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SHEET PROCESSING MACHINE WITH COOLING ROLLER AND INSPECTION DEVICE AS WELL AS A SHEET PRINTING MACHINE WITH SIMULTANEOUS DOUBLE PRINTING UNIT, CURING DEVICE AND COOLING DEVICE

Abstract

Examples include a sheet processing machine to which a transport path is assigned for transporting sheets. The sheet processing machine includes an application device with an application point for applying material to the sheets. A cooling device including a cooling cylinder is arranged along the transport path, downstream from the application point. An inspection transport body is arranged along the transport path, downstream from the cooling cylinder, and has a sensor device of an inspection unit aligned therewith. Examples further include a sheet-fed printing machine with a simultaneous double printing unit and an application point. A curing device with an LED UV radiation source is arranged downstream from the application point and includes two curing units for drying two opposite sides of sheets. A cooling device of the curing device includes a cooling element with a line system, and the cooling section is arranged downstream from the curing section.

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Background/Summary

CROSS-REFERENCES TO RELATED APPLICATIONS [0001] This application is the US national phase, under 35 USC § 371, of PCT/EP2024/072330, filed on Aug. 7, 2024, and claiming priority to DE 10 2023 122 881.1 filed on Aug. 25, 2023, and DE 10 2023 122 880.3 filed on Aug. 25, 2023, and all of which are incorporated by reference herein in their entireties.

TECHNICAL FIELD

[0002] Some examples herein relate to a sheet processing machine with cooling roller and inspection device as well as a sheet-fed printing machine with simultaneous double printing unit, curing device and cooling device.

BACKGROUND

[0003] A device for drying and inspecting sheets in a securities printing machine is known from EP 1 142 712 A1.

[0004] A printing machine is known from EP 3 530 460 A1, comprising a curing chamber that is partly delimited by a cooling cylinder and partly by UV lamps designed as LED lamps.

[0005] A rotating body of a printing machine is known from WO 2004/039589 A1, which comprises a line system designed for conducting through temperature control medium.

[0006] A discharge drum of a gravure printing machine is known from DE 477 308 A, which comprises grippers and cavities for cooling water.

[0007] A cylinder for a machine that processes web-format material is known from EP 0 557 245 A1, which comprises liquid lines.

[0008] A respective sheet processing machine is known from EP 3 130 468 A2 and WO 2011/145028 A1, comprising an application device with an application point, wherein initially at least one inspection transport body with a respective inspection device aligned therewith, and thereafter a cooling cylinder are arranged along a transport path provided for sheets, downstream from the application point.

[0009] A sheet processing machine is known from DE 10 2018 212 429 B4, comprising an application device with an application point, wherein comprises a cooling cylinder, along a transport path provided for sheets, downstream from the application point, with which an inspection device can be aligned.

[0010] A sheet-fed printing machine is known from DE 10 2005 062 203 A1, comprising a cylinder that comprises cooling elements for temporarily holding sheets by means of a layer of frozen

adhesive. In this way, the sheets are intended to be held securely on this cylinder for an inspection.
[0011] A respective screen printing machine is known from DE 10 2019 108 765 A1 and WO 2020/200703 A1, by means of which sheets can be printed on one side and which, along a transport path for sheets, downstream from an application device comprises a curing device with radiation sources designed as UV-LEDs, and thereafter a cooling cylinder.
[0012] A web-fed printing machine with ink jet printing devices is known from DE 10 2013 213 998 A1, comprising infrared radiation dryers and cooling rollers.
[0013] A web-fed printing machine is known from DE 10 2013 200 113 A1, which comprises a drying device and the web transport path of which can be changed in such a way that selectively a first or a second side of a web can be printed and dried.
[0014] A screen printing machine is known from DE 10 2018 127 936 A1, which prints sheets on one side and comprises a curing device with radiation sources designed as UV-LEDs, and a cooling cylinder.
[0015] A sheet processing machine with an application device and a magnetic alignment device is known from EP 3 015 266 A1, wherein a camera is provided for monitoring a transport of sheets in the region of the alignment device.

SUMMARY

[0016] It is an object of some examples herein to provide a sheet processing machine with a cooling roller and an inspection device as well as a sheet-fed printing machine with a simultaneous double printing unit and a curing device.
[0017] The object discussed above is achieved in some examples by a sheet processing machine including at least one transport path provided for a transport of sheets assigned to the sheet processing machine. The sheet processing machine includes at least one application device with at least one application point arranged along the transport path provided for the transport of sheets for applying material to the sheets. At least one cooling device is arranged along the transport path, downstream from the at least one application point, and which includes at least one cooling element designed as a cooling cylinder. At least one first inspection transport body is arranged along the transport path, downstream from the at least one cooling element, and with which at least one sensor device of a first inspection unit is aligned. The first inspection unit includes at least one sensor device for detecting electromagnetic radiation in the visible range of the spectrum, and the first inspection unit includes at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum.
[0018] The object discussed above is further achieved in some examples by a sheet-fed printing machine including a transport path provided for a transport of sheets assigned to the sheet-fed printing machine. The sheet-fed printing machine including at least one application device designed as a simultaneous double printing unit with at least one application point arranged along the transport path provided for the transport of sheets for applying material to the sheets. A curing device, which includes at least one LED UV radiation source, is arranged along the transport path, downstream from the at least one application point. The curing device includes a first curing unit for drying a first side of the sheets and a second curing unit for drying a second side of the sheets located opposite the first side. The transport path extends between the first curing unit and the second curing unit, and at least one cooling device is assigned to the curing device. The at least one cooling device includes at least one cooling element, which includes a line system through which cooling liquid can flow for the transport thereof. At least one curing section of the transport path is defined by at least one operating zone of the curing unit, and a cooling section of the transport path is defined by at least one operating zone of the at least one cooling element. Any cooling section is arranged downstream from any curing section, and the sheet-fed printing machine further includes at least one inspection device, which is arranged so as to be aligned with a region of the transport path that is arranged downstream from the at least one cooling element. The at least one inspection device includes a first inspection unit and the first inspection unit includes at least one sensor

device for detecting electromagnetic radiation in the visible range of the spectrum. The first inspection unit further includes at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum.

[0019] A transport path provided for a transport of sheets is assigned to a sheet processing machine. The sheet processing machine comprises at least one application device with at least one application point for applying material to sheets, which is arranged along the transport path provided for the transport of sheets. The sheet processing machine is preferably designed as a sheet-fed printing machine. Preferably, a curing device, which more preferably comprises at least one UV radiation source, which more preferably is designed as an LED UV radiation source, is arranged along the transport path provided for the transport of sheets, downstream from the at least one application point. At least one cooling device is preferably assigned to the curing device, comprising at least one cooling element, which more preferably comprises a line system through which cooling liquid can flow for the transport thereof. The at least one cooling element is preferably designed as a rotatable cooling cylinder. Preferably, the at least one cooling device, comprising the at least one cooling element, which more preferably is designed as a cooling cylinder, is arranged along the transport path provided for the transport of sheets, downstream from the at least one application point. The arrangement of a cooling device ensures rapid cooling of the substrate after curing. The substrate is thus protected and can be inspected and/or further processed more quickly. For example, a deformation of the substrate during curing is decreased or avoided.

[0020] Preferably, at least one curing section of the transport path provided for the transport of sheets is defined by at least one operating zone of the curing device. Preferably, a cooling section of the transport path provided for the transport of sheets is defined by at least one operating zone of the at least one cooling element. Preferably, any cooling section is arranged downstream from any curing section. Due to the spatial separation of the curing section and the cooling section, a first phase of the cooling process can take place passively, that is, in particular by giving off heat to ambient air. In this first phase, the temperature difference between the substrate and the surrounding area is the greatest so that passive cooling is most effective. After the first phase of the cooling process, the cooling by the at least one cooling element can then be utilized particularly efficiently. Moreover, it is avoided that the at least one cooling element comes in contact with applied material that has not cured yet. In this way, soiling of the at least one cooling element is avoided.

[0021] The cooling cylinder preferably comprises at least one gripper system for gripping sheets. This enables a particularly secure transport of sheet-format substrate.

[0022] The at least one application device preferably comprises at least one forme cylinder, which is in particular designed to carry at least one printing forme, and an effective circumference of the at least one cooling cylinder corresponds to an integer multiple of an effective circumference of this at least one forme cylinder. Due to the circumference being at least twice as large, a particularly large distance of the transport path provided for the transport of sheets is defined by the cooling cylinder, and thus the operating zone thereof is increased. This ensures particularly effective cooling and enables a high transport speed, and thus a high printing speed.

[0023] Preferably, a curing device is arranged along the transport path provided for the transport of sheets, downstream from the at least one application point and upstream from the at least one cooling cylinder. The curing device preferably comprises at least one UV radiation source and/or at least one LED UV radiation source. Such curing devices can be used in an energy-saving manner.

[0024] The curing device preferably comprises at least one first curing unit, which comprises a plurality of LED UV radiation sources arranged at various points, based on a transverse direction, so as to be aligned with the transport path provided for the transport of substrate. The curing device preferably comprises at least one first curing unit, and multiple LED UV radiation sources of the at least one first curing unit are arranged consecutively in a transport direction and/or along the transport path provided for the transport of sheets. This enables an operation that is adapted to the

particular print job and thus saves energy and conserves material.
[0025] Preferably, the curing device comprises at least one second curing unit, and the transport path provided for the transport of sheets extends between the first curing unit and the second curing unit. In this way, the curing process can be optimized, in particular during two-sided printing.
[0026] The sheet processing machine preferably comprises a curing and inspection module, wherein more preferably the curing and inspection module comprises the curing device and the at least one cooling element designed as a cooling cylinder and the at least one inspection device and/or the curing and inspection module comprises a dedicated machine frame. This, in particular, enables simple retrofitting of existing systems. Moreover, when configured appropriately, particularly easy accessibility of the individual components is ensured.
[0027] The sheet processing machine preferably comprises at least one inspection device, which is arranged so as to be aligned with a region of the transport path provided for the transport of sheets, which is arranged downstream from the at least one cooling element. Preferably, at least one first inspection transport body, which more preferably is designed as an inspection transport cylinder and with which at least one sensor device of a first inspection unit is aligned, is arranged along the transport path provided for the transport of sheets, downstream from the at least one cooling element. Cooling the substrate prior to the inspection thereof ensures that the printed material is inspected in a state that comes closest to the desired final state, and undesirable temperature-induced uncertainties of the inspection are thus avoided. For example, no negative influencing of the spectrum of the radiation originating from the substrate due to superimposition with corresponding heat radiation takes place. This is, in particular, advantageous when inspecting in the infrared range. In particular when curing and cooling take place first, and an inspection takes place thereafter, it is also ensured, in addition to the advantages with respect to the inspection, that the inspection transport bodies are not soiled by applied material, such as printing ink or varnish. As a result, the print quality can be increased since undesirable back transfer is avoided. Moreover, it is avoided that the processing machine has to be stopped for cleaning and/or maintenance work an undesirably large number of times.
[0028] Preferably, the at least one inspection device comprises a first inspection unit, in particular for inspecting a first side of sheets, and more preferably an, in particular additional, second inspection unit, in particular for inspecting a second side of sheets. The transport path provided for the transport of sheets preferably extends between the first inspection unit and the second inspection unit. Preferably, a second inspection transport body, which is in particular designed as a second inspection transport cylinder and with which at least one sensor device of the second inspection unit is aligned, is assigned to the second inspection unit. This allows an easy inspection of both sides of a substrate.
[0029] The first inspection unit preferably comprises at least one sensor device for detecting electromagnetic radiation in the visible range of the spectrum. The first inspection unit preferably comprises at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum. In this way, for example, security features of securities can be inspected to ensure correct production.
[0030] The first inspection transport body or inspection transport cylinder preferably comprises at least one gripper system for gripping sheets and/or the first inspection transport body or inspection transport cylinder is designed as a suction transport cylinder. Each of these units increases a precision of the position and of the transport of the, in particular sheet-format, substrate on the corresponding inspection transport body or inspection transport cylinder.
[0031] Preferably, the sheet processing machine comprises an upstream sheet transport means, which is in particular designed as a first chain conveyor system or preferably chain gripper system, which more preferably comprises at least one rear chain deflection shaft, and an in particular first transfer point for transferring sheets from the upstream sheet transport means to the cooling element, which is preferably designed as a cooling cylinder, is defined, in particular in the region of

the rear chain deflection shaft of the first chain conveyor system. It is then possible, for example, for the curing section to be arranged in the region of the chain conveyor system, in which an almost contactless transport, and thus improved passive cooling, without heating of components, is enabled. Accordingly, no transport cylinder becomes excessively heated and/or no transport cylinder, for example, requires excessive cooling.

[0032] The sheet processing machine preferably has an in particular second transfer point for transferring sheets from the cooling element, which is preferably designed as a cooling cylinder, to the first inspection transport body or inspection transport cylinder. By arranging these components directly one after the other along the transport path, installation space and/or transfer points can be saved.

[0033] The sheet processing machine is preferably designed as a sheet-fed securities printing machine. The sheet processing machine preferably comprises a multiple pile delivery unit. The sheet processing machine preferably comprises at least one simultaneous printing unit and/or at least one simultaneous double printing unit. This then, for example, represents the at least one application device. Prints having a particularly high color register quality can be implemented by means of a simultaneous printing unit. In addition, prints having a particularly high perfecting register quality can be implemented by means of a simultaneous double printing unit. As a result of the conservative treatment of the material and corresponding inspection, in particular in the dried and already cooled state, additionally an overall particularly high product quality can be achieved.

[0034] The cooling cylinder preferably comprises at least one cylinder barrel and two cylinder journals arranged at the ends thereof, wherein a cylinder axis is assigned to the cylinder barrel. The cooling cylinder preferably comprises a line system designed for conducting through temperature control medium. Preferably, the cylinder barrel comprises at least one base body, which is more preferably made at least 50% of aluminum. This enables a particularly high thermal conductivity and, at the same time, a low moment of inertia and consequently high possible accelerations. An outer surface of the cylinder barrel preferably comprises at least one transport region, which is designed as a bearing surface for sheet-format substrate, wherein the outer surface of the cylinder barrel preferably comprises at least one cylinder channel in which at least one holding means, comprising a gripper system, for holding sheet-format substrate is arranged. The base body preferably comprises a multitude of flow lines configured as boreholes, which extend parallel to the cylinder axis and are designed as components of the line system. This allows a particularly simple design of the cooling cylinder. The base body preferably comprises a layer produced by way of anodizing on the outer surface thereof.

[0035] The base body is preferably designed as a substantially tubular base body. This also contributes to a simple design. The base body preferably has an inner cavity, which extends parallel to the cylinder axis across the entire base body and the dimension of which oriented orthogonally with respect to the cylinder axis is at least 50% of a maximum outside diameter of the base body. This enables a lightweight but stable design. The flow lines configured as boreholes preferably extend parallel to the cylinder axis across the entire base body. The cylinder barrel preferably comprises at least two end pieces, which each include line sections and are connected, in terms of flow, to the flow lines of the base body.

[0036] For controlling the gripper system of the at least one holding means, the cooling cylinder preferably comprises at least one scanning means that is designed to cooperate with a cam disk.

[0037] In addition to the cooling cylinder, the sheet processing machine preferably comprises at least one drive motor, wherein more preferably the cooling cylinder comprises a gear wheel at a cylinder journal and the at least one drive motor is connected to the at least one gear wheel in a manner that transmits or is capable of transmitting torque.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] Exemplary embodiments of the invention are illustrated in the drawings and will be described in greater detail below. The figures show:

[0039] FIG. **1***a* a schematic illustration of a part of an exemplary sheet processing machine, designed as a printing machine, which comprises a substrate feed device and a printing unit;

[0040] FIG. **1***b* a schematic illustration of a part of the sheet processing machine according to FIG. **1***a* which comprises a curing device, an inspection device, and a substrate output device;

[0041] FIG. **2** a schematic illustration of a curing device with multiple radiation sources;

[0042] FIG. **3** a schematic illustration of an alternative embodiment of a simultaneous printing unit with two collecting cylinders, which each cooperate with two forme cylinders;

[0043] FIG. **4** a schematic illustration of a cooling cylinder with a rotary union and a gear wheel in an oblique view;

[0044] FIG. **5** a schematic illustration according to FIG. **4**, wherein an inner region of the cooling cylinder was rendered visible;

[0045] FIG. **6** a schematically enlarged illustration of a part of the illustration according to FIG. **5**;

[0046] FIG. **7** a schematic illustration, in part as a sectional view, and in part as an elevation, of a cooling cylinder according to FIG. **4**; and

[0047] FIG. **8** a schematic illustration of a region of the cooling cylinder and of a cam disk.

DETAILED DESCRIPTION

[0048] A substrate processing machine **01** is preferably designed as a sheet processing machine **01**. A sheet processing machine **01** is designed, for example, as a sheet-fed printing machine **01**, in particular as a sheet-fed rotary printing machine **01**. The sheet processing machine **01** is preferably designed as a securities sheet processing machine **01**, in particular as a sheet-fed securities printing machine **01**. An exemplary sheet processing machine **01** is described hereafter.

[0049] The sheet processing machine **01** comprises, for example, a substrate feed device **100**. The sheet processing machine **01** comprises, for example, at least one processing device **200** or sheet processing device **200**, which is designed, for example, as an application device **200**. The sheet processing machine **01** comprises, for example, at least one curing device **300**. The sheet processing machine **01** comprises, for example, at least one cooling device **301**. For example, the sheet processing machine **01** comprises at least one inspection device **400**. The sheet processing machine **01** comprises, for example, at least one substrate output device **500**. A transport path provided for a transport of sheets **02** is preferably assigned to the sheet processing machine **01**.

[0050] The sheet processing machine **01** preferably comprises the at least one substrate feed device **100** or printing substrate feed device **100** or sheet feed device **100** designed as a sheet feeder **100**, in particular in addition to the at least one sheet processing device **200** and/or along a transport path provided for a transport of substrate **02**, in particular sheets **02**, upstream from the at least one, and more preferably upstream from each, sheet processing device **200**. The at least one substrate feed device **100**, comprises, for example, a conveyor line designed, for example, as a feed table. For example, at least one receiving unit designed as a pile board is provided. It is then possible for printing substrate bundles, designed as sheet piles, to be arranged thereon for separation. The receiving unit is preferably connected to at least one transport means, which ensures that the respective uppermost sheet of the sheet pile is arranged in a defined position, including when the sheet pile is being processed. The substrate feed device **100** preferably comprises sheet separation elements and sheet transport elements. The sheet separation elements are designed as separating suckers, for example. The sheet transport elements are designed as transport suckers, for example. Preferably, at least one front stop is provided. For example, the substrate feed device **100** comprises at least one non-stop device for an uninterrupted supply of sheets **02**, including when a succeeding pile is provided. The feed table arranged downstream from the sheet pile is designed as a suction feed table. For example, at least one infeed device referred to as a sheet infeed is provided, which

preferably comprises a feed table and comprises at least one movable front stop.
[0051] A transverse direction A is preferably a horizontal direction A that is oriented orthogonally with respect to a transport direction T. In particular in the case of a curved transport path, the transport direction T is preferably in each case the direction T that runs tangential to a segment and/or point of the provided transport path closest to a respective reference point and that is provided for the transport of the substrate **02** and/or sheet **02** at this segment and/or point. This particular reference point is preferably situated at the point and/or at the component that is being related to the transport direction T. The transport direction T thus preferably in each case extends along the transport path provided for substrate **02** and/or sheets **02**.
[0052] The processing machine **01** preferably comprises at least one processing device **200** for processing substrate **02**. The substrate **02** is preferably designed as sheet-format substrate **02**. The at least one processing device **200** comprises at least one processing point **201**. The at least one processing device **200** is designed, for example, as an application device **200** and preferably comprises at least one processing point **201** designed as an application point **201** for applying material to, in particular sheet-format, substrate **02**. The sheet processing machine **01** preferably comprises at least one application device **200** with at least one application point **201** for applying material to sheets **02**, which is arranged along the transport path provided for the transport of sheets **02**. The at least one processing device **200** is preferably designed as a printing unit **200** and comprises at least one processing point **201** designed as a printing nip **201**. For example, the application device **200** is designed as a tool-dependent application device **200** and/or comprises at least one forme cylinder **202**, which is designed, for example, as a plate cylinder **202**. As an alternative or in addition, the application device **200** is, for example, designed as a non-impact application device **200** and/or comprises at least one activatable print head. The at least one printing unit **200** preferably comprises at least one printing mechanism **203** and/or at least one forme cylinder **202**. Each such printing mechanism **203**, for example, comprises an inking unit assigned thereto and/or a dampening unit assigned thereto.
[0053] A printing unit **200**, which comprises at least one forme cylinder **202** and at least one printing mechanism **203**, is described hereafter by way of example as an application device **200**. The at least one forme cylinder **202** is preferably designed as at least one plate cylinder **202**. The printing unit **200** is preferably designed as a multicolor printing unit **200**. Preferably, multiple printing mechanisms **203** and accordingly multiple inking units are provided in the at least one printing unit **200** so as to print various printing inks onto the same substrate **02** during the same production run, for example in keeping with the number of these inking units. In one embodiment, printing mechanisms **203** that preferably operate according to differing printing principles are arranged in the same printing unit **200**. For example, at least one printing mechanism **203** is designed as a planographic printing mechanism **203**, for example an offset printing mechanism **203**, and/or at least one other printing mechanism **203** is designed as a letterpress printing mechanism **203**, in particular as an indirect letterpress printing mechanism **203**. It is possible to employ a waterless offset printing method. As an alternative or in addition, a so-called wet offset printing method can be employed, for which the printing mechanism then comprises at least one dampening unit. These different printing mechanisms **203** then, for example, print the same printing substrate **02** in the same production run, more preferably by means of at least one transfer cylinder **204**, and still more preferably by means of at least one shared transfer cylinder **204**, which is also referred to as collecting cylinder **204**. In one embodiment, at least one printing mechanism **203** is preferably designed as at least one intaglio printing mechanism **203**. One example of indirect letterpress printing is letterset printing.
[0054] For example, the at least one printing unit **200** is designed as a simultaneous printing unit **200**. A simultaneous printing unit **200** comprises a collecting cylinder **204**, which is preferably arranged so as to directly cooperate with multiple forme cylinders **202**. The inks of the multiple forme cylinders **204** are collected on the collecting cylinder **204** and then transferred together in a

printing nip to an appropriate substrate **02**. A simultaneous printing unit **200** thus operates according to an indirect printing method, for example an indirect planographic printing method or offset printing method and/or according to an indirect letterpress printing method, in particular a letterset printing method. The simultaneous printing unit **200** is preferably designed as a simultaneous double printing unit **200**. In such a unit, two collecting cylinders **204** together form a printing nip **201**, in which substrate **02** is simultaneously printed on both sides with multiple colors. Each of the two collecting cylinders **202** cooperates, in particular directly, with multiple forme cylinders **204**, for example in each case with exactly two forme cylinders **204** or in each case with exactly four forme cylinders **204**.

[0055] Preferably, the at least one printing unit **200** comprises at least one transfer cylinder **204**, which is preferably designed as a blanket cylinder **204** and by way of the contact region of which with a further cylinder **204**, in particular with a further transfer cylinder **204** designed, for example, as a blanket cylinder **204** and/or collecting cylinder **204**, a printing nip **201** is preferably defined and which is preferably in contact with multiple forme cylinders **202**. The at least one printing unit **200** accordingly preferably comprises at least one pair of transfer cylinders **204**, which are preferably designed as blanket cylinders **204** and/or collecting cylinders **204**, with a printing nip **201** of the printing unit **200** being defined by the shared contact region thereof. Preferably at least one, and more preferably each of the at least two transfer cylinders **204** is in preferably rolling contact with at least one forme cylinder **202**, and more preferably with multiple, for example exactly two or exactly four forme cylinders **202**.

[0056] Preferably, each inking unit cooperating with a forme cylinder **202** is arranged so as to be movable away from this particular forme cylinder **202**. As a result, the corresponding forme cylinder **202** is accessible for maintenance work and/or for a printing plate replacement. More preferably, the inking units of all forme cylinders **202** cooperating with a shared transfer cylinder **204** are arranged so as to be movable away from this forme cylinder **202** together and, for this purpose, are more preferably mounted in a shared frame section.

[0057] During a printing operation of the printing machine **01**, at least one sheet **02** that is taken from the substrate feed device **100**, preferably a sequence of multiple sheets **02**, is fed to the printing unit **200**. The printing unit **200** preferably operates in recto and verso printing, wherein both sides of the substrate **09** are inked simultaneously in the printing nip **201**. More preferably, multi-color print images are transferred in the printing nip **201** to the substrate **02** in a single printing step. These multi-color print images are preferably composed of individual colored print image segments, which were previously transferred from multiple plate cylinders **202** to the corresponding transfer cylinder **204** and collected there. The at least one printing unit **200** is preferably composed of two halves that have substantially the same design. Each of the halves comprises a transfer cylinder **204**, which is preferably designed as a blanket cylinder **06**. The forme cylinders **202**, and in particular printing plates arranged thereon, are preferably each inked with a different printing ink by a respective inking unit. Each of the forme cylinders **202** preferably transfers at least one print image to the corresponding transfer cylinder **204** against which they are placed. In this way, a multi-color print image is preferably created on each transfer cylinder **204**, which more preferably is transferred to the substrate **02** in a single step.

[0058] The at least one printing unit **200** comprises, for example, one or more additional collecting cylinders **204**, which are likewise arranged so as to cooperate with multiple forme cylinders **202**. (This is also shown by way of example in FIG. **1**).

[0059] As an alternative or in addition, the processing machine **01** comprises application devices **200** operating according to other methods. For example, the processing machine **01** comprises at least one screen printing unit and/or at least one flexographic printing unit and/or at least one letterpress printing unit and/or at least one numbering printing unit and/or at least one gravure printing unit.

[0060] The processing machine **01** preferably comprises at least one curing device **300**. The at least

one curing device **300** is preferably arranged along the transport path provided for the transport of substrate **02**, in particular sheets **02**, downstream from the at least one application device **200** or downstream from the at least one application point **201**, in particular printing nip **201**. For example, the at least one curing device **300** is arranged along the transport path provided for the transport of substrate **02**, in particular sheets **02**, downstream from each application device **200** or downstream from each application point **201**, in particular printing nip **201**. The at least one curing device **300** preferably comprises at least one first curing unit **321**, in particular for curing material applied to a first side of sheets **02** or for drying the first side of sheets **02**. More preferably, the at least one curing device **300** also comprises a second curing unit **322**, in particular for curing material applied to a second side of sheets **02** or for drying the second side of sheets **02**. The second side is in particular the side located opposite the first side. The transport path provided for the transport of sheets **02** preferably extends between the first curing unit **321** and the second curing unit **322**.

[0061] The curing device **300** preferably comprises at least one UV radiation source **302** and/or at least one LED UV radiation source **302**. Preferably, at least one curing section of the transport path provided for the transport of sheets **02** is defined by at least one operating zone of the curing device **300**. This curing section is, for example, the section of the transport path provided for the transport of sheets **02** which overlaps with an operating zone of the curing device **300**, for example since corresponding electromagnetic radiation is emitted so as to be directed at this curing device **300** by means of the curing device **300** and in particular the at least one LED UV radiation source **302** thereof.

[0062] The at least one curing device **300** comprises, and in particular the at least one first curing unit **321** and/or the at least one second curing unit **322** comprise, at least one radiation source **302** for electromagnetic radiation, for example infrared radiation and/or UV radiation. Preferably, the at least one curing device **300** comprises, and in particular the at least one first curing unit **321** and/or the at least one second curing unit **322** comprise, at least one radiation source **302** for ultraviolet radiation, that is, for electromagnetic radiation with at least a predominant fraction of emitted radiant power that is in the UV spectral region, for example between 100 nm and 380 nm. This at least one radiation source **302** for ultraviolet radiation is also referred to as UV radiation source **302**. Radiation in the ultraviolet region of the electromagnetic spectrum can be applied by this at least one curing device **300** to the substrate **02** passing the at least one curing device **300** on the transport path thereof for drying the same or for curing the applied material. The at least one UV radiation source **302** is preferably designed as an LED UV radiation source **302**. An LED UV radiation source **302** is a radiation source **302** that is designed as a light emitting diode (LED) and designed to emit ultraviolet radiation. Preferably, a curing device **300** in particular for curing the applied material, which comprises at least one LED UV radiation source **302**, is arranged along the transport path provided for the transport of sheets **02**, downstream from the at least one application point **201**.

[0063] Preferably, the at least one curing device **300** comprises, and in particular the at least one first curing unit **321** and/or the at least one second curing unit **322** comprise, in each case a plurality of UV radiation sources **302**, in particular LED UV radiation sources **302**, which are arranged at various points, based on the transverse direction A, so as to be aligned with the transport path provided for the transport of substrate **02**. More preferably, the at least one curing device **300** comprises, and in particular the at least one first curing unit **321** and/or the at least one second curing unit **322** comprise, in each case at least five UV radiation sources **302**, in particular LED UV radiation sources **302**, which are arranged at various points, based on the transverse direction A, so as to be aligned with the transport path provided for the transport of sheets **02**, still more preferably at least ten per meter, still more preferably at least twenty per meter, and still more preferably at least fifty per meter, and still more preferably at least one hundred per meter. For example, multiple LED UV radiation sources **302** of the at least one curing device **300**, and in particular of the at least one first curing unit **321** and/or of the at least one second curing unit **322**,

are consecutively arranged in the transport direction T and/or along the transport path provided for the transport of substrate **02**, in particular in each case at least two, preferably in each case at least five, and more preferably in each case at least ten. For example, the LED UV radiation sources **302** are arranged in the form of a matrix made up of multiple rows and multiple columns, which is referred to, for example, as an LED array. As an alternative or in addition, the LED UV radiation sources **302** can be arranged so as to be at least partly displaceable in the position thereof based on the transverse direction A, in particular for the adaptation to a position, based on the transverse direction A, of material to be cured on the substrate **02**.

[0064] The LED UV radiation sources **302** of the at least one curing device **300** can preferably be activated individually and/or groupwise, in particular in subgroups that are smaller than the total number of LED UV radiation sources **302** of the at least one curing device **300**, more preferably smaller than half the LED UV radiation sources **302** of the at least one curing device **300**, still more preferably smaller than one fifth of the LED UV radiation sources **302** of the at least one curing device **300**, and still more preferably smaller than one tenth of the LED UV radiation sources **302** of the at least one curing device **300**.

[0065] The LED UV radiation sources **302** of the at least one first curing unit **321** can preferably be activated individually and/or groupwise, in particular in subgroups that are smaller than the total number of LED UV radiation sources **302** of the at least one first curing unit **321**, more preferably smaller than half the LED UV radiation sources **302** of the at least one first curing unit **321**, still more preferably smaller than one fifth of the LED UV radiation sources **302** of the at least one first curing unit **321**, and still more preferably smaller than one tenth of the LED UV radiation sources **302** of the at least one first curing unit **321**. The LED UV radiation sources **302** of the at least one second curing unit **322** can preferably be activated individually and/or groupwise, in particular in subgroups that are smaller than the total number of LED UV radiation sources **302** of the at least one second curing unit **322**, more preferably smaller than half the LED UV radiation sources **302** of the at least one second curing unit **322**, still more preferably smaller than one fifth of the LED UV radiation sources **302** of the at least one second curing unit **322**, and still more preferably smaller than one tenth of the LED UV radiation sources **302** of the at least one second curing unit **322**.

[0066] Due to the groupwise activation, an adaptation of the activation of the particular LED UV radiation sources **302** to a distribution and/or an amount of the material applied to the substrate **02** can be carried out. For example, the LED UV radiation sources **302** can be activated in strips when curing across an entire width is not necessary. For example, the LED UV radiation sources **302** can be operated in a synchronized manner so that radiation is only emitted when material to be cured is in the process of being transported through beneath the particular LED UV radiation source **302**. It is possible, for example, that the particular LED UV radiation sources **302** cannot just be switched on with respect to the emitted radiant power but can also be operated at different selectable intensity ranges.

[0067] The sheet processing machine **01** preferably comprises at least one cooling device **301**, comprising at least one cooling element **303**, which more preferably comprises a line system through which cooling liquid can flow for the transport of this cooling liquid.

[0068] Preferably, at least one cooling device **301**, which comprises at least one cooling element **303** designed as a cooling cylinder **303**, is arranged along the transport path provided for the transport of sheets **02**, downstream from the at least one application point **201**. Preferably, the curing device **300**, in particular for curing the applied material, is arranged along the transport path provided for the transport of sheets **02**, downstream from the at least one application point **201** and upstream from the at least one cooling cylinder **303**. In particular, at least one cooling device **301** is preferably assigned to the curing device **300**, comprising at least one cooling element **303**, which more preferably comprises a line system through which cooling liquid can flow for the transport of this cooling liquid. In particular, at least one cooling section of the transport path provided for the

transport of sheets **02** is defined by at least one operating zone of the at least one cooling element **303**. This cooling section is, for example, the section of the transport path provided for the transport of sheets **02** which overlaps with an operating zone of the cooling device **301**, for example since in particular sheet-format substrate **02** can be cooled there by way of contact with the at least one cooling element **303** of the at least one cooling device **301**. Preferably, any cooling section is arranged downstream from any curing section. In particular, the at least one cooling device **301** is arranged along the transport path provided for the transport of sheets **02**, downstream from an operating zone of the at least one LED UV radiation source **302**, and preferably downstream from the operating zone of each LED UV radiation source **302**.

[0069] The at least one cooling element **303** is preferably designed as a rotatable cooling cylinder **303**. The cooling device **301** preferably comprises exactly one cooling cylinder **303**. This at least one, and preferably exactly one, cooling cylinder **303** preferably comprises at least one gripper system **342** for gripping sheets **02**. The cooling cylinder **303** is preferably actively driven. For example, the at least one cooling cylinder **303** is arranged so as to be rotatable by way of a gear and/or a drive that is assigned to the cooling cylinder **303**.

[0070] The at least one application device **200** preferably comprises at least one forme cylinder **202**, which is, in particular, designed to carry at least one printing forme. An effective circumference of the at least one cooling cylinder **303** preferably corresponds to an integer multiple of an effective circumference of this at least one forme cylinder **202**. An integer multiple shall, in particular, be understood to mean a doubling, tripling or quadrupling, and in particular not an identical effective circumference.

[0071] Even though the cooling cylinder **303** is only described above and below as a cooling cylinder **303**, it can, in principle, be used as a temperature control cylinder **303**. The cooling cylinder **303** preferably comprises at least one cylinder barrel **326** and two cylinder journals **336**; **337** arranged at the ends thereof. A cylinder axis **308** is preferably assigned to the cylinder barrel **326**, which in particular serves as the axis of rotation **308** thereof. The cooling cylinder **303** preferably comprises a line system **333** designed for conducting through temperature control medium that is, in particular, designed as coolant. The cylinder barrel **326** preferably comprises at least one preferably substantially tubular base body **327**. A substantially tubular base body **327** shall be understood to mean a base body **327** that extends along the cylinder axis **308** and the cross-section of which, in a sectional illustration, with a plane orthogonal to the cylinder axis **308**, has a substantially, that is, at least 70%, circular outer delimitation. Preferably, at least 50%, more preferably at least 70%, still more preferably at least 85%, still more preferably at least 90%, and still more preferably at least 95% of the base body **327** is made of aluminum. The base body **327** is preferably produced from an aluminum alloy. In addition to aluminum, this aluminum alloy comprises, for example, at least fractions composed of silicon and/or iron and/or copper and/or manganese and/or magnesium and/or chromium and/or zinc and/or titanium. For example, the base body **327** is produced from a material according to EN AW-5083. At the outer surface **328**, the base body **327** preferably comprises a layer generated by way of anodizing, which more preferably is designed as a hard anodized layer according to ISO 10074 and/or has a layer thickness of at least 25 µm and/or no more than 100 µm and which, more preferably, has a layer thickness of at least 40 µm and/or no more than 60 µm.

[0072] An outer surface **328** of the cylinder barrel **326** preferably has at least one transport region **329**, which is designed as a bearing surface **329** for sheet-format substrate **02**. This at least one transport region **329** has the shape of a part of an outer cylindrical surface **329**, for example. The outer surface **328** of the cylinder barrel **326** preferably comprises at least one cylinder channel **331** in which at least one holding means **332**, comprising a gripper system **342**, for holding sheet-format substrate **02** is arranged. The gripper system **342** preferably comprises gripper fingers that can be moved in the manner known per se and that can be pressed against corresponding contact surfaces, for example so as to clamp leading edges of sheets. The at least one gripper system **342**

can be controlled, for example, by way of a gear, which comprises at least one scanner **344** and at least one cam disk **343**. For controlling the gripper system **342**, and in particular the gripper fingers, of the at least one holding means **332**, the cooling cylinder **303** preferably comprises at least one scanning means **344** that is designed to cooperate with a cam disk **343**. Such a cam disk **343** is preferably a component of the sheet processing machine **01**. The cylinder channel preferably has two such cylinder channels **331** with corresponding holding means **332**. For example, the at least one cylinder channel **331** is designed as a cylinder channel **331** that is milled into the base body **327**.

[0073] The in particular tubular base body **327** preferably comprises a multitude of flow lines **334** configured as boreholes **334**, which extend parallel to the cylinder axis **308** and are designed as components of the line system **333**. These boreholes **334** are more preferably designed as deep boreholes **334**. The flow lines **334** configured in particular as boreholes **334** preferably extend parallel to the cylinder axis **308** across the entire base body **327**. This applies to a multitude, and more preferably to each individual, of these flow lines **334**. Preferably, at least 50%, more preferably at least 75%, and still more preferably at least 85% of all components of all bearing surfaces **329** of the cooling cylinder **303** are located no more than **30** mm away from the next flow line **334**.

[0074] The base body **327** preferably has an inner cavity **347**, which more preferably has a cylindrical shape and which extends across the entire base body **327**, in particular parallel to the cylinder axis **308**. A dimension **348** of this cavity **347** which is oriented orthogonally with respect to the cylinder axis **308**, and in particular the diameter **348** thereof, is preferably at least 50%, more preferably at least 60%, and still more preferably at least 70% of a maximum outside diameter **349** of the base body **327**. For example, the outside diameter **349** is between 500 mm and 600 mm, more preferably between 550 mm and 570 mm. For example, the dimension **348** of this cavity **347** which is oriented orthogonally with respect to the cylinder axis **308**, and in particular the diameter thereof, is between 350 mm and 480 mm, more preferably between 400 mm and 430 mm. For example, a wall thickness of the base body **327** is between 50 mm and 100 mm, more preferably between 65 mm and 80 mm. A diameter of the multitude of flow lines **334** configured as boreholes **334** in each case is preferably between 10 mm and 30 mm, more preferably between 18 mm and 24 mm.

[0075] The cooling cylinder **303** preferably comprises a rotary unit **338** for temperature control medium at at least one, and more preferably at exactly one, cylinder journal **336**. The cooling cylinder **303** preferably comprises a gear wheel **346** at at least one, and more preferably at exactly one, cylinder journal **337**. Preferably, a rotary union **338** is arranged at exactly one cylinder journal **336** and a gear wheel **346** is arranged at exactly the opposite cylinder journal **337**.

[0076] The cylinder barrel **326** preferably comprises at least two end pieces **339**; **341**, which each include line sections **351**; **352** and are connected, in terms of flow, to the flow lines **334** of the tubular base body **327**. For example, one of these line sections is directly connected to the rotary union **338**. The end pieces **339**; **341** preferably terminate the inner cavity **347**.

[0077] The sheet processing machine **01** preferably comprises at least one drive motor. This at least one drive motor is preferably arranged so as to be connected to the at least one gear wheel **346** in a manner that transmits or is capable of transmitting torque, for example via at least one gear wheel and/or at least one chain and/or at least one belt. This at least one drive motor is preferably arranged so as to be connected to the at least one forme cylinder **202** of the at least one application device **200** in a manner that transmits or is capable of transmitting torque, for example via at least one gear wheel and/or at least one chain and/or at least one belt.

[0078] The at least one cooling cylinder **303** preferably comprises at least one feed device **338**, which is designed, for example, as at least one rotary union **338**. The at least one feed device is preferably designed as a gas feed device and/or gas discharge device and/or liquid feed device and/or liquid discharge device. The at least one feed device is preferably used to feed and/or

discharge gas and/or at least one temperature control liquid, in particular cooling liquid. The at least one feed device is preferably designed as at least one rotary union.

[0079] The sheet processing machine **01** preferably comprises the upstream sheet transport means **304**, which is in particular designed as a first chain conveyor system **304**, and more preferably a chain gripper system **304**, and which more preferably comprises at least one rear chain deflection shaft **306**. Preferably, at least one sheet transport means **304**, which is also referred to as an upstream sheet transport means **304**, is arranged along the transport path provided for the transport of sheets **02**, downstream from the at least one application device **200** and the at least one cooling device **301**. The upstream sheet transport means **304** preferably comprises at least one gripper system for gripping sheets **02**. In one embodiment, the upstream sheet transport means **304** is designed, for example, as a transport cylinder. The upstream sheet transport means **304** is preferably designed as an in particular first chain conveyor system **304** or first chain gripper system **304** and more preferably comprises at least one rear chain deflection shaft **306**. Preferably, a respective operating zone of the at least one, and preferably each, radiation source **302** of the curing device **300** designed in particular as a UV radiation source **302** and/or LED UV radiation source **302** is arranged so as to be aligned with such a section of the transport path provided for the transport of sheets **02**, which is defined by the upstream sheet transport means **304**, in particular the first chain conveyor system **304**. In particular, the curing section is preferably at least partly, and more preferably completely, defined by the at least one upstream sheet transport means **304** that is preferably designed as the first chain conveyor system **304**.

[0080] Preferably, an in particular first transfer point **309** is defined for, in particular directly, transferring sheets **02** from the upstream sheet transport means **304** to the cooling element **303**, which is in particular designed as a cooling cylinder **303**. In the case in which the upstream sheet transport means **304** is designed as an in particular first chain conveyor system **304**, the in particular first transfer point **309** for transferring sheets **02** from the first chain conveyor system **304** to the cooling element **303** designed as the cooling cylinder **303** is preferably defined in the region of the rear chain deflection shaft **306** of the first chain conveyor system **304**.

[0081] Preferably, the sheet processing machine **01** thus comprises a first chain conveyor system **304**, which comprises at least one rear chain deflection shaft **306**, wherein the in particular first transfer point **309** for transferring sheets **02** from the first chain conveyor system **304** to the cooling element **303** designed as the cooling cylinder **303** is defined in the region of the rear chain deflection shaft **306** of the first chain conveyor system **304**. An axis of rotation **308** of the cooling element **303** designed as the cooling cylinder **303** is preferably arranged lower, based on a vertical direction V, than an axis of rotation **306** of the rear chain deflection shaft **306** of the first chain conveyor system **304**.

[0082] The sheet processing machine **01** preferably comprises at least one inspection device **400**, which is arranged so as to be aligned with a region of the transport path provided for the transport of sheets **02**, which is arranged downstream from the at least one cooling element **303**. This region is also referred to as inspection region. The at least one inspection device **400** preferably comprises a first inspection unit **401**, in particular for inspecting a first side of sheets **02**. Preferably, in particular in the case of a sheet processing machine **01** for processing sheets **02** on both sides, the at least one inspection device **400** comprises a second inspection unit **402**, in particular for inspecting a second side of sheets **02**. The transport path provided for the transport of sheets **02** then extends between the first inspection unit **401** and the second inspection unit **402**.

[0083] The first inspection unit **401** preferably comprises at least one sensor device for detecting electromagnetic radiation in the visible range of the spectrum. As an alternative or more preferably in addition, the first inspection unit **401** preferably comprises at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum. More preferably, the first inspection unit **401**, in particular in addition to the sensor device for detecting electromagnetic radiation in the visible range of the spectrum, comprises at least two sensor

devices for detecting electromagnetic radiation in the infrared range of the spectrum, wherein these two sensor devices differ in terms of the wavelength range these are able to detect.
[0084] The second inspection unit **402** preferably comprises at least one sensor device for detecting electromagnetic radiation in the visible range of the spectrum. As an alternative or more preferably in addition, the second inspection unit **402** preferably comprises at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum. More preferably, the second inspection unit **401**, in particular in addition to the sensor device for detecting electromagnetic radiation in the visible range of the spectrum, comprises at least two sensor devices for detecting electromagnetic radiation in the infrared range of the spectrum, wherein these two sensor devices differ in terms of the wavelength range these are able to detect.
[0085] Preferably, the first inspection unit **401** comprises at least one camera and/or at least one contact image sensor and/or the second inspection unit **402** comprises at least one camera and/or at least one contact image sensor. Preferably, the first inspection unit **401** comprises at least one first illumination unit and/or the second inspection unit **402** comprises at least one second illumination unit. These are preferably matched to the part of the spectrum to be detected.
[0086] A first inspection transport body **403**, with which at least one sensor device of the first inspection unit **401** is aligned, is preferably assigned to the first inspection unit **401**. This first inspection transport body **403** is preferably designed as an in particular first inspection transport cylinder **403**. Preferably, at least one first inspection transport body **403**, which is in particular designed as a first inspection transport cylinder **403**, and with which at least one sensor device of a first inspection unit **401** is aligned, is arranged along the transport path provided for the transport of sheets **02**, downstream from the at least one cooling element **303**. The first inspection transport body **403**, which is preferably designed as a first inspection transport cylinder **403**, preferably comprises at least one gripper system for gripping sheets **02**. As an alternative or preferably in addition, the first inspection transport cylinder **403** is preferably configured as a suction transport cylinder **403**. A suction transport cylinder **403** shall, in particular, be understood to mean a cylinder that is designed to transport in particular sheet-format substrate **02** on the outer cylindrical surface thereof and that, on this outer cylindrical surface, has a multitude of suction openings, which are arranged so as to be connected and/or connectible to a vacuum source.
[0087] A second inspection transport body **404**, with which at least one sensor device of the second inspection unit **402** is aligned, is preferably assigned to the second inspection unit **402**. This second inspection transport body **404** is preferably designed as an in particular second inspection transport cylinder **404**. The inspection transport body **404**, which is preferably designed as the second inspection transport cylinder **404**, preferably comprises at least one gripper system for gripping sheets **02**. As an alternative or preferably in addition, the second inspection transport cylinder **404** is designed as a suction transport cylinder **404**.
[0088] The sheet processing machine **01** preferably has an in particular second transfer point **311** for transferring sheets **02** from the cooling element **303** that is preferably designed as a cooling cylinder **303** to the first inspection transport body **403**, which is preferably designed as a first inspection transport cylinder **403**. The sheet processing machine **01** preferably has an in particular third transfer point **312** for transferring sheets **02** from the first inspection transport body **403**, which is in particular designed as the first inspection transport cylinder **403**, to the second inspection transport body **404**, which is in particular designed as the second inspection transport cylinder **404**. An axis of rotation **313** of the first inspection transport body **403** and, in particular, of the first inspection transport cylinder **403** is preferably arranged lower, based on a vertical direction V, than an axis of rotation **308** of the cooling element **303** which is preferably designed as a cooling cylinder **303**. An axis of rotation **314** of the second inspection transport body **404**, which is in particular designed as the second inspection transport cylinder **404**, is preferably arranged lower, based on a vertical direction V, than the axis of rotation **313** of the first inspection transport body **403**, which is in particular designed as the first inspection transport cylinder **403**.

[0089] Preferably, at least one sheet transport means **506**, which is also referred to as a downstream sheet transport means **506**, is arranged along the transport path provided for the transport of sheets **02**, downstream from the inspection device **400**, in particular downstream from the first inspection unit **401**, and more preferably downstream from the second inspection unit **402**. The downstream sheet transport means **506** preferably comprises at least one gripper system for gripping sheets **02**. In one embodiment, the downstream sheet transport means **506** is designed, for example, as a transport cylinder. The downstream sheet transport means **506** is preferably designed as an in particular second chain conveyor system **506**, in particular chain gripper system **506**, and more preferably comprises at least one front chain deflection shaft **317**. The second chain conveyor system **506** is preferably used to feed sheets **02** to a respective assigned delivery station **501**; **502**; **503**; **504** of the substrate output device **500**.
[0090] Preferably, an in particular fourth transfer point **316** for, in particular directly, transferring sheets **02** from an inspection transport body **403**; **404**, and in particular from the second inspection transport body **404**, to the downstream sheet transport means **506** is defined. In the case in which the downstream sheet transport means **506** is designed as the in particular second chain conveyor system **506** or chain gripper system **506**, the in particular fourth transfer point **316** for transferring sheets **02** from an inspection transport body **403**; **404**, and in particular from the second inspection transport body **404**, to the in particular second chain conveyor system **506** is preferably defined in the region of the front chain deflection shaft **317** of the in particular second chain conveyor system **506**. The sheet processing machine **01** preferably has the fourth transfer point **316** for transferring sheets **02** from the second inspection transport body **404**, which is in particular designed as the second inspection transport cylinder **404**, to the front chain deflection shaft **317** of a second chain conveyor system **506**. An axis of rotation **318** of the front chain deflection shaft **317** of the second chain conveyor system **506** is preferably arranged lower, based on a vertical direction V, than an axis of rotation **314** of the second inspection transport body **404**, which is in particular designed as the second inspection transport cylinder **404**.
[0091] The sheet processing machine **01** preferably comprises the at least one substrate output device **500**, which is preferably designed as a delivery device **500**, in particular sheet delivery **500**, in particular in addition to the at least one application device **100** and/or in addition to the at least one curing device **300** and/or in addition to the at least one inspection device **400** and/or along the transport path provided for the transport of sheets **02**, downstream from the at least one, and more preferably downstream from each, application device **100** and/or downstream from the at least one curing device **300** and/or downstream from the at least one cooling device **301** and/or downstream from the at least one inspection device **400**. The sheet delivery **500** preferably comprises at least partly a sheet conveyor system **506**, which is in particular designed as a chain conveyor system **506**. This chain conveyor system **506** is preferably identical to the second chain gripper system **506**, to which the sheets **02** are transferred from the inspection device **400**, and in particular from an inspection transport body **403**; **404**.
[0092] The sheet conveyor system **506** comprises, for example, traction means moved by way of driving and deflection means, which drive gripping devices for conveying the sheets. The gripping devices comprise fixing elements for receiving and fixing the sheets **02**. Fixing elements that can be used include in particular clamping and/or suction grippers for gripping the sheet edges. By means of the sheet delivery **500**, the sheets **02** are preferably deposited onto at least one, or more preferably one of multiple transport bases, which are, for example, configured as a pallet or in another manner, in the form of a respective delivery pile. For example, a sheet guide device is arranged in the sheet delivery **500**. A respective braking system for decelerating the sheets **02** released by the gripper devices is preferably arranged in front of the corresponding delivery pile. The sheets **02** that are decelerated by the braking system bear against front stops and in this way are deposited in an aligned manner onto the particular delivery pile. The respective delivery pile is preferably lowered by a pile lifting drive by the respective deposited sheet thickness so that the pile

surface always assumes an approximately constant level.

[0093] For example, the sheet delivery **500** is equipped with a non-stop device for transporting delivery piles away without interruption. This predominantly comprises an auxiliary pile carrier. As an alternative or in addition, the delivery device **500**, along the transport path provided for the transport of the substrate **02** and/or the sheets **02**, comprises at least two, more preferably at least three, and still more preferably at least four, delivery stations **501**; **502**; **503**; **504** that are in particular arranged one behind the other along the transport path provided for the transport of sheets **02**. The at least one delivery device **500** is thus preferably designed as a multiple pile delivery unit **500**, in particular at least as a dual pile delivery unit **500** or at least as a triple pile delivery unit **500** or at least as a quadruple pile delivery unit **500**. The delivery stations **501**; **502**; **503**; **504** are also referred to as pile deliveries **501**; **502**; **503**; **504**. A respective delivery station **501**; **502**; **503**; **504** or pile delivery **501**; **502**; **503**; **504** shall in particular be understood to mean a device that is used for forming a respective pile. At least two or three or four different delivery piles can thus be formed by means of the at least two or at least three or at least four delivery stations **501**; **502**; **503**; **504**, without having to remove another pile in each case. The multiple pile delivery unit **500** can also comprise five or even more delivery stations **501**; **502**; **503**; **504** or pile deliveries **501**; **502**; **503**; **504**.

[0094] Preferably, the at least one curing device **300** and/or the at least one cooling device **301** and/or the at least one inspection device **400** are arranged along the transport path provided for the transport of substrate **02**, upstream from each delivery station **501**; **502**; **503**; **504** of the delivery device **500**.

[0095] The sheet processing machine **01** preferably comprises a curing and inspection module **600**. The curing and inspection module **600** preferably comprises the curing device **300**. The curing and inspection module **600** preferably comprises the at least one cooling element **303** designed as a cooling cylinder **303**. The curing and inspection module **600** preferably comprises the at least one inspection device **400**. More preferably, the curing and inspection module **600** comprises the curing device **300** and the at least one cooling element **303** designed as a cooling cylinder **303** and the at least one inspection device **400**. The curing and inspection module **600** preferably comprises a dedicated machine frame **601**; **602**; **603**, which is in particular separated and/or separable from machine frame parts of other regions of the sheet processing machine **01**.

[0096] The machine frame **601**; **602**; **603** of the curing and inspection module **600**, for example, comprises a first frame section **601**, a second frame section **602**, and a third frame section **603**. The three frame sections **601**; **602**; **603** are preferably rigidly connected to one another, at least during operation. For example, each of these frame sections **601**; **602**; **603** in each case comprises two frame side walls. The first frame section **601** is preferably arranged along the transport path provided for the transport of sheets **02**, upstream from the second frame section **602**. The second frame section **602** is preferably arranged along the transport path provided for the transport of sheets **02**, upstream from the third frame section **603**.

[0097] For example, the first frame section **601** is arranged so as to carry at least one, and preferably each, sensor device of the first inspection unit **401** of the inspection device **400**. For example, the first frame section **601** is arranged so as to carry at least one, and preferably each, radiation source **302** of the curing device **300**, which is in particular designed as an LED UV radiation source **302**. For example, the third frame section **603** is arranged so as to carry at least one, and preferably each, sensor device of the second inspection unit **402** of the inspection device **400**. For example, an axis of rotation **308** of the cooling element **303**, which is in particular designed as a cooling cylinder **303**, and an axis of rotation **313** of the first inspection transport cylinder **403** and an axis of rotation **314** of the second inspection transport cylinder **404** are arranged at the second frame section **602**. For example, the axis of rotation **307** of the rear chain deflection shaft **306** of the first chain conveyor system **304** and/or the axis of rotation **318** of the front chain deflection shaft **317** of the second chain conveyor system **506** are arranged at the

second frame section **602**. For example, the first frame section **601** is arranged so as to carry a part of a guide system of the first chain conveyor system **304**. For example, the third frame section **603** is arranged so as to carry a part of a guide system of the second chain conveyor system **506**. For example, the machine frame **601**; **602**; **603** of the curing and inspection module **600** carries at least all components that define the transport path provided for the transport of sheets **02** between the first transfer point **309** and the fourth transfer point **316**.

[0098] The transport path provided for the transport of in particular at least partially separated sheets **02** preferably starts at the substrate feed device **100** and/or preferably ends at the sheet delivery **500**. Piles comprising several sheets **02** are preferably fed to the substrate feed device **100** and/or removed from the sheet delivery **500**. The transport path of these piles shall not be considered to be part of the transport path provided for the transport of sheets **02**.

[0099] Although the disclosure herein has been described in language specific to examples of structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described in the examples. Rather, the specific features and acts are disclosed merely as example forms of implementing the claims.

Claims

1-35. (canceled)

36. A sheet processing machine (**01**), at least one transport path provided for a transport of sheets (**02**) being assigned to the sheet processing machine (**01**); and the sheet processing machine (**01**) comprising at least one application device (**200**) with at least one application point (**201**) arranged along the transport path provided for the transport of sheets (**02**) for applying material to sheets (**02**); and at least one cooling device (**301**) being arranged along the transport path provided for the transport of sheets (**02**), downstream from the at least one application point (**201**), which comprises at least one cooling element (**303**) designed as a cooling cylinder (**303**); and at least one first inspection transport body (**403**) being arranged along the transport path provided for the transport of sheets (**02**), downstream from the at least one cooling element (**303**), with which at least one sensor device of a first inspection unit (**401**) is aligned; and the first inspection unit (**401**) comprising at least one sensor device for detecting electromagnetic radiation in the visible range of the spectrum, and the first inspection unit (**401**) comprising at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum.

37. The sheet processing machine (**01**) according to claim 36, characterized in that the at least one application device (**200**) comprises at least one forme cylinder (**202**), and that an effective circumference of the at least one cooling cylinder (**303**) corresponds to an integer multiple of an effective circumference of this at least one forme cylinder (**202**).

38. The sheet processing machine (**01**) according to claim 36, characterized in that the cooling cylinder (**303**) comprises at least one gripper system (**342**) for gripping sheets (**02**).

39. The sheet processing machine (**01**) according to claim 36, characterized in that the sheet processing machine (**01**) has a transfer point (**311**) for transferring sheets (**02**) from the cooling element (**303**) designed as a cooling cylinder (**303**) to the first inspection transport body (**403**).

40. The sheet processing machine (**01**) according to claim 36, characterized in that a curing device (**300**) is arranged along the transport path provided for the transport of sheets (**02**), downstream from the at least one application point (**201**) and upstream from the at least one cooling cylinder (**303**).

41. The sheet processing machine (**01**) according to claim 40, characterized in that at least one curing section of the transport path provided for the transport of sheets (**02**) is defined by at least one operating zone of the curing unit (**300**), and that a cooling section of the transport path provided for the transport of sheets (**02**) is defined by at least one operating zone of the at least one

cooling element (**303**), and that any cooling section is arranged downstream from any curing section.

42. The sheet processing machine (**01**) according to claim 40, characterized in that the sheet processing machine (**01**) comprises a curing and inspection module (**600**), and that the curing and inspection module (**600**) comprises the curing device (**300**) and the at least one cooling element (**303**) designed as a cooling cylinder (**303**) and the at least one inspection device (**400**), and that the curing and inspection module (**600**) comprises a dedicated machine frame (**601**; **602**; **603**).

43. The sheet processing machine (**01**) according to claim 36, characterized in that the at least one cooling element (**303**) comprises a line system through which cooling liquid can flow for the transport thereof.

44. The sheet processing machine (**01**) according to claim 36, characterized in that the sheet processing machine (**01**) comprises at least one simultaneous printing unit (**200**) and/or at least one simultaneous double printing unit (**200**).

45. A sheet-fed printing machine (**01**), a transport path provided for a transport of sheets (**02**) being assigned to the sheet-fed printing machine (**01**); and the sheet-fed printing machine (**01**) comprising at least one application device (**200**) designed as a simultaneous double printing unit (**200**) with at least one application point (**201**) arranged along the transport path provided for the transport of sheets (**02**) for applying material to sheets (**02**); and a curing device (**300**), which comprises at least one LED UV radiation source (**302**), being arranged along the transport path provided for the transport of sheets (**02**), downstream from the at least one application point (**201**); and the curing device (**300**) comprising a first curing unit (**321**) for drying a first side of sheets (**02**) and a second curing unit (**322**) for drying a second side of sheets (**01**) located opposite the first side; and the transport path provided for the transport of sheets (**02**) extending between the first curing unit (**321**) and the second curing unit (**322**); and at least one cooling device (**301**) being assigned to the curing device (**300**), comprising at least one cooling element (**303**), which comprises a line system through which cooling liquid can flow for the transport thereof; and at least one curing section of the transport path provided for the transport of sheets (**02**) being defined by at least one operating zone of the curing unit (**300**); and a cooling section of the transport path provided for the transport of sheets (**02**) being defined by at least one operating zone of the at least one cooling element (**303**); and any cooling section being arranged downstream from any curing section; and the sheet-fed printing machine (**01**) comprising at least one inspection device (**400**), which is arranged so as to be aligned with a region of the transport path provided for the transport of sheets (**02**), which is arranged downstream from the at least one cooling element (**303**); and the at least one inspection device (**400**) comprising a first inspection unit (**401**); and the first inspection unit (**401**) comprising at least one sensor device for detecting electromagnetic radiation in the visible range of the spectrum, and the first inspection unit (**401**) comprising at least one sensor device for detecting electromagnetic radiation in a first portion of the infrared region of the spectrum.

46. The sheet-fed printing machine (**01**) according to claim 45, characterized in that the at least one cooling element (**303**) is designed as a rotatable cooling cylinder (**303**).

47. The sheet-fed printing machine (**01**) according to claim 46, characterized in that the cooling cylinder (**303**) comprises at least one gripper system (**342**) for gripping sheets (**02**).

48. The sheet-fed printing machine (**01**) according to claim 46, characterized in that the at least one application device (**200**) comprises at least one forme cylinder (**202**), and that an effective circumference of the at least one cooling cylinder (**303**) corresponds to an integer multiple of an effective circumference of this at least one forme cylinder (**202**).

49. The sheet-fed printing machine (**01**) according to claim 45, characterized in that a first inspection transport body (**403**) is assigned to the first inspection unit (**401**), with which at least one sensor device of a first inspection unit (**401**) is aligned, and that the first inspection transport body (**403**) comprises at least one gripper system for gripping sheets (**02**) and/or is designed as a suction transport cylinder (**403**).

50. The sheet-fed printing machine (**01**) according to claim 45, characterized in that the sheet-fed printing machine (**01**) comprises a curing and inspection module (**600**), and that the curing and inspection module (**600**) comprises the curing device (**300**) and the at least one cooling element (**303**) and the at least one inspection device (**400**), and that the curing and inspection module (**600**) comprises a dedicated machine frame (**601**; **602**; **603**).