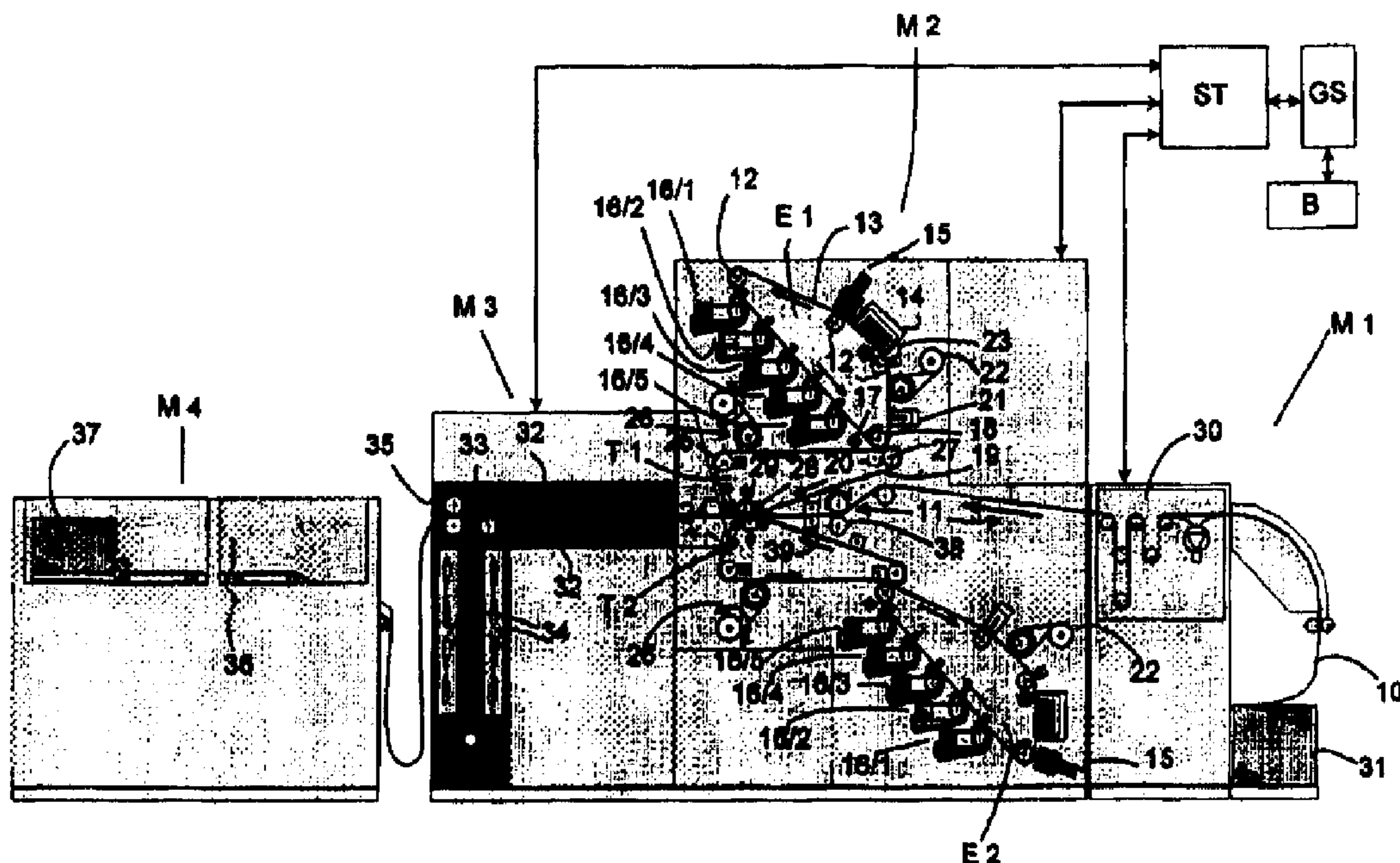




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(54) Titre : DISPOSITIF D'IMPRESSION ET DE COPIE POUR REALISER UNE IMPRESSION MONOCHROME OU EN COULEURS, ADAPTEE A DES PERFORMANCES, SUR UN OU DEUX COTES D'UN SUPPORT
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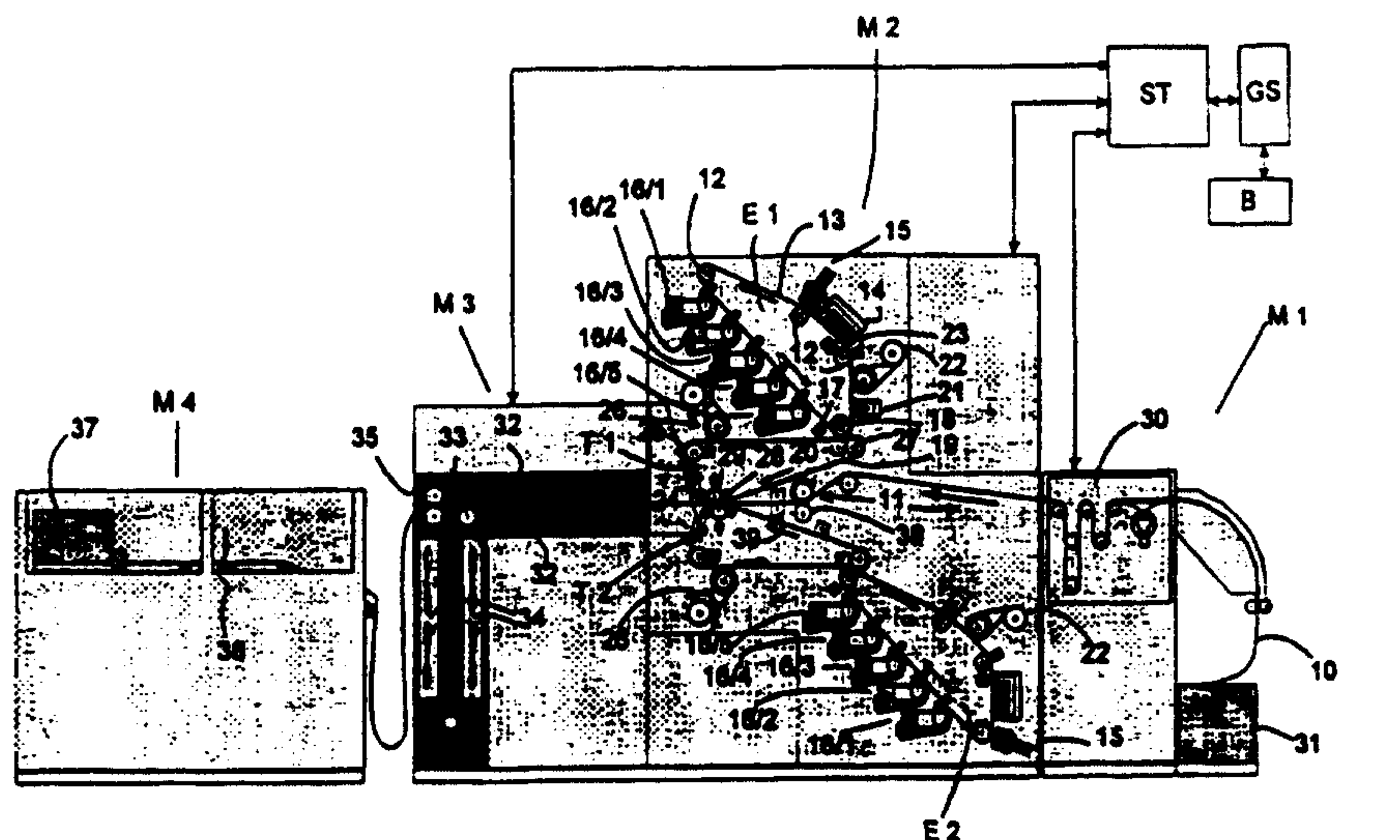
(57) Abrégé/Abstract:

The invention relates to a printing or copying apparatus for performance-adjusted monochrome or colour printing on one or both sides of a recording medium. On both sides of a transport channel (11) said apparatus has an electrophotography module (E1, E2) with an endless photoconductor (13) and a transfer module (T1, T2) with an endless transfer ribbon (19). A control device (ST) controls the electrophotography modules (E1, E2), transfer modules (T1, T2) and transport device (38) in such a way that, in a collective state, colour-separated toner images are serially transferred from the electrophotography module to the transfer ribbon (19). The collective toner image generated in this way is transferred to the recording medium in a start-stop operation. In a continuous operating state assigned to monochrome printing, individual toner images are transferred directly from the electrophotography module via the transfer module to the recording medium (10).



(57) Abstract

The invention relates to a printing or copying apparatus for performance-adjusted monochrome or colour printing on one or both sides of a recording medium. On both sides of a transport channel (11) said apparatus has an electrophotography module (E1, E2) with an endless photoconductor (13) and a transfer module (T1, T2) with an endless transfer ribbon (19). A control device (ST) controls the electrophotography modules (E1, E2), transfer modules (T1, T2) and transport device (38) in such a way that, in a collective state, colour-separated toner images are serially transferred from the electrophotography module to the transfer ribbon (19). The collective toner image generated in this way is transferred to the recording medium in a start-stop operation. In a continuous operating state assigned to monochrome printing, individual toner images are transferred directly from the electrophotography module via the transfer module to the recording medium (10).



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TEXT TRANSLATION

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**PRINTER AND COPIER DEVICE FOR PERFORMANCE-ADAPTED,
MONOCHROME AND/OR CHROMATIC, SINGLE-SIDED OR BOTH-
SIDED PRINTING OF A RECORDING MEDIUM**

The invention is directed to a printer or copier device for performance-
5 adapted, monochrome and/or chromatic, single-sided or both-sided printing of a
recording medium.

In electrophotographic color printers having high printing quality as
disclosed, for example, by EP-A1-0 629 931, there is the problem that the same length
of time is always required for producing a printed page given both monochrome
10 printing mode as well as given chromatic printing mode. This means that was is
referred to as the performance, i.e. the speed efficiency of the printer, is based on full
color printing. When such a printer is utilized in mixed operation, then it is too for
the monochrome printing that usually occurs. Given electrophotographic high-
performance printing with 200 pages/minute or higher, the print jobs to be processed
15 contain a majority of monochrome printouts. Only a small portion of the print job is
chromatic. Thus, for example, it can occur that a plurality of black-and-white
successive pages are printed within a print job and that a full color image must then be
printed, for example when producing a brochure. When the standard color printing
devices are utilized for production of such a brochure, then they are relatively slow,
20 since, as already stated, the printing performance is based on the color printing
performance. Such color printer devices are also complicated and cost-intensive and
inefficiently utilized for mixed operation.

Color printer devices with which single-color or two-color can be printed
at high speed are disclosed, for example, by US-A-5,526,107. In the known color
25 printer device, continuous form paper is supplied to a transfer printing location of a
photoconductive cylinder that comprises respective electrophotographic units for
producing differently colored toner images on two surfaces. The continuous form
paper is printed with a first color on the front side at the transfer printing location, the
continuous form paper is subsequently deflected and supplied to a printing location at
30 the same photoconductive cylinder lying opposite the transfer printing location and is
printed on the backside thereat.

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DE-A-196 18324 also discloses that color printing be generated in that a plurality of developer stations allocated to the individual color separations of the color image are arranged along a photoconductor. The developer
5 stations can be individually mechanically activated, namely in that they are brought into mechanical contact with the photoconductor band. For producing color printing, individual color separations are generated on the photoconductor band and are then transferred onto a
10 collector in the form of an intermediate transfer drum. This intermediate transfer drum then transfers the full color image that has arisen by the superimposition onto a single page.

It is also known to employ a transfer band instead
15 of the transfer cylinder, as disclosed by EP-A2-0 320 985.

What all known color printer devices have in common is that their performance is based on the color printing and that the printer devices are therefore uneconomical to utilize for mixed operation.

20 An object of the invention is to offer a multi-color printer or copier device with high printing performance that is especially suited for mixed operation and whose performance is based on the maximum printing output in monochrome operation.

25 A broad aspect of the invention provides a printer or copier device for at least one of performance-adapted, monochrome and chromatic single-sided or both-sided printing of a recording medium, comprising: at least one electrophotography module for generating toner images, said
30 at least one electrophotography module including: a continuous photoconductor on which the toner images are generated, a plurality of developer stations arranged along

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a surface of the continuous photoconductor and individually switchable to generate the toner images on said continuous photoconductor, said developer stations each being respectively allocated to a single color separation toner image; at least one transfer module including: an endless transfer band that has a transfer accepting region for accepting toner images from the at least one electrophotography module and a controllable transfer printing region for transfer printing of toner images onto the recording medium, wherein in a transfer printing condition of the at least one transfer module the endless transfer band contacts the recording medium and in a collecting condition of the at least one transfer module the endless transfer band is distanced from the recording medium; a transport channel including: controllable transport for the recording medium, the recording medium being a continuous web-shaped recording medium, said at least one electrophotography module and said at least one transfer module being arranged at at least one side of the transport channel; a controller coupled to the at least one electrophotography module and to the at least one transfer module and to the controllable transport that controls the at least one electrophotography module and the at least one transfer module and the controllable transport such that printing is performed in two printing modes, said two modes being a start/stop mode and a continuous mode wherein, for printing a recording medium moved through the transfer printing region in the start-stop mode in a first operating condition of the apparatus, the color separation toner images in the collecting condition of the transfer module are serially transferred from the electrophotography module onto the transfer band and an exactly registered collective image is produced on the transfer band, said collective image then being transferred in the transfer printing region

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of the transfer module onto the recording medium, and, for printing a recording medium moved continuously through the transfer printing region in the continuous mode of the apparatus of the transfer module, the toner images are
5 directly transferred from the at least one electrophotography module onto the endless transfer band and are transferred onto the recording medium without collecting.

Another broad aspect of the invention provides a
10 method for at least one of performance-adapted monochrome and chromatic, single-sided or both-sided printing of a recording medium with a printer or copier device, whereby the device comprises: a) at least one electrophotography module for generating toner images on a continuous
15 photoconductor with the assistance of a plurality of developer stations arranged along the surface of the photoconductor and individually switchable that are respectively allocated to a single color separation toner image; b) at least one transfer module with an endless
20 transfer band that comprise a transfer region for accepting toner images from the electrophotography module and a controllable transfer printing region for the transfer printing of toner images onto the recording medium, whereby, in a transfer printing condition of the transfer module, the
25 transfer band contacts the recording medium and, in a collecting condition of the transfer module, the transfer band is distanced from the recording medium; c) a transport channel comprising a controllable transport for the recording medium and having electrophotography and transfer
30 module arranged at one side or both sides of the transport channel; comprising the following steps: printing a continuous web-shaped recording medium moved through the transfer printing region in start-stop mode in a first

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operating condition of the apparatus by serial transfer from the electrophotography module, superimposed depositing as a collective image on the transfer band, and transfer printing of the collective image onto the recording medium, and
5 printing a recording medium moved continuously through the transfer printing region in a second operating condition of the apparatus by direct transfer of a toner image from the electrophotography module onto the transfer band and from the transfer band onto the recording medium without
10 collecting.

Embodiments of the invention are shown in the drawings and are described in greater detail below by way of example.

Shown are:

15 Figure 1 a schematic sectional view of an electrophotographic printer device for performance-adapted, monochrome and/or chromatic, single-sided or both-sided printing of a web-shaped recording medium;

20 Figure 2 a schematic sectional view of a printer device according to Figure 1 that is designed only for simplex mode;

Figure 3 a schematic sectional view of a printer device designed for duplex mode, whereby the electrophotography modules comprise two independent, image-generating means, and that is designed for continuous two-color printing operations;

5 Figure 4 a schematic sectional view of a printer device according to Figure 1 that comprises two developer stations in the electrophotography module;

Figure 5 a schematic sectional view of a printer device according to Figure 1 having a specific arrangement of the electrophotography modules;

10 Figure 6 a schematic illustration of the transfer module with constantly circulating transfer band and switchable cleaning stations;

Figure 7 a schematic illustration of a transfer module that is operated in repetition mode;

15 Figure 8 a schematic sectional view of an embodiment of the printer device wherein respectively two electrophotography and transfer modules are arranged at both sides of the transport channel for the recording medium;

Figure 9 a schematic sectional view of an embodiment of a printer device according to Figure 8 wherein the two transfer modules are respectively combined to form one transfer module;

20 Figures 10 through 14 schematic sectional views of printer devices according to Figure 1 with differing arrangement and differing embodiments of electrophotography and transfer modules;

Figures 15 through 18 different embodiments of printer devices that are suitable for operation with single sheets; and

25 Figure 19 a schematic sectional view of a printer device corresponding to Figure 5 with transfer modules that contain heatable transfer bands.

The printer device for performance-adapted, monochrome and/or chromatic, single-sided or both-sided printing of a web-shaped recording medium shown in Figure 1 is modularly constructed and fundamentally comprises a delivery module M1, a printer module M2, a fixing module M3 and a post-processing module

M4. The delivery module M1 contains the elements for delivering, for example, continuous form paper taken from a stacker to the printer module M2. The printer module M2 contains the actual electrophotographic printer units that print the recording medium that is then fixed in the fixing module M3 and cut or, respectively,
 5 stacked in the post-processing module M4.

The modules in detail:

The printer module contains the units required for printing a web-shaped recording medium 10 with toner images, these being arranged at both sides of a transfer channel 11 for the recording medium 10. These units are essentially
 10 composed of two differently configurable electrophotography modules E1 and E2 with appertaining transfer modules T1 and T2. The modules E1 and T1 are thereby allocated to the front side of the recording medium 10 and the modules E2 and T2 are allocated to the back side. The identically constructed electrophotography modules E1 and E2 contain a seamless photoconductor band 13 supplied via deflection rollers
 15 12 and electromotively driven in arrow direction, for example an organic photoconductor (OPC). The units for the electrophotographic process are arranged along the light-sensitive outside. They serve the purpose of generating toner images allocated to the individual color separations on the photoconductor. To this end, the photoconductor moved in arrow direction is first charged to a voltage of
 20 approximately 1000 V with the assistance of a charging means 14, and then is discharged to approximately 50 volts character-dependent with the assistance of a character generator 15 composed of a LED comb. The latent charge image generated in this way and situated on the photoconductor is then inked with toner with the assistance of developer stations 16/1 through 16/5, and, with the assistance of the
 25 intermediate illumination means 17, the image is subsequently loosened and transferred onto a transfer band 19 of the transfer band module T1 in a transfer printing region 18 with the assistance of a transfer corona means 20. Subsequently, the entire photoconductor band is discharged over its entire width with the assistance of the discharging corona means 21 and is cleaned from adhering toner dust via a

cleaning means 22 with cleaning brush. A following intermediate illumination means 23 sees to it corresponding charge-related conditioning of the photoconductor band that, as already described, is then uniformly charged with the assistance of the charging means 14.

5 Toner images allocated to the individual color separations of the color image to be produced are generated with the electrophotography module E1 or, respectively, E2. To this end, the developer stations 16/1 through 16/5 are fashioned switchable. They contain the respective toner allocated to an individual color separation. For example, the developer station 16/1 contains black toner, the
10 developer station 16/2 contains toner having the color yellow, the developer station 16/3 contains toner having the color magenta, the developer station 16/4 contains toner having the color cyan and, for example, the developer station 16/5 has blue toner or toner of a special color. Both single-component as well as two-component toner developer stations can be employed as developer stations. Preferably, however,
15 single-component toner developer stations are utilized, these working with fluidizing toner as disclosed, for example, by United States Letters Patent 4,777,106, issued October 11, 1988 (Fotland). In order to achieve the switchability of the developer stations, i.e. in
order to be able to individually actuate each individual developer station, these, given
20 the employment of fluidizing toner, can, for example, be fashioned in conformity with WO 98/27472, which does not enjoy prior publication. The switching of the developer station thereby ensues by changing the electrical bias of the transfer drum or, respectively, by modifying the electrical bias of the applicator drum. It is also known to switch the developer stations in that they are mechanically shifted and are
25 thereby brought into contact with the photoconductor band 13. Such a principle is disclosed, for example, by DE-A1-19618324.

During operation of the printer means, it is always respectively one toner image that is generated by a single developer station via the developer stations 16/1 through 16/5, this toner image being allocated to a single color separation. This toner

image is then electrostatically transferred onto the transfer band 19 of the transfer module T1 via the transfer printing means 18 in combination with the transfer corona means 20. The transfer module T1 contains the transfer band 19 that is composed of a rubber-like substance and that is conducted around a plurality of deflection devices and motor-driven. The transfer band 19 is fashioned similar to the photoconductor band 13, being endless and without seam. It is moved in arrow direction and, proceeding from the transfer region with the drum 18 and the transfer corona means 20, is moved to a transfer printing station 24 and is moved therefrom around a deflection roller 25 to a cleaning station 26 and is moved in turn from the latter to the transfer region 18, 20 with the deflection drum 27 arranged thereat.

The transfer band 19 in the transfer module T1 functions as collector for the individual toner images allocated to the color separations, these being transferred onto the transfer band 19 via the transfer means 18, 20. The individual toner images are thereby arranged on top of one another, so that an overall toner image corresponding to the color image arises. In order to be able to produce the overall color toner image and to then transfer it onto the front side of the recording medium 10, the transfer module T1 contains a switchable transfer printing station 24. This, corresponding to the illustration of Figure 1, can contain a plurality of mechanically displaceable transfer printing drums 28 with appertaining transfer corona means 29. In the operating mode "collect", transfer printing drums 28 and transfer printing corona 29 are shifted upward in conformity with the arrow direction, so that the transfer band is spaced from the recording medium 10. In this condition, the individual toner images are taken from the electrophotography module E1 and are superimposed on the transfer band 19. The cleaning station 26 is deactivated by being pivoted out. The recording medium 10 is at rest in the region of the transfer printing station 24 in this operating condition.

The electrophotography module E2 and the transfer module T2 for the backside of the recording medium 10 are constructed like the modules E1 and T1. Here, too, a collective color toner image for the backside is generated on the transfer

band T2, whereby the corresponding transfer printing station 24 is also swivelled out in the operating condition "collect".

For simultaneously printing the front side and back side of the recording medium 10, the transfer bands 19 of the transfer modules T1 and T2 are
5 simultaneously brought into contact with the recording medium 10 in the region of their transfer printing stations 24 and the recording medium 10 is thereby moved. At the same time, the cleaning stations 26 of the transfer modules T1 and T2 are pivoted in and activated. After transfer of the two toner images onto the front side or, respectively, onto the back side of the recording medium 10, toner image residues
10 adhering to the transfer bands 19 are removed via the cleaning stations 26. This is then in turn followed by a collecting cycle for generating new toner images, whereby the transfer bands 19 are pivoted out and the recording medium 10 is at a standstill. The transfer of the toner images from the transfer modules T1 and T2 onto the recording medium 10 thus ensues in start-stop operation of the recording medium.

15 The recording medium 11 is moved in the paper transport band [sic] with the assistance of motor-driven conveyor rollers 38. In the region between the conveyor rollers 38 and the transfer printing stations 24, charge or, respectively, corona devices 39 for paper conditioning can be provided so that the paper 10 is set in terms of charge before the transfer printing, for example uniformly.

20 So that the recording medium 10 composed of paper does not tear given this start-stop operation and can also be continuously supplied, the delivery module M1 contains a loop-forming element 30. This loop-forming element 30 functioning as band store buffers the recording medium 10 that is continuously taken from a stack means 31.

25 After the transfer of the two chromatic toner images onto the recording medium 10 in the region of the transfer printing stations 24, these must still be fixed. The fixing module M3 serves this purpose. It contains an upper and lower row of infrared radiators 32 between which the paper transport channel or the recording medium 10 proceeds. Since a loose toner image is situated both on the front side as

well as on the back side of the recording medium, the recording medium 10 in the region of the infrared radiators 32 is guided freely in non-contacting fashion via a deflection roller 33 arranged at the output side. The fixing ensues via the heat of the infrared radiators 32. A cooling of the recording medium 10 ensues in a cooling path
5 following the infrared radiators 32 with cooling elements 34 and deflection rollers 35, as is a smoothing, for example via appropriate decurler devices. Blower-driven air chambers can serve as cooling elements 34.

After fixing and cooling the two toner images, a corresponding post-processing of the recording medium 10 ensues within the framework of the post-
10 processing module M4 that, for example, can contain a cutter means 36 with stacking means 37.

The printer was described above with reference to the printing mode of duplex and color. In this operating condition, color images are printed on both sides on the recording medium 10 operated start-stop. This mode is the slowest. In the
15 framework of a job to be processed, printing is carried out single-color in simplex or duplex mode for the majority of the time. In this operating condition, the recording medium 10 is continuously moved and the transfer stations T1 and T2 are in continuous contact with the recording medium. Only one developer station of the developer module E1 or, respectively, E2 is activated, this respectively producing a
20 single-color toner image that is transferred directly onto the transfer bands 19 and from the latter onto the recording medium 10. The transfer bands 19 thereby work as direct transfer elements without collecting functions; the cleaning stations 26 are therefore continuously activated.

The printer device is thus constructed performance-adapted. This means it
25 is adapted to the most frequently occurring, monochrome printing and is especially fast as a result of the continuous operation. When color printing is desired, a switch is made to start-stop mode and the required time expenditure is dependent on the plurality of colors contained in the color image and, thus, is dependent on the plurality of activated developer stations 16/1 through 16/5. When, for example, only two

colors are printed, for example black with red in the spot color method, then only two transfer processes with collecting processes are required in the developer module E1 and in the transfer module T1 for the presentation of the collective toner image. The analogous applies given three colors, etc.

5 Various other operating conditions can be produced in the printer dependent on the activation of the various modules. Thus, for example, chromatic simplex by activating developer module and transfer module at only the corresponding, desired side of the recording medium or, on the other hand, a mixed operation, whereby, for example, multicolor images are printed on the front side and
10 monochrome images are printed on the back side. In this case, the transfer module serving for monochrome image generation can remain permanently swivelled in.

A microprocessor-controlled control means ST coupled to the device controller GS of the printer serves to realize these various operating conditions, this control means ST being in communication with the components delivery module M1,
15 printer module M2 and fixing module M3 or, respectively, post-processing module M4 to be controlled and regulated. Within the modules, it is coupled to the individual units, thus, for example, to the electrophotography modules E1 and E2 and to the transfer modules T1 and T2. A control panel B via which the various operating conditions can be input is connected to the device controller GS or, respectively, to
20 the control ST, which can be a component part of the device controller. The control panel can contain a touch screen picture screen or, respectively, a PC with coupled keyboard. The control itself can be conventionally constructed.

The subject matter of the invention can then be varied in conformity with the desired purpose. This is particularly easily possible because the device is
25 modularly constructed and the individual units are also fashioned as individual modules that can be exchanged and added.

Given the embodiment according to Figure 2, an electrophotography module E1 and a transfer module T1 are arranged at only one side of the transport channel 11. In this slimmed-down form, the device is thus fashioned performance-

adapted for simplex mode. The device can be operated in full-color mode and monochromatically.

Given the embodiment according to Figure 3, the electrophotography modules E1 and E2 contain two devices B1 and B2 that generate images and work independently of one another. The first image-generating device B1 contains a character generator 15, a charging means 14, an intermediate exposure means 23, a cleaning device 22, a discharge corona means 21 and a developer station 16/1. The second image-generating means B2 is constructed analogous thereto with charging means 14, character generator 15, a developer station 16/2 and an intermediate exposure means 17. The developer station 16/1 can be allocated to a first color, for example black, and the developer station 16/2 can be allocated to a second color, for example blue or some other color. It is thus possible to first produce a first toner image with the color black with the electrophotography modules E1 or E2 and to superimpose this black toner image with a toner image having the additional color with the second image-generating means B2. The toner image superimposed of this way (spot color toner image) is then transferred onto the transfer modules T1 and T2 and is immediately transferred therefrom onto the recording medium 10. It is thus possible to apply two-color toner images on both sides on the continuously moving recording medium. When only the image-generating means B1 or B2 is activated, continuous printing is carried out monochrome. In both operating modes, the transfer modules T1 and T2 serve only for the transfer without the operating mode "collect" being necessary. However, it can also be imagined that both image-generating means B1 and B2 be actuated in alternation and that the transfer modules T1 and T2 be operated in the operating mode "collect", as initially set forth.

Another possibility for generating spot color in duplex operation is shown in the embodiment according to Figure 4. The two electrophotography modules E1 and E2 thereby contain only two developer stations 16/4 and 16/5 to which respectively one color, for example the color black or the color red in the other developer station is allocated. The recording medium 10 is operated in start-stop

mode, and the transfer modules T1 and T2 work in the operating mode "collect". Here, too, it is possible to activate only one of the developer stations 16/4 or, respectively, 16/5 in monochrome operation and to then continuously print the recording medium 10 performance-adapted.

5 The embodiment according to Figure 5 corresponds in terms of fundamental structure to the embodiment of Figure 1 and, differing from Figure 1, the electrophotography modules E1 and E2 are arranged in space-saving fashion, namely at an angle of approximately 45° relative to the perpendicular.

Figure 6 shows a schematic illustration of the transfer module T1 with
10 constantly circulating transfer band and switchable cleaning station. What is referred to as a cold transfer band serves as transfer band 19. The cleaning station 26 can be mechanically pivoted in and out and can thus be activated. The transfer printing station 24 composed of the transfer printing drum 28 and a cooperating drum 40 is likewise switchable. The recording medium 10 is brought into touching contact with
15 the transfer band 12 via the cooperating drum 40. The means is thus particularly suited for the simplex operation shown in Figure 2.

A further fundamental possibility of producing the collecting mode in the transfer module T1 is shown in Figure 7. The cleaning station 26 is thereby constantly pivoted in against the transfer band 19, and the transfer band 19 and, thus,
20 the transfer module T1 is operated in retarding mode. This means that the cooperating drum 40 is pivoted out in the retarding collecting mode and, thus, that the recording medium 10 is not in contact with the transfer band 19. The first separation toner image is transferred onto the transfer band 19 via the electrophotography module E1. The transfer band 19 is subsequently mechanically separated from the
25 electrophotography module E1 and is moved back in conformity with the length of the toner image. For the second superimposed toner image, the transfer band 19 is pivoted back in against the photoconductor 13, and, given opposite direction of movement, a further color separation toner image is superimposed on the toner image

situated on the transfer band 19, etc. When all color separations are superimposed, the collective color toner image is transferred onto the recording medium.

In the illustrated exemplary embodiments of Figures 6 and 7, the transfer printing stations 24 are switchable with the assistance of pivotable cooperating drums
5 40. However, it is also possible to enable the switching by corresponding displacement of the transfer printing drums 28 in order to thus enable an operating mode as shown in Figure 1.

The embodiment according to Figure 8 comprises respectively two electrophotography modules E1/1 and E1/2 or, respectively, E2/1 and E2/2 as well as
10 corresponding transfer modules T1/1 and T1/2 or, respectively, T2/1 and T2/2 at both sides of the transport channel 11. As a result of this arrangement of respectively two modules at each side of the transport channel, these working independently of one another, the printing speed can be doubled, particularly given full-color operation. Moreover, it is possible to actuate the electrophotography or, respectively, transfer
15 modules in alternation in order, for example, to thus also increase the printing speed in that, for example, the transfer module T1/1 is in collecting condition while the transfer module T1/2 transfer prints or vice versa.

When respectively only one transfer module T1 or, respectively, T2 is respectively employed at each side of the transport channel 11, one arrives at the
20 embodiment corresponding to Figure 9, whereby two electrophotography modules E1/1, E1/2 or, respectively, E2/1, E2/2 are arranged at each side, these respectively acting on one transfer module T1 or T2. It is thus possible to significantly shorten the collecting event in that the two electrophotography modules simultaneously transfer corresponding color separation images onto the transfer module.

25 In terms of basic structure, the exemplary embodiment shown in Figure 10 corresponds to the exemplary embodiment of Figure 1. In order to save space, the transfer modules T1 and T2 were arranged at an angle of nearly 90° relative to one another. The electrophotography modules, analogous to the embodiment according to Figure 1 are installed at an angle of approximately 45° relative to the perpendicular.
30 The angle of 45° is generally advantageous because, due to the slant, all developer stations 16/1 through 16/5 can be installed above one another or, respectively, next to

one another. In general, the developer stations 16/1 through 16/5 can be arranged along a path of the photoconductor (13) proceeding in an angular range of 35° through 50° to the perpendicular.

The embodiments [sic] according to Figure 11, which basically likewise
5 corresponds to Figure 1, exhibits transfer modules T1 and T2 that are arranged at an obtuse angle relative to one another. The transfer modules are fanned open in the transfer region between transfer modules and electrophotography modules, so that a broader seating surface for the transfer band 19 at the photoconductor band 13 derives.

10 In conformity with the illustration of Figure 12, it is also possible to arrange the transfer modules T1 and T2 opposite one another in a vertical installed position. The electrophotography modules E1 and E2 can be fashioned proceeding horizontally in the region of the image-generating means with character generator 15, charging means 14, intermediate exposure means 23, cleaning station 22 and
15 discharge means 21. The transfer band 19 thus proceeds on a straight line in this region, this facilitating the image generation and the arrangement of the units.

As can be seen from the embodiment corresponding to Figure 13, it is also possible to arrange an additional transfer printing roller U between the transfer band modules T1 or, respectively, T2 and the electrophotography modules.

20 Electrophotography module E1, E2 and transfer module T1, T2 can thus be exactly matched to one another, and the advantages of the transfer technology also take effect in the region between electrophotography module and transfer module.

The embodiment according to Figure 14 is a modification in the embodiment of Figure 12 or, respectively, Figure 13 with corresponding arrangement
25 of transfer module T1, T2 and electrophotography module E1, E2.

The device has been described up to now with reference to operation with continuous form paper. According to the versions of Figures 15 through 18, however, it can also be designed for operation with single sheets. To this end, the transport channel 11 corresponding to the embodiment of Figure 15 contains a plurality of

conveying rollers 42 for single sheets. The delivery module M1 comprises three reservoirs 43, 44 and 45 for single sheets. Corresponding haul-off devices 46 are coupled to the reservoirs 43, 44 and 45. These haul-off devices 46 are in turn in communication with the transport channel 11. Controlled by the control means ST,
5 the haul-off devices 46 are corresponding activated and a single sheet is supplied to the transport channel 11. The printing of the single sheets ensues analogous to the way described in conjunction with Figure 1. The single sheets are thereby supplied either in start-stop mode or are also continuously printed given monochrome printing. Analogous to the delivery module M1, the post-processing module M4 contains three
10 collecting receptacles 47, 48 and 49 that are in communication with the transport channel via corresponding channels with allocated guide shunts. A job-by-job deposit of the printed single sheets in the collecting containers 47, 48 and 49 of the post-processing module M4 is thus possible. For example, it is possible to compile corresponding jobs in the collecting containers 47, 48 and 49, namely dependent on
15 the charging via the reservoir of the delivery module M1. Thus, the reservoirs 43, 44 and 45 of the delivery module M1 can, for example, contain different types of paper with different size and quality. These papers can then be correspondingly printed and deposited in the collecting containers of the post-processing module M4.

The exemplary embodiment of Figure 16, which is suitable for single
20 sheets, corresponds in terms of basic structure to the exemplary embodiment of Figure 15, with the difference that, analogous to the exemplary embodiment of Figure 5, the electrophotography modules E1 and E2 are installed perpendicularly relative to one another in space-saving fashion.

As regards the exemplary embodiment of Figure 17, its fundamental
25 structure corresponds to the exemplary embodiment of Figure 2, i.e. only one electrophotography module E1 with a transfer module T1 is arranged at one side of the transport channel 11. Given operation with continuous form paper, it would thus only be suitable for simplex mode. The exemplary embodiment of Figure 17, however, contains a turn-over means W1 following the fixing module M3 in paper

conveying direction, this turn-over means being constructed in a way known from single sheet technology. A return channel R is connected to the turn-over means W1, this return channel R discharging into the actual transport channel 11 preceding the transfer printing station 24 of the transfer module T1 as viewed in conveying direction of the paper. It is thus possible to print single sheets on both sides, even though the device comprises an electrophotography module E1 and a transfer module T1 at only one side. After a collective toner image has been initially applied on a single sheet on the front side, this collective toner image is fixed in the fixing module M3. Subsequently, the single sheet fixed in this way is reversed in terms of its moving direction in the turn-over station W1 and is resupplied to the transfer printing station 24 via the return channel in turned-over form for the acceptance of a backside toner image. After fixing the backside toner image, the turn-over station W1 is deactivated and the duplex-printed single sheet is deposited in one of the collecting containers 47, 48 or 49. With the means shown in Figure 17, it is possible to print, for example, in simplex mode performance-adapted and to activate a duplex printing mode as needed by turn-over.

In conformity with the illustration of Figure 18, it can be beneficial to pull the opposite positions of the transfer modules T1 and T2 away from one another. For example, it has been found that the transfer modules T1 and T2 lying opposite one another mutually influence one another in the region of their transfer printing stations 24, this requiring special shielding measures. When the transfer modules T1 and T2 are locationally separated according to the illustration of Figure 18, then no special shielding and no particular decoupling are required. It is also possible to arrange an additional fixing module M3/1, which functions as intermediate fixing module, between the transfer printing stations 24 of the transfer modules T1 and T2. It is thus not necessary to transport the sheet-shaped recording medium in non-contacting fashion in the region of the fixing module M3/1. For example, it can have its side that has not yet been printed lying on a conveyor belt 50, and can be conveyed along infrared radiators 32 with the assistance of this conveyor belt. After applying the

backside toner image, the backside toner image is fixed with the backside fixing means M3/2 in an analogous fashion. Here, too, the single sheet is transported in the region of the side that has already been fixed, namely with the conveyor belt 50, and the fixing of the loose toner image of the backside ensues via the infrared radiators 32.

5 The function of the device corresponds to the embodiment of Figure 15.

Given the exemplary embodiments described up to now, what are referred to as cold transfer bands are employed as transfer bands 19 in the region of the transfer modules T1 and T2. This means that the transport or, respectively, the transfer of the toner images onto the transfer band ensues on the basis of electrostatic
10 forces of adhesion. After the transfer printing of the loose toner images onto the recording medium 10, a hot fixing is then needed in the described way. When, corresponding to the illustration of Figure 19, what are referred to as warm transfer bands are employed instead of the cold transfer bands, it is possible to transfer the collective toner image onto the recording medium 10 in the region of the transfer
15 printing station 24 and to simultaneously fix it with the transfer event. To this end, a heating means 51 is allocated to each of the transfer bands 19 in the region of the transfer modules T1 and T2, this heating means 51 heating the transfer band 19 with the collective toner image located thereon, namely into the boundary region in which the toner image becomes sticky. The transfer band 19 is subsequently rolled on the
20 recording medium 10 with the warm toner image. The toner image fuses with the surface of the recording medium 10. Toner residues are removed via a cleaning means 26, as described. A cooling device 52, for example in the form of a blower, is arranged following the cleaning station 26 as viewed in conveying direction of the transfer band 19, this serving the purpose of cooling the transfer band 19. After this,
25 it is again in the transfer condition wherein toner images can be transferred from the photoconductor band 13 onto the transfer band 19. The printer device described in Figure 19 can be operated in all operating conditions analogous to the printer device of Figure 1. The fixing, however, ensues immediately after the transfer printing

process. When the fixing is inadequate, it is also possible to additionally arrange a fixing module at the output side at the paper guidance channel 10.

The invention was described above with reference to a high-performance printer means. However, it is also possible to fashion the device as copier means. In
5 this case, the original to be copied is scanned in the standard way and the scan signals are supplied directly to the character generator 15. Further, transfer bands 19 were employed in the transfer modules T1 and T2. However, it can also be imagined that transfer drums be employed instead of transfer bands.

List of Reference Characters

	M1	delivery module
	M2	printer module
	M3	fixing module
5	M4	post-processing module
	10	recording medium, paper, single sheet or, respectively, continuous form paper
	11	transport channel
	E1	electrophotography module, front side
10	E2	electrophotography module, back side
	T1	transfer module, front side
	T2	transfer module, back side
	12	deflection drums
	13	photoconductor
15	14	charging means
	15	character generator
	16/1 through 16/5	developer stations
	17	intermediate exposure means
	18	transfer printing means, transfer region
20	19	transfer band
	20	transfer corona means
	21	discharge corona means
	22	cleaning station
	23	intermediate exposure means
25	24	transfer printing station
	25	deflection drum
	26	cleaning station
	27	deflection drum
	28	transfer printing drum

	29	transfer printing corotron
	30	loop-forming means
	31	stacking means
	32	infrared radiator
5	33	deflection drum
	34	cooling element
	35	deflection drum
	36	cutter means
	37	stacking means
10	GS	device controller
	ST	control means
	B	control part
	38	conveyor drums
	39	charging corona means
15	B1	image-generating means
	B2	image-generating means
	40	cooperating drum
	41	transfer printing drum
	U	transfer printing roller
20	42	conveyor drum (single sheets)
	43, 44, 45	reservoir
	46, 47, 48	haul-off means
	49	collecting container
	W1	turn-over means
25	R	return channel
	M3/1	front side fixing means (intermediate fixing means)
	50	conveyor belt
	M3/2	back side fixing means, final fixing means
	51	heating device

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cooling device

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CLAIMS:

1. A printer or copier device for at least one of performance-adapted, monochrome and chromatic single-sided or both-sided printing of a recording medium, comprising:

5 at least one electrophotography module for generating toner images, said at least one electrophotography module including:

a continuous photoconductor on which the toner images are generated,

10 a plurality of developer stations arranged along a surface of the continuous photoconductor and individually switchable to generate the toner images on said continuous photoconductor, said developer stations each being respectively allocated to a single color separation toner
15 image;

at least one transfer module including:

an endless transfer band that has a transfer accepting region for accepting toner images from the at least one electrophotography module and a controllable
20 transfer printing region for transfer printing of toner images onto the recording medium, wherein in a transfer printing condition of the at least one transfer module the endless transfer band contacts the recording medium and in a collecting condition of the at least one transfer module the
25 endless transfer band is distanced from the recording medium;

a transport channel including:

controllable transport for the recording medium, the recording medium being a continuous web-shaped recording

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medium, said at least one electrophotography module and said at least one transfer module being arranged at at least one side of the transport channel;

a controller coupled to the at least one
5 electrophotography module and to the at least one transfer module and to the controllable transport that controls the at least one electrophotography module and the at least one transfer module and the controllable transport such that printing is performed in two printing modes, said two modes
10 being a start/stop mode and a continuous mode wherein,

for printing a recording medium moved through the transfer printing region in the start-stop mode in a first operating condition of the apparatus, the color separation toner images in the collecting condition of the transfer
15 module are serially transferred from the electrophotography module onto the transfer band and an exactly registered collective image is produced on the transfer band, said collective image then being transferred in the transfer printing region of the transfer module onto the recording
20 medium, and,

for printing a recording medium moved continuously through the transfer printing region in the continuous mode of the apparatus of the transfer module, the toner images are directly transferred from the at least one
25 electrophotography module onto the endless transfer band and are transferred onto the recording medium without collecting.

2. A printer or copier device according to claim 1, wherein said at least one electrophotography module includes

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at least one electrophotography module allocated to a front side of the recording medium with a first appertaining transfer module and

at least one electrophotography module allocated
5 to a back side of the recording medium with a second appertaining transfer module, said first and second transfer modules being arranged at both sides of the transport channel.

3. A printer or copier device according to claim 2,
10 wherein said first and second transfer modules are arranged lying opposite one another in the transfer printing region.

4. A printer or copier device according to claim 2,
wherein said first and second transfer modules have their transfer printing regions arranged offset relative to one
15 another along the transport channel.

5. A printer or copier device according to claim 4,
further comprising; a fixing module with thermal fixing following every transfer printing region of the first and second transfer modules arranged offset relative to one
20 another as viewed in a conveying direction of the recording medium.

6. A printer or copier device according to any one of claims 1 to 4, further comprising:

at least one fixing module following the transfer
25 printing region in a conveying direction of the recording medium and having a thermal fixing apparatus arranged therein.

7. A printer or copier device according to claim 6,
wherein the thermal fixing apparatus is an infrared fixing
30 apparatus that works in a non-contacting fashion.

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8. A printer or copier device according to claim 6, wherein said thermal fixing apparatus includes

a conveyor belt that accepts the recording medium with its side that has not yet been toned or on which
5 toner is already fixed, and

an infrared apparatus lying opposite the conveyor belt for fixing loose toner images.

9. A printer or copier device according to claim 6, further comprising:

10 a post-processing module following the at least one fixing module and having a separating apparatus arranged therein.

10. A printer or copier device according to any one of claims 1 to 9, wherein said controllable transport includes
15 motor-driven conveyor rollers for the recording medium.

11. A printer or copier device according to any one of claims 1 to 10, further comprising: a delivery module for the recording medium having a web storing apparatus which is a loop-forming apparatus.

20 12. A printer or copier device according to any one of claims 1 to 11, wherein the developer stations are individually replaceable.

13. A printer or copier device according to any one of claims 1 to 12, wherein said at least one electrophotography
25 module includes a plurality of image-generating devices with a character generator and at least one developer station.

14. A printer or copier device according to any one of claims 1 to 13, wherein said endless transfer band is a cold

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transfer band, whereby transfer of the toner images ensues on the basis of electrostatic forces.

15. A printer or copier device according to any one of claims 1 to 13, wherein said endless transfer band is a heat transfer band and further comprising: an appertaining heating apparatus such that the toner image is simultaneously transfer printed and fixed in the transfer printing region between said endless transfer band and the recording medium.

10 16. A printer or copier device according to any one of claims 1 to 15, wherein said electrophotography module and said transfer module are arranged at only one side of the transport channel, and further comprising:

a turn-over apparatus with appertaining return channel arranged downstream of the fixing module, said turnover apparatus discharging into the transport channel upstream of the transfer printing region.

17. A printer or copier device according to any one of claims 1 to 16, wherein said developer stations are fluidizing developer stations.

18. A printer or copier device according to any one of claims 1 to 17, wherein said developer stations are arranged along a path of the photoconductor proceeding in an angular range of 35° through 50° relative to a perpendicular.

25 19. A method for at least one of performance-adapted monochrome and chromatic, single-sided or both-sided printing of a recording medium with a printer or copier device, whereby the device comprises:

a) at least one electrophotography module for generating toner images on a continuous photoconductor with

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the assistance of a plurality of developer stations arranged along the surface of the photoconductor and individually switchable that are respectively allocated to a single color separation toner image;

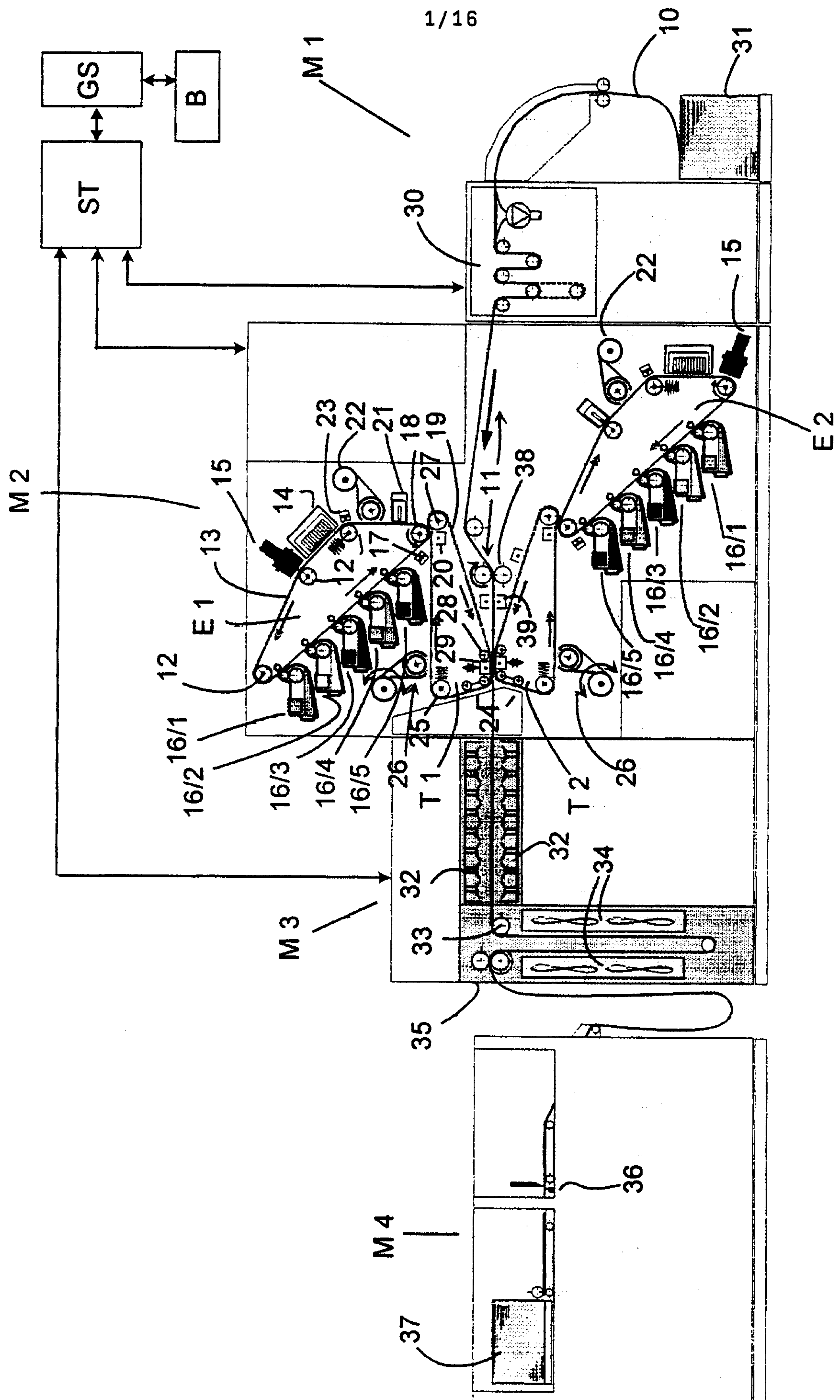
5 b) at least one transfer module with an endless transfer band that comprise a transfer region for accepting toner images from the electrophotography module and a controllable transfer printing region for the transfer printing of toner images onto the recording medium, whereby,
10 in a transfer printing condition of the transfer module, the transfer band contacts the recording medium and, in a collecting condition of the transfer module, the transfer band is distanced from the recording medium;

 c) a transport channel comprising a controllable
15 transport for the recording medium and having electrophotography and transfer module arranged at one side or both sides of the transport channel;

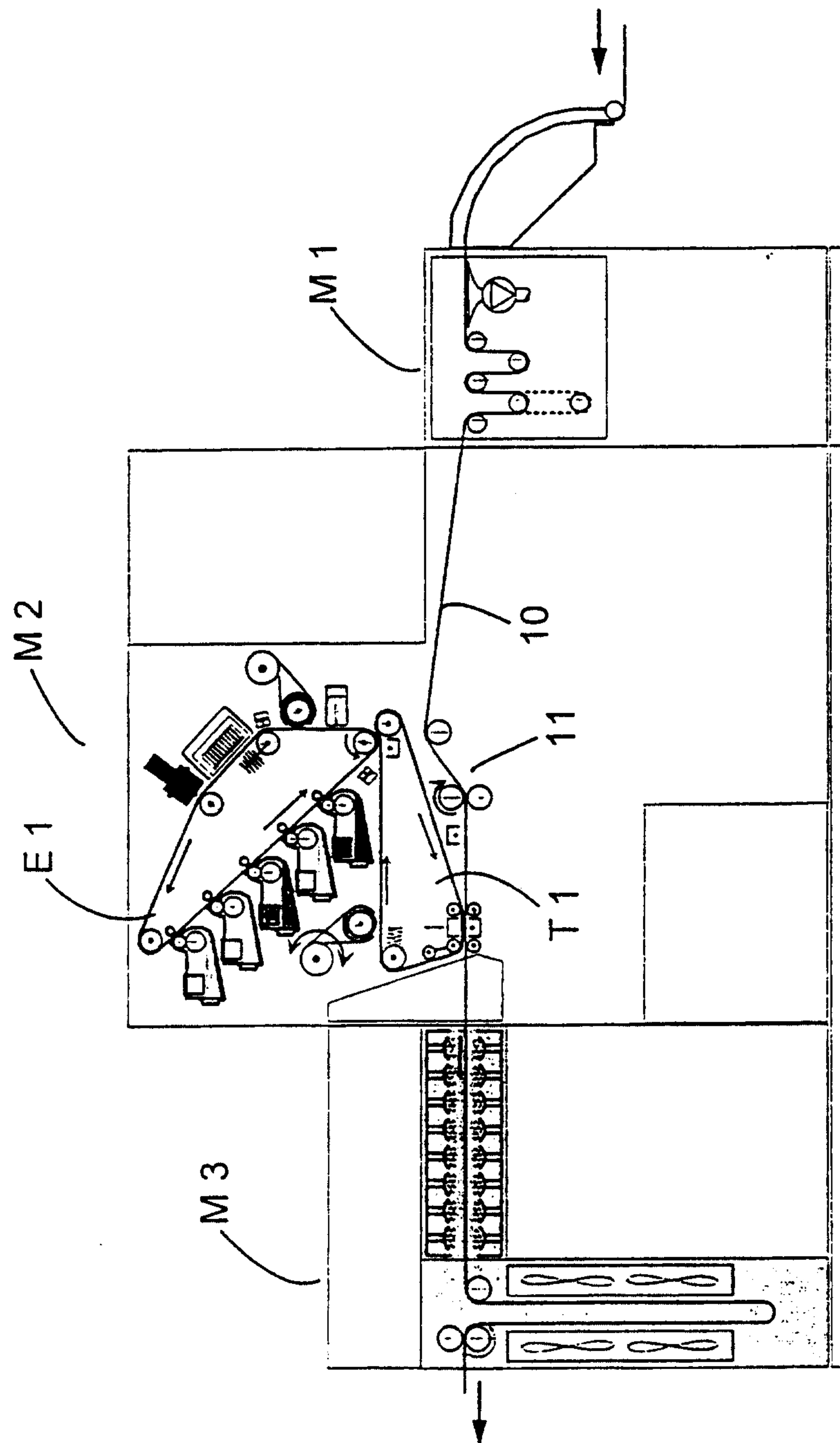
comprising the following steps:

 printing a continuous web-shaped recording medium
20 moved through the transfer printing region in start-stop mode in a first operating condition of the device by serial transfer from the electrophotography module, superimposed depositing as a collective image on the transfer band, and transfer printing of the collective image onto the recording
25 medium, and

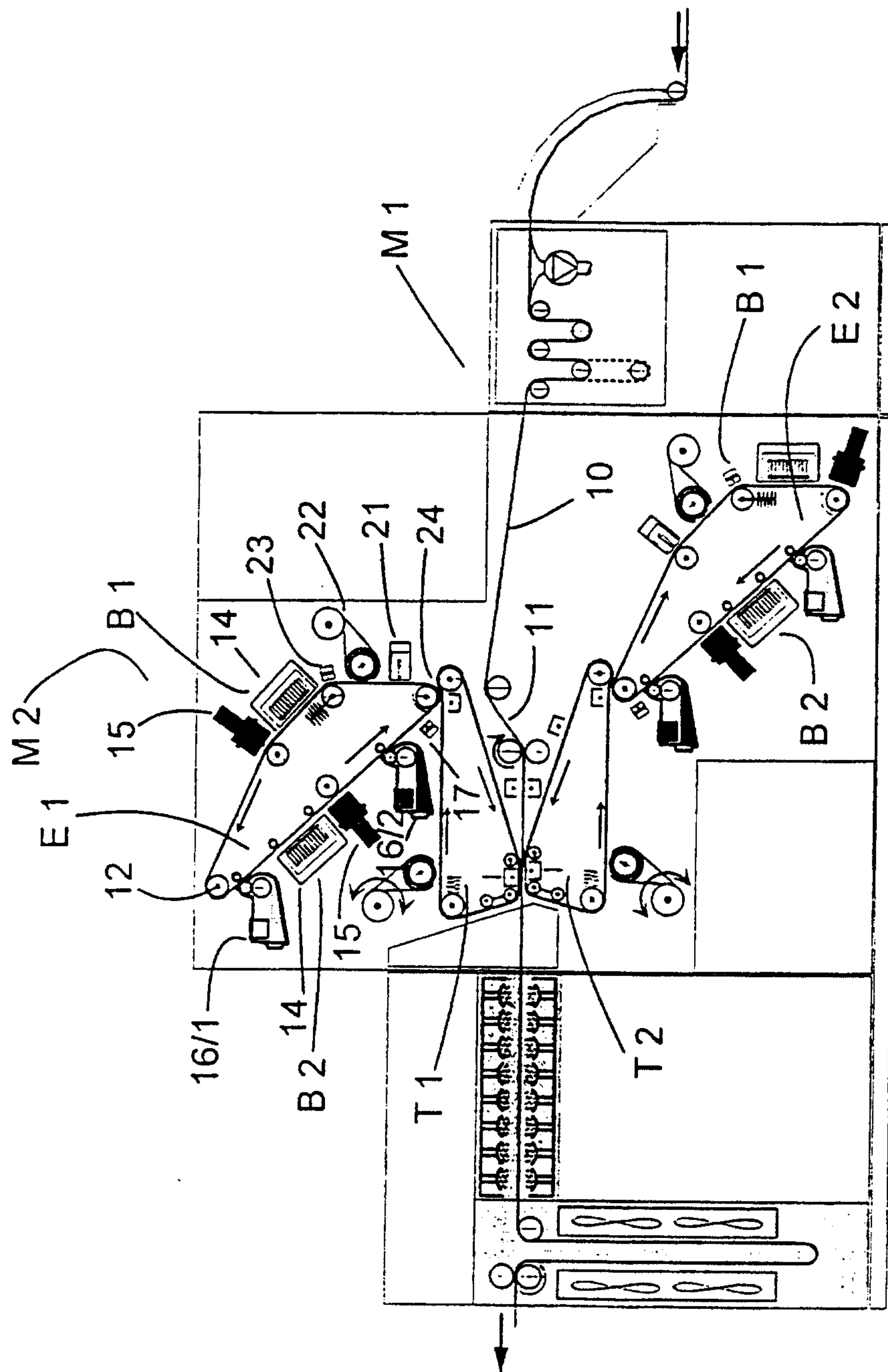
 printing a recording medium moved continuously through the transfer printing region in a second operating condition of the device by direct transfer of a toner image from the electrophotography module onto the transfer band
30 and from the transfer band onto the recording medium without collecting.



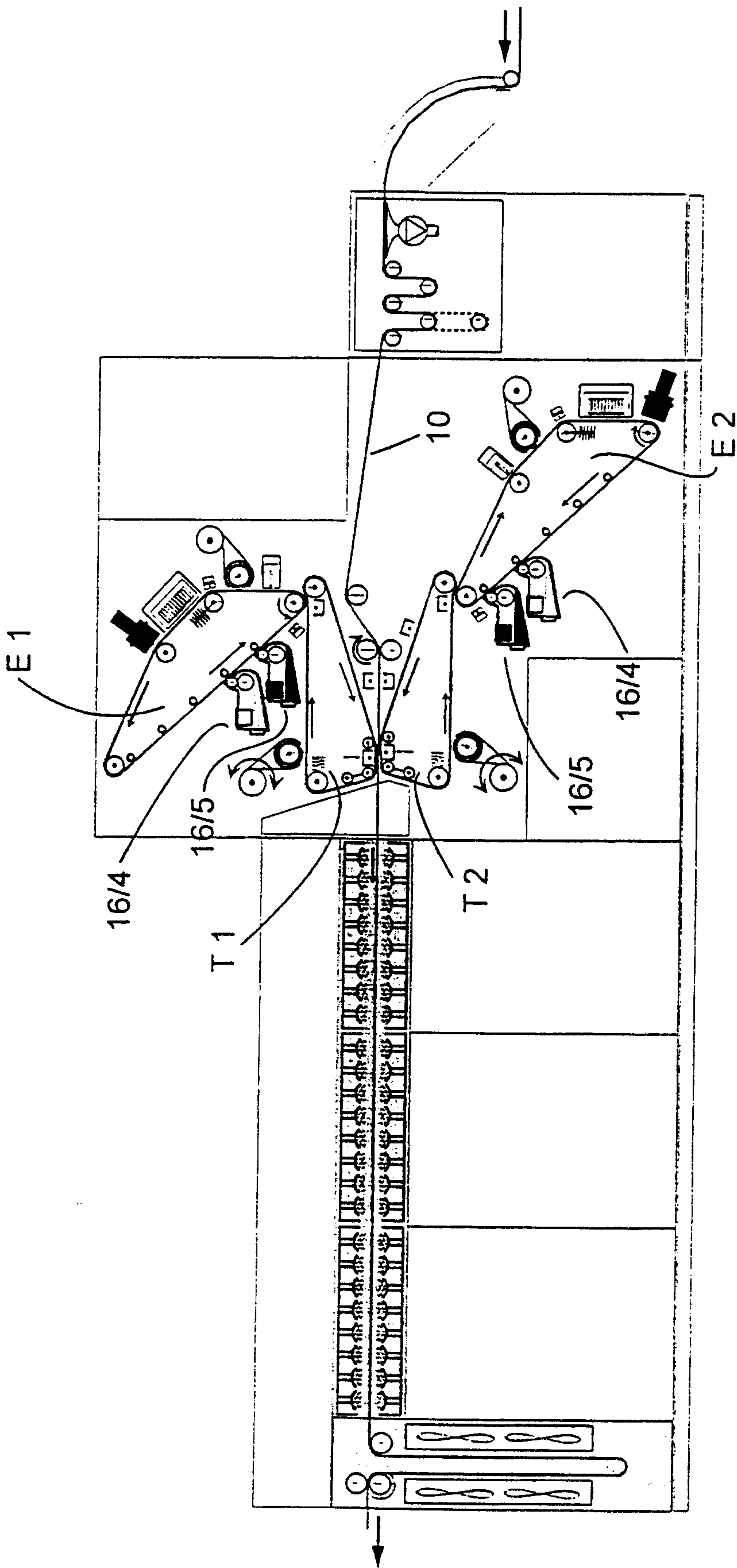
Figur 1



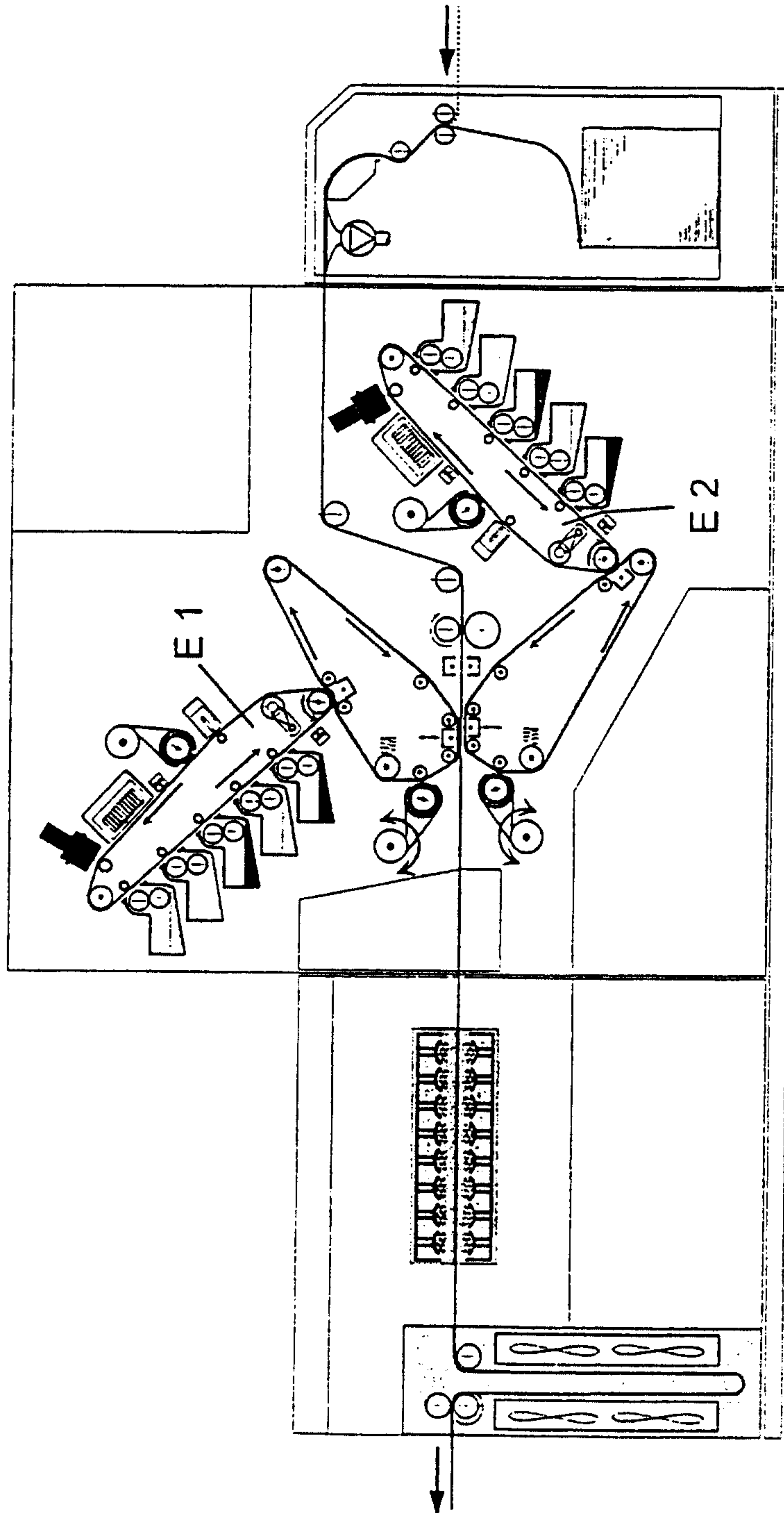
Figur 2



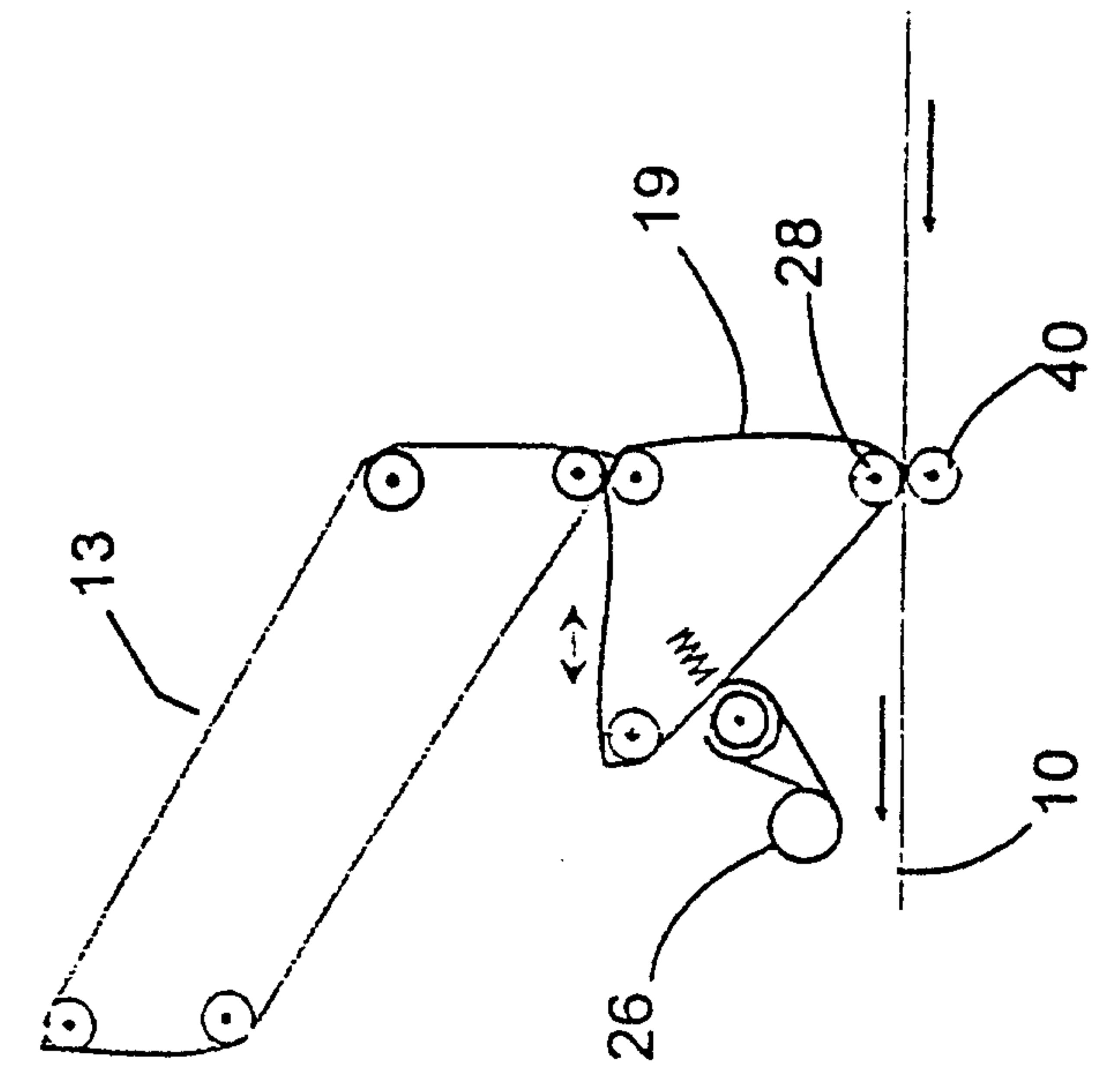
Figur 3



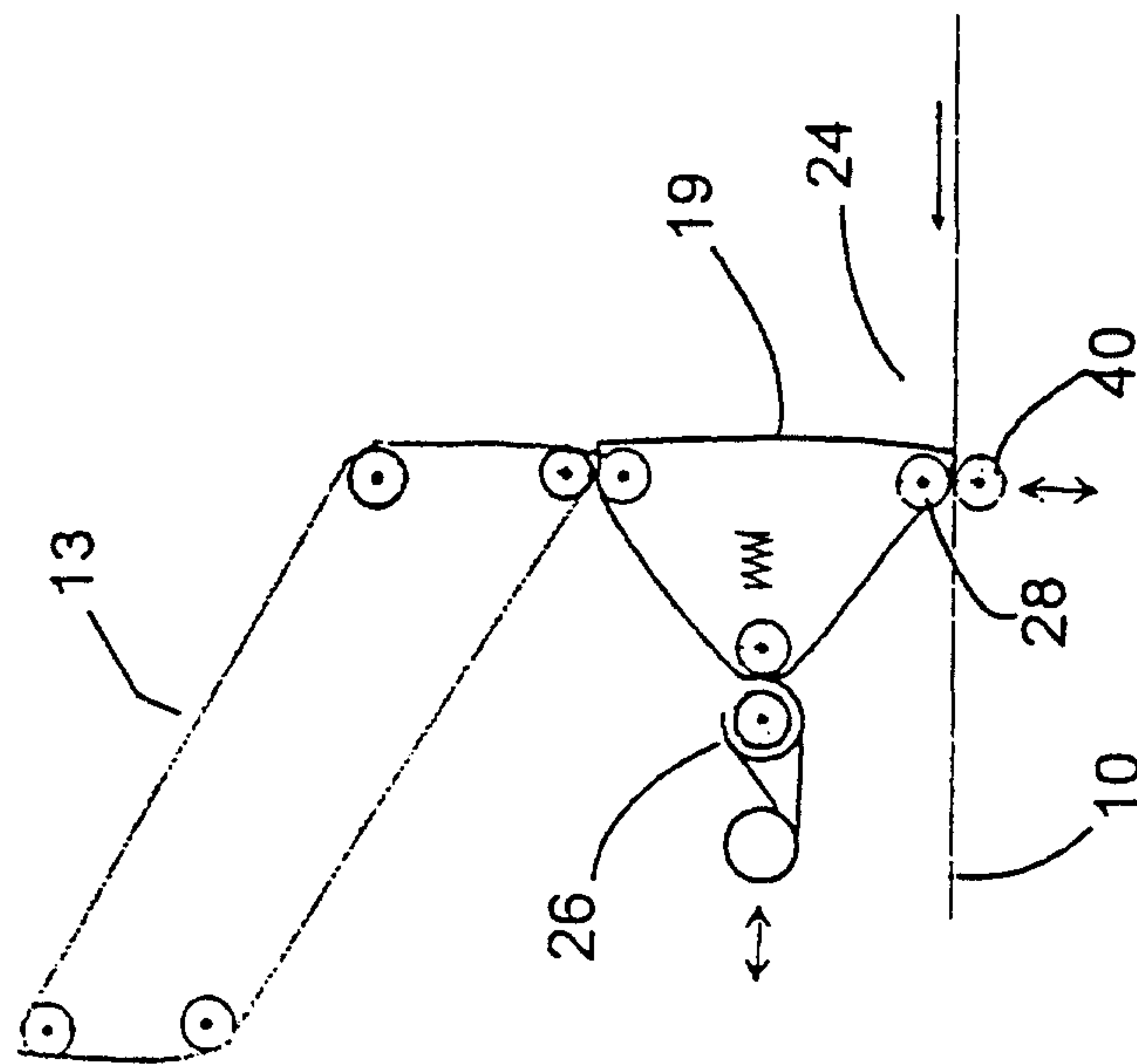
Figur 4



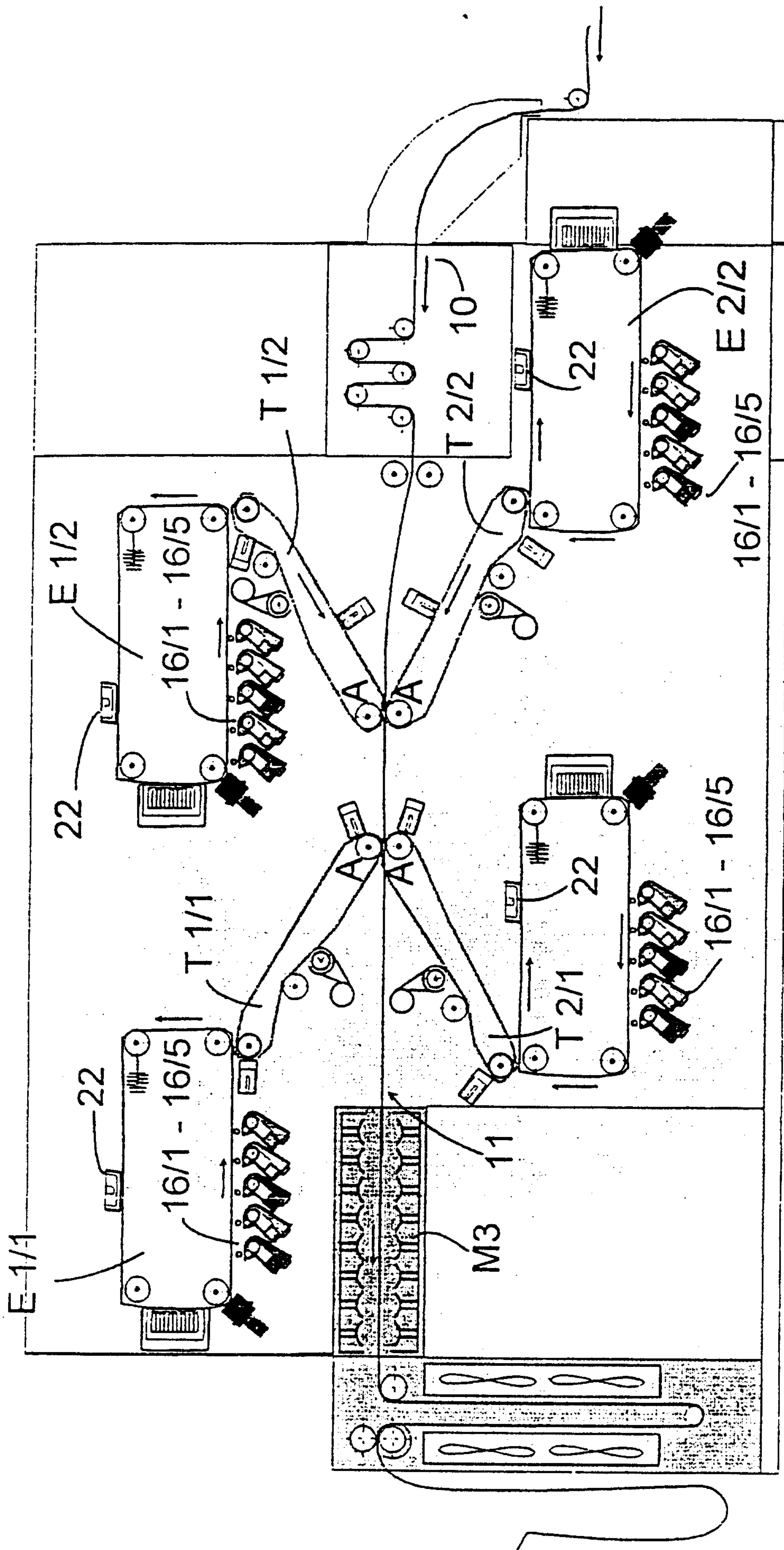
Figur 5



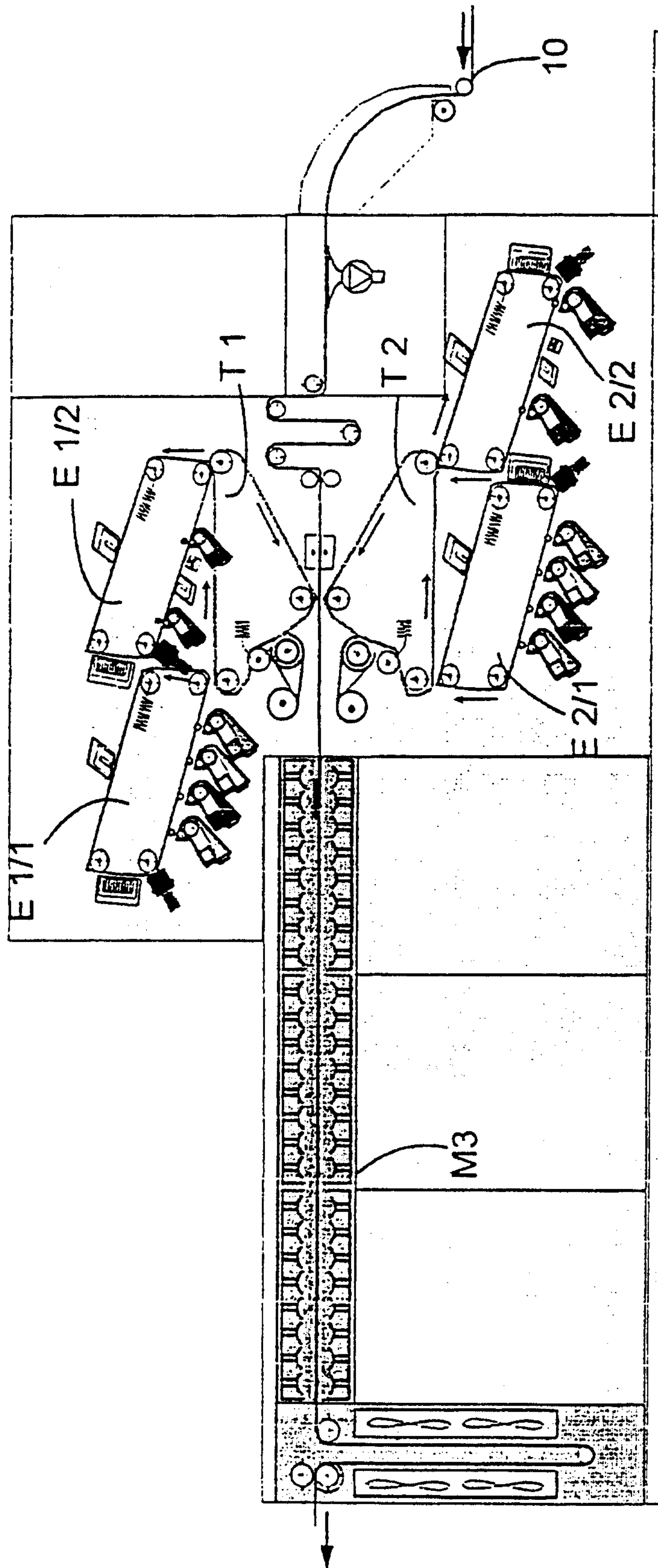
Figur 7



Figur 6

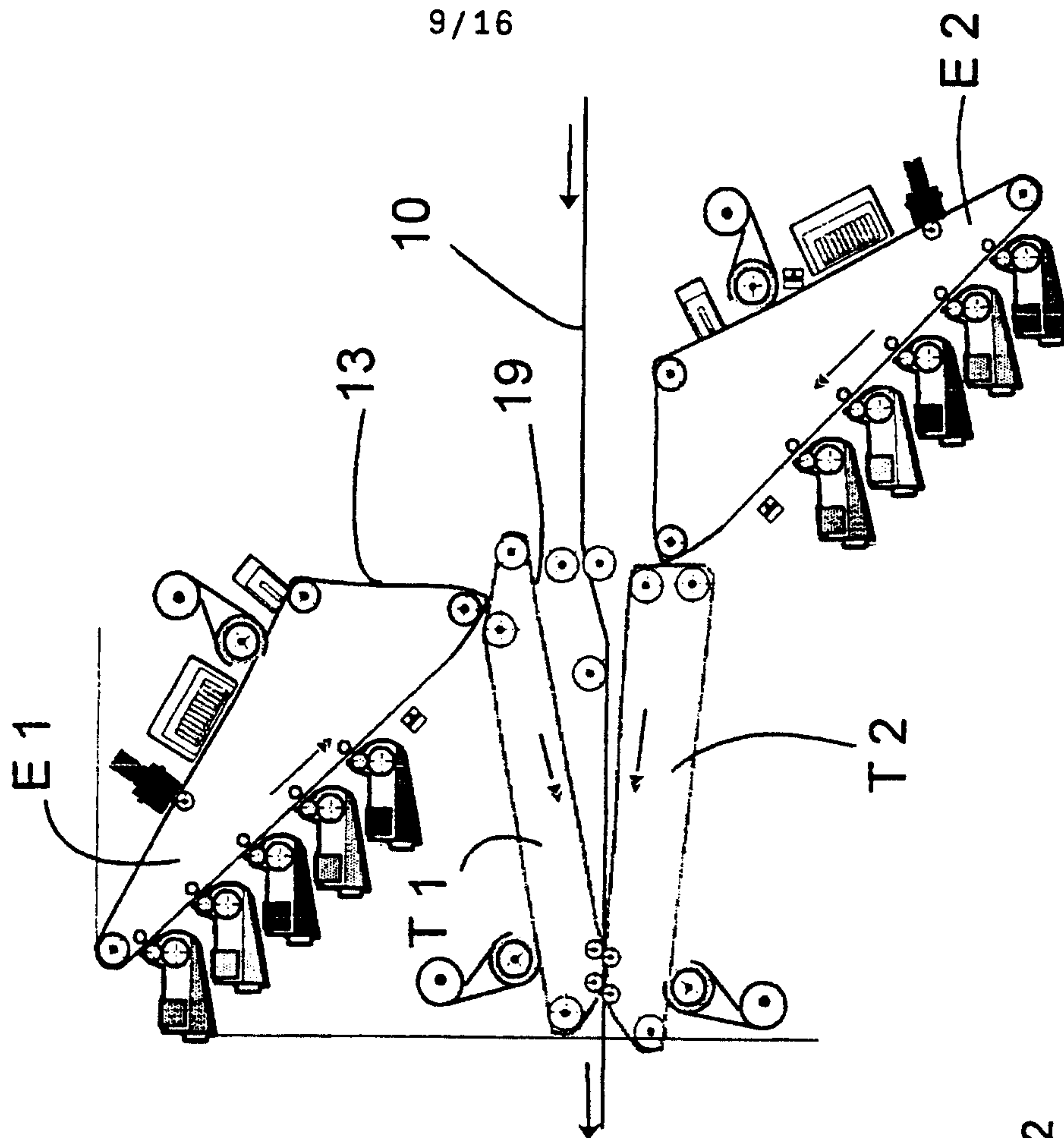


Figur 8

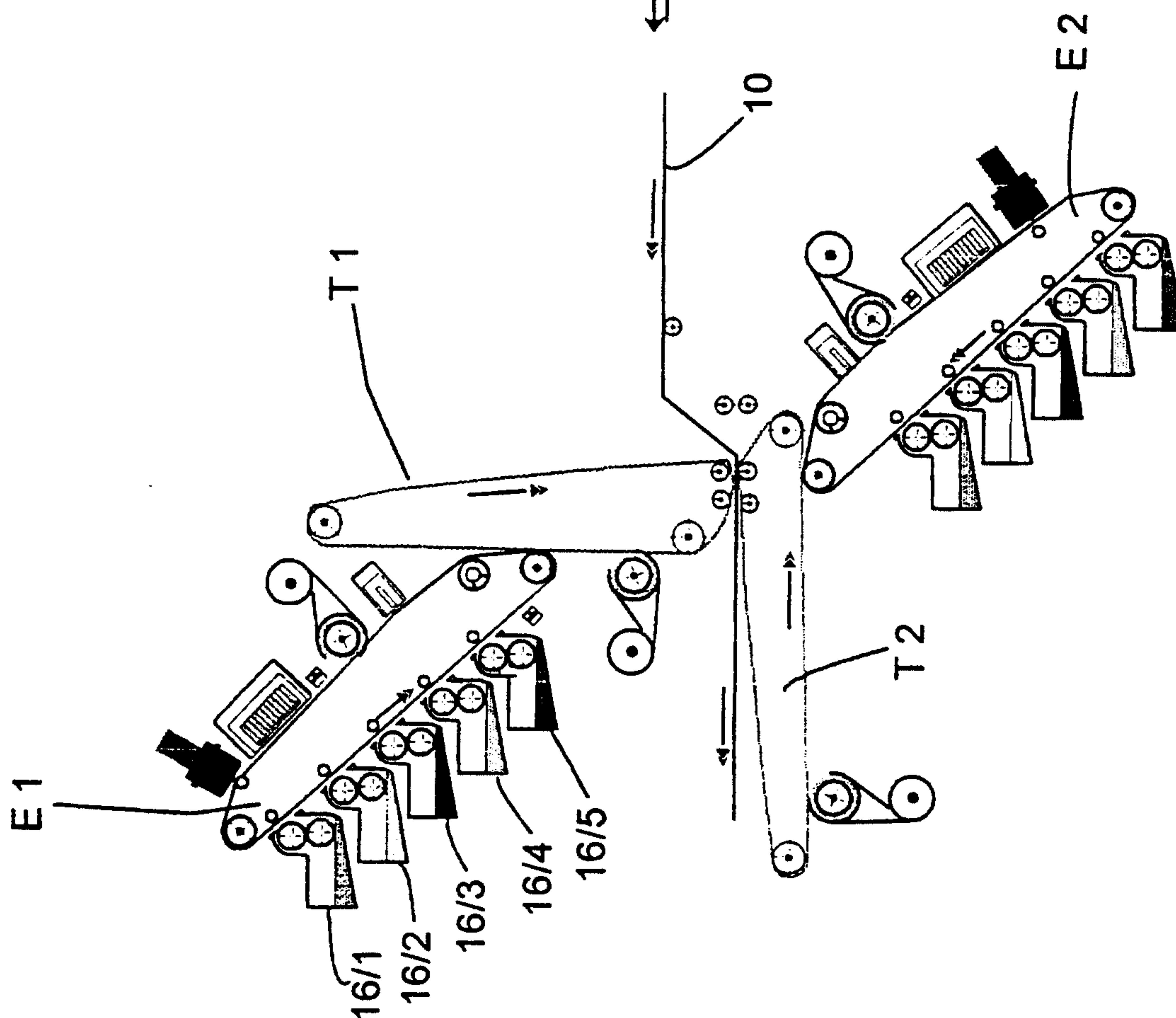


Figur 9

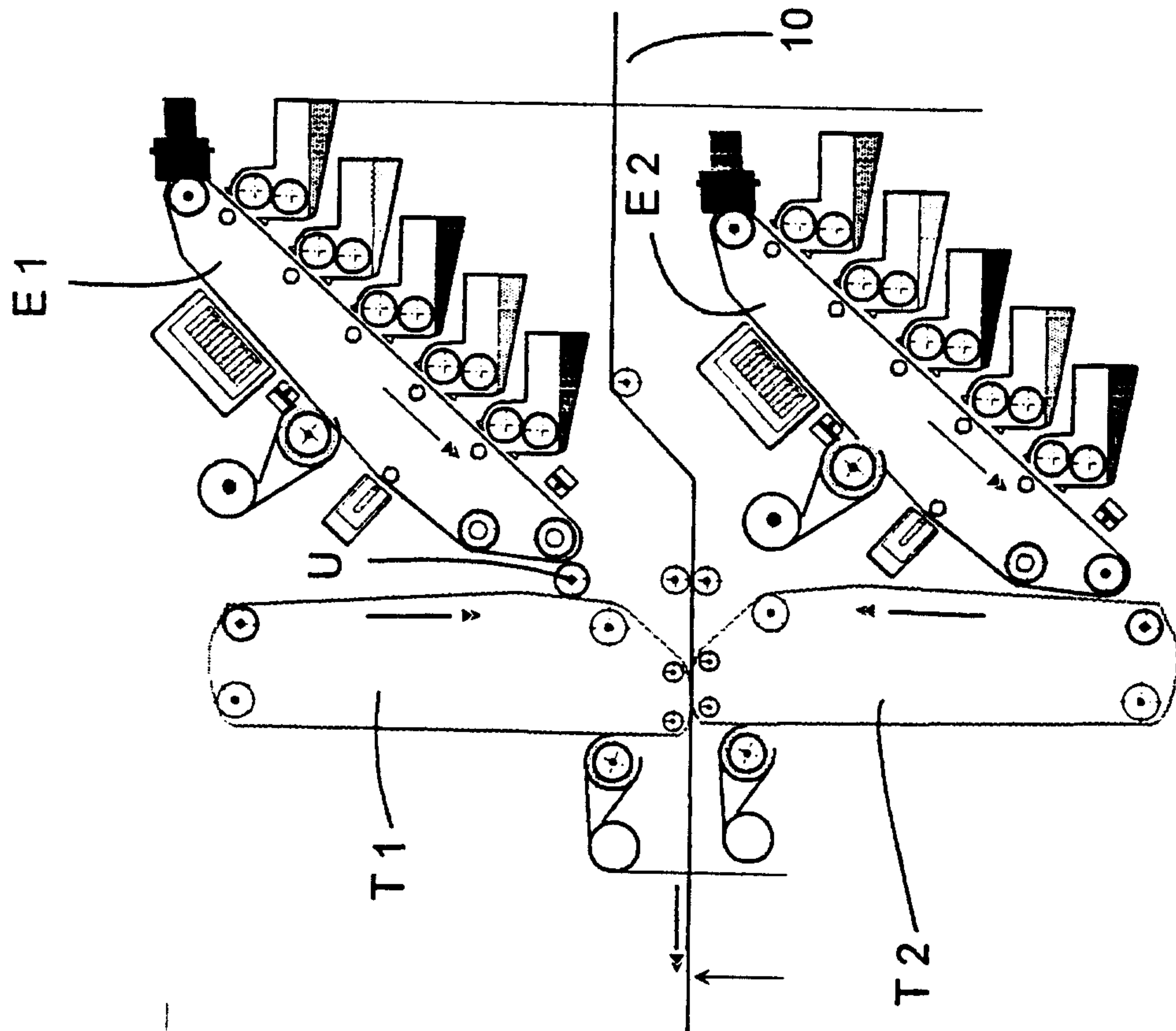
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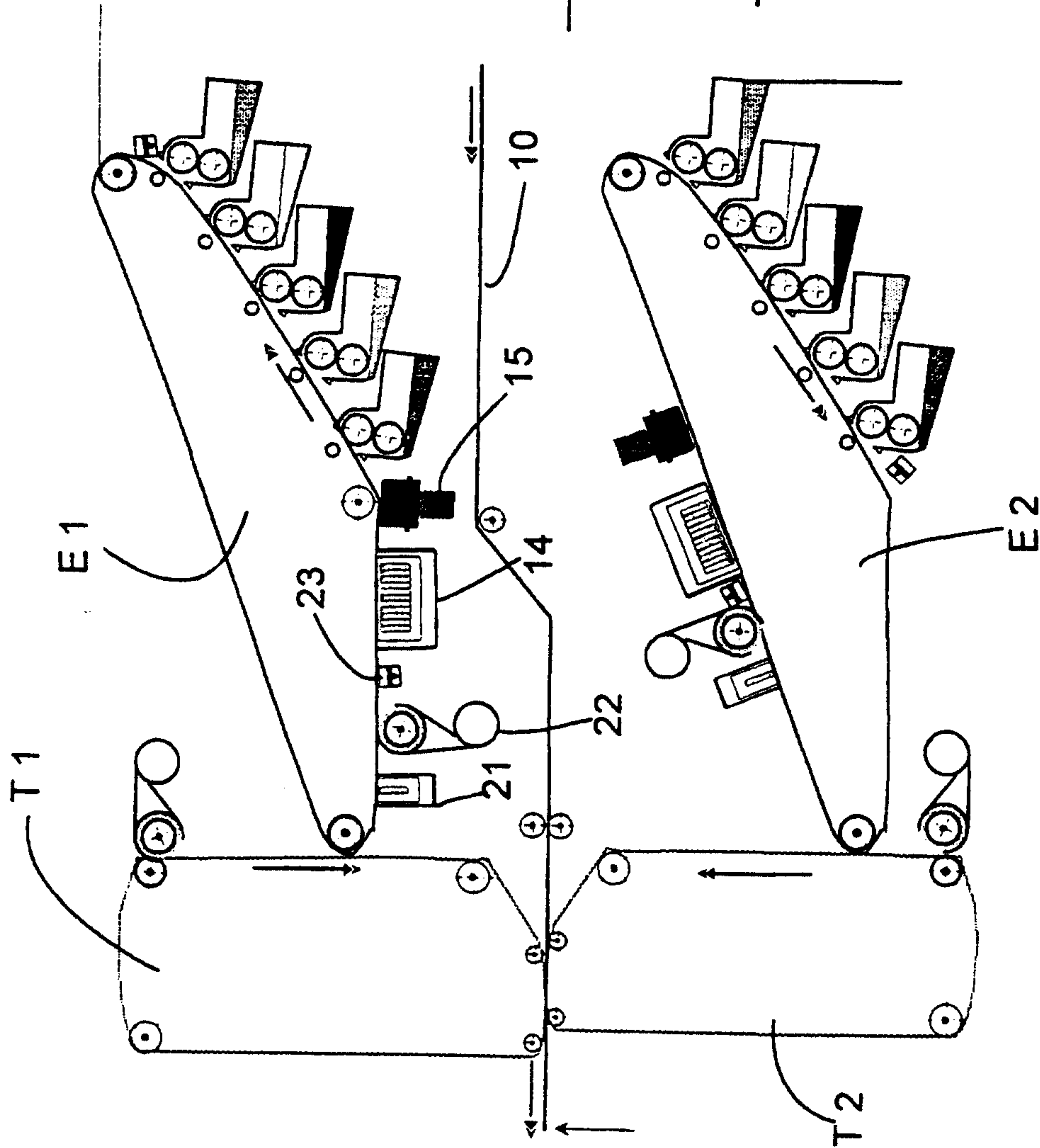
Figur 11



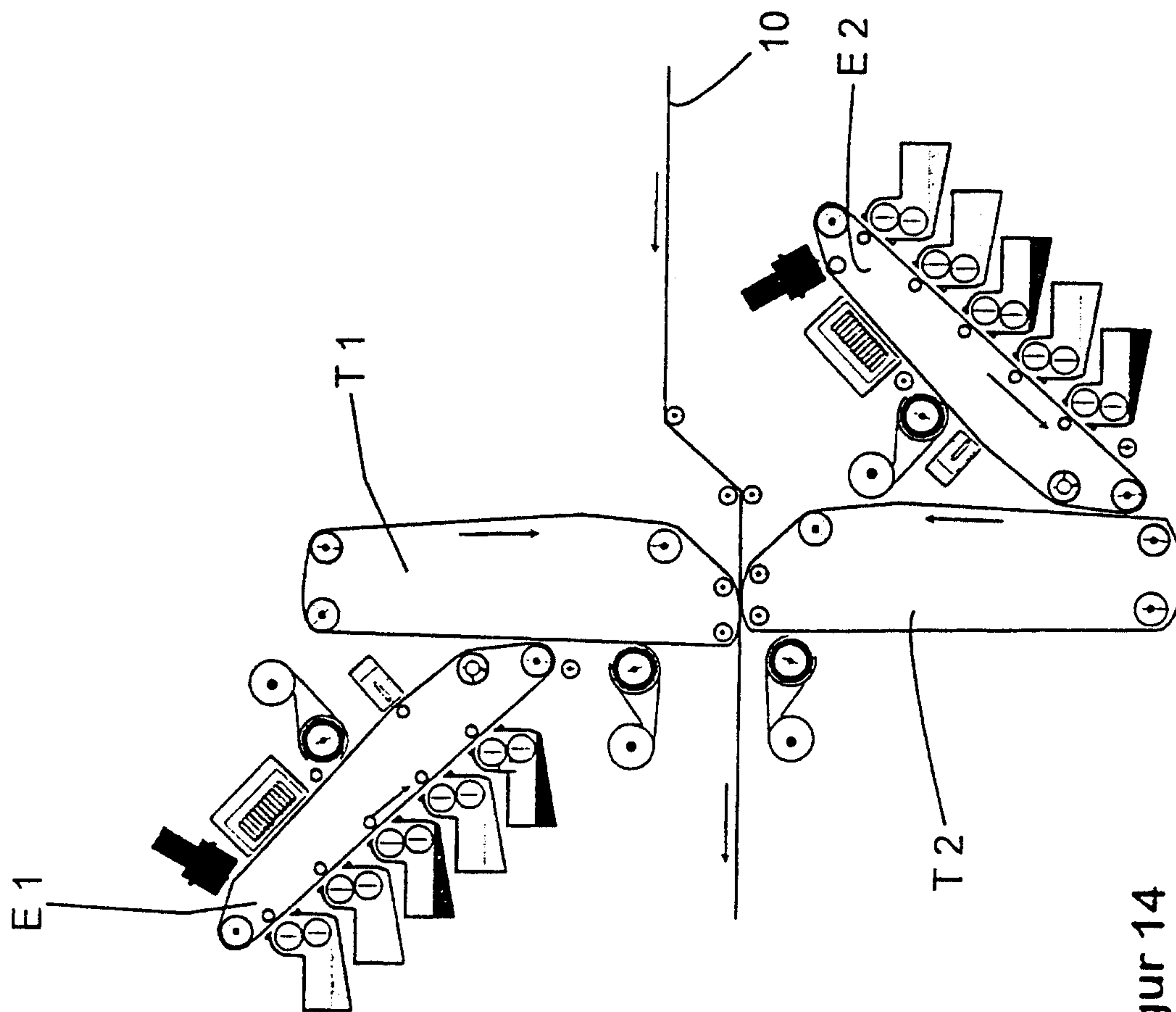
Figur 10



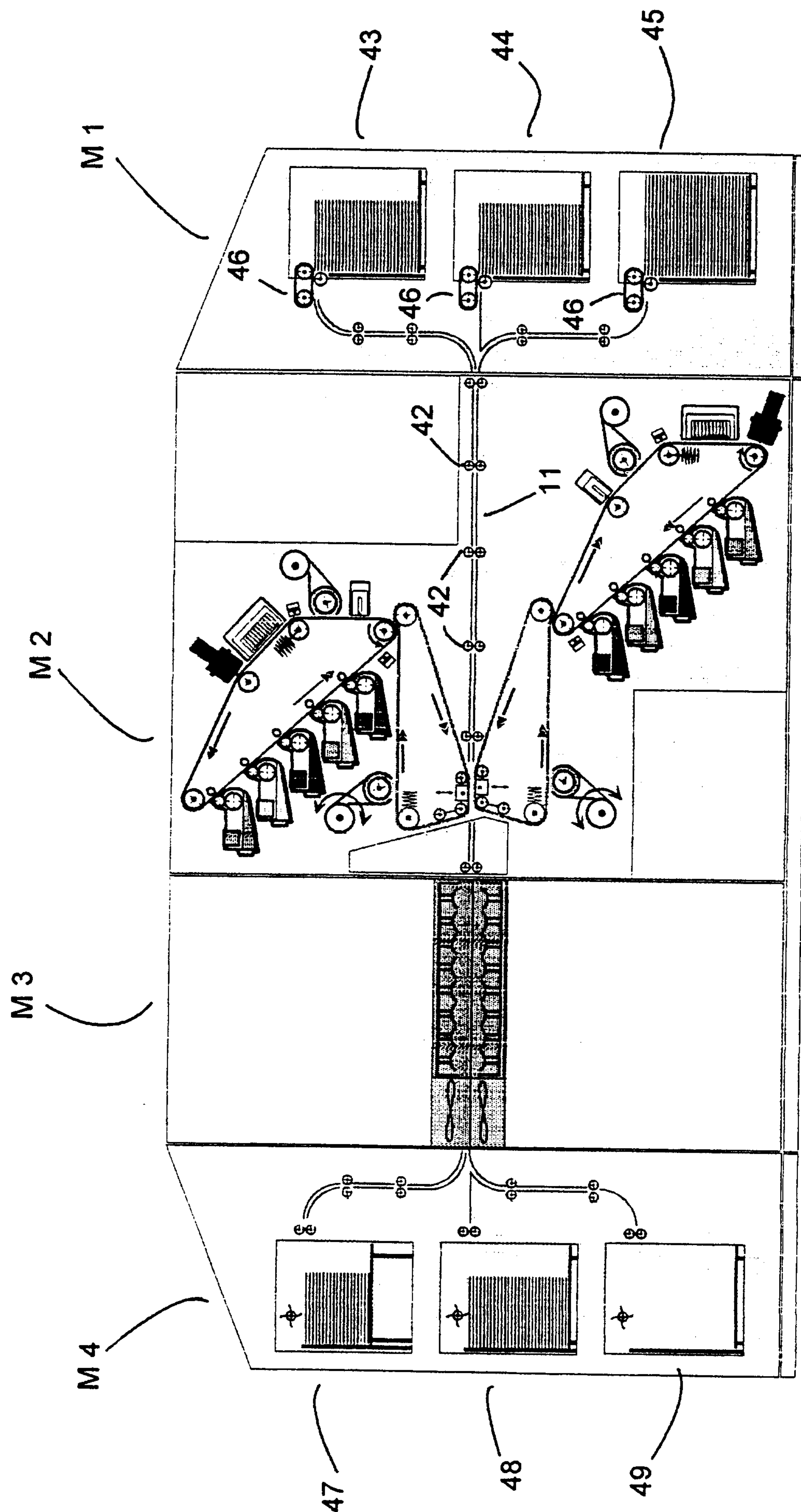
Figur 13



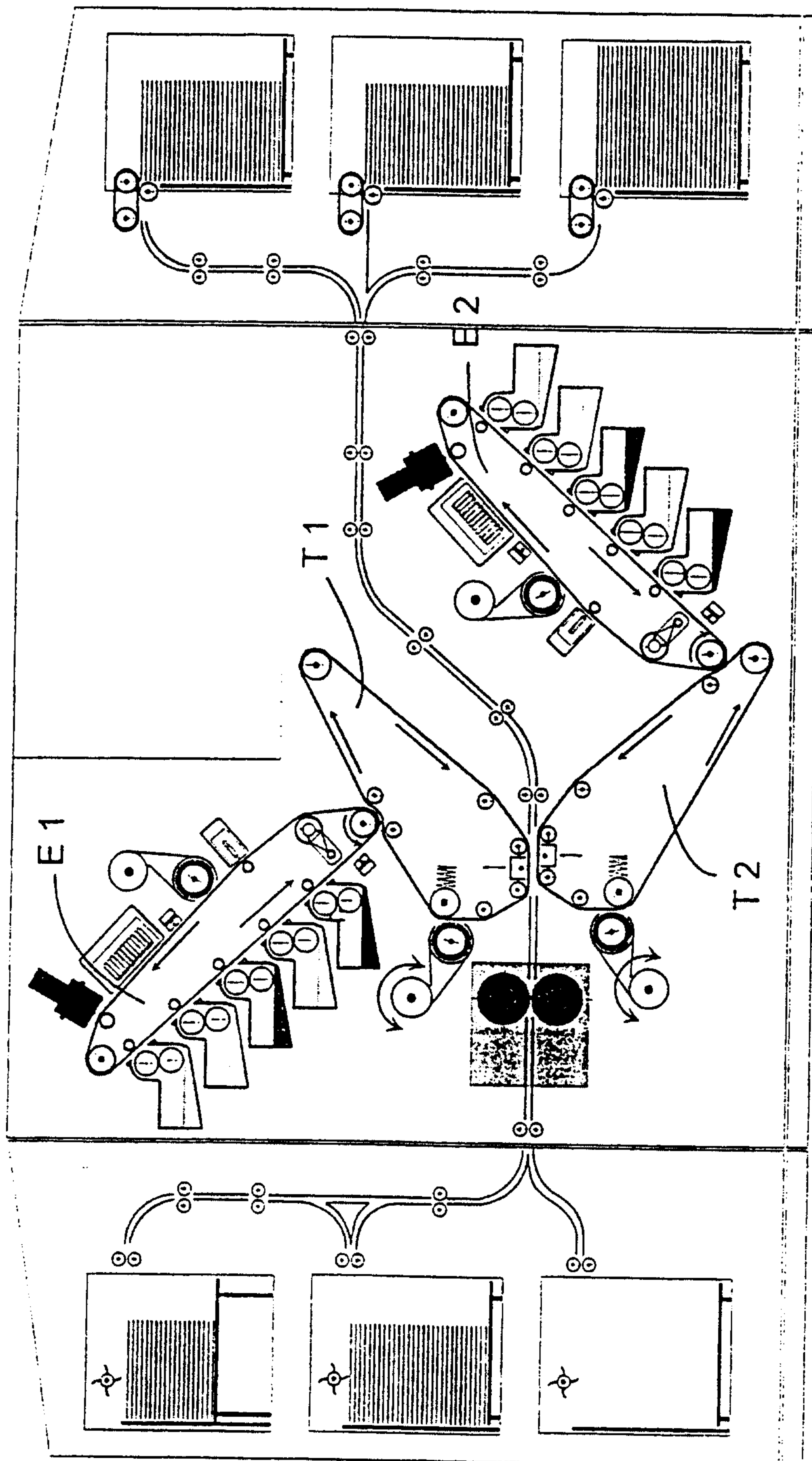
Figur 12



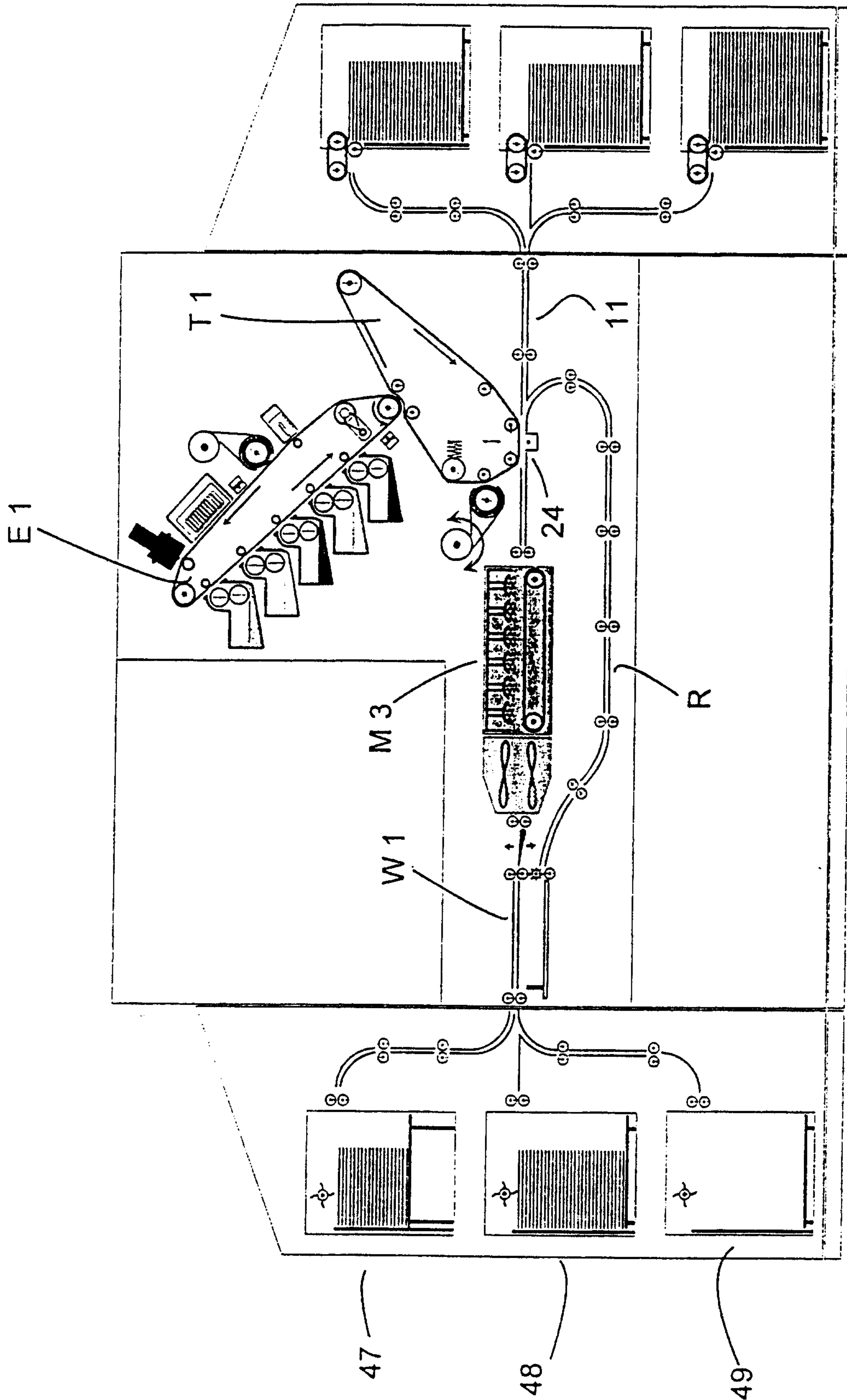
Figur 14



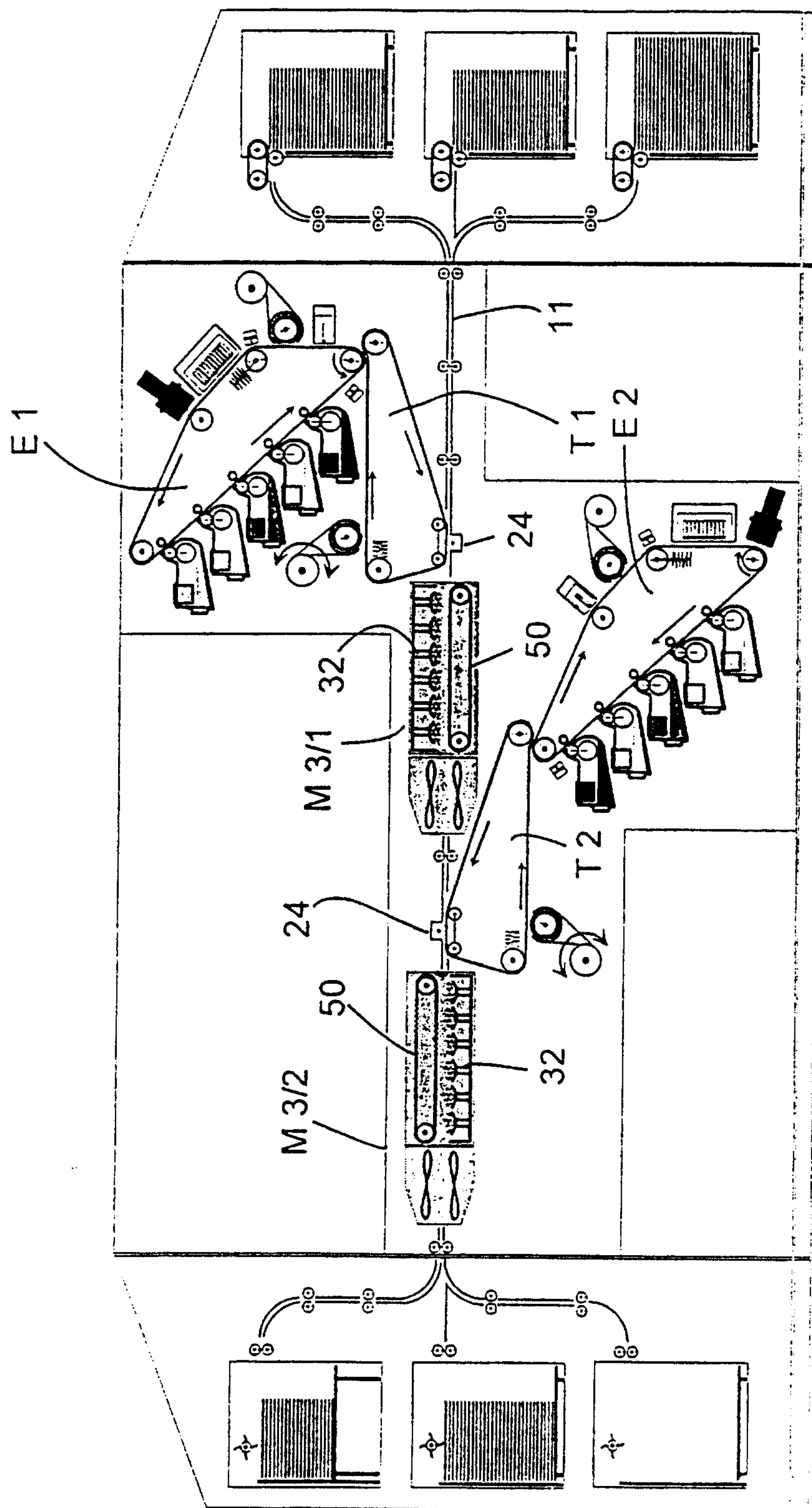
Figur 15



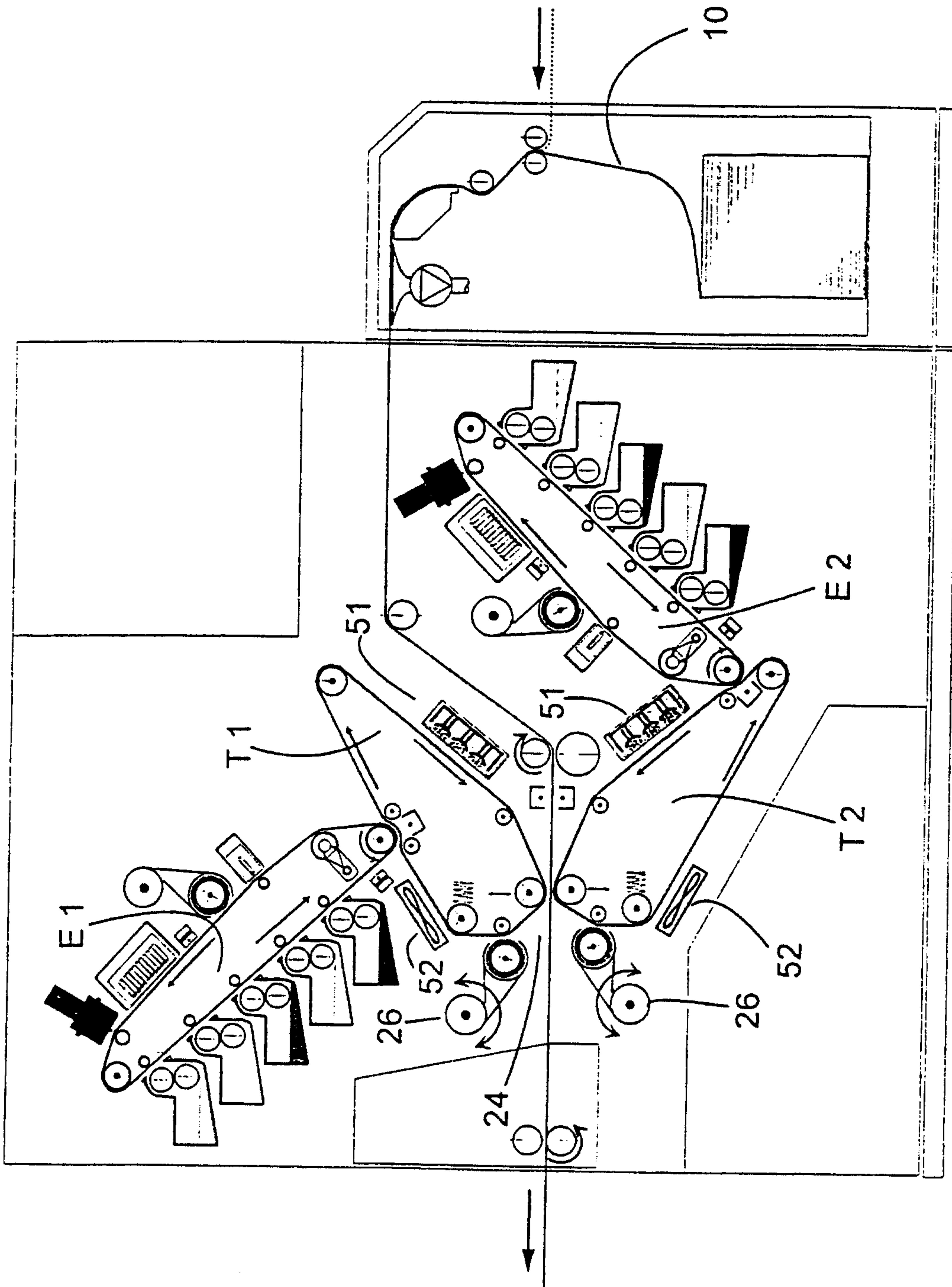
Figur 16



Figur 17



Figur 18



Figur 19

