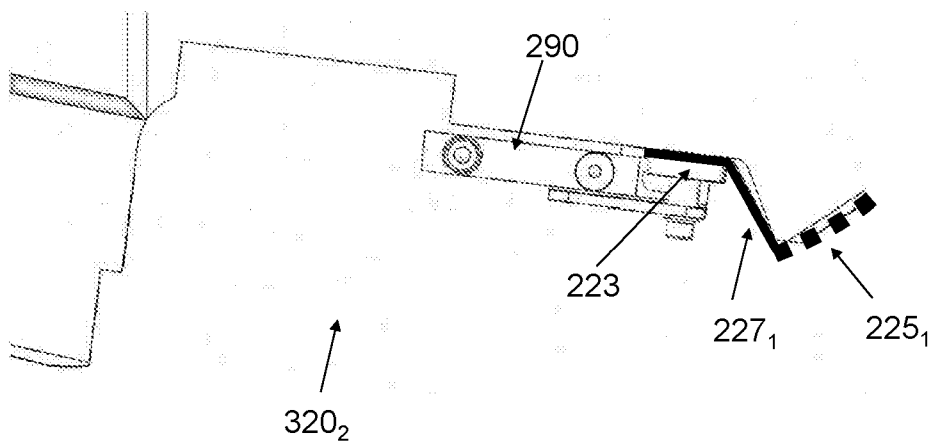


FIG. 16

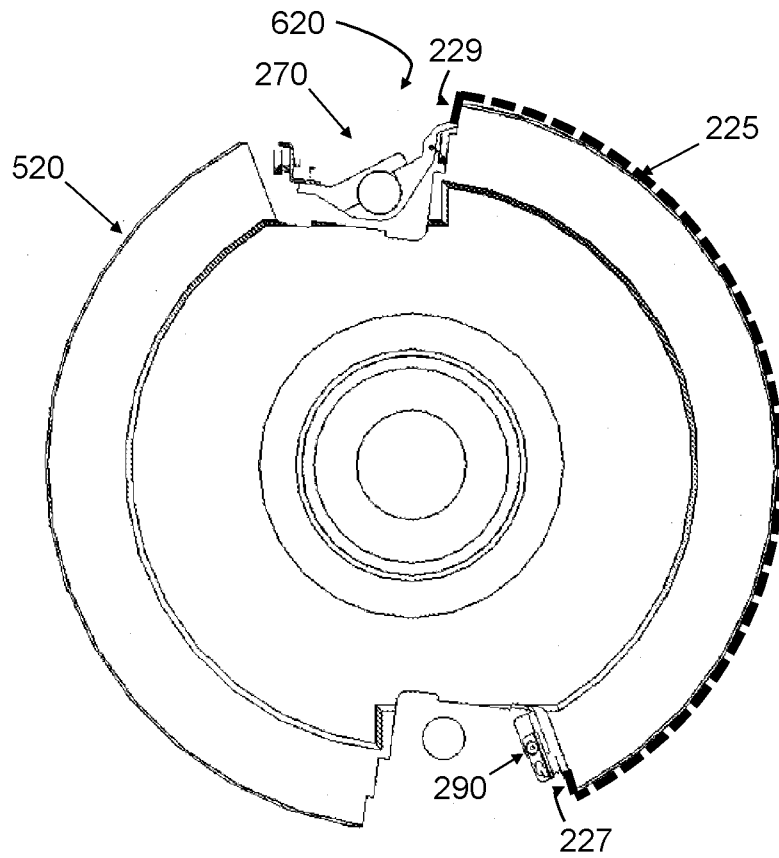


FIG. 17

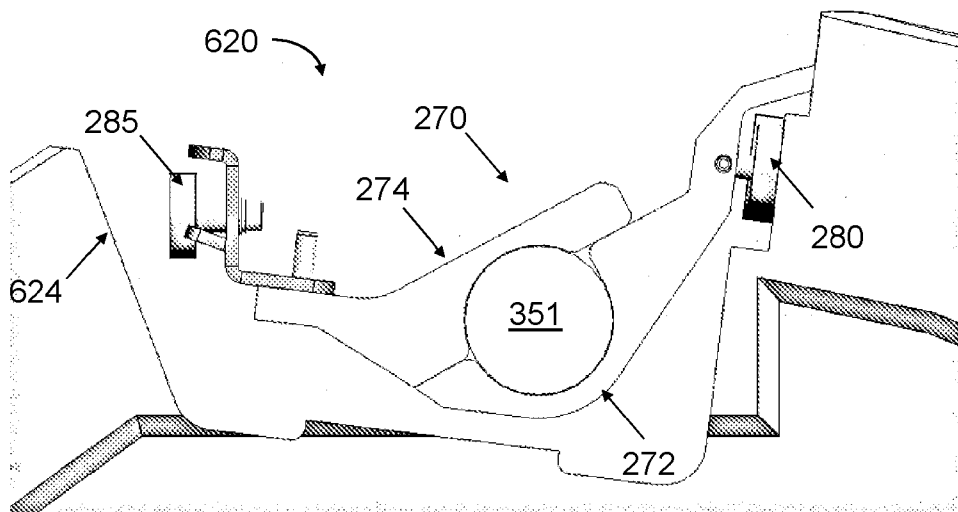


FIG. 18

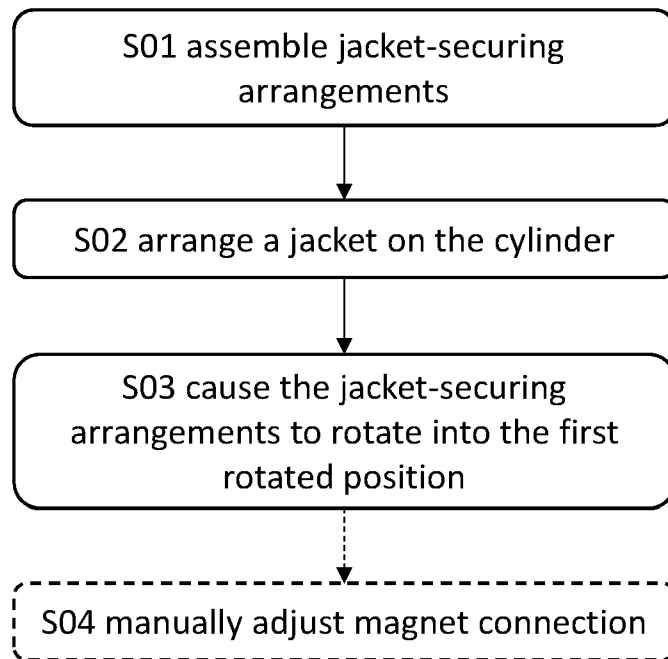


FIG. 19

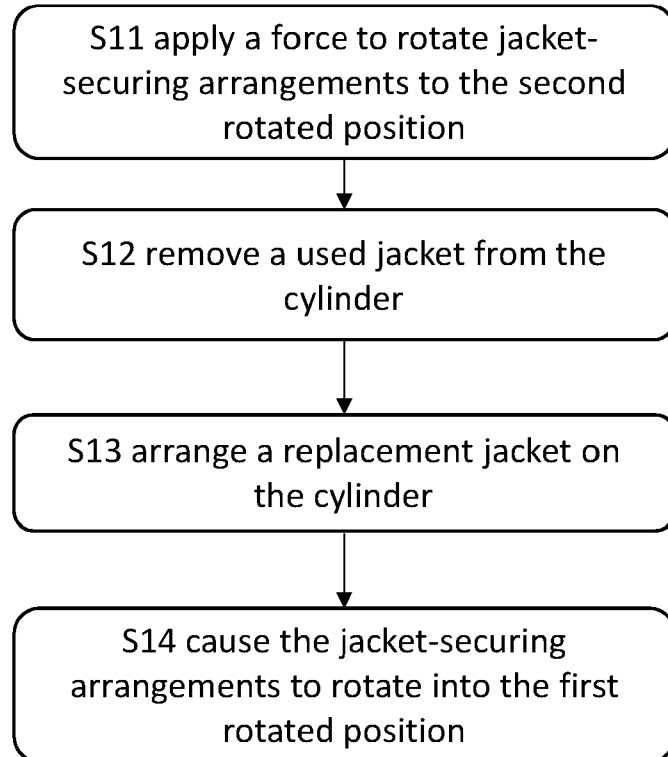


FIG. 20

ARRANGEMENTS FOR SECURING CYLINDER JACKETS

FIELD

The present invention relates to devices and methods for securing cylinder jackets to cylinders in printing systems.

5 BACKGROUND

Printing can be divided into direct and indirect processes, depending on the surface upon which an ink image is first deposited. In the former printing method, the ink image is directly deposited on a printing substrate, whereas in the latter process the ink image is first formed on an intermediate surface. Conventional offset printing processes include lithography, flexography, gravure and screen printing. But the ink image can also be digitally created by a number of techniques. Printing devices can, for instance, use an indirect inkjet printing process in which an inkjet print head is used to deposit ink droplets forming an ink image onto the surface of an intermediate transfer member, which is then used to transfer the image onto a substrate. The intermediate transfer member (ITM) may be any suitable plate, drum or flexible belt. This latter type of printing may lead to a number of problems, such as the abrasion of a surface as a result of repeated contact with another or dirt and detritus accumulating, with time, on the ITM and on surfaces contacting it. Such problems can be aggravated when a relatively high pressure is applied to urge contact between the different surfaces, for instance the outer surface of an impression cylinder at the image transfer location may experience an increased rate of deterioration. Moreover, if the printing system performs duplex printing, so-called back transfer can cause dried ink and/or other unwanted materials to transfer from the previously printed image to the surface of the 'perfecting' impression cylinder, adding one more cause for decline in the properties of the cylinder surface.

It has long been known in the printing industry that foil-based jackets can protect the surfaces of impression and/or transport cylinders, and these are commonly used, for example in offset printing presses, whether digital or not. To this end, many printing cylinders are provided with the necessary attachment arrangements for attaching new cylinder jackets. Printing cylinders may include more than one cylinder jacket along a circumferential direction of the cylinder.

GB 764,560 discloses a device for clamping a printing plate to a printing cylinder that employs a lever mounted in a recess in the printing cylinder and a magnet to retain the lever in a position in which it clamps an end of the printing plate against the cylinder.

SUMMARY

5 According to a first aspect of the invention, there is provided a jacket-securing arrangement as hereinafter set forth in Claim 1 of the appended claims.

The invention provides in further aspects a jacket securing assembly including a jacket securing arrangement of the invention, a cylinder including the jacket securing assembly and a printing system incorporating such a cylinder.

10 Features of embodiments of the invention are as set forth in the dependent claims.

A jacket-securing arrangement for securing a portion of a jacket to a rotatable impression cylinder of a printing system, according to embodiments of the invention, is disclosed herein. The impression cylinder has a cylinder gap that houses a plurality of grippers spaced along a gripper shaft so as to define a plurality of inter-gripper regions, the jacket-securing arrangement
15 comprising a magnet, a first member configured for holding the magnet, and a second member, detachably attachable to the first member. The first and the second members are adapted to be rotatably mounted around the gripper shaft when disposed in an assembled state in one of the inter-gripper regions. When in said assembled state, the jacket-securing arrangement is configured to magnetically secure the jacket portion to the impression cylinder when in a first
20 rotated position and not when in a second rotated position. For brevity, the cylinder jacket can also be said to be secured when the jacket-securing arrangement is in the first rotated position, and released (or releasable) when the jacket-securing arrangement is in the second rotated position.

In some embodiments, magnetically securing the jacket portion to the impression cylinder
25 can include magnetically securing the jacket portion to a surface of the cylinder gap, for instance, a part of a gap inner wall. The jacket portion can therefore be viewed as an inwardly turned edge of a replaceable jacket. The magnet allowing to secure the portion of the cylinder jacket to at least a portion of the impression cylinder or a portion of the surface of the cylinder gap, when the jacket-securing arrangement is in the first rotated position can also be referred to
30 as the “first magnet”. The jacket-securing arrangement can be viewed, more generally, as including a clamping lever pivotable about the shaft located within the recess of the cylinder, the pivoting being between a clamping position in which the edge of the jacket inwardly turned

to be disposed in the cylinder gap is clamped between the lever and a side wall of the recess (a surface of the cylinder gap) and a release position in which the lever is spaced from the side wall of the recess, a magnet being provided to retain the lever in the clamping position.

In some embodiments, the jacket portion can be releasable from being secured magnetically, by rotation of the jacket-securing arrangement from the first rotated position to the second rotated position. A jacket secured by such a jacket-securing arrangement to a cylinder can be replaced, and therefore can also be referred to as a “replaceable jacket”.

In some embodiments, the first and second members can be detachably attachable to each other such that in an unassembled state the two members are unconnected to each other.

In some embodiments, the first and second members can be reversibly attachable to each other such that in an unassembled state the two members are connected to each other by a linking arrangement. In such embodiments, the linking arrangement can include a hinge.

In some embodiments, at least one of the first and second members can have a respective volume (or profile, if considering a two-dimensional view) for receiving a part of the contour (*e.g.*, circumference) of the gripper shaft. For illustration, for shafts often having elliptic and mainly circular cross-sections, the receiving volume allowing mounting of the two members around the shaft can accordingly be a hollow depression in at least one of the members, this open cavity having a curvature corresponding to the part of the shaft perimeter allocated therein.

The first and second members when in assembled state can be said to form a clamping lever pivotable about a shaft housed in a recess in the outer surface of a cylinder. The two members assembled about the shaft define between them a bearing surface engaging an outer surface of the shaft.

In some embodiments, the jacket-securing arrangement can be configured such that when the jacket-securing arrangement is in said assembled state and in the first rotated position, a first portion of the first member holds the magnet, and a second portion of the first member contacts the jacket portion. In some embodiments, the jacket-securing arrangement can be configured such that when the jacket-securing arrangement is in said assembled state and in the first rotated position, the second member contacts the jacket portion. In some embodiments, the magnetic attraction between the magnet and a surface of the cylinder gap at a first location (*i.e.* at a first part of the surface of the cylinder gap) can cause the securing of the jacket portion to the surface of the cylinder gap at a second location (*i.e.* at a second part of the surface of the cylinder gap). In some embodiments, the first location (first part) and the second location

(second part) can be displaced from each other on different sides of a step in the surface of the cylinder gap. In some embodiments, it can be that when the jacket-securing arrangement is in said assembled state and in the first rotated position and the jacket portion is secured to the surface of the cylinder gap, a connecting arrangement between the magnet and the jacket-securing arrangement is adapted to be manually adjustable so as to improve the contact between the magnet and the first location.

In some embodiments, when the jacket-securing arrangement is in said assembled state and in the first rotated position, the magnet can contact the jacket portion so as to secure the jacket portion to the surface of the cylinder gap or a part of the gap.

In some embodiments, the jacket-securing arrangement can have a force-receiving surface for receiving a force that causes rotation of the jacket-securing arrangement in said assembled state from the first rotated position to the second rotated position, the force-receiving surface being within $\pm (+/-)$ 30° of perpendicular to said surface portion of the cylinder gap and the force is in a direction that is within $\pm 30^\circ$ of parallel to said surface portion of the cylinder gap. In such embodiments, it can be that the force-receiving surface is within $\pm 15^\circ$ of perpendicular to said surface portion of the cylinder gap and the force is in a direction that is within $\pm 15^\circ$ of parallel to said surface portion of the cylinder gap.

In some embodiments, the jacket-securing arrangement can additionally comprise a second magnet, such that when the jacket-securing arrangement is in said assembled state and in the second rotated position, a magnetic attraction between the second magnet and a second surface portion of the cylinder gap holds the jacket-securing arrangement in the second rotated position. The second surface portion of the gap where a second magnet can hold the jacket-securing arrangement in the second rotated position can also be referred to as the second position surface portion or as a third location of the surface of the cylinder gap.

In any of the aforementioned embodiments, it can be that the first magnet and/or the second magnet is held by a respective magnet-holder and the magnet-holder of the first magnet and/or of the second magnet is connected to the jacket-securing arrangement. The magnets that may be used in relation with the present jacket-securing arrangements, regardless of role and position on the clamping lever or on the wall of the recess, are generally strong magnets, such as neodymium magnets. In any of the aforementioned embodiments, the jacket portion can include a folded or foldable tab (*e.g.*, an edge turned / turning inwardly toward a recess in a cylinder).

In some embodiments, it can be that the jacket-securing arrangement is substantially recessed within the cylinder gap when disposed in said assembled state in one of the inter-gripper regions and rotatably mounted around the gripper shaft in the first rotated position.

5 In some embodiments, a printing system comprises an impression cylinder having a jacket cylinder, and a plurality of jacket-securing arrangements according to any one of the aforementioned embodiments, wherein each one of the plurality of jacket-securing arrangements is disposed in a respective inter-gripper region.

A jacket-securing arrangement according to embodiments of the invention is disclosed. The jacket-securing arrangement is for securing a portion of a cylinder jacket to an impression
10 cylinder that comprises a cylinder gap that has a shaft fixedly disposed therein, and the jacket-securing arrangement comprises a plurality of members, detachably attachable to each other and adapted, when attached to each other, to collectively form a rotatable assembly around said shaft so as to define an assembled state, and a magnet held by at least one of the plurality of members, wherein the jacket-securing arrangement is configured, when in the assembled state,
15 to magnetically secure said cylinder jacket portion to the impression cylinder.

In some embodiments, the rotatable assembly including the plurality of jacket-securing arrangements can be additionally configured, when in the assembled state, to be rotated around the shaft so as to not magnetically secure the cylinder jacket portion to the impression cylinder.

According to further embodiments of the invention, there is disclosed a rotatable
20 impression cylinder for a printing system, the impression cylinder having one or more impression cylinder gaps each cylinder gap housing a respective shaft and a respective plurality of jacket-securing arrangements, each jacket-securing arrangement comprising respective first and second members that are detachably attachable to each other, the first and second members being rotatably mountable around the shaft in assembled state, each respective first member
25 holding a magnet, wherein when the jacket-securing arrangements are in respective assembled states, the jacket-securing arrangements are operative to magnetically secure a cylinder jacket or a portion thereof to the impression cylinder when the jacket-securing arrangements are in a first rotated position and are operative to release the cylinder jacket or portion thereof when the jacket-securing arrangements are in a second rotated position. In some embodiments, the shaft
30 is a gripper shaft that is comprised in a gripper assembly, the gripper assembly further comprising a plurality of grippers that are fixedly mounted to the shaft and spaced along an axis

thereof to define a plurality of inter-gripper regions, and each of the jacket-securing arrangements is disposed in one of the plurality of inter-gripper regions of the cylinder gap.

According to further embodiments of the invention, there is disclosed a kit for assembling a jacket-securing arrangement around a shaft of a cylinder gap of a rotatable impression cylinder, the kit comprising one or more of a respective first member, a respective first magnet and a respective second member collectively forming in an assembled state a respective jacket-securing arrangement, the first member being configured for holding the first magnet directly or owing to a first magnet holder, and the second member being detachably attachable to the first member, the first member and the second member being configured to be rotatably mounted around the shaft, wherein when in the assembled state, the respective jacket-securing arrangement is configured to provide reversible magnetic securing of a portion of a cylinder jacket to at least part a surface of the impression cylinder or cylinder gap when the respective jacket-securing arrangement is in a first rotated position and not in a second rotated position. In some embodiments, each jacket-securing arrangement that can be assembled from the kit is according to the teachings herein. In some embodiments, the kit comprises a plurality of respective first members, respective first magnets and respective second members, which can be assembled to form a plurality of jacket-securing arrangements, which in some embodiments form rotatable assemblies according to the present teachings.

According to further embodiments of the invention, there is disclosed a printing system comprising (a) an intermediate transfer member (ITM) operable to have ink images formed thereupon at an image-forming station, the ITM and the image-forming station being movable with respect to one another; and (b) an impression station configured for transfer of the ink images to a substrate (*e.g.*, after the ink images are conveyed to the impression station by the ITM), the impression station comprising: (i) a rotatable impression cylinder having an impression cylinder gap housing a shaft, (ii) a jacket disposed around a portion of the circumference of the impression cylinder, the jacket comprising multiple tabs, and (iii) a plurality of jacket-securing arrangements for securing a corresponding plurality of the jacket tabs to the impression cylinder, each jacket-securing arrangement comprising respective first and second members that are detachably attachable to each other, each respective first member holding a magnet, wherein when the jacket-securing arrangements are in respective assembled states and rotatably mounted around the shaft, the jacket-securing arrangements are operative to reversibly secure corresponding jacket tabs magnetically to the impression cylinder.

In some embodiments, the shaft is a gripper shaft along which grippers are spaced to form a plurality of grippers, defining a plurality of inter-gripper regions. In such embodiment, the jacket-securing arrangements are rotatably mounted around the gripper shaft in respective inter-gripper regions. A printing system designed to only print on web substrate may include an impression cylinder wherein the shaft of the cylinder gap is devoid of grippers.

In some embodiments, the image-forming station of the printing system is capable of forming the ink image by depositing an ink material on selected regions of the ITM. The ink material can be a liquid ink or a solid ink. The liquid or solid ink material can be of one or more color, and/or one or more shade of a color. For instance, the image-forming station may deposit one or more color/shade of a liquid ink on selected regions of the ITM to form a desired ink image. In an example of such an image-forming station, the ink can be selectively deposited by any suitable ink-jetting device.

In other embodiments, the image-forming station of the printing system is capable of forming the ink image by selectively activating an ink material deposited on the ITM. For instance, the image-forming station may selectively soften a dry ink material, so as to form a desired ink image transferable at the impression station. In some such embodiments, the image-forming station can include a coating station where particles of dry ink are deposited on the ITM and an imaging station selectively applying energy to the deposited particles. In one such embodiment, the applied energy is in the form of electromagnetic radiation. In one such embodiment, the ink consists of thermoplastic materials and the particles can also be referred to as “thermoplastic particles”. In one such embodiment, the energy is applied to the thermoplastic particles from the side of the ITM upon which the ink was deposited, this first side being also referred to as the “front side”. Alternatively or additionally, the energy can be applied to the thermoplastic particles from the side of the ITM opposite the front side, this second side being also referred to as the “rear side”. In some embodiments, the imaging station includes thermal print heads or laser elements, the print heads and laser elements being capable of applying sufficient energy to the particles on the ITM, so as to selectively activate the particles and permit the transfer of the particles selectively activated at the impression station.

The ITM upon which ink can be deposited or activated to form an ink image may be of various types, including, for instance, a plate, a drum and an endless flexible belt. The multiple tabs extending from the jacket in a first portion thereof (*e.g.*, a leading edge) are foldable. The tabs of the jacket are in folded position when the tabs are secured by the jacket-securing arrangements in the impression cylinder gap, the folding allowing for the remaining portion of

the jacket to follow the contour of the impression cylinder. A second portion of the jacket, at the end opposite the first portion (*e.g.*, a trailing edge) can also be foldable or folded. The folding of the second portion of the jacket allows the insertion of the second portion of the jacket in a cylinder gap, which, in some embodiments, can be the same cylinder gap to which the first portion is secured.

According to embodiments disclosed herein, a printing system comprises (a) an intermediate transfer member (ITM) comprising a flexible belt operable to have ink images formed thereupon by droplet deposition at an image-forming station; and (b) an impression station configured for transfer of the ink images to substrate after the ink images are conveyed to the impression station by the ITM, the impression station comprising: (i) a rotatable impression cylinder having an impression cylinder gap housing a plurality of grippers spaced along a gripper shaft so as to define a plurality of inter-gripper regions, (ii) a jacket disposed around a portion of the circumference of the impression cylinder, the jacket comprising multiple tabs, and (iii) a plurality of jacket-securing arrangements for securing a corresponding plurality of the jacket tabs to the impression cylinder, each jacket-securing arrangement comprising respective first and second members that are detachably attachable to each other, each respective first member holding a magnet, wherein when the jacket-securing arrangements are in respective assembled states and rotatably mounted around the gripper shaft in respective inter-gripper regions, the jacket-securing arrangements are operative to reversibly secure corresponding jacket tabs magnetically to the impression cylinder.

In some embodiments, the printing system is configured so that the impression cylinder serves for duplex printing.

In some embodiments, magnetically securing the jacket to the impression cylinder can include magnetically securing the portion of the jacket including the multiple tabs to a surface of the cylinder gap.

In some embodiments, it can be that (i) the jacket portion comprises N tabs $TAB(1) \dots TAB(N)$ extending from a first end of the jacket, each of the N tabs $TAB(n)$ having a respective width value $TAB-WIDTH(n)$ and a respective spacing value $TAB-SPACING(n)$; (ii) the plurality of grippers defines a corresponding plurality of gripper-regions which includes a subset of N inter-gripper regions $REGION(1) \dots REGION(N)$ corresponding to the N tabs, each of the N inter-gripper regions $REGION(n)$ of the subset having a respective width value $REGION-WIDTH(n)$ and a respective spacing value $REGION-SPACING(n)$; (iii) the arranging of the

jacket on the cylinder is such that $TAB(1)$ is in $REGION(1)$, and $TAB(N)$ is in $REGION(N)$; and (iv) for each value of n from 1 to N , $TAB-WIDTH(n)$ is not greater than $REGION-WIDTH(n)$, and $TAB-SPACING(n)$ is substantially equal to $REGION-SPACING(n)$. N is a positive integer number equal to or greater than 1 ($N \geq 1$).

5 In some embodiments, it can be that when the jacket-securing arrangements are in said respective assembled states and in the first rotated position, a first portion of each respective first member holds the magnet, and a second portion of each respective first member contacts the corresponding jacket tab. In some embodiments, it can be that when the jacket-securing arrangements are in said respective assembled states and in the first rotated position, each
10 respective second member contacts the corresponding jacket tab. In some embodiments, the magnetic attraction between each magnet and a surface of the cylinder gap at a respective first location can cause the securing of the corresponding jacket tab to the surface of the cylinder gap at a respective second location.

15 In some embodiments, each respective first and second locations can be displaced from each other on different sides of a step in the surface of the cylinder gap. Considering a cross-section view of the cylinder gap, its inner walls may appear as including a number of contiguous segments, each segment, for instance, being either straight or curved. A threshold between such segments, not necessarily adjacent, may form a step-like structure the segments of which need not intersect with one another at a right angle.

20 In some embodiments, it can be that when the jacket-securing arrangements are in said respective assembled states and in the first rotated position, and the corresponding jacket tabs are secured to the surface of the cylinder gap, a connecting arrangement between each magnet and the respective jacket-securing arrangement is adapted to be manually adjustable so as to improve the contact between said magnet and the respective first location.

25 In some embodiments, it can be that when the jacket-securing arrangements are in said respective assembled states and in the first rotated position, each magnet contacts the corresponding jacket tab so as to secure said tab to the surface of the cylinder gap.

In some embodiments, it can be that each jacket-securing arrangement has a force-receiving surface for receiving a force that causes rotation of the jacket-securing arrangement
30 in said assembled state from the first rotated position to the second rotated position, each force-receiving surface being within $\pm 30^\circ$ of perpendicular to said surface portion of the cylinder gap and the force is in a direction that is within $\pm 30^\circ$ of parallel to said surface portion of the

cylinder gap. In such embodiments, it can be that each force-receiving surface is within $\pm 15^\circ$ of perpendicular to said surface portion of the cylinder gap and the force is in a direction that is within $\pm 15^\circ$ of parallel to said surface portion of the cylinder gap.

In some embodiments, it can be that (i) each force-receiving surface is a surface of a force-receiving portion having a thickness that is variable in a direction that is radial with respect to the gripper shaft, and (ii) for the plurality of jacket-securing arrangements, not all of the force-receiving portions have the same variable thickness, the differences in variable thickness being in a direction that is substantially normal to a longitudinal axis of the gripper shaft. In such embodiments, it can be when the jacket-securing arrangements are in said respective assembled states and in the first rotated position, the differences in variable thickness are such that not all of the force-receiving surfaces are disposed at the same angle of rotation with respect to the gripper shaft. In such embodiments, it can be that for the plurality of jacket-securing arrangements, no more than three force-receiving portions have the same variable thickness. In such embodiments, it can be that for the plurality of jacket-securing arrangements, no more than two force-receiving portions have the same variable thickness. In such embodiments, the printing system can be configured such that application of a force to the force-receiving surfaces of the plurality of jacket-securing arrangements by a substantially straight rigid bracket (or bar) held parallel to the gripper shaft, is effective to cause rotation of the jacket-securing arrangements from the first rotated position to the second rotated position in a sequence that begins with rotation of the jacket-securing arrangements having the force-receiving portions with the largest variable thickness and that ends with rotation of the jacket-securing arrangements having the force-receiving portions with the smallest variable thickness.

In some embodiments of the printing system, it can be that (i) the impression cylinder has a second impression cylinder gap housing a second plurality of grippers spaced along a second gripper shaft so as to define a second plurality of inter-gripper regions; (ii) the impression station additionally comprises (A) a second jacket disposed around a second portion of the circumference of the cylinder, the second jacket comprising multiple tabs, and (B) a second plurality of jacket-securing arrangements for securing a corresponding plurality of the tabs of the second jacket to the cylinder, each jacket-securing arrangement comprising respective first and second members that are reversibly attachable to each other, each respective first member holding a magnet; and (iii) when the jacket-securing arrangements of the second plurality of jacket-securing arrangements are in respective assembled states and rotatably mounted around the second gripper shaft in respective inter-gripper regions, said jacket-securing arrangements

are operative to reversibly secure corresponding tabs of the second jacket magnetically to a surface portion of the second cylinder gap.

In some embodiments, the printing system can additionally comprise: (a) a second rotatable impression cylinder having an impression cylinder gap housing a plurality of grippers spaced along a gripper shaft so as to define a plurality of inter-gripper regions, (b) a jacket disposed around a portion of the circumference of the second cylinder, the jacket comprising multiple tabs, and (c) a plurality of jacket-securing arrangements for securing a corresponding plurality of the jacket tabs to the second cylinder, each jacket-securing arrangement comprising respective first and second members that are reversibly attachable to each other, each respective first member holding a magnet, wherein when the jacket-securing arrangements are in respective assembled states and rotatably mounted around the gripper shaft in respective inter-gripper regions, the jacket-securing arrangements are operative to reversibly secure corresponding jacket tabs magnetically to a surface portion of the cylinder gap. In such embodiments, the second impression cylinder can be configured for duplex printing.

A method is disclosed, according to embodiments of the present invention, for installing a cylinder jacket on an impression cylinder, the impression cylinder having a cylinder gap that houses a plurality of grippers spaced along a gripper shaft so as to define a plurality of inter-gripper regions. The method comprises: (a) assembling a plurality of jacket-securing arrangements, each jacket-securing arrangement comprising (i) a magnet, (ii) a first member holding the magnet, and (iii) a second member that is detachably attachable to the first member, such that each assembled jacket-securing arrangement is disposed in a respective inter-gripper region and rotatably mounted around the gripper shaft; (b) arranging, on the impression cylinder, a jacket having a plurality of tabs extending therefrom, such that each of the tabs is disposed in a corresponding inter-gripper region, and (c) rotating each of the jacket-securing arrangements around the gripper shaft so as to magnetically secure each of the jacket tabs to the cylinder gap.

In some embodiments, it can be that (i) the jacket comprises N tabs $TAB(1) \dots TAB(N)$ extending from a first end of the jacket, each of the N tabs $TAB(n)$ having a respective width value $TAB-WIDTH(n)$ and a respective spacing value $TAB-SPACING(n)$; (ii) the plurality of grippers defines a corresponding plurality of gripper-regions which includes a subset of N inter-gripper regions $REGION(1) \dots REGION(N)$ corresponding to the N tabs, each of the N inter-gripper regions $REGION(n)$ of the subset having a respective width value $REGION-WIDTH(n)$ and a respective spacing value $REGION-SPACING(n)$; (iii) the arranging of the jacket on the

cylinder is such that $TAB(1)$ is in $REGION(1)$, and $TAB(N)$ is in $REGION(N)$; and (iv) for each value of n from 1 to N , $TAB-WIDTH(n)$ is not greater than $REGION-WIDTH(n)$, and $TAB-SPACING(n)$ is substantially equal to $REGION-SPACING(n)$. The plurality of tabs extending from a first end of the jacket can be said to reside in a first portion of the jacket.

5 In some embodiments of the jacket installation method, it can be that when the assembled jacket-securing arrangements are in the jacket-securing position, a first portion of each respective first member holds the magnet, and a second portion of each respective first member contacts the corresponding jacket tab. In some embodiments of the method, it can be that when the assembled jacket-securing arrangements are in the jacket-securing position, each respective
10 second member contacts the corresponding jacket tab. In some embodiments, it can be that the magnetic attraction between each magnet and a surface of the cylinder gap at a respective first location causes the securing of the corresponding jacket tab to the surface of the cylinder gap at a respective second location. In some embodiments, each respective first and second locations can be displaced from each other on different sides of a step in the surface of the
15 cylinder gap.

In some embodiments, the jacket installation method can additionally comprise: (d) when the assembled jacket-securing arrangements are in the jacket-securing position, and the corresponding jacket tabs are secured to the surface of the cylinder gap, manually adjusting a connecting arrangement between a magnet and a respective jacket-securing arrangement so as
20 to improve the contact between said magnet and the surface of the cylinder gap.

In some embodiments of the jacket installation method, it can be that when the assembled jacket-securing arrangements are in the jacket-securing position, the magnets contact the corresponding jacket tabs so as to secure said tabs to the surface of the cylinder gap.

25 In some embodiments of the jacket installation method, the jacket can be folded so as to substantially follow the circumference of the impression cylinder on a surface devoid of the cylinder gap. In some embodiments, a second portion of the jacket at an end opposite the multiple tabs in the first portion can be folded, so as to be secured to a cylinder gap. In some embodiments, the second portion of the jacket is inserted in the same cylinder gap as the first portion of the jacket, the first and second portion of the jacket being secured to different surface
30 parts of the cylinder gap. In some other embodiments, the second portion of the jacket is inserted in an additional cylinder gap different from the cylinder gap to which the first portion of the jacket is secured.

A method is disclosed, according to embodiments, for replacing a cylinder jacket on an impression cylinder, wherein (i) the impression cylinder has a cylinder gap that houses a plurality of grippers spaced along a gripper shaft so as to define a plurality of inter-gripper regions, (ii) the jacket comprises a plurality of tabs extending therefrom along an edge of the jacket, and (iii) a plurality of jacket-securing arrangements are disposed in respective inter-gripper regions and are rotatably mounted around the gripper shaft in a first rotated position such that the jacket tabs are magnetically secured to a surface portion of the cylinder gap. The method comprises: (a) applying a force to rotate the jacket-securing arrangements to a second rotated position and thereby release the jacket tabs from being magnetically secured to said surface portion; (b) removing the jacket from the cylinder; (c) providing a replacement jacket comprising a plurality of tabs; (d) arranging the replacement jacket on the impression cylinder, such that each of the tabs is disposed in a corresponding inter-gripper region, and (e) rotating each of the jacket-securing arrangements around the gripper shaft to the first rotated position, so as to magnetically secure each of the tabs of the replacement jacket to said surface portion.

In some embodiments of the jacket replacement method, the force can be applied at a respective force-receiving surface of each of said jacket-securing arrangements. In such embodiments, it can be that each force-receiving surface is within $\pm 30^\circ$ of perpendicular to said surface portion of the cylinder gap and the force is applied in a direction that is within $\pm 30^\circ$ of parallel to said surface portion of the cylinder gap. In such embodiments, it can be that each force-receiving surface is within $\pm 15^\circ$ of perpendicular to said surface portion of the cylinder gap and the force is applied in a direction that is within $\pm 15^\circ$ of parallel to said surface portion of the cylinder gap.

In some embodiments, it can be that each of the jacket-securing arrangements additionally comprises a respective second magnet, and the rotating of the jacket-securing arrangements to a second rotated position includes holding the jacket-securing arrangements in the second rotated position by the magnetic attraction between the respective second magnets and a second surface portion of the cylinder gap.

In some embodiments, it can be that each force-receiving surface is a surface of a force-receiving portion having a thickness that is variable in a direction that is radial with respect to the gripper shaft, and (ii) for the plurality of jacket-securing arrangements, not all of the force-receiving portions have the same variable thickness, the differences in variable thickness being in a direction that is substantially normal to a longitudinal axis of the gripper shaft. In such embodiments, it can be that when the jacket-securing arrangements are in the first rotated

position, the differences in variable thickness are such that not all of the force-receiving surfaces are disposed at the same angle of rotation with respect to the gripper shaft. In such embodiments, it can be that for the plurality of jacket-securing arrangements, no more than three force-receiving portions have the same variable thickness. In such embodiments, it can be that for the plurality of jacket-securing arrangements, no more than two force-receiving portions have the same variable thickness. In such embodiments, it can be that the force applied to the force-receiving surfaces is applied by a substantially straight rigid bracket held parallel to the gripper shaft, the applying of force being effective to cause rotation of the jacket-securing arrangements from the first rotated position to the second rotated position in a sequence that begins with rotation of the jacket-securing arrangements having the force-receiving portions with the largest variable thickness and that ends with rotation of the jacket-securing arrangements having the force-receiving portions with the smallest variable thickness. In such embodiments, it can be that all of the jacket-securing arrangements are rotated from the first rotated position to the second rotation position within one second. In such embodiments, it can be that the rigid bracket includes a plurality of protrusions, and each of the force-receiving portions having the largest variable thickness includes a protrusion-receiving portion for receiving a respective one of the plurality of protrusions.

The jacket-securing arrangements as herein disclosed are adapted to secure a wide variety of cylinder jackets. By way of illustration, the jackets of the afore-mentioned impression cylinders, printing systems, methods of installation and methods of replacement, each including the jacket-securing arrangements as herein detailed can be made of any suitable foldable material. Preferably, the jacket is compatible with the operating conditions of the printing system wherein the impression cylinder to which it is secured is installed. By compatible, it is meant, for instance, that the jacket is able to resist physical conditions (*e.g.*, pressure, temperature, *etc.*) and/or chemical conditions (*e.g.*, being chemically inert) for a duration of time sufficient for the meaningful exploitation of the printing system. A person skilled in the art of printing can readily appreciate which jacket can be compatible with each printing system or set of operating conditions.

In some embodiments, the jacket is made of a relatively hard material. In some embodiments, the jacket comprises or consists of a metal or an alloy. In one such embodiment, the jacket can include or consist of stainless steel. In some embodiments, the jacket has a relatively smooth surface. While the material constituting the jacket can be rigid in bulk form,

the jacket is sufficiently flexible to enable its securing to an impression cylinder according to the present teachings.

The dimensions of the jacket are adapted *inter alia* to the dimensions of the impression cylinder and to the dimensions of the substrate to be printed on (*e.g.*, having an area supporting at least one sheet in a direction parallel to a longitudinal axis of the cylinder). For instance, the jacket may have a width no greater than the length of the cylinder along its longitudinal axis of rotation. The jacket may have a length correlating with the circumference of the impression cylinder or a segment thereof in-between cylinder gap(s). The length of the jacket should take into account the length of the foldable portions, each not exceeding the dimensions of the cylinder gap(s). Finally, the jacket may have a thickness adapted to the dimensions of the impression station, such as the dimension of a gap between the ITM and the underlying impression cylinder at an impression nip. The jacket thickness may additionally be selected to be in accordance with the thickness of the printing substrate. In some embodiments, the jacket has a thickness not exceeding 1 mm, not exceeding 500 μm , or not exceeding 250 μm . In some embodiments, the jacket has a thickness of at least 20 μm , or at least 50 μm .

Cylinder jackets may be used for a number of reasons, known to the person skilled in the art of printing. For non-limiting illustration, they may serve to protect the outer surface of an impression cylinder or a perfecting cylinder, to facilitate the maintenance (*e.g.*, cleaning) or “replacement” of such surfaces. They may serve to adapt an impression or perfecting cylinder to differently sized sheet-based printing substrates, for instance having different areas (*e.g.*, by bridging over cylinder gaps), and/or having different thicknesses, and/or different textures, or they serve to adapt an impression cylinder to different operating conditions of a printing system. More generally, use of cylinder jackets may allow a printing system to be operated in a more efficient manner with respect to time, as such use may shorten the duration of interruptions otherwise due for the maintenance of an impression cylinder in absence of cylinder jackets. For instance, the impression cylinder of a printing system may have a set of interchangeable cylinder jackets, one replacement jacket being installed to permit continuing operation of the printing system, while the cylinder jacket being replaced is maintained.

In some embodiments, the impression cylinder jacket can be further treated by a treatment method capable of delaying, reducing or preventing contamination of the outwardly facing surface of the jacket by ink residues. In some embodiments, the treatment method is a physical treatment method, which in some cases may be applied solely to one side of the jacket, typically the side due to face an ITM or images thereon. In some embodiments, the treatment method is

a chemical treatment method, which includes the application of a coating composition the outwardly facing surface of the jacket.

In some embodiments, the impression cylinder jacket can further include an underneath layer on at least a portion of its inner surface (facing the impression cylinder once mounted and secured thereto). The underneath layer can be a compressible layer (*e.g.*, made of an elastomer) capable of facilitating at an impression nip the contact between the outer surface of the cylinder jacket, a printing substrate transported thereon and an ink image carried by an ITM. The underneath layer may, for instance, conveniently allow adapting the spacing between the relevant surface of the printing system to the actual thickness of a printing substrate and compensating for minor variations in its thickness (and/or minor variations in the topography of the jacket and/or ITM facing surfaces in between which the substrate is transported at the impression nip). As mentioned, the jacket-securing arrangements as herein disclosed can be configured to secure *inter alia* any of the afore-exemplified cylinder jackets, regardless of intended use and according adaptation of the jackets, treatment, if applied, and underneath layer, if present.

While for illustration, the jacket-securing arrangements according to the present teachings are herein detailed in connection with an impression cylinder of a printing system (or with a perfecting cylinder thereof), the present jacket-securing arrangements can be equally used to secure cylinder jackets to any other rotatable cylinder of any other system which may benefit from the presence of such wound around jackets. Still considering for illustration a printing system, a jacket may additionally benefit a substrate transport cylinder having no particular interaction with an ITM. Therefore, unless otherwise clear from context, for instance in relation with an impression station, the term impression cylinder is deemed to encompass any rotatable cylinder having one or more cylinder gaps, each cylinder gap housing a shaft, and in relation to direct or indirect printing systems, the term impression cylinder is deemed to encompass any rotatable printing cylinder having one or more cylinder gaps, each cylinder gap housing a respective shaft, which shaft can optionally be a gripper shaft.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which the dimensions of components and features shown in the figures are chosen for convenience and clarity of presentation and not necessarily to scale. Also, in some drawings the relative sizes of objects, and the relative distances between objects, may

be exaggeratedly large or small for the sake of convenience and clarity of presentation. In the drawings:

Fig. 1 is an elevation-view schematic illustration of a printing system according to embodiments of the present invention.

5 Fig. 2 is a perspective view of an impression cylinder having cylinder gaps, according to embodiments of the present invention.

Figs. 3A and 4B are, respectively, a schematic cross-section (elevation) view and a partial top (plan) view of an impression cylinder with gripper shaft and grippers, according to embodiments of the present invention.

10 Fig. 4 is an end (elevation) projection view of the impression cylinder and associated equipment of Fig. 2, with a cylinder jacket mounted and secured to the cylinder, according to embodiments of the present invention.

Figs. 5A and 5B are, respectively, a top (plan) view and an end (elevation) view of a cylinder jacket according to embodiments of the present invention.

15 Fig. 5C shows an alternative partial end view of the trailing portion of a cylinder jacket according to embodiments of the present invention.

Fig. 6 is schematic illustration of jacket tabs of the jacket of Fig. 5A, and corresponding gripper shaft, grippers and inter-gripper regions of an impression cylinder, according to embodiments of the present invention.

20 Fig. 7 is an annotated illustration of the jacket tabs of Fig. 6.

Fig. 8 is an annotated illustration of the gripper shaft, grippers and inter-gripper regions of Fig. 6.

Figs. 9A and 9B, are, respectively, side and top views of a jacket-securing arrangement according to embodiments of the present invention, in an assembled state on a gripper shaft.

25 Figs. 9C and 9D are, respectively, elevation views of the jacket-securing arrangement of Fig. 9A, in a first disassembled state showing complete disassembly, and in a second disassembled state using a linkage arrangement.

Figs. 10A and 10C are, respectively, elevation views of a jacket-securing arrangement that is magnetically securing a jacket tab to a surface of a cylinder gap of the impression cylinder
30 of Fig. 2, according to preferred and alternative embodiments of the present invention.

Fig. 10B is a detail view of a jacket tab with an affixing element on one side and a friction pad on the other side, according to embodiments of the present invention.

Figs. 11A and 11B are, respectively, elevation views of a jacket-securing arrangement in an assembled state on a gripper shaft, in a first rotated position and a second rotated position,
5 according to embodiments of the present invention.

Fig. 12 is an elevation view of a jacket-securing arrangement in the assembled state and in the first rotated position, showing the location of a force on a force-receiving surface of the jacket-securing arrangement, said force being effective for rotating the jacket-securing arrangement away from the first rotated position and in the direction of the second rotated
10 position, according to embodiments of the present invention.

Fig. 13 is a partial perspective view of the cylinder of Fig. 2, including a bracket provided for applying the force of Fig. 12 to a plurality of jacket-securing arrangements, according to embodiments of the present invention.

Fig. 14A is a schematic illustration of thickness options for force-receiving portion of a jacket-securing arrangement according to embodiments of the present invention.
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Fig. 14B is an illustration of the integration of the thickness options of Fig. 14A with the elevation view of Fig. 12.

Fig. 14C is an illustration of respective rotation angles associated with two of the thickness options of Figs. 14A and 14B.

Fig. 15 shows the elevation view of Fig. 3 with two cylinder jackets mounted and secured thereto, according to embodiments of the present invention.
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Fig. 16 is a partial view of one of the two cylinder gaps of the impression cylinder of Fig. 15, showing arrangements for securing the end of the jacket that is not the end secured by the jacket-securing arrangement of Fig. 10A, according to embodiments of the present invention.

Fig. 17 is an end (elevation) view of a perfecting cylinder suitable for use in a printing system configured for duplex printing, with a cylinder jacket mounted and secured thereto, according to embodiments of the present invention.
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Fig. 18 is an elevation view of a jacket-securing arrangement for use with the perfecting cylinder of Fig. 17, according to embodiments of the present invention.

Fig. 19 shows a flowchart of a method for installing a jacket-securing arrangement and a cylinder jacket, according to embodiments of the present invention.

Fig. 20 shows a flowchart of a method for replacing a cylinder jacket on a cylinder, according to embodiments of the present invention.

5 DETAILED DESCRIPTION

Embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in the
10 cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.
15 Throughout the drawings, like-referenced characters are generally used to designate like elements.

For convenience, in the context of the description herein, various terms are presented here. To the extent that definitions are provided, explicitly or implicitly, here or elsewhere in this application, such definitions are understood to be consistent with the usage of the defined
20 terms by those of skill in the pertinent art(s). Furthermore, such definitions are to be construed in the broadest possible sense consistent with such usage.

Note: Throughout this disclosure, subscripted reference numbers (*e.g.*, 10₁ or 10_A) may be used to designate multiple separate appearances of elements of a single species, when in a drawing or not; for example: 10₁ is a single appearance (out of a plurality of appearances) of
25 element 10. The same elements can alternatively be referred to without subscript (*e.g.*, 10 and not 10₁) when not referring to a specific one of the multiple separate appearances, *i.e.*, to the species in general.

In various embodiments, an ink image is first formed (*e.g.*, selectively deposited or activated) on a surface of an intermediate transfer member (ITM), and transferred from the
30 surface of the intermediate transfer member to a substrate (*i.e.* sheet substrate or web substrate). The location in the printing system at which the ink is deposited or the image otherwise formed (*e.g.*, by application of energy) on the ITM is referred to as the “image forming station”. In

many embodiments described in more details, the ITM comprises a flexible or endless “belt” and the terms “belt” and “ITM” are used interchangeably in such descriptions. However, this should not be construed as limiting, the ITM being, as mentioned, additionally able to include a more rigid body, the ITM being an outer surface of a plate or a drum. Regardless of the type of ITM, the surface upon which the ink image is deposited or formed can also be referred to as the “release surface”, in view of its ability to transfer the ink image at an impression station.

The area or region of the printing press at which the ink image is transferred from the ITM to a substrate is an “impression station”. It is appreciated that for some printing systems, there may be a plurality of impression stations. In some embodiments of the invention, the intermediate transfer member is formed as a belt comprising a reinforcement or support layer coated with a release layer forming the release surface. In other embodiments, the ITM is formed of a plate or a drum coated at their outermost surface with a release layer, so as to form the release surface.

Referring now to the figures, Fig. 1 is a schematic diagram of an exemplary printing system **100** for indirect printing according to some embodiments of the present invention. The system of Fig. 1 comprises an intermediate transfer member (ITM) **210** comprising a flexible endless belt mounted over a plurality of guide rollers **232, 240, 260, 253, 255, 242**. This figure shows aspects of a specific configuration relevant to discussion of the invention, and the shown configuration is not limited to the presented number and disposition of the rollers, nor is it limited to the shape and relative dimensions, all of which are shown here for convenience of illustrating the system components in a clear manner. In the example of Fig. 1, the ITM **210** rotates in the clockwise direction relative to the drawing, as indicated by arrow **2012**. This direction can also be referred to as the “printing direction”.

The printing system **100** can further comprise:

(a) an image forming station **212** comprising print bars, in the number of four in the present illustration: **222A-222D** (each designated one of C – for Cyan, M – for Magenta, Y – for Yellow and K – for black). The image forming station **212** is configured to form ink images **50** (only a few being shown the figure) upon a surface of the ITM **210** (e.g., by droplet deposition thereon);

(b) a drying station **214** for drying the ink images; and

(c) an impression station **216** where the ink images **50** are transferred from the surface of the ITM **210** to a substrate **231**. The substrate **231** is shown as sheet-fed substrate, such as paper

or carton product, but it can alternatively be a continuous-feed (web) substrate. The substrate transport system conveying the substrate from a feeding end to a delivery end via the impression station is not shown in the figure.

In the particular non-limiting example of Fig. 1, the impression station **216** comprises an impression cylinder **220** and a pressure cylinder assembly **318** which includes a pressure cylinder **218** and an optional compressible blanket **219** disposed at least around a large portion of the circumference of the pressure cylinder. The impression cylinder **220** is rotatable in the direction indicated by arrow **2010**, so as to transport sheets of substrate **231** from a supply stack to a delivery one. The pressure cylinder **218** can rotate synchronously with the impression cylinder **220** but in the opposite direction, as shown by arrow **2011**. As is known in the art, the respective rotation of the cylinders forming the impression station (*e.g.*, **218** and **220**) can be synchronized through the use of gears and/or bearers on the corresponding cylinders. When the cylinders of the impression station are engaged with one another (urged one against the other), the line of contact between the two may be referred to as the “impression nip”. Disengagement may be achieved by increasing the distance between the axes of rotation of the cylinders, for instance, by lifting-up the pressure assembly **318**. Alternatively, the axes of rotation of the cylinders may remain at a same spacing enabling contact, however at least one of the cylinders include a gap, so that as the gap reaches the nip, contact cannot be made with the circumference of the facing cylinder.

The skilled artisan will appreciate that not every component illustrated in Fig. 1 is required. Also, it can be appreciated that such a printing system can include additional features and components such as, for example, a different number of components in the previously described stations (*e.g.*, a different number of print bars in the imaging station), a conditioning station, a cooling station or a cleaning station, to respectively condition (*e.g.*, chemically and/or physically treat), cool or clean the surface of the ITM, if desired. In some embodiments, the printing system can include arrangements for performing duplex printing (*i.e.* printing a second image on the second side of a substrate printed on its first side), the printing system including an additional substrate transport system allowing to feed the other side of the substrate to the impression station or including a second (‘perfecting’) impression cylinder for that purpose.

Referring now to Fig. 2, an impression cylinder **220** is shown with additional detail. The cylinder **220** has a first cylinder gap **320₁** and a second cylinder gap **320₂**. A cylinder gap, as is known in the printing industry, is a recess in the circumference of a printing cylinder for housing and/or anchoring ancillary equipment within the gap. Typically, the remainder of the cylinder

circumference - from the trailing edge of a first cylinder gap (e.g., **320₁**) to the leading edge of a second cylinder gap (e.g., **320₂**) – is smooth. Terms such as ‘leading edge’ and ‘trailing edge’ wherever used herein are used within a reference framework having a specific direction of movement during operation of the printing system; in this case, the terms are used with reference to cylinder rotation direction **2010**, which is indicated in Fig. 2 by an arrow and which corresponds with the rotation direction indicated in Fig. 1. The smooth surface between the cylinder gaps **320** carries the substrate **231** which receives the ink-images transferred from the ITM.

As is known in the printing industry, grippers can be used to grip sheets of substrate **231** on impression cylinders (and on some other types of cylinders, which are not relevant to this disclosure). Grippers serve to releasably engage the sheets on the impression cylinder and to maintain them thereon, often by way of gripper pads at one end of gripper fingers pivotably mounted on an axis. Figs. 3A and 3B schematically illustrate an impression cylinder **220** wherein a plurality of grippers **350** attached to gripper shaft **351** are substantially recessed (meaning, in this disclosure: either completely recessed, or at least 90% recessed, or at least 80% recessed) inside the impression cylinder gap **320** so as to substantially not extend (meaning: either the grippers **350** do not extend at all, or at most of the grippers **350** extend by 10% or 20%) beyond the circumference of the impression cylinder, i.e., the virtual cylinder where the cylindrical circumference would be without the discontinuity of the impression cylinder gap **320**. One of the reasons for selecting a design with recessed grippers can be so as to avoid damage or excessive wear of the ITM **210** as it traverses the impression station **216**. Another reason can be to avoid damage or misalignment of the grippers from the same encounter (during every rotation) with the ITM **210**. While Fig. 3A is a cross-sectional view showing only a single gripper **350**, Fig. 3B is a partial top view showing a plurality of grippers **350** spaced along the length of gripper shaft **351**. As can be seen in Fig. 3B, the grippers **350** are not necessarily evenly spaced along the length of the shaft **351**. The number and spacing of grippers are illustrative and there can be different numbers of grippers and/or different spacing of grippers in other examples. The grippers **350** extend from the gripper shaft **351** and overlap the trailing edge of the cylinder gap **320** (in the direction of rotation **2010**). The grippers **350** can be seen, in both Figs. 3A and 3B, to overlap a part of the surface of the impression cylinder **220** beyond the edge of the cylinder gap **320**.

As is known in the printing industry, cylinder jackets can be provided to cover a surface of a cylinder, including impression cylinders. Fig. 4 shows another view of an impression

cylinder with a jacket **225** attached on one side of the cylinder, covering the cylinder surface on one smooth circumferential surface between cylinder gaps **320**. Although not shown in Fig. 4, the plurality of grippers **350** shown in Fig. 3B may tend to interfere with the attachment of the jacket **225** at its leading edge, *i.e.*, at the edge where grippers **350** are extended from the cylinder gap **320** and cover a small part of the cylinder surface.

Details of the jacket **225**, illustrating an example of how the potential blockage by grippers **350** at the edge of the cylinder gap **320** can be overcome, can be seen in Figs. 5A and 5B. An examination of Fig. 5B will reveal that the jacket **225** is the same as the one mounted on the cylinder **220** in Fig. 4, but rotated here for convenience. On the leading edge of the jacket **225** (*i.e.*, the leading edge in cylinder rotation direction **2010**), a plurality of folded or foldable tabs **229** is provided. The tabs are shown in an unfolded state in Fig. 5A and in a folded state in Fig. 5B. The tabs **229** can be folded at first folding line **226₁** so as to facilitate mounting and securing of the jacket **225** on the cylinder **220**. Depending on the materials used in fabricating the jacket **225**, as well as the geometry of the edge of the cylinder gap **320**, the ‘folding’ may in some embodiments be more like ‘bending,’ *i.e.*, with a larger radius that does not crease or create a distinct corner. On the trailing edge of the jacket **225**, a trailing portion **227** is folded (or bent) at a second folding line **226₂**, preferably through an angle greater than 90°, for purposes of mounting and securing on the cylinder **220**. The foldable trailing portion **227** on the trailing edge of the jacket **225** need not be a solid strip as illustrated, and in some examples of suitable jackets **225**, the foldable portion **227** can comprise multiple portions including, for example, tabs similar to tabs **229**. As illustrated in Fig. 5C, the foldable portion **227** can include multiple foldable portions that may be designed in accordance with a surface of a specific cylinder gap **320**, or of equipment therein, to which the foldable portion conforms when mounted on a cylinder **220**.

It is not important where, when and how the folding of the tabs **229** and the trailing portion **227** is performed. In some embodiments, the folding of the tabs **229** and the trailing portion **227** can be factory-performed or supplier-performed, *i.e.*, a jacket **225** is provided with tabs **229** and trailing portion **227** already folded. In other embodiments, the jacket **225** can be provided unfolded, and the folding is performed, *e.g.*, by a jacket installer, whether *in situ* by placing the jacket **225** on a cylinder **220** and folding the tabs **229** and trailing portion **227** around the edges of the cylinder gaps **320**, or as part of preparing a jacket **225** for installation by using a folding jig.

Fig. 6 illustrates schematically how the provision of tabs on the edge of a jacket can help to overcome the partial and intermittent ‘blocking’ of the edge of the cylinder gap by the grippers extending from the cylinder gap so as to cover part of the cylinder surface. The underlying concept is that a folded tab **229** can be inserted between each pair of adjacent grippers **350**. On the left side of the diagram of Fig. 6, the gripper shaft **351** and 14 grippers **350** of Fig. 3B are shown. Between each pair of grippers is a region of space, such that there are 13 spaces defined by the 14 grippers. Three of these regions are marked as “other inter-gripper space.” These spaces are so marked because, according to a non-limiting example, the presence of other equipment (not shown) in the spaces prevent the insertion of a jacket tab. A common type of equipment present in such cases is a shaft bearing that secures the gripper shaft and allows it to rotate through at least the rotation range necessary for opening and closing grippers when gripping and ‘un-gripping’ sheets of substrate on the surface of the impression cylinder **220**. The other ten between-gripper spaces constitute inter-gripper regions **353** which can be used to accommodate jacket tabs **229**. Speaking generally, there can be N inter-gripper regions **353** in which each $REGION(n)$, for every integer value of n from 1 to N , has a set of parameter values. In the non-limiting example of Fig. 6, N is equal to 10, and the $N=10$ inter-gripper regions **353** are labeled accordingly from $REGION(1)$ to $REGION(10)$. The efficacy of this notation is illustrated when considering the leading edge of jacket **225** having tabs **229** extending therefrom, on the right side of the diagram of Fig. 6. It can be seen that, in this example, 10 tabs **229** corresponding to the 10 inter-gripper regions **353** are provided, and that for every $REGION(n)$ from $REGION(1)$ to $REGION(10)$, there is a corresponding $TAB(n)$, i.e., from $TAB(1)$ to $TAB(10)$. In this example, the value of N is the same for inter-gripper regions and for tabs. In other examples, there can be more inter-gripper regions **353** than tabs **229**, as long as there are enough tabs **229** to enable proper securing of a jacket **225** to a cylinder **220**. Conversely, there cannot be more tabs **229** than inter-gripper regions **353**, other than by using a ‘trick’ such as having two ‘narrow’ tabs instead of one wide one, where of course any such set of ‘narrow’ tabs in a single inter-gripper region is equivalent for purposes of the invention to a single tab. It will be obvious to the skilled artisan that having more tabs than inter-gripper regions, when the width of the tabs and the spaces between the grippers is such that an inter gripper region can only accommodate a single tab, would mean that ‘extra’ tabs would be ‘blocked’ by grippers **350** at the edge of a cylinder gap **320** when mounting a jacket **225** on a cylinder **220**.

We refer now to Fig. 7. For the set of N jacket tabs $TAB(n)$ described in the foregoing discussion, $TAB-WIDTH(n)$ is a one-dimensional array of values of widths corresponding to respective tabs $TAB(n)$. If a tab **229** has a substantially rectangular shape ('substantially' meaning except as modified for manufacturing purposes, *e.g.*, because of cutting radiuses) as per preferred embodiments and as illustrated throughout this disclosure, then the value of $TAB-WIDTH(n)$ is obviously the width of $TAB(n)$ as shown in Fig. 7. In alternative embodiments in which the width is irregular, then $TAB-WIDTH(n)$ can equal the maximum value of the width at any point on the $TAB(n)$. Nonetheless, a substantially rectangular shape can be preferable so as to best facilitate use of the tabs in securing a jacket to the cylinder.

Similarly, $TAB-SPACING(n)$ is a one-dimensional array of values of spacing corresponding to respective tabs $TAB(n)$. Spacing of tabs can be assessed in different ways. In the example of Fig. 7, $TAB-SPACING(n)$ is assessed as the distance from a lateral edge of the jacket **225** to the 'beginning' of the respective tab, *i.e.*, to the 'bottom' of the tab in the plan view of Fig. 7. Alternatively, spacing can be from tab to tab (beginning-to-beginning, ending-to-ending or centerline to centerline), from jacket lateral edge to centerline of tab, from jacket lateral edge to ending of tab, and so on. It is obviously important that the same approach be taken for all tabs and, with reference to Fig. 8, for inter-gripper regions as well. Fig. 8 illustrates one-dimensional arrays $REGION-SPACING(n)$ and $REGION-WIDTH(n)$ respective of the set of inter-gripper regions $REGION(n)$ described earlier in the discussion of Fig. 6.

As long as the spacing values of $REGION-SPACING(n)$ are assessed in the same manner as were the spacing values of $TAB-SPACING(n)$, it is possible to link the width and spacing parameters of tabs **229** to those of inter-gripper regions **353**. For each integer value of n from 1 to N , it is preferable that $TAB-SPACING(n)$ be substantially equal to $REGION-SPACING(n)$, and it is also preferable that $TAB-WIDTH(n)$ be no larger than $REGION-WIDTH(n)$. It is especially preferable that each $TAB-WIDTH(n)$ be smaller than the corresponding $REGION-WIDTH(n)$. These conditions allow respective tabs **229** to fit (and, preferably, fit easily without interference or friction) within corresponding respective inter-gripper regions **353** when a tabbed jacket **225** is mounted on a cylinder **220**. The phrase 'substantially equal to' earlier in this paragraph should be understood to mean that the combination of tab and region spacings and widths is such that each of the tabs **229** fits properly in the corresponding inter-gripper region **353**. It should be obvious from the foregoing that if the tolerance or imprecision of the respective spacing variables is large, then it is likely that the difference between tab widths and corresponding region widths (*i.e.*, extra space between grippers **350**) for any values of n needs

to be larger in order to ensure proper fit of the tabs **229** in the corresponding inter-gripper regions **353**. On the other hand, if the spacings of the tabs and corresponding regions are exactly equal, then the difference in the respective widths of tabs and corresponding regions can be very small.

5 The foregoing discussion dealt primarily with the provision of tabs of appropriate widths and spacings so as to allow a jacket to be mounted on a cylinder with the tabs inserted into the inter-gripper regions at the trailing edge (in the rotation direction) of a cylinder gap. The following paragraphs discuss apparatus and methods for magnetically securing the jacket tabs to a surface of the cylinder gap and thereby reversibly securing the leading edge of a mounted
10 cylinder jacket to the cylinder.

Printing cylinders commonly include a ferromagnetic material such that it is possible to secure a jacket to the cylinder using magnets. However, in the present embodiments, the area of a cylinder gap in which such magnetic securing is likely to take place is also used to house the gripper shaft and set of grippers. Thus, there is little or no access for an operator's hand or
15 tool to accurately place a magnet, or forcefully remove a magnet from the surface of the cylinder gap to which a jacket tab may be magnetically secured. And even if there were enough access for a tool, it would be difficult to find the leverage necessary to remove the magnet from the cylinder gap surface, as the magnet may have a magnetic pull strength of more than 5 kg or more than 10 kg or more than 20 kg.

20 Referring now to Figs. 9A and 9B, a jacket-securing arrangement **270** according to some embodiments of the present invention comprises a two-armed bell-crank clamping lever formed of first and second members **272**, **274**. In other embodiments, not illustrated, a jacket-securing arrangement **270** may include more than two members. The jacket-securing arrangement **270** of Fig. 9A is shown in an assembled state. The assembled state of jacket-securing arrangement
25 **270** according to some embodiments satisfies the following features:

- The two members **272**, **274** are releasably attached to each other. This can be accomplished effectively, for example, by providing one or more pre-drilled holes **267**,
e.g., for screws or bolts, passing through the second member **274**, and corresponding receiving portion(s) (not shown - they are obscured in Fig. 9B by second member **274**),
30 e.g., threaded receptacles in the first member **272** for receiving the screws or bolts. In one embodiment, the screws are captive screws. Two holes **267** are shown so as to

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accommodate two respective screws, which are disposed one on each side of the shaft, but there can be any number.

- The assembled jacket-securing arrangement **270** is rotatably mounted around gripper shaft **351**. The jacket-securing arrangement must be able to freely rotate (in terms of the gripper shaft **351**) although the range of its rotation may be otherwise limited by the confines of the cylinder gap **320**. The members **272**, **274** are each formed with part of a bearing surface to permit the clamping lever to rotate about the axis of the gripper shaft **351**. In the non-limiting example of Fig. 9A and subsequent figures, each of the members **272**, **274** has a part-cylindrical surface for engaging the circumference of the gripper shaft **351**.
- The assembled jacket-securing arrangement **270** is disposed in an inter-gripper region, such as in any *REGION(n)* as discussed in connection with Fig. 6. The skilled artisan will understand that in the embodiments illustrated, the jacket-securing arrangement **270** can only be disposed in an inter-gripper region **353** because otherwise a gripper **350** or other equipment (*e.g.*, shaft bearing **269**) will preclude such disposition.

The jacket-securing arrangement also includes a magnet **280**, such as a neodymium magnet. The magnet **280**, in the example of Fig. 9A, is fixedly attached to the first member **272**, although in alternative embodiments the magnet **280** can be attached to another part of the clamping lever. The magnet **280** can be attached directly to a member of the jacket-securing arrangement **270** or, alternatively, it can be installed in a magnet holder (not shown) which is fixedly attached to the member.

In some embodiment, a magnet **280** may alternatively or additionally be secured to the wall of the recess and the clamping lever may be made of a ferromagnetic material. Such a configuration may be adopted in a situation where the material of the wall of the recess in the cylinder is not strongly ferromagnetic.

The jacket assembly **270** cannot be mounted on a gripper shaft **351** when in the assembled state. Rather, it must be in an unassembled state. Fig. 9C shows a jacket-securing arrangement **270** in a first unassembled state – the members **272**, **274** are completely disassembled and are not connected in any way. Fig. 9D shows a jacket-securing arrangement **270** in a second unassembled state according to an alternative embodiment – the members **272**, **274** are connected by a linking arrangement **273**. Linking arrangement **273** can comprise a hinge, as shown in Fig. 9D, or it can comprise any other mechanical arrangement, such as a cable, for

connecting the two members in the unassembled state. Using a linking arrangement can be beneficial, for example, where the possibility of dropping one of the members into the cylinder gap during installation or removal of the jacket-securing arrangement **270** might be a concern.

Referring now to Fig. 10A. The jacket-securing arrangement of Fig. 9A, in the assembled state (*i.e.*, rotatably mounted around the gripper shaft **351** and disposed in an inter-gripper region **353**), secures a tab **229** of jacket **225** to a surface of the cylinder gap **320**. Specifically, the magnet **280** holds the jacket-securing assembly **270** in place, by the force of its magnetic attraction to the surface of the cylinder gap at a first location **321**; ‘in place’ can mean, for example, that the jacket-securing assembly **270** is not easily rotatable when in this position.

This magnetic force is effective to cause the securing of an upper portion **275** of first member **272** to the surface of the cylinder gap at a second location **322**, with a portion of the jacket tab **229** being ‘clamped’ or ‘trapped’ between the upper portion **275** and the surface of the cylinder gap. In other words, the force of the magnetic attraction at the first location **321** causes the ‘indirect’ [magnetic] securing of the jacket tab **229** at the second location **322**. As used herein, the magnetic securing provided by the jacket-securing arrangement, unless otherwise stated or clear from context, encompasses the ‘direct’ securing of the first magnet on a first part of the cylinder gap (*e.g.*, at a first location **321**) and the ‘indirect’ securing of a portion of the jacket of the impression cylinder to a second part of the cylinder gap (*e.g.*, at a second location **322**), for instance by reversible, quick release, mechanical clamping.

In some embodiments, an adjustment mechanism **281** is provided to facilitate manual adjustment (*e.g.*, tightening or loosening) of the connection between the first member **272** and the magnet **280**. This can be a useful feature to have available when, for example, imperfections in the surface of the cylinder gap **320** at the first location are such that the magnet is not disposed at the optimal angle when the upper portion **275** contacts the tab **229** at the second location **322** during installation of the jacket-securing arrangement **270**. In one non-limiting example, the surface of the cylinder gap **320** at the second location **322** may be machined, while the surface at the first location **321** may be the result of a less precise casting process, the ‘step’ between the two locations being one artefact of such a two-step manufacturing process.

In some embodiments one or more additional elements can be fastened to a jacket tab **229** for improving the installation process on a cylinder **220** and for otherwise increasing the effectiveness of the use of jacket-securing arrangements **270**.

In one example, it can be desirable to affix a jacket tab **229** or multiple jacket tabs **229** lightly to the surface of the cylinder gap **320** before rotating respective jacket-securing arrangements **270** into the first rotated position for long-term magnetic securing of the tabs **229**. The folding or bending of the tab(s) **229** may cause ‘springiness’ in the folds or bends that prevents the tabs **229** from sitting properly in place before the long-term magnetic securing. The tabs **229** are relatively small extensions on a much larger jacket **225**, such that properly seating the jacket **225** on the cylinder **220** may leave one or more tabs **229** somewhat ‘up in the air’ rather than exactly where they need to be, folded down snugly in place against the surface of the cylinder gap **320**. Therefore, in some embodiments the jacket installation process can be made more efficient by lightly affixing the jacket tabs **225** to the cylinder gap surface, using sufficient adhesion to temporarily keep the tabs **229** in place long enough to complete the installation process.

In a second example, it can be desirable to increase a frictional resistance force between the upper portion **275** of first member **272** of jacket-securing arrangement **270** – the portion of the jacket-securing arrangement **270** most likely to contact the tab **229** – and the surface of the tab **229**. This may provide some additional security to the attachment of jacket **225** to the cylinder **220** during operation of the printing system **100**, when high speeds and high centrifugal forces may otherwise cause slippage of the tabs between the jacket-securing arrangement **270** and the surface of the cylinder gap **320**.

Referring now to Fig. 10B, an affixing element **81** is caused to adhere to the cylinder-facing side of a jacket tab. In one example, affixing element **81** comprises a small, thin magnet with sufficient force to hold a respective jacket tab **229** in place during installation – but which does not require undue force or special tooling for disconnecting the tab from the cylinder gap surface when the jacket **225** is eventually removed and the jacket-securing arrangement **270** is rotated out of the first rotated position. In another example, affixing element **81** comprises an adhesive tape or film, which can be a two-sided adhesive tape or film, for example a reusable tape or film.

Also illustrated in Fig. 10B is friction pad **79**, which can be provided so as to increase a frictional resistance force between the upper portion **275** of first member **272** of jacket-securing arrangement **270**, and the surface of the tab **229**. Friction pad **79** can comprise a cloth, a rubber, a plastic or any combination of such materials that increases the frictional resistance and can help reduce possible centrifugal slippage of the tab **229** during operation of the printing system **100**.

Any number of tabs **229** on a jacket **225**, from zero to N (all the tabs) can be equipped with friction pads **79** and/or affixing elements **81**. For example, it can be that none are so equipped, or that some tabs **229** are equipped with one or both of a friction pad **79** and an affixing element **81**, or even that all tabs **229** are equipped with one or both of a friction pad **79** and an affixing element **81**.

In an alternative embodiment illustrated in Fig. 10C, the magnet **280** can be attached elsewhere, for example to the upper portion **275**, such that the magnet directly secures the jacket tab **229** to the surface of the cylinder gap **320** at the ‘second’ (only) location **322**.

In some embodiments, the magnet **280** is attached to, and at other times removed from, the surface of the cylinder gap **320** at the first location **321** by rotating the jacket-securing arrangement **270** around the gripper shaft **351**. In Fig. 11A, the jacket-securing arrangement is in a first rotated position where, as in Fig. 10A, the magnet is in place at the first location **321** on the surface of the cylinder gap **320**, and the jacket tab **229** is secured by the upper portion **275** at the second location **322**. The first rotation position is thus the ‘jacket-securing position’.

The rotation of the jacket-securing arrangement **270** to the first rotation position is in the direction indicated by arrow **2020**. As shown in Fig. 11A, the jacket-securing arrangement **270** can comprise a second magnet **285** attached to a portion of the jacket-securing arrangement **270** displaced from the first magnet **280**. The second magnet can be attached directly or, as shown in Fig. 11A by a bracket **287** that holds the second magnet **285** at a more favorable angle for its purpose. In Fig. 11B, the jacket-securing arrangement **270** is shown in the second rotated position. The rotation of the jacket-securing arrangement **270** to the second rotation position is in the direction indicated by arrow **2030**, and is opposite to the direction of rotation to the first rotated position which is indicated in Fig. 11A by arrow **2020**. In the second rotated position, as shown in Fig. 11B, the first magnet is displaced from the first location **321** on the surface of the cylinder gap **320**. A magnetic attraction between the second magnet **285** and a second surface portion **323** of the cylinder gap **320** holds the jacket-securing arrangement **270** in the second rotated position, the second surface portion **323** being therefore also referred to as the second position surface portion or as a third location of the gap surface. In some embodiments (not illustrated), the second magnet **285** is not provided, and if necessary, other methods of preventing the magnet **280** from ‘snapping back’ to its regular target of the first location **321** on the surface of the cylinder gap **320** can be used, such as providing a mechanical restraint.

A preferred method for rotating a jacket-securing arrangement to the second rotated position is to apply a force to the second arm of the bell-crank clamping lever that will translate

to sufficient moment to remove the magnet **280** from where it adheres magnetically to the first location **321** on the surface of the cylinder gap **320**. Referring now to Fig. 12, a force F can be applied effectively to a force-receiving surface **277** of the jacket-securing arrangement **270**. The force-receiving surface **277** in Fig. 12 is an upward-facing surface of a force-receiving portion **278** of the jacket-securing arrangement **270**. The force-receiving portion **278** is provided so as to be diametrically opposite the first location **321** where the magnet **280** is disposed when in the first rotated position – or within $\pm 30^\circ$ of being diametrically opposed, or within $\pm 15^\circ$ of being diametrically opposite. The force F can be applied in a downward direction relative to the cylinder gap, meaning roughly parallel to the surface of the cylinder gap **320** at the first location **321**. By ‘roughly parallel’ we mean within 15° either way of being parallel, or within 30° either way of being parallel. The force-receiving surface at the time of applying the force F is roughly perpendicular to the surface of the cylinder gap **320** at the first location **321**. By ‘roughly perpendicular’ we mean within 15° either way of being perpendicular, or within 30° either way of being perpendicular. In this manner, the magnet **280** can be removed relatively more easily and also without direct access by fingers or tool to the magnet **280**. The moment removes the magnet **280** by rotating the jacket-securing arrangement **270** away from the first rotated position (and towards the second rotated position) and thereby releases the jacket tab **229** (not shown in Fig. 12) clamped by the upper portion **275** against the surface of the cylinder gap **320** at the second location **322**. Neither the second magnet **285** nor its corresponding bracket **287** is shown in Fig. 12, solely for convenience, so that the position of the force F on the force-receiving surface **277** could be illustrated.

As described in the foregoing paragraphs, the release of the jacket tabs **229** coincident with the release of the magnet **280** from the surface of the cylinder gap **320** is effectively accomplished by leveraging the rotatability of the jacket-securing arrangement **270** around the gripper shaft **351**. In this method, applying a moderate force F to the force-receiving portion on the opposite side of the jacket-securing arrangement **270** (*i.e.*, the side of the jacket-securing arrangement **270** that is on the opposite side of the gripper shaft **351**) makes it possible to accomplish the release of the magnet **280** with less force than would be necessary to pull it directly off with a force applied at the first location **321**. However, removing a jacket **225** from a cylinder **220** involves releasing multiple magnets **280** from the surface of the cylinder gap **320** and rotating multiple jacket-securing arrangements **270** away from the first rotated position. As shown in Fig. 13, there can be more than 5, or more than 10 or more than 15 jacket-securing arrangements **270** provided in a single cylinder gap **320**, and there is a like number of magnets

280 to be pulled off the surface of the cylinder gap **320**. An elongated, rigid bar or bracket **369** can be provided to apply a force (*e.g.*, F) at each of the force-receiving surfaces **277** of all of the jacket-securing arrangements **270**. In some embodiments, even the moderate force F , when multiplied by the number of jacket-securing arrangements **270** present, may prove to be too great a force for an operator to apply all at once to the plurality of jacket-securing arrangements **270**. In such embodiments, a method of releasing the jacket tabs **229** can be performed which includes using a bracket **369** to apply a force simultaneously to all of the force-receiving surfaces **277**, but without simultaneous rotation of all of the plurality of jacket-securing arrangements **270**. According to the method, a thickness of the force-receiving portion **278** can vary among different, and especially adjacent, jacket-securing arrangements. Referring now to Fig. 14A, a schematic illustration of a force-receiving portion **278** (of a jacket-securing arrangement **270**) is shown with multiple possible thicknesses and corresponding possible dispositions (or versions) of the upward-facing force-receiving surface **277**. Each force-receiving portion **278** can have a variable thickness along its length, but the variable thickness is nonetheless different in each of the thickness possibilities shown in Fig. 14A. For example, the force-receiving portion **278** shown in all previous figures in this disclosure has the maximum thickness possibility of all the possibilities illustrated in Fig. 14A and includes the uppermost force-receiving surface **277A**. The second-thickest possible force-receiving portion **278** in Fig. 14A includes force-receiving surface **277B**. The third-thickest possible force-receiving portion **278** in Fig. 14A includes force-receiving surface **277C**, and so on until the thinnest possible force-receiving portion **278** of the possibilities illustrated in Fig. 14 includes force-receiving surface **277G**. The efficacy of this solution can be understood from Fig. 14B, which integrates the illustration of multiple force-receiving portion thicknesses of Fig. 14A with the elevation view of Fig. 12. When disposed in the first rotated position, all of the jacket-securing arrangements **270** are parallel to each other: (a) respective magnets **280** are disposed against the surface of the cylinder gap **320** at respective first locations **321** and therefore are parallel to each other; and (b) the bottom or downward-facing surfaces of the respective force-receiving portions **278** are also parallel to each other.

In some embodiments, the relative disposition of different upward-facing force-receiving surfaces **277A**, **277B**, *etc.*, can be defined by rotation angles with respect to the gripper shaft **351**. In Fig. 14C, a force-receiving surface **277A** is at a first rotation angle indicated by the arrow **2040A**, and a force-receiving surface **277B** is at a second rotation angle indicated by the arrow **2040B**. Each possible receiving surface **277** can have a different corresponding rotation

angle **2040**. The rotational difference between the two consecutive rotation angles **2040A** and **2040B** can be, for example 1° . In some examples, all pairs of respective rotation angles **2040** corresponding to consecutive thickness options are separated by substantially the same 1° angle. In other examples, the separation can involve larger or smaller angles of rotational differences, and not all angles of rotational differences between consecutive thickness options of force-receiving portions need be the same.

When a force F' is applied by a bracket **369** (not shown in Fig. 14B), the following occurs:

- At a first time, only those jacket-securing arrangements with 'highest' force-receiving surfaces **277A** are contacted by the bracket **369** and are rotated away from the first position by the resulting moment.
- At a second time, only those jacket-securing arrangements with force-receiving surfaces **277B** are contacted by the bracket **369** and are rotated away from the first position by the resulting moment.
- At a third time, only those jacket-securing arrangements with force-receiving surfaces **277C** are contacted by the bracket **369** and are rotated away from the first position by the resulting moment.

This continues until the thinnest force-receiving portions **278** (those with the 'lowest' force-receiving surfaces **277**, *e.g.*, **277G**) are contacted.

The interval between the 'first time' and the 'second time', or between the 'second time' and the 'third time' can be less than a second, less than half a second, or less than one tenth of one second. In some embodiments, the total time elapsed between contacting the highest force-receiving surface **277** (**277A**) and contacting the lowest force-receiving surface **277** (*e.g.*, **277G** or **277F**, or **277E**, *etc.*, depending on how many different thicknesses of force-receiving portions **278** are deployed) can be less than two seconds or less than one second. Despite the very short time intervals between the contacting of different thickness, the intervals are sufficient to distribute the work of applying forces F' among the different time intervals, and thereby allow the release of all of the respective magnets **280** from the surface of the cylinder gap **320** with a single downward force-application of bracket **369**. In some embodiments, no more than two jacket-securing arrangements **270** share the same force-receiving portion thickness. In some embodiments, no more than three jacket-securing arrangements **270** share the same force-receiving portion thickness. In some embodiments, jacket-securing arrangements **270** are arranged so that the distribution of force-receiving portion thicknesses is

symmetrical. In one exemplary implementation of a symmetrical distribution of force-receiving portion thicknesses, jacket-securing arrangements **270** with force-receiving surfaces **277A** are placed as the outermost jacket-securing arrangements **270**, *i.e.*, closest to the opposite ends of the cylinder gap **320**. Adjacent to them (inter-gripper region **353** closer to the center of the array of jacket-securing arrangements **270**) are those with force-receiving surfaces **277B**, and then those with force-receiving surfaces **277C**, and so on. When such a symmetrical arrangement is deployed, the bracket **369** can be positioned such that a protrusion (not shown) included near each end of the bracket **369** can be fitted to a matching receptacle (**265** in Fig. 9B) provided on the force-receiving surfaces **277** (*e.g.*, **277A**) of the outermost jacket-securing arrangements **270**, which are the first ones contacted during the application of force by the bracket **369**. The protrusion-receptacle fitting can be useful in firmly positioning the bracket for the application of the force that rotates the jacket-securing arrangements **270** away from the first rotated position and thereby releases the jacket tabs **229**.

Referring now to Figs. 15 and 16. In some embodiments, a printing system **100** can be designed such that an impression cylinder **220** completes one rotation for every two ink-images transferred to substrate **231**. In such embodiments, there can be two cylinder gaps and two smooth surfaces therebetween on a cylinder **220**, each of the surfaces allowing transfer of one of the ink images from the ITM to each substrate and the surfaces being suitably protected by a cylinder jacket **225**. Fig. 15 illustrates an example of such a case, wherein tabs **229₁** of first jacket **225₁** are secured by first jacket-securing arrangements **270₁** in first cylinder gap **320₁**, and tabs **229₂** of second jacket **225₂** are secured by second jacket-securing arrangements **270₂** in second cylinder gap **320₂**. Similarly, a first trailing portion **227₁** of first jacket **225₁** is secured in second cylinder gap **320₂**, and a second trailing portion **227₂** of second jacket **225₂** is secured in first cylinder gap **320₁**.

Fig. 16 shows in greater detail (with the second jacket-securing arrangement **270₂** removed from the drawing) the securing of first trailing portion **227₁** within second cylinder gap **320₂**. The trailing portion does not encounter grippers and grippers shafts and therefore can be simply secured to a surface of the cylinder gap without special arrangements. For instance, a trailing edge of the jacket can be inwardly turned to follow an undercut segment of the gap, the undercut wall being recessed with respect to the outer surface of the cylinder. Alternatively, in some embodiments, a trailing edge magnet holder **290** for applying and removing a trailing-portion magnet **223** (or a plurality of trailing-portion magnets **223**) is provided for securing the first trailing portion **227₁**.

Referring now to Figs. 17 and 18, a printing system **100** adapted to enable printing on both sides of a substrate **231** (perfecting) can include a second impression cylinder **520** for that purpose. A jacket **225** according to the various embodiments disclosed herein can be mounted on the perfecting cylinder **520** in the same manner as described for mounting on the ‘simplex’
 5 impression cylinder **220**: a jacket-securing arrangement **270** rotatably mounted on a gripper shaft **351** in cylinder gap **620** magnetically secures a jacket tab **229** to a surface of the cylinder gap **620** using a magnet **280**. In the second rotated position, the jacket-securing arrangement **270** of the perfecting cylinder **520** can be positioned with magnet **280** removed from the surface of the cylinder gap **620** (and jacket tab **229** released) by the use of second magnet **285** and its
 10 magnetic attraction to opposite cylinder gap surface **624**. The arrangement of the second magnet **285** here can be different than the arrangement in the simplex cylinder (Fig. 11B) because of structural differences between the cylinder gaps. This minor difference does not change the underlying concept of using a second magnet **285** to hold the jacket-securing arrangement **270** in the second rotated position, *e.g.*, for replacement of a jacket **225**.

15 Referring now to Fig. 19, a method is disclosed for installing a jacket-securing arrangement **270** and a cylinder jacket **225** on a cylinder **220** (or **520**). The method comprises:

- a) Step **S01** assembling a plurality of jacket-securing arrangements **270**, each jacket-securing arrangement **270** comprising (i) a magnet **280**, (ii) a first member **272** holding the magnet, and (iii) a second member **274** that is reversibly attachable to the first member **272**, such that each assembled jacket-securing arrangement **270** is disposed
 20 in a respective inter-gripper region **353** and rotatably mounted around the gripper shaft **351**.
- b) Step **S02** arranging, on the cylinder **220** (or **520**), a jacket **225** having a plurality of tabs **229** extending therefrom, such that each of the tabs **229** is disposed in a
 25 corresponding inter-gripper region **353**.
- c) Step **S03** causing each of the jacket-securing arrangements **270** to rotate around the gripper shaft **351** to the first rotated position, so as to magnetically secure each of the jacket tabs **229** to a surface portion of the cylinder gap **320** (or **620**).

In some embodiments, the method additionally comprises the following optional step:

- d) Step **S04** when the assembled jacket-securing arrangements **270** are in the first rotated position, and the corresponding jacket tabs **229** are secured to the surface of the cylinder gap **320** (or **520**), manually adjusting a connecting arrangement **281** between
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a magnet **280** and a respective jacket-securing arrangement **270** so as to improve the contact between the magnet **280** and the surface of the cylinder gap **320** (or **620**) at a respective first location **321**.

Referring now to Fig. 20, a method is disclosed for replacing a cylinder jacket **225** on a cylinder **220** (or **520**) on which jacket-securing arrangements **270** are installed according to any of the embodiments disclosed herein. The method comprises:

- a) Step **S11** applying a force F (or F') at a respective force-receiving surface **277** of each of the jacket-securing arrangements **270**, so as to rotate the jacket-securing arrangements **270** to the second rotated position and thereby release the jacket tabs **229** from being magnetically secured to the surface of the cylinder gap **320** (or **620**).
- b) Step **S12** removing the used jacket **225** from the cylinder **220** (or **520**).
- c) Step **S13** arranging a replacement jacket **225** on the cylinder **220** (or **520**), such that each of the tabs **229** is disposed in a corresponding inter-gripper region **353**.
- d) Step **S14** causing each of the jacket-securing arrangements **270** to rotate around the gripper shaft **351** to the first rotated position, so as to magnetically secure each of the tabs **229** of the replacement jacket **225** to the surface of the cylinder gap **320** (or **620**).

It is appreciated that certain features of the disclosure, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the disclosure, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination or as suitable in any other described embodiment of the disclosure. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

The word “exemplary” is used herein to mean “serving as an example, instance or illustration”. Any embodiment described as “exemplary” is not necessarily to be construed as preferred or advantageous over other embodiments and/or to exclude the incorporation of features from other embodiments.

As used herein, the terms “configured to”, “adapted to”, “operative to”, “suitable for”, “made to”, and “designed to” may be used interchangeably to indicate the ability or capability of an element or structure to perform its recited function.

In the description and claims of the present disclosure, each of the verbs, “comprise”, “include” and “have”, and conjugates thereof, are used to indicate that the object or objects of the verb are not necessarily a complete listing of features, members, steps, components, elements or parts of the subject or subjects of the verb. As used herein, the singular form “a”, “an” and “the” include plural references unless the context clearly dictates otherwise.

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CLAIMS

1. A jacket-securing arrangement for mounting in a cylinder, which cylinder has an outer surface and at least one recess in the outer surface for receiving an inwardly turned edge of a replaceable jacket overlying at least part of the outer surface of the cylinder, wherein the jacket-securing arrangement is mountable within the recess so as not to project beyond the outer surface of the cylinder when the jacket is secured thereto, and includes a clamping lever pivotable about a shaft located within the recess between a clamping position in which the edge of the replaceable jacket is clamped between the lever and a side wall of the recess and a release position in which the lever is spaced from the side wall of the recess, a magnet being provided to retain the lever in the clamping position, wherein the clamping lever is formed of two or more members assembled around the shaft and defining between them a bearing surface engaging an outer surface of the shaft.

2. A jacket-securing arrangement as claimed in claim 1, wherein the magnet is mounted on the lever and is magnetically attracted to a wall of the recess when the lever is in the clamping position

3. A jacket-securing arrangement as claimed in claim 2, wherein the magnet is mounted on the lever at a first position on the lever and wherein clamping of the jacket occurs between a wall of the recess and a second position on the lever.

4. A jacket-securing arrangement as claimed in any one of claims 1 to 3, wherein two members of the two or more members forming the clamping lever are separable from one another and held against the shaft by threaded fasteners connecting said two members to one another.

5. A jacket-securing arrangement as claimed in any one of claim 1 to claim 3, wherein two members of the two or more members forming the clamping lever are connected to one another by a pivot and are further secured to one another by at least one threaded fastener after the clamping lever has been assembled around the shaft.

6. A jacket-securing arrangement as claimed in any one of the preceding claims, wherein a second magnet is provided to retain the clamping lever in the release position.

7. A jacket-securing assembly for mounting in a cylinder for transporting a substrate in a printing system, which cylinder has an outer surface and at least one recess in the outer surface for receiving an inwardly turned edge of a replaceable jacket overlying at least part of the outer surface of the cylinder, the assembly comprising a plurality of jacket-securing arrangements as

claimed in any one of claim 1 to claim 6, wherein the clamping levers are mounted for rotation about the axis of a common shaft and are spaced from one another along the axis of the shaft, and wherein a respective magnet is provided to retain each of the clamping levers in the clamping position.

8. A cylinder for a printing system having a cylindrical surface, a recess in the cylindrical surface for receiving an inwardly turned edge of a replaceable jacket overlying at least part of the outer surface of the cylinder, and a shaft located in the recess, wherein the cylinder is further provided with a jacket-securing arrangement as claimed in any one of claim 1 to claim 6 that is located within the recess.

9. A cylinder for a printing system having a cylindrical surface, a recess in the cylindrical surface for receiving an inwardly turned edge of a replaceable jacket overlying at least part of the outer surface of the cylinder, and a shaft located in the recess, wherein the cylinder is further provided with a jacket-securing assembly as claimed in claim 7 that is located within the recess.

10. A cylinder as claimed in claim 9, wherein the cylinder is a substrate transport cylinder and wherein the shaft is a gripper shaft fitted with grippers that are spaced along the length of the gripper shaft, the grippers being pivotable about a longitudinal axis of the gripper shaft between a gripping position in which tips of the grippers serve to trap an edge of a substrate sheet against the outer surface of the cylinder and a release position in which the grippers project beyond the outer surface of the cylinder, the clamping levers of the jacket-securing assembly being located in spaces between the grippers.

11. A cylinder as claimed in claim 9 or claim 10, wherein a bracket is provided to apply a force to all the clamping levers to force the clamping levers away from their respective clamping positions.

12. A cylinder as claimed in claim 11, wherein the bracket and the clamping levers are configured in such a manner that the clamping levers are released from their clamping positions in a sequential manner in response to a continuous movement of the bracket.

13. A cylinder as claimed in any one of claim 8 to claim 12, in combination with a replaceable jacket overlying the surface of the cylinder, wherein the jacket has a first inwardly turned edge to be clamped against a wall of a recess by means of the one or more jacket-securing arrangements and a second inwardly turned edge at an opposite end of the jacket that engages an undercut wall of the, or another, recess in the surface of the cylinder.

14. A cylinder as claimed in any one of claim 8 to claim 12, in combination with a replaceable jacket overlying the surface of the cylinder, wherein the jacket has a first inwardly turned edge to be clamped against a wall of a recess by means of the one or more jacket-securing arrangements and a second inwardly turned edge at an opposite end of the jacket to be clamped against a different wall of the, or another, recess in the surface of the cylinder by means of a magnetically actuated mechanism.

15. A printing system comprising a cylinder having a cylindrical surface, a recess in the cylindrical surface for receiving an inwardly turned edge of a replaceable jacket overlying at least part of the outer surface of the cylinder, a shaft located in the recess, wherein the cylinder is according to any one of claim 8 to claim 14.

16. A printing system comprising:

- a. an intermediate transfer member (ITM) operable to have ink images formed thereupon at an image-forming station; and
- b. an impression station configured to transfer the ink images from the ITM to a substrate by pressing the ITM and the substrate one against the other, the impression station comprising:
 - i. a rotatable impression cylinder for contacting a surface of the substrate opposite that in contact with the ITM,
 - ii. at least one replaceable jacket disposed around a portion of the circumference of the impression cylinder and having inwardly turned edges,
 - iii. one or more recesses in the cylindrical surface each recess for receiving the inwardly turned edges of the replaceable jacket, each recess housing a respective shaft, and
 - iv. one or more jacket-securing arrangements according to any one of claim 1 to claim 6 to engage with an inwardly turned edge of each jacket or a tab thereof.

17. A printing system according to claim 16, wherein the image-forming station is able to deposit a liquid ink on selected regions of said ITM, the printing system further comprising a drying station configured to evaporate the liquid of the ink-image before said image is transferred at the impression station, the ITM being one of a plate, a drum and an endless continuous belt.

18. A printing system according to claim 16, wherein the image-forming station is able to activate a dry ink on selected regions of said ITM, the image-forming station optionally including an imaging element configured to selectively apply electromagnetic radiation to the

dry ink on the ITM, the ITM being selected from a group consisting of a plate, a drum and an endless continuous belt.