



US 20100006234A1

(19) **United States**

(12) **Patent Application Publication**
Preisner

(10) **Pub. No.: US 2010/0006234 A1**

(43) **Pub. Date: Jan. 14, 2010**

(54) **MODULAR FILM UNIT**

(30) **Foreign Application Priority Data**

(75) Inventor: **Mario Preisner, Kirchheim/Teck (DE)**

Dec. 20, 2006 (DE) 10 2006 060 243.9

Publication Classification

Correspondence Address:
LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900, 180
NORTH STETSON AVENUE
CHICAGO, IL 60601-6731 (US)

(51) **Int. Cl.**
B65H 37/04 (2006.01)
(52) **U.S. Cl.** **156/540**

(57) **ABSTRACT**

In order to transfer an image-type coating from a carrier film to a printed sheet, an image-type adhesive is applied to the printed sheet. In a film transfer module (2), the carrier film comprising the image-type coating is rolled over the printed sheet using contact pressure such that the coating adheres to the adhesive sections, thus forming an image. In order to improve the function, simplify the device and increase flexibility, a modular holder for film rolls of the transfer foil (5) is provided, allowing simplified handling.

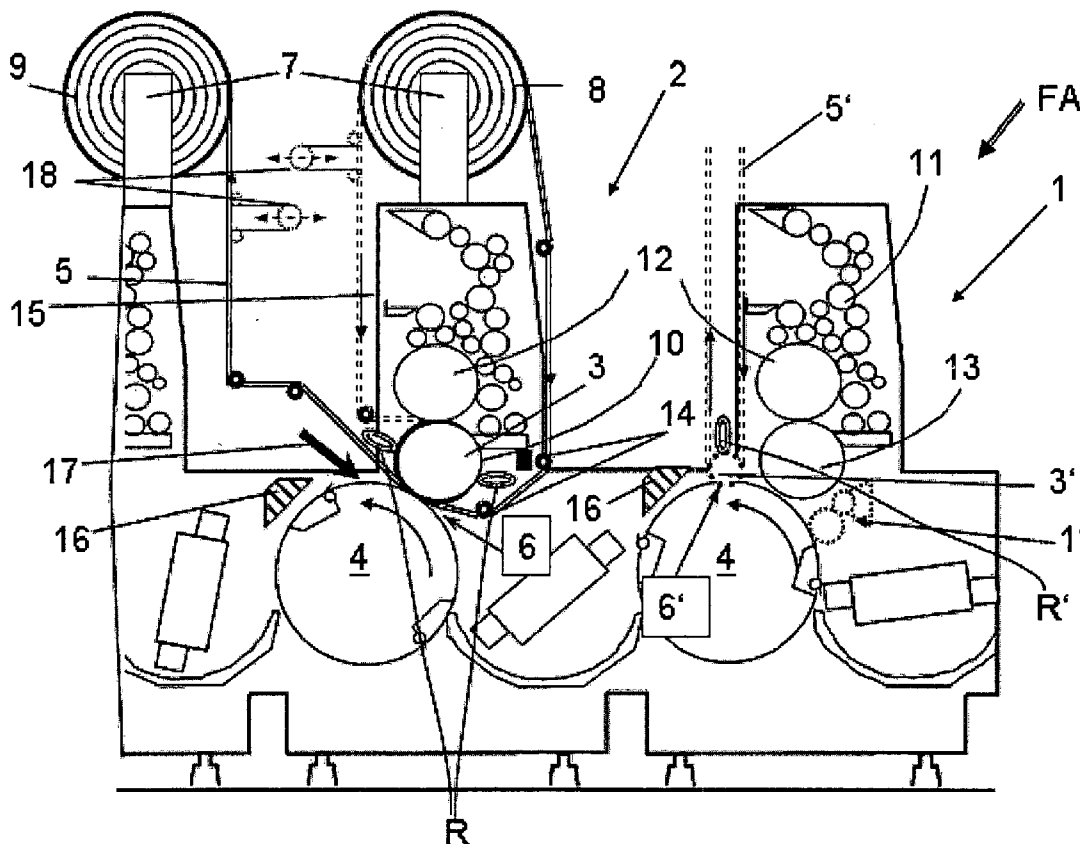
(73) Assignee: **Manroland AG, Offenbach (DE)**

(21) Appl. No.: **12/519,696**

(22) PCT Filed: **Dec. 13, 2007**

(86) PCT No.: **PCT/EP2007/010940**

§ 371 (c)(1),
(2), (4) Date: **Sep. 10, 2009**



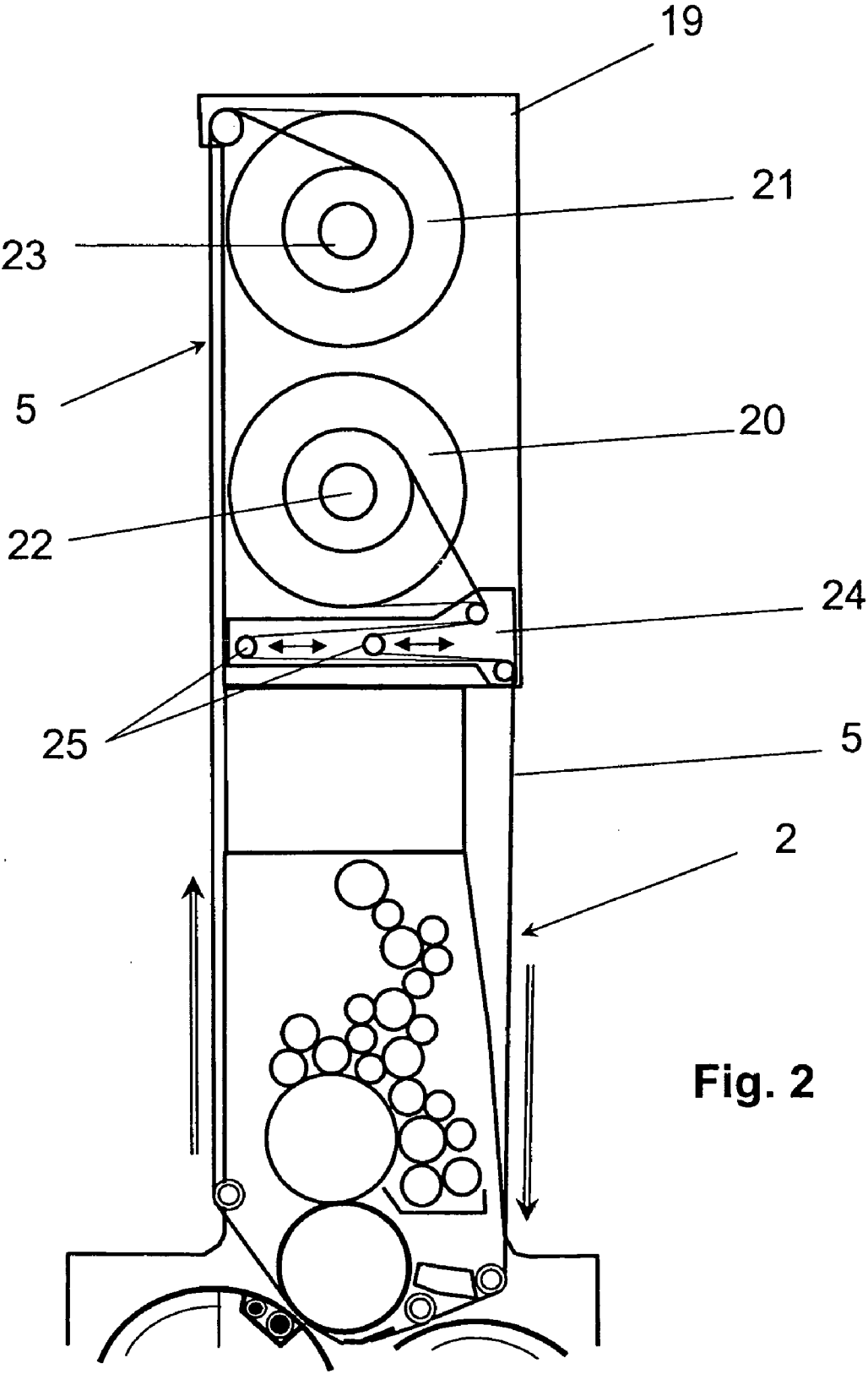


Fig. 2

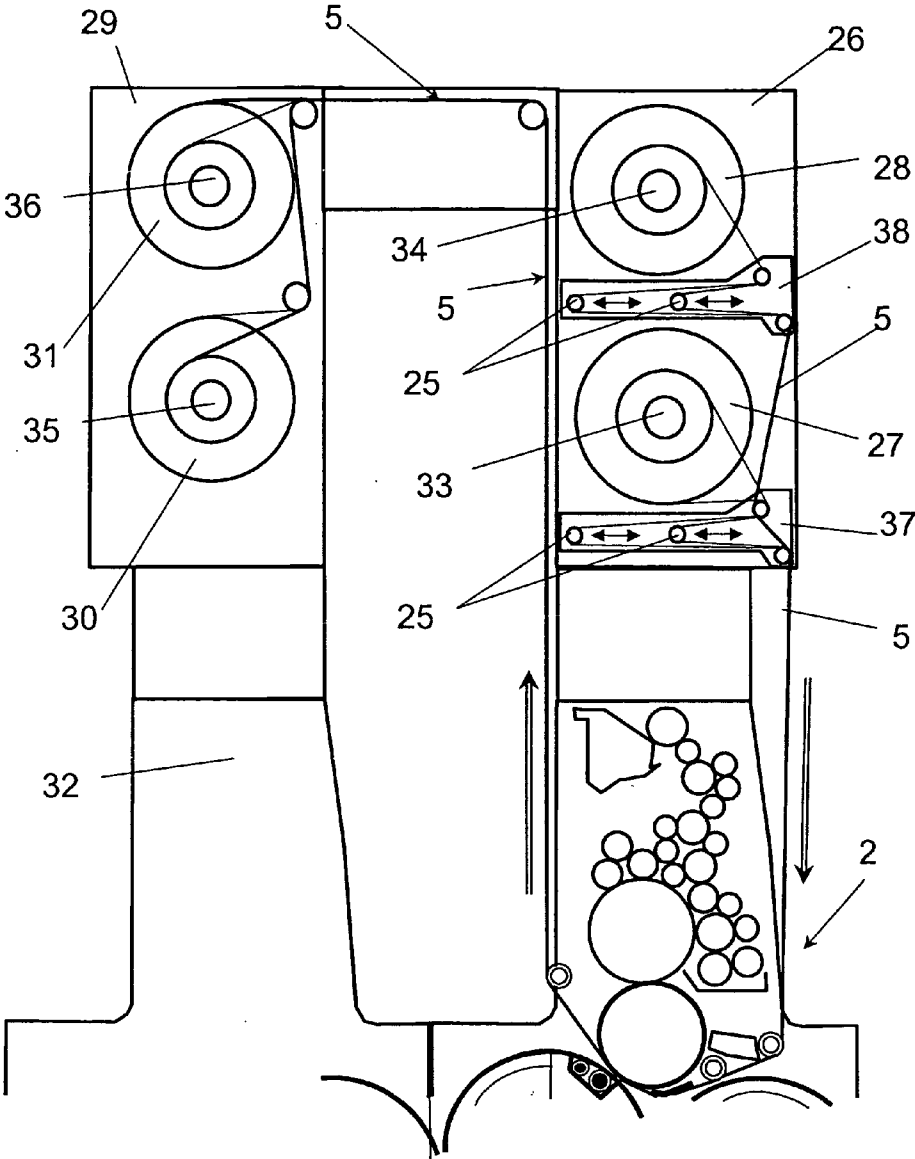


Fig. 3

MODULAR FILM UNIT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application is the national phase of PCT/EP2007/010940, filed Dec. 13, 2007, which claims the benefit of German Patent Application No. 102006060243.9, filed Dec. 20, 2006.

FIELD OF THE INVENTION

[0002] The present invention relates generally to printing machines, and more particularly, to printing machines which include a station for transferring imaging layers from a carrier film onto sheets being processed through the printing machine.

BACKGROUND OF THE INVENTION

[0003] It is known to produce metallic layers on sheets by means of a film transfer method. For example, EP 0 569 520 B 1 discloses a printing material and a printing device that utilizes this material. This publication describes a sheet-processing machine that includes a feeder and a delivery unit, wherein printing units and a film transfer module are arranged between these two assemblies. An adhesive pattern is applied in at least one of the printing units by means of a flatbed printing method. This adhesive pattern is applied in a cold-printing process. The film transfer module arranged downstream of the printing unit includes an impression cylinder and a transfer cylinder and is provided with a film guide. The film guide is designed in such a way that a film strip or transfer film is guided from a film supply reel through a transfer nip of the film transfer module between the impression cylinder and the transfer cylinder. The film strip is wound up once again on the outlet side after it emerges from the film transfer module. The transfer film has a carrier layer onto which imaging layers such as metallic layers, for example, of aluminum are applied. During the transport of sheets through the printing unit, each sheet is provided with an adhesive pattern. Subsequently, the sheet is guided through the film transfer module, wherein the sheet lying on the impression cylinder is brought into contact with the film material by means of the transfer cylinder. During this process, the metallic layer adheres to the regions of the sheet that are provided with adhesive. After transport of the sheet through the film transfer module, the metallic layer adheres only to the region of the patterns provided with adhesive. Thus, the metallic layer is removed from the carrier film in the region of the adhesive patterns and transfer film thereafter is re-wound. The sheet is thereupon delivered in the coated state.

[0004] It is known to utilize film transfer modules of this type, for example, in printing units of printing machines. A disadvantage of known devices is that they cannot be flexibly utilized and the consumption of transfer film is expensive.

OBJECTS AND SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide a printing machine that is operable for more reliably, economically, and precisely effecting the transfer of an imaging layer, such as a metallization layer, onto sheets being processed through the printing machine.

[0006] Another object is to provide a printing machine of the foregoing type which simplifies manufacture, printing machine setup, and sheet handling.

[0007] In carrying out the invention, one or more modular holders for reels of transfer film are provided for more efficient access and utilization. A strip of the transfer film is stored on one or more film reels within the module, and existing film reel can be used within the same module in order to change film reels by means of a film strip connecting device (receptacle modules). Two variations of modular receptacles for film reels that allow simple exchange of one of or more such reels are disclosed.

[0008] According to a first embodiment, the receptacles may be provided in one module, wherein at least two shafts for accommodating film reels are arranged one on top of the other. One or more film reels may be arranged on each shaft. Drives may be provided for the shaft or shafts, and a strip tensioning unit may be provided for each holder for a film reel. This makes it possible to improve the set-up times in connection with a film transfer module.

[0009] According to a second embodiment, the receptacles may be provided in two modules, wherein at least two shafts for accommodating film reels are arranged one on top of the other in each module. One or more film reels may be arranged on each shaft. Drives again may be provided for the shaft or shafts, and a strip tensioning unit may be provided for each holder for a film reel in at least one module. This makes it possible to further improve the set-up times in connection with a film transfer module because the exchange of film reels is significantly simplified.

[0010] Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a diagrammatic depiction of an illustrative printing machine having a film transfer device;

[0012] FIG. 2 is a fragmentary side elevational view of a printing machine having a receptacle module in accordance with the invention for housing film transfer film; and

[0013] FIG. 3 is an alternative embodiment of a receptacle modular arrangement for handling of transfer film for an image transfer device of the printing machine.

[0014] While the invention is susceptible of various modifications and alternative constructions, certain illustrative embodiments thereof have been shown in the drawings and will be described below in detail. It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Referring now more particularly to FIG. 1 of the drawings, there is shown an illustrative sheet processing machine, namely a printing machine, that includes at least two printing units. In a first step, a sheet to be coated is provided with an imaging adhesive pattern in the application unit 1. A printing unit of an offset printing machine with inking and dampening units 11, a printing plate on a plate

cylinder 12, an offset blanket or blanket cylinder 13, and an impression cylinder 4 may be used for this purpose.

[0016] In a second step, a transfer film 5 is guided through a transfer nip 6 together with the sheet and pressed against the sheet. A film transfer module 2 used for this purpose may consist of a printing unit, a varnishing module, a base unit or another type of processing station of a sheet-fed offset printing machine.

[0017] The transfer nip 6 in the film transfer module 2 is formed by a transfer cylinder 3 and an impression cylinder 4. The transfer cylinder 3 may correspond to an offset blanket or plate cylinder of a generally known offset printing unit or a varnishing module of a sheet-fed offset printing machine. A strip guide for the transfer film 5 is illustrated within the film transfer module 2. The device may also be arranged within a printing unit in the form of an integrated film transfer module FA.

[0018] In the basic arrangement shown in FIG. 1, the film transfer module 2 has a film supply reel 8 on a side of the sheet feeder. The film supply reel 8 has a rotary drive 7 operable under appropriate control for ensuring a continuous, controlled supply of the transfer film 5 to the film transfer module 2. Furthermore, control equipment 14 such as deflection and tensioning rollers, pneumatically actuated control elements, directional baffles or the like are provided in the region of the film feeder and the film delivery unit. This makes it possible always to guide the strip of transfer film 5 without distortions and to maintain the tension of the film strip constant relative to the transfer cylinder 3.

[0019] The transfer film 5 can be guided around the transfer cylinder 3, wherein the transfer film 5 can be advantageously supplied to and delivered from the transfer nip 6 from one side of the film transfer module 2 only as depicted in broken lines in FIG. 1. In addition, the transfer film 5 essentially may also be guided on the transfer cylinder 3 tangentially or be looped around said transfer cylinder by a small angle circumferentially in the transfer nip 6. The transfer film 5 is fed to one side of the film transfer module and delivered to its opposite side. A film collecting reel 9 for winding used film material is illustrated on the outlet side of the printing unit. A controllable rotary drive 7 is also provided in this case.

[0020] Supplementary dryers 16 further may be arranged in a film transfer module 2 or FA in order to pre-dry the adhesive on the substrate and/or to completely dry the finished coating. The coating quality can be monitored by means of an inspection device 17. Furthermore, cleaning devices R are provided in the film transfer module 2 or FA in order to remove foreign matter that drops off the film strip of the transfer film 5 and may adhere to the cylinders.

[0021] In accordance with the invention, devices for the form of modular holders are provided for accommodating film reels. FIG. 2 shows an embodiment of a device that includes a single receptacle module 19 for film reels 20, 21 attached or associated with the film transfer module 2 or FA. The receptacle module 19 is provided with two shafts 22, 23 for holding respective film reels 20, 21. One or more film reels 20, 21 can be held on each shaft 22, 23 in accordance with processing tracks that lie parallel to one another relative to the transport direction of the sheets to be coated.

[0022] The transfer film 5 is fed to the transfer nip 6 from one or more film reels 20 that are held on the lower shaft 22 on the right side of the film transfer module 2 or FA. The used transfer film 5 is returned from the transfer nip 6 to one or more film reels 21 held on the upper shaft 23 parallel to the

film transfer module 2 or FA. All shafts 22, 23 may be provided with rotary drives in order to drive or decelerate the film reels 20, 21.

[0023] A strip tensioning unit 24 is arranged beneath the lower shaft 22 or the film reel 20 held thereon. The strip tensioning unit 24 may be in the form of a retractable module having several guide rollers 25 that can be adjusted in accordance with the required strip tension of the film strip relative to its strip path. The adjustment may be appropriately controllable as a function of the strip tension. Depending on the number of film reels 20 that are arranged on the shaft 22 in accordance with the processing tracks, several strip tensioning units 24 may also be arranged parallel to one another in the form of exchangeable modules. Consequently, this arrangement makes it possible to respectively operate with one film strip of the format width or with several film strips of a partial format width.

[0024] FIG. 3 shows an alternative embodiment with a first receptacle module 26 for film reels 27, 28, similar to the module 19 in FIG. 2, and a second receptacle module 26 for film reels 30, 31. The first receptacle module 26 is coupled or attached to the film transfer module 2 or FA, and the second receptacle module 29 is coupled or attached to a printing or processing unit 32 of the sheet processing machine that is arranged downstream thereof. Each of the receptacle modules 26, 29 is respectively provided with two shafts 33, 34 and 35, 36, respectively, for holding film reels 27, 28 and 30, 31. One or more film reels 27, 28 and 30, 31 again may be held on each of the shafts 33, 34 and 35, 36 corresponding to the processing tracks on the sheet to be printed that need to be supplied. An again, each of the shafts 33, 34 and 35, 36 may be provided with a rotary drive for driving or decelerating the film reels 27, 28 and 30, 31.

[0025] The transfer film 5 is fed to the transfer nip 6 from one or more film reels 27, 28 of the first receptacle module 26. In this case, the transfer film 5 can be fed to the transfer nip 6 for each processing track from either film reels 27 held on the lower shaft 33 or from film reels 28 held the upper shaft 34 on the right side of the film transfer module 2 or FA. The used transfer film 5 is returned from the transfer nip 6 to the second receptacle module 29 and its film reels 30, 31 held on upper and lower shafts 35, 36 parallel to the film transfer module 2 or FA.

[0026] In the first receptacle module 26, a strip tensioning unit 37 is arranged underneath the lower shaft 33 or the film reels 27 held thereon. The strip tensioning unit 37 again may be in the form of a retractable module having several guiding rollers that can be adjusted in accordance with the required strip tension of the film strip relative to its strip path, the adjustment of which may be appropriately controllable as a function of the strip tension.

[0027] Depending on the number of film reels 27, 28 that are arranged on the shafts 33, 34 in accordance with the required processing tracks, several strip tensioning units 37 may also be arranged parallel to one another in the form of exchangeable modules. In addition, one or more corresponding strip tensioning unit(s) 38 is/are assigned to the upper shaft 34 or the film reels 28 held thereon.

[0028] In the latter-described arrangement, it is also possible to respectively operate with one film strip of the format width or with several film strips or transfer films that are arranged in accordance with the required processing tracks and respectively have a partial format width.

[0029] The arrangement also allows for a quick-change operating mode concept in which several film reels can be used per processing track. Furthermore, a device is created within the printing machine that can be fitted with film reels and operated analogously to a reel changer. For this purpose, a back up supply reel 28 for transfer film 5 may be provided on a free shaft 34 in the receptacle module 26 as depicted in FIG. 3, while the active film reel 27 is processed. The film strip from the back up reel 28 can be glued to the active film reel 27 at a standstill when or shortly before the transfer film 5 is completely used up. This may be effected manually or semi-automatically with the aid of auxiliary means. Consequently, the new transfer film of the new film reel 28 can be directly pulled into the film transfer module 2 by means of the transfer film being currently processed.

[0030] This also makes it possible to automate the foregoing system. For this purpose, a sufficient quantity of transfer film 7 may be stored in a magazine, e.g., in connection with a strip tensioning unit 37 or 38 for the transfer film being unwound from the active film reel 27. The active film from the reel 27 can then be glued to the new film reel 28 to be used. An appropriate acceleration of the next film reel 28 to be used, if applicable, up to the machine speed simplifies the exchange between old and new film reel 27 and 28 to such a degree that a quasi-continuous reel change takes place. This process can also be fully automated, as is known in automatic reel changers of web-processing printing machines. In this case, the conventional arrangement of the film transfer module in the form of two printing towers according to FIG. 1 is preserved.

[0031] It would also be possible to effect a double arrangement of the film reels 30, 31 that wind up the film strip. If an automatic reel change from a full wind-up reel to an empty wind-up reel also is required, the processes for set-up and take-down can also be carried out by the support personnel during idle times or with minimal or even no production interruptions. The arrangement can be additionally improved if the shafts 22 or 33, 33 and 34 or 35 and 36 of the receptacle modules 19 or 26 and 29 are loaded and unloaded on their face sides, e.g., from the rear side of the printing machine.

[0032] The strip tensioning units 37, 38 illustrated in FIGS. 2 and 3 extend over the entire width of the device. This makes it possible to accommodate any arrangement and width of the film strips or partial film strips during the film transfer. Consequently, strip handling and guiding can be effected in a completely variable fashion with respect to the position and width of the partial film strips and their arrangement relative to the position of the processing tracks on the printing substrate.

[0033] In order to additionally improve the arrangement, a device may be provided for detecting the gluing point in the film strip to the film guide. A corresponding sensor arrangement is positioned between the film being unwound in the receptacle module 19 or 26 and the feed of the transfer film 5 to the transfer nip 6 in the film transfer module 2. The detection of the gluing point makes it possible to detect the sheet or sheets that contain the gluing point or are situated upstream or downstream of the gluing point, as well as to sort out and identify these sheets in the delivery stack of the printing machine with the aid of corresponding auxiliary means. For this purpose, the corresponding distances traveled by the sheet and the transfer film can be calculated with the aid of a computer. Alternatively, the gluing point can be marked by means of an RFID-transponder or a magnetic strip and detected with sensors. In this context, it is also possible to

transfer the marking element onto the sheets even in case there are several film strips. Different copies on the sheet can then be detected as faulty in an additional processing station, such that copies with film gluing points can be reliably sorted out.

[0034] In addition, the used film strip can be transported away downstream of the transfer nip by means of turning bars, such that it is guided laterally out of the printing machine. In this case, the film strip can be wound up above auxiliary assemblies arranged beside the printing machine. The used film strip could also be shredded and removed by suction at this location.

[0035] From the foregoing, it can be seen that the described device makes it possible to operate with one film reel of the format width or several narrower film reels over the format width in accordance with the processing tracks required on the sheet to be printed. The processing may take place in a synchronized or non-synchronized fashion.

[0036] A film severing device, if applicable, with a film capture device may be provided with the film transfer module in the vicinity of the reel being unwound in order to detect a torn film. The torn film detection is realized with the aid of the strip tension measurement or control and/or a strip monitoring sensor arrangement.

LIST OF REFERENCE SYMBOLS

- [0037] 1 Application unit
- [0038] 2 Film transfer module
- [0039] 3 Transfer cylinder
- [0040] 4 Impression cylinder
- [0041] 5 Transfer film/film strip
- [0042] 6 Transfer nip
- [0043] 7 Reel drive
- [0044] 8 Film supply reel
- [0045] 9 Film collecting reel
- [0046] 10 Press covering
- [0047] 11 Inking/dampening unit
- [0048] 12 Plate cylinder
- [0049] 13 Offset blanket cylinder
- [0050] 14 Guiding device
- [0051] 15 Protective cover
- [0052] 16 UV-dryer
- [0053] 17 Monitoring system
- [0054] 18 Dancer roll
- [0055] 19 Receptacle module
- [0056] 20 Film reel (wind-up)
- [0057] 21 Film reel
- [0058] 22 Shaft
- [0059] 23 Shaft
- [0060] 24 Strip tensioning module
- [0061] 25 Guide roller
- [0062] 26 Receptacle module
- [0063] 27 Film reel
- [0064] 28 Film reel
- [0065] 29 Receptacle module
- [0066] 30 Film reel (wind-up)
- [0067] 31 Film reel (wind-up)
- [0068] 32 Printing or processing unit
- [0069] 33 Shaft
- [0070] 34 Shaft
- [0071] 35 Shaft
- [0072] 36 Shaft

- [0073] 37 Strip tensioning unit
- [0074] 38 Strip tensioning unit
- [0075] FA Film transfer module

1-15. (canceled)

16. A sheet processing machine comprising an image transfer device for transferring imaging layers of a carrier film that jointly form a transfer film (5) onto moving sheets in a cold film transfer process, said image transfer device including a transfer cylinder (3) and a sheet guiding impression cylinder (4) that together form a transfer nip (6) therebetween through which the transfer film (5) can be guided together with a moving sheet passing through the sheet processing machine to which an image from the transfer film is to be transferred, said image transfer device having an associated first receptacle module comprising a plurality of film reels mounted on two shafts (22,23; 33,34) arranged in offset relation to each other for supplying transfer film to the image transfer device and for receiving the transfer film following transfer of the image layer thereof.

17. The sheet processing machine of claim 16 in which said first receptacle module is mounted directly on said image transfer device.

18. The sheet processing machine of claim 16 including a sheet processing unit (32) located downstream of said image transfer device, and a second receptacle module (29) associated with said processing unit (32) having a plurality of film reels (30,31) mounted on shafts (35,36) arranged in offset relation to each other.

19. The sheet processing machine of claim 18 in which said second receptacle module is mounted directly on said downstream sheet processing unit (32).

20. The sheet processing machine of claim 18 in which the shafts of the film reels of said first and second receptacle modules are arranged in different planes that are offset horizontally and vertically with respect to each other.

21. The sheet processing machine of claim 16 in which said shafts of said receptacle module each accommodate a plurality of film reels for supplying strips of film to adjacent processing tracks.

22. The sheet processing machine of claim 16 in which said shafts of said receptacle module are disposed in vertically offset relation to each other, and a strip tension module associated with one of the shafts of the receptacle module for guiding film and regulating the film strip tension.

23. The sheet processing machine of claim 21 including a strip tension module being operable for individually guiding and controlling the tension of a plurality of strips of film moving along adjacent film tracks.

24. The sheet processing machine of claim 16 including a strip tension module associated with each shaft of the receptacle module for guiding moving strips of film and controlling strip tension.

25. The sheet processing machine of claim 24 in which said strip tension modules (24,37,38) are in the form of removal modules through which the strips of film pass.

26. The sheet processing machine of claim 22 including a film connecting device associated with the strip tension mod-

ule for connecting two strips of transfer film in a region of the end section of a first film strip and the starting section of a second film strip.

27. The sheet processing machine of claim 16 including a film connecting device associated with the strip tension module for connecting strips of transfer film for enabling strips of film to be carried away on reels on different shafts.

28. The sheet processing machine of claim 27 in which said strip tension module includes sensors for detecting regions between strips of film of two different reels.

29. The sheet processing machine of claim 21 in which the transfer film (5) is respectively unwound in the form of fresh film strips for one or more processing tracks from one first film reel (20) per processing track that is held on a first shaft (22) and forms part of the first receptacle module (19) and respectively wound up in the form of used film strips on a respective second film reel (21) per processing track that forms part of the same receptacle module (19) and is held on a second shaft (23) that is vertically and/or horizontally offset relative to the first shaft (22).

30. The sheet processing machine of claim 21 in which the transfer film (5) in the form of fresh film strip(s) for one or more processing tracks is respectively provided as one or more respective first film reel (20) per processing track that is held on a first shaft (22) and/or additional film reels (27, 28) that are held on one or more additional shafts (33, 34) and form part of a first receptacle module (26).

31. The sheet processing machine of claim 18 in which the shafts of said receptacle modules each accommodate a plurality of film reels for supplying strips of film to adjacent processing tracks, the transfer film being unwound from one of the film reels (27, 28) per processing track, guided to the transfer nip (6) and respectively wound up in the form of used film strip(s) on one or more film reels (30, 31) per processing track that form part of the second receptacle module (29) and are arranged on at least one first and/or one or more additional shafts (35, 36).

32. The sheet processing machine of claim 18 including the shafts of said receptacle modules each accommodate a plurality of film reels for supplying strips of film to adjacent processing tracks, the transfer film being a film connecting device that is operable in the first receptacle module for each processing track at or before the end of the use of the transfer film of a film reel in use for connecting an end of a film strip being unwound is connected to the beginning of a new film strip for the same processing track and the unwinding and feeding of the transfer film (5) for the respective processing track to the transfer nip (6) is continued from a newly-connected film reel separately and simultaneously for each of the processing tracks.

33. The sheet processing machine of claim 29 including sensors for separately detecting for each processing track the connecting points between strips of film and calculating the position relative to the connecting points with respect to the position of a sheet to be coated and marking the sheets at such point with reference to the region of the sheet to be coated whereby the marked sheets can be selectively sorted out in a delivery region of the sheet processing machine.

* * * * *