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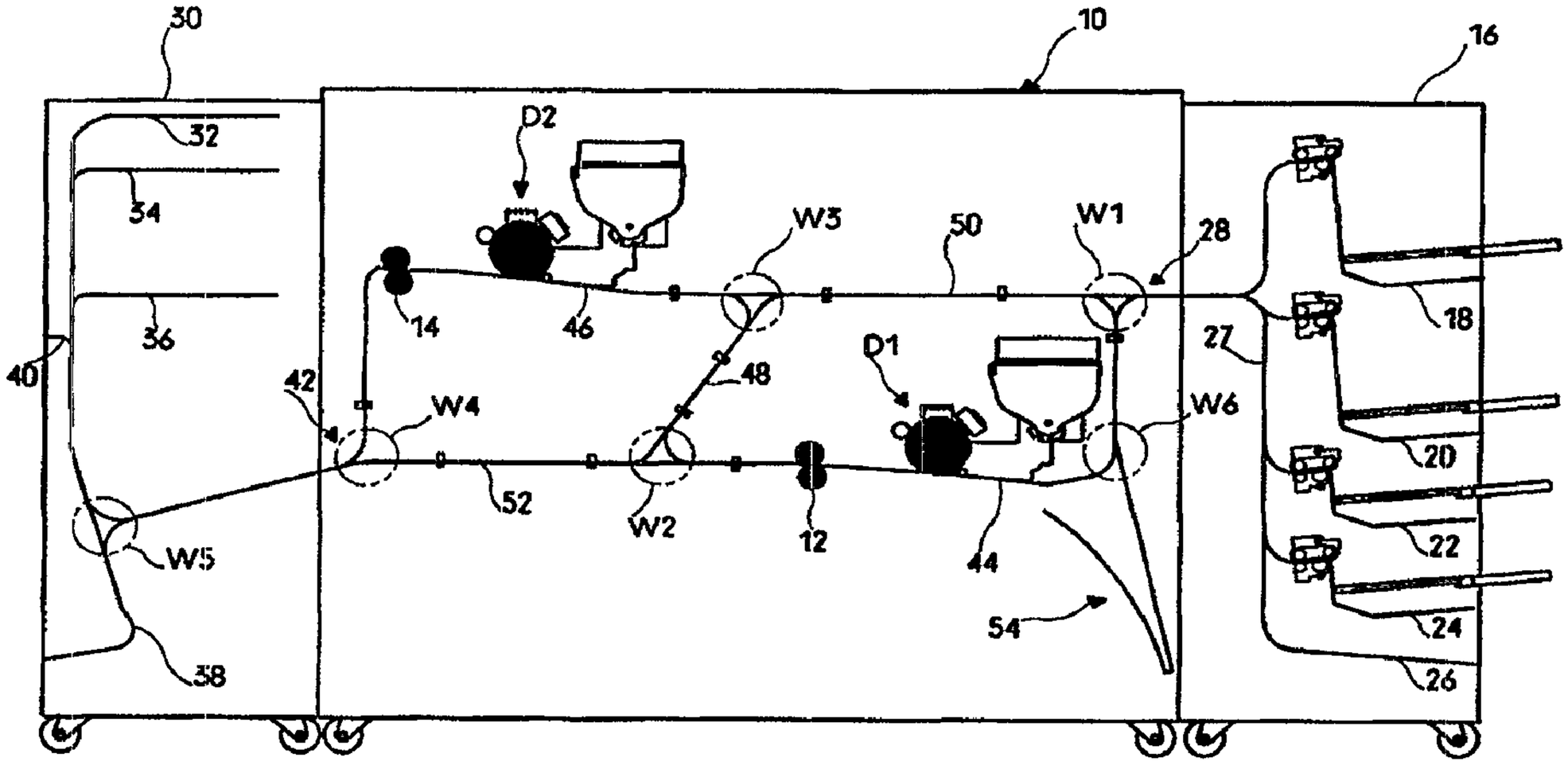
(72) Inventeurs/Inventors:
BOHMER, GEORG, DE;
DIETL, JOSEPH, DE;
HAHN, HANS, DE;
HELLER, BERNWARD, DE;
MUGRAUER, HUBERT, DE;
OLBRICH, OTTO, DE;
RIGAUER, REINHOLD, DE;
...

(73) Propriétaire/Owner:
OCE PRINTING SYSTEMS GMBH, DE

(74) Agent: FETHERSTONHAUGH & CO.

(54) Titre : IMPRIMANTE OU COPIEUR A DEUX GROUPES IMPRIMANTS ET METHODE D'OPERATION DE CET APPAREIL

(54) Title: PRINTER OR COPIER WITH TWO PRINTING UNITS AND METHOD FOR THE OPERATION OF SUCH AN APPARATUS




(57) Abrégé/Abstract:
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(72) Inventeurs(suite)/Inventors(continued): ROTHEIMER, OTTO, DE; SEEBERGER, RUDOLF, DE

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(71) **Anmelder** *(für alle Bestimmungsstaaten ausser US)*: OCE PRINTING SYSTEMS GMBH [DE/DE]; Siemensallee 2, D–85586 Poing (DE).

(72) **Erfinder; und**
(75) **Erfinder/Anmelder** *(nur für US)*: BÖHMER, Georg [DE/DE]; Lustheimerstrasse 8, D–81247 München (DE). DIETL, Joseph [DE/DE]; Fasanenstrasse 148, D–82008 Unterhaching (DE). HAHN, Hans [DE/DE]; Carl–Orff–Weg 16, D–82008 Unterhaching (DE). HELLER, Bernward [DE/DE]; Isarweg 2, D–85551 Kirchheim (DE). MUGRAUER, Hubert [DE/DE]; Parkstrasse 38, D–85604 Zorneding (DE). OLBRICH, Otto [DE/DE]; Birkenstrasse 39, D–82024 Taufkirchen (DE). RIGAUER, Reinhold [DE/DE]; Drechslerstrasse 60, D–85435 Erding (DE). ROTHEIMER, Otto [DE/DE]; Kurzbauerstrasse 4, D–81479 München (DE). SEEBERGER, Rudolf [DE/DE]; Lindenstrasse 24, D–82166 Lochham (DE).

(74) **Anwälte:** SCHAUMBURG, Karl–Heinz usw.; Postfach 86 07 48, D–81634 München (DE).

(81) **Bestimmungsstaaten:** CA, DE, JP, US, europäisches Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

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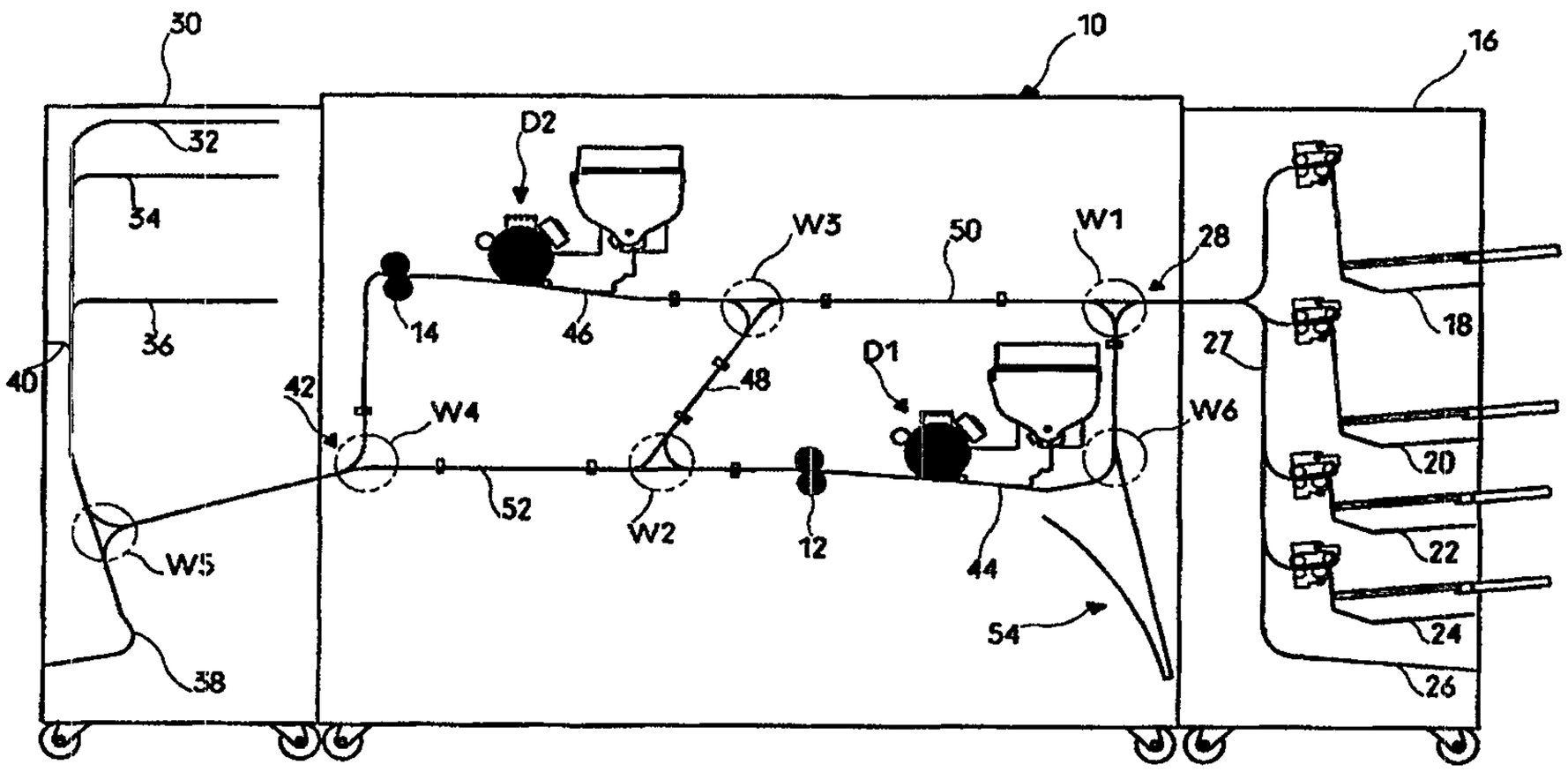
(54) **Title:** METHOD TO OPERATE A PRINTER WITH TWO PRINTING UNITS

(54) **Bezeichnung:** VERFAHREN ZUM BETREIBEN EINES DRUCKERS MIT ZWEI DRUCKWERKEN




(57) **Abstract**

Disclosed is a method enabling two similar printing units (D1, D2) to print sheetlike material in a printer. In case of failure of one of the printing units (D1, D2) limited printing can be maintained .

(57) **Zusammenfassung**

Beschrieben wird ein Verfahren, bei dem in einem Drucker zwei gleichartige Druckwerke (D1, D2) blattförmiges Material bedrucken. Bei Ausfall eines der Druckwerke (D1, D2) kann dennoch ein eingeschränkter Druckbetrieb aufrechterhalten werden.

# PRINTER OR COPIER WITH TWO PRINTING UNITS AND METHOD FOR THE OPERATION OF SUCH AN APPARATUS

This invention is directed to a printer or copier and a method for the operation of such an apparatus, whereby sheet-shaped material is individually successively supplied via an input section to a first electrographic printing unit that prints an image on a sheet-shaped material, and whereby the printed material is individually successively output via an output section.

Given a high-performance printer having only a single printing unit, the individual printer components are normally exactly matched to one another, so that a reliable operating condition with high printing output is achieved. In order to increase the printing output even farther, structural modifications must be undertaken at these components, this leading to a high development outlay and raising the outage probability due to the redesign of the individual components.

US 4,587,532 discloses a printer that has three printing units that print single sheets in common or alternation arranged above one another. The paper delivery contains shunts in order to supply the single sheets to the various printing units.

DE 34 22 942 A1 discloses a printing system that has two electrophotographic printing stations. Given occurrence of a malfunction in one printing station, the appertaining printing station is shut off, whereby the other printing stations continues operating.

WO 91/13386 discloses a modularly constructed printer means that contains two printing modules. The printing modules can operate in simplex mode, whereby single

sheets are supplied to both printing modules via shunts. Further, a duplex mode is possible, whereby the single sheets are first supplied to the one printing module for printing with a first print image; subsequently, a further print image can be applied with the second printing module. The printing modules are designed as separate structural units for installation in a single housing.

DE 34 07 847 A1 discloses an image recording means with multiple functions. Functions such as, for example, high-speed recording, two-side recording and multiplex recording are possible. The printer system contains two printing units that are connectable to one another via a paper guidance system. The paper guidance system also enables the single sheets to be turned over, so that a duplex mode with printing on both sides is possible.

US 4,972,236, further, discloses an image generating system having a plurality of printing units that are arranged vertically over one another in order to save space. In one exemplary embodiment, the paper transports for both printing units are connected to one another by a connecting channel.

US 5,150,167 A discloses a printing system that contains essentially identically constructed printing units. Each of the printing units has a separate input section allocated to it via which sheet material is supplied to the respective printing unit. Given outage of one of the printing units, for example given a paper jam within the transfer printing zone of a printing unit, the second printing unit must be served by the appertaining paper input compartment. What is disadvantageous given this arrangement is that two input compartments must be provided in order to

maintain the operational readiness of the apparatus given the outage of a printing unit. When, for example, the lower printing unit goes down because of a paper jam and when the appertaining input compartment in the upper printing unit is empty, then the printer arrangement is entirely out of service.

US 4,591,884 A and US 5,208,640 A disclose a number of printing unit versions. However, a multi-functional arrangement such that both a simplex operating mode with high throughput as well as a duplex operating mode wherein two printing units are employed and an emergency mode given outage of one of the two printing units is [sic] possible are [sic] thereby not provided.

An object of an embodiment of the invention is to specify a method for the operation of a printer or of a copier that enables a high printing output or, respectively, copier output and works dependably.

This object is inventively achieved by methods and apparatus according to embodiments of the invention.

In one aspect of the present invention, there is provided method for operating a printer or copier, whereby sheet-shaped material is supplied individually in succession, via an input section, to a first electrographic printing unit that prints an image pattern onto a sheet-shaped material; printed material is output individually in succession via an output section; whereby sheet-shaped material is supplied via the same input section to a second printing unit; the sheet-shaped material printed by the second printing unit is output via the output section; and whereby switching is carried out between a) a simplex operating mode wherein a throughput of sheet-shaped material that is enhanced compared to the throughput given a single printing units is produced, in that

sheet-shaped material is supplied in alternation to the two printing units via a shunt in the input section; b) a duplex operating mode wherein sheet-shaped material is supplied from the input section and from the first printing unit, and the material is supplied from a first transfer printing transport path via a connecting channel to a second transfer printing transport path of the second printing unit for printing a backside of the material; and c) an emergency operating mode wherein, given a malfunctioning first printing unit or given a malfunctioning second printing unit, the malfunctioning printing unit is shut off and the shunt supplies sheet-shaped material only to the non-malfunctioning printing unit.

There is also provided method for operating a printer or copier, whereby sheet-shaped material is individually supplied via an input section in succession to a first electrographic printing unit that prints an image pattern on a sheet-shaped material, the printed material is individually successively output via an output section, the sheet-shaped material printed by a second printing unit is output via the same output section, comprising: a) a first simplex operating mode with increased throughput of sheet-shaped material wherein sheet-shaped material for printing is supplied in alternation to the two printing, and b) a first duplex operating mode wherein sheet-shaped material that was printed on one side by one of the two printing units is resupplied to the same printing unit for printing a back side.

A further aspect of the invention provides printer or copier having a first electrographic printing unit that prints an image pattern onto a sheet-shaped material to which sheet-shaped material is individually successively supplied via an input section, an output section via which printed material is individually output in succession, a

second printing unit from which printed sheet-shaped material is output via the same output section, that can be switched between a) a first simplex operating mode with increased throughput of sheet-shaped material wherein sheet-shaped material for printing is supplied to the two printing units in alternation, and b) a first duplex operating mode wherein the sheet-shaped material that was printed on one side by one of the two printing units is resupplied to the same printing unit for printing a back side.

According to one embodiment of the invention, two essentially identically constructed printing units are employed. The components for these printing units, for example the electronic drive, the developing units, the toner delivery and elimination mechanisms, etc., can be retained nearly unmodified. Viewed in and of itself, each printing unit thus has an extremely high operating dependability. Both printing units use a common input section via which the sheet-shaped material is supplied. Likewise, both printing units share an output section for discharging the printed, sheet-shaped material. As a result thereof, the new apparatus is very compactly constructed and can be manufactured with little outlay. The printing output is noticeably increased due to the two printing units.

Given a malfunctioning first printing unit or given a malfunctioning second printing unit, the malfunctioning printing unit is shut off according to the invention, whereby the first shunt then supplies sheet-shaped material only to the non-malfunctioning printing unit. Printing operations can thus still be maintained with the

assistance of the non-malfunctioning printing unit, so that printing jobs can be processed until the repair service arrives.

In what is referred to as simplex mode, wherein sheet-shaped material is supplied to the input section with double the transfer printing speed given undisturbed operation, the delivery given a malfunctioning printing unit can only ensue at half speed compared to normal operation. Nonetheless, a considerable advantage is established in this version of the invention since the user of the printing system can continue to work with reduced performance.

In duplex mode, wherein both sides of the single sheets are printed, work can also continue to be carried out given outage of one printing unit. The conveying path in the printer is then set such that the undisturbed printing unit first prints one side, the single sheets are then turned over and resupplied to the same printing unit in order to print the second side.

A redundant operation can thus be built up by employing two printing units in a single printer system or copier system. As a result of this redundancy mode, the down probability of the entire printer system or copier system is substantially reduced. According to the rules of stochastics, the function probability in redundant systems wherein at least one of the two printing units is fully functional -- regardless of which -- is defined as follows:

$$Pred. = P1 \times (1-P2) \times 2 + P1 \times P2,$$

wherein Pred. is the function probability of the overall printer system or copier system, P1 is the function probability of the first printing unit and P2 is the function probability of the second printing unit.

When one assumes a function probability of, for example, 90% for each printing unit, then the function probability for a redundantly limited operation rises to 99% according to this equation. As mentioned, the printing output is in fact reduced given outage of a printing unit, but the complete outage of the printer system or copier system is avoided with extremely high probability, which means a high dependability for the user for the implementation of his jobs.

One embodiment of the invention provides that the input section contains a shunt that supplies sheet-shaped material either to the first transfer printing transport path or to the second transfer printing transport path. In this embodiment, the operating mode of simplex printing is realized with one color, i.e. supplied sheet-shaped material, for example single sheets of paper, are printed on one side by the first printing unit or by the second printing unit. In one development, the shunt conducts sheet-shaped material to the first transfer printing transport path and the second transfer printing transfer path in alternation. Since each printing unit prints the sheet-shaped material with the same transfer printing speed and two printing units are arranged in parallel, the printing output in the apparatus is doubled overall. Accordingly, single sheets can be supplied and in turn discharged with double the printing speed.

Another exemplary embodiment provides that the first transfer printing transport path and the second transfer printing transfer path are connected by a connecting channel through which sheet-shaped material can be conveyed in one or in both conveying directions. As a result of these measures, printed material can be supplied from the first printing unit to the second printing unit as well as from the second printing unit to the first printing unit in order to print it. The connecting channel thus results in the creation of a return that connects the two printing units to one another, as a result whereof many-faceted printing processes are enabled.

A further embodiment provides that the sheet-shaped material is turned over during transport from the first transfer printing transport path to the second transfer printing transport path. In this way, each printing unit can print the front side and, too, the back side of a single sheet. When developing stations with different colors are employed for the two printing units, then two image patterns with two different colors can be printed on each side of the single sheet, i.e. what is referred to as a two-color duplex mode, also called duplex color spot mode, can be realized.

Despite technical improvements at the printing units, damage and outage can never be completely precluded since these are in part caused by incorrect

applications or operating errors. In order to then shorten the down times of a such a printing system, various device manufacturers for high-performance printers and copiers maintain a very quickly reacting service department with on-call service. The outlay for this service department is very high. In the present invention, it is then possible to considerably reduce the overall failure probability of the operation of such apparatus.

Exemplary embodiments of the invention are explained below with reference to the drawing. Shown therein are:

Figure 1 the schematic structure of a high-performance printer wherein the invention is realized;

Figure 2 the operating mode of simplex printing with the lower printing unit, shown schematically;

Figure 3 the operating mode of simplex printing with the upper printing unit, shown schematically;

Figure 4 the operating mode of alternating simplex printing;

Figure 5 the operating mode of duplex printing;

Figure 6 the operating mode of two-color simplex printing; and

Figure 7 the operating mode of two-color duplex printing, shown schematically.

Figure 1 shows a high-performance printer 10 that serves for fast printing of single sheets of paper. The high-performance printer 10 contains a first, lower printing unit D1 as well as a second, upper printing unit D2. Both printing units D1, D2 work according to the known electrographic process with the same transfer printing speed. The printing units D1, D2 are followed by fixing devices that are schematically indicated in Figure 1 by two roller pairs 12, 14. A paper input 16 is connected to the high-performance printer 10, said paper input 16 containing a plurality of reservoirs 18 through 24 with single sheets as well as an external paper input channel 26 via which single sheets can be supplied from the outside. Single sheets are supplied to an input section 28 via a transport channel. At the output side, a paper output 30 that contains a plurality of output containers 32 through 36 is

connected to the high-performance printer 10. Further, two output channels 38, 40 via which single sheets can be output to further-processing stations are provided. The high-performance printer 10 outputs the printed single sheets via the output section 42.

Transport paths for the transport of the single sheets are arranged in the inside of the high-performance printer 10, various operating modes of the high-performance printer being realized therewith. The printing units D1, D2 have respective transport paths 44, 46 allocated to them that are respectively set such by drives that the supplied single sheets have their transfer printing speed at the printing units D1, D2. The two transfer printing transport paths 44, 46 are connected to one another via a connecting channel 48. The transport path around the first printing unit D1 is augmented to form a ring by a feeder channel 50 via which single sheets can also be supplied from the input section 28 to the second transfer printing transport path 46. The transport path for the second printing unit D2 is augmented to form a ring in a similar way a discharge channel 52 via which the single sheets printed by the printing unit D1 can be supplied to the output section 42.

A first shunt W1 that makes it possible that single sheets from the input section 28 are optionally supplied to the first transfer printing path 44 or to the feeder channel 50 is arranged between the input section 28, the first transfer printing transport path 44 and the feeder channel 50. A further version is comprised therein that single sheets transported on the feeder channel 50 in the direction of the shunt W1 can be supplied to the first transfer printing transport path 44.

Further, a second shunt W2 and a third shunt W3 are arranged at the ends of the connecting channel 48 and respectively connect the adjoining transport paths 44, 48, 52 or, respectively, 46, 48, 50. A fourth shunt W4 is located in the proximity of the output section 42 and connects the adjoining transport paths. The paper output 30 contains a fifth shunt W5 that works as turnover means. Further, an ejection means 54 should also be pointed out, reject single sheets being supplied thereto via a shunt W6

Various operating modes of the high-performance printer 10 can be realized by the arrangement described in Figure 1. The various operating modes are schematically shown in the following Figures 2 through 7. The respective conveying of the single sheets is illustrated on the basis of arrows.

Figure 2 schematically shows simplex printing with only one printing unit. Only one side of a single sheet is printed in this simplex printing. The single sheet proceeds via the input section 28 and the correspondingly switched shunt W1 along the arrow P1 to the first transfer printing transport path 44 and is printed at the printing unit D1. Subsequently, the single sheet is output (arrow P3) into the paper output 30 along the discharge channel 52 (arrow P2) via the output section 42.

Figure 3 shows the simplex printing with the upper, second printing unit D2. The transport of the single sheet ensues via the feeder channel 50 (arrow P4), the second transfer printing transport path (arrow P5) to the paper output 30 (arrow P6).

Given alternating simplex printing with enhanced printing output, single sheets are supplied to via the input section 28 with at least double the transfer printing speed of the printing units D1, D2. Figure 4 schematically shows the transport of the single sheets. The shunt W1 supplies single sheets to the feeder channel 50 or, respectively, the first transfer printing transport path (arrows P7, P8) in alternation. While being transported to the printing units D1, D2, the single sheets are decelerated to transfer printing speed, are respectively printed on the front side thereat and are subsequently further-conveyed to the shunt W4. During this further-conveying according to the arrows P9, P10, the single sheets are accelerated to at least double the transfer printing speed, so that they are output at the common output section via the shunt W4 spaced from one another and can be successively further-conveyed in the paper output 30 according to the arrow P11 with at least double the transfer printing speed.

In what is referred to as the operating mode of "alternating simplex printing", thus, it is inventively provided that, in the paper input 16, the single sheets in the input section 28 are supplied to the printing units D1, D2 with at least double

the transfer printing speed. In the paper output 30 as well, the single sheets are likewise further-conveyed and deposited with at least double the speed. As a result of this measure, the single sheets arrive at the common input section 28 and at the common output section 42 without the possibility of a collision of single sheets and, accordingly, a paper jam occurring. Preferably, the transport paths for the single sheets supplied to the first printing unit D1 and the single sheets supplied to the second printing unit D2 are symmetrically designed or are at least of equal length, so that the single sheets on both conveying paths can be decelerated and accelerated with the same speed profile. As a result thereof, it is possible to construct the drives and mechanisms required for the transport identically. Further, it is possible to employ identical controls.

Figure 5 schematically shows the duplex printing mode wherein the single sheets are printed on both sides. The single sheets supplied to the input section 28 are supplied to the first transfer printing transport path 44 (arrow P13) by the first shunt W1. After being printed by the printing unit D1, the respective single sheet is conveyed out a turnover distance via the shunt W2 according to the arrow P14. This turnover distance is a part of the discharge channel 52. Subsequently, the conveying direction is reversed according to arrow P15, and the shunt W2 then conducts the single sheet into the connecting channel 48 according to the arrow P16. The single sheet is then steered to the second transfer printing transport path 46 by the shunt W3 in the direction of the arrow P17. The as yet unprinted backside of the single sheet is thus supplied to the printing unit D2 for printing. Subsequently, the single sheets are supplied according to the arrow P18 to the shunt W4 and are transported into the paper output 30 along the arrow P19. Since the single sheet is transported with its backside facing up in this condition, it must still be turned over before being deposited into the compartments 32 through 36. The shunt W5 serves this purpose. The single sheet is first conducted for a predetermined turnover distance in the direction of the arrow P20 by the shunt W5. The conveying direction is then reversed according to the arrow P21, and the shunt W5 conveys the single sheet in the direction of the arrow

P22, whereupon it is deposited in the deposit compartments 32 through 36 with the proper side up.

As can be seen, the shunt W2 acts as turnover means in order to supply the backside of the single sheet to the printing unit D2. Alternatively, the shunt W3 can also be utilized for turning over. The single sheet leaving the printing unit D1 is then conducted in the direction of the shunt W1 via the shunt W2, the connecting channel 48 of the shunt W3 and then along the feeder channel 50 for a short turnover distance. Subsequently, the conveying direction is reversed and the shunt W3 conducts the single sheet in the direction of the printing unit D2 with its backside facing up.

Figure 6 schematically shows a further operating mode, the two-color simplex printing, wherein the front side of a single sheet is printed with two image patterns of different color. The two printing units D1, D2 print image patterns of different color. In said operating mode of two-color simplex printing, the single sheet is supplied to the printing unit D1 (arrow P25) via the shunt W1. Subsequently, the single sheet is supplied via the shunt W2 to the connecting channel 48 without being turned over and is then supplied to the printing unit D2 via the shunt W3 (arrows P26, P27). The printing unit D2 prints the front side with a color different from the color of the printing unit D1. Subsequently, the single sheet is output to the paper output 30 via the shunt W4 (arrow P28).

Figure 7 schematically shows the conveying path of a single sheet in the operating mode of two-color duplex printing wherein the front side and the backside of a single sheet are printed with image patterns of different color. A precondition therefor is that the printing units D1 and D2 print differently colored print images. For two-color printing of the front side, one proceeds as in the operating mode of two-color simplex printing according to Figure 6. The arrows P25, P26, P27 and P28 illustrate the conveying path. Subsequently, the single sheet is resupplied to the printing unit D1. The arrows P29 through P36 illustrate the conveying path of the single sheet for printing the backside. So that this backside is supplied to the printing unit D1, the single sheet must be turned over on the conveying path between the

printing unit D2 and the printing unit D1. This turning can ensue, for example, at the shunt W4, the shunt W2 or at the shunt W3.

In a preferred exemplary embodiment of the invention, the turning ensues with the assistance of the shunt W4, i.e. the single sheet is first transported in the direction of the shunt W5 for a short turnover distance, the conveying direction is then reversed, and the single sheet is further conveyed in the direction of the shunt W2. After transport into the paper output 30 according to the arrow P36, a further turning ensues with the shunt W5 and the side-proper deposit of the single sheet printed double-sided with respect to the two color images subsequently ensues.

An alternative transport of the single sheet through the high-performance printer 10 for realizing the operating mode of two-color duplex printing can ensue in the following way. First, the single sheet is supplied from the input section 28 via the shunt W1 to the printing unit D1, its front side is printed and, subsequently, it is conducted via the shunts W2 and W3 for turn-over in the direction of a shunt W1 for a short distance. After passing the shunt W3, the conveying direction is modified in the direction of the printing unit D2, and the single sheet is conveyed on the transfer printing transport path 46. The shunt W3 thus serves as turn-over station. At the printing unit D2, accordingly, the backside of the single sheet is printed. Subsequently, the single sheet is resupplied to the first printing unit D1 via the shunts W4, W2, W3 and W1 in order to now print the backside. The single sheet must be turned over for this purpose. This ensues at the shunt W4, whereby it is briefly conveyed in the direction of the shunt W5, the conveying direction is reversed and it is conveyed in the direction of the shunt W2 in its turned-over condition. After printing the backside of the single sheet in the printing unit D1, the single sheet is supplied via the shunts W2 and W3 to the printing unit D2, whereby it is turned over. The front side is now printed by the printing unit D2. Subsequently, the single sheet is conducted to the deposit compartments 32 through 36 via the shunt W4. Since it now proceeds into the deposit 30 attitutendly correct, i.e. with the top side up, it need not be turned over again by the shunt W5.

As already mentioned above, a limited printing operation can be maintained with the high-performance printer 10 even given failure of a printing unit D1 or D2. In the operating mode of simplex printing (Figure 2), the shunt W1 can be set such, for example, given outage of the printing unit D2, that it supplies single sheets only to the printing unit D1. The printing unit D2 is turned off and the second transfer printing transport path 46 is not used. The single sheets printed by the printing unit D1 are output to the paper output 30 via the shunt [sic] W2 and W4. In this operating condition, the high-performance printer 10 works only with half the conveying speed of the single sheets compared to non-malfunctioning operation.

If the first printing unit D1 fails in the operating mode of simplex printing, this is then shut off. The shunts W1 and W3 then conduct the single sheets via the feeder channel 50 and the second transfer printing transport path 46 to the second printing unit D2. Subsequently, the printed single sheets are output to the paper output 30 via the shunt W4.

A limited duplex printing mode can also be maintained in the operating mode of duplex printing with printing on front side and backside of the single sheets given failure of a printing unit D1 or D2. When, for example given a duplex mode (see Figure 5), the upper, second printing unit D2 fails, then this is shut off. The single sheets continue to be supplied to the printing unit D1 via the shunt W1. Subsequently, the single sheets are conveyed in the direction of the fourth shunt W4 (arrow P14) via the second shunt W2. After passing the second shunt W2, the conveying direction (arrow P15) is reversed, and the single sheets are resupplied to the first printing unit D1 via the third shunt W3 and the first shunt W1. Due to the turn-over event by the reversal of conveying direction at the shunt W2, the backside is now printed by the first printing unit D1. Subsequently, the sheet-shape material is in turn output via the second shunt W2 and the fourth shunt W4.

When the first printing unit D1 malfunctions and the second printing unit D2 is still fully functional, then a duplex mode can nonetheless be maintained with the second printing unit D2 via the conveying paths 46, 52 and 48. The single sheets are

supplied to the second printing unit D2 via the shunts W1 and W3. The printed single sheets are conducted for a short distance in the direction of the shunt W5 via the shunt W4. The conveying direction is reversed and the respective single sheet is conducted in the direction of the shunt W2. Due to the reversal of conveying direction at the shunt W4, the single sheet is turned over. Subsequently, the single sheet is resupplied to the printing unit D2 via the connecting channel 48 and the shunt W3 and the backside is now printed. Subsequently, the single sheet printed on both sides is output via the shunt W4 and is turned over as needed at the shunt W5 and subsequently deposited in one of the output containers 32 through 36.

Due to the disclosed redundancy operation given one malfunctioning and one fully functional printing unit, the function probability for the operation of the overall high-performance is enhanced. In practice, the user of the high-performance printer can continue to process his job despite a malfunctioning printing unit until the repair service that has been called has again brought both printing units into a functional condition.

CLAIMS:

1. Method for operating a printer or copier,

whereby sheet-shaped material is supplied individually in succession, via an input section, to a first electrographic printing unit (D1) that prints an image pattern onto a sheet-shaped material;

printed material is output individually in succession via an output section (42);

whereby sheet-shaped material is supplied via the same input section (28) to a second printing unit (D2);

the sheet-shaped material printed by the second printing unit (D2) is output via the output section (42);

and whereby switching is carried out between

a) a simplex operating mode wherein a throughput of sheet-shaped material that is enhanced compared to the throughput given a single printing unit is produced, in that sheet-shaped material is supplied in alternation to the two printing units (D1, D2) via a shunt (W1) in the input section (28);

b) a duplex operating mode wherein sheet-shaped material is supplied from the input section (28) and from the first printing unit (D1), and the material is supplied from a first transfer printing transport path (44) via a connecting channel (48) to a second transfer printing transport path (46) of the second printing unit (D2) for printing a backside of the material; and

c) an emergency operating mode wherein, given a malfunctioning first printing unit (D1) or given a malfunctioning second printing unit (D2), the malfunctioning

printing unit (D1, D2) is shut off and the shunt (W1) supplies sheet-shaped material only to the non-malfunctioning printing unit (D1, D2).

2. Method according to claim 1, characterized in that, in the simplex mode with enhanced throughput, sheet-shaped material is supplied to the first printing unit (D1) only via the first transfer printing transport path (44) and the sheet-shaped material is supplied to the second printing unit (D2) only via the second transfer printing transport path (46).

3. Method according to one of the claims 1 or 2, characterized in that, in a condition with a malfunctioning printing unit (D1, D2), the sheet-shaped material is supplied with a conveying speed that is only half compared to normal operation.

4. Method according to one of the claims 1 or 3, characterized in that the first transfer printing transport path (44) of the first printing unit (D1) and the second transfer printing transport path (46) of the second printing unit (D2) are each respectively supplemented to form a ring by the connecting channel (48) as well as by a respective further channel (50, 52).

5. Method according to claim 4, characterized in that sheet-shaped material is conveyed through the connecting channel (48) to one or both of the first and second transfer printing transport paths.

6. Method according to one of the claims 1 through 5, characterized in that the sheet-shaped material is turned over at an end of the connecting channel (48).

7. Method according to claim 6, characterized in that, given transport from the first transfer printing transport path (44) to the second transfer printing transport path (46), the sheet-shaped material is turned over by a turn-over means.

8. Method according to claim 7, characterized in that the turn-over means contains a further shunt (W2, W3, W4); in that the sheet-shaped material, for being turned over, is first conveyed past the further shunt (W2, W3, W4) on a first conveying path in a conveying direction in a turn-over section; in that, subsequently, the conveying direction is reversed; and in that the further shunt (W2, W3, W4) conveys the sheet-shaped material to a second conveying path in an other conveying direction.

9. Method according to one of the claims 1 through 8, characterized in that, in duplex printing mode, the sheet-shaped material is first supplied to the first transfer printing transport path (44) and is then supplied to the second transfer printing transport path (46); in that the sheet-shaped material printed by the second printing unit (D2) is resupplied to the first transfer printing transport path (44) while being turned over; and in that, finally, the sheet-shaped material is supplied to the second transfer printing transport path (46) without being turned over and is then output.

10. Method according to one of the claims 1 through 9, characterized in that the first transfer printing transport path (44), the connecting channel (48) and a feeder channel (50) form a closed transport path, whereby the feeder channel can transport sheet-shaped material in both directions and supplies sheet-shaped material to the second transfer printing transport path (46).

11. Method according to one of the claims 1 through 10, characterized in that the second transfer printing transport path (46), the connecting channel (48) and a discharge channel (52) for sheet-shaped material form a closed transport path, whereby the discharge channel (52) can convey sheet-shaped material in both directions and connects the first transfer printing transport path to the output section.

12. Method according to one of the claims 1 through 11, characterized in that a turn-over means that turns the sheet-shaped material over before being deposited is arranged following the output section (42) as viewed in conveying direction of the sheet-shaped material.

13. Method according to one of the claims 1 through 7, characterized in that, in addition to the shunt (W1) arranged following the input section (28), a second shunt (W2) is arranged at a junction between the first transfer printing transport path (44) and the connecting channel (48) and a discharge channel (52); in that a third shunt (W3) is arranged at a junction between the connecting channel (48), the second transfer printing transport path (46) and a feeder channel (50); and in that a fourth shunt (W4) is arranged at a junction between the second transfer printing transport path (46) and the discharge channel (52).

14. Method for operating a printer or copier,

whereby sheet-shaped material is individually supplied via an input section (28) in succession to a first electrographic printing unit (D1) that prints an image pattern on a sheet-shaped material,

printed material is individually successively output via an output section (42),

the sheet-shaped material printed by a second printing unit (D2) is output via the same output section (42),

comprising:

a) a first simplex operating mode with increased throughput of sheet-shaped material wherein sheet-shaped material for printing is supplied in alternation to the two printing units (D1, D2), and

b) a first duplex operating mode wherein sheet-shaped material that was printed on one side by one of the two printing units (D1, D2) is resupplied to the same printing unit (D1, D2) for printing a back side.

15. Method according to claim 14, whereby sheet-shaped material is supplied to the second printing unit (D2) via the same input section as the first printing unit (D1).

16. Method according to claim 15, whereby the sheet-shaped material is supplied to the two printing units (D1, D2) via a shunt (W1) in the input section (28).

17. Method according to one of the claims 14 through 16, comprising a second duplex operating mode wherein sheet-shaped material from the input section (28) is supplied to a first transfer printing transport path (44) of the first printing unit (D1), and the material from the first transfer printing transport path (44) is supplied via a connecting channel (48) to a second transfer printing transport path (46) of the second printing unit (D2) for printing the back side of the material.

18. Method according to claim 17, whereby the first duplex operating mode is implemented given a malfunction of a printing unit (D1, D2), whereby sheet-shaped material is

printed only by the non-malfunctioning printing unit (D1, D2).

19. Method according to one of the claims 14 through 18, comprising a second simplex operating mode implemented given failure of a printing unit (D1, D2), whereby the sheet-shaped material is printed only by the other of the two printing units (D1, D2) and only on one side.

20. Method according to one of the claims 14 through 19, whereby, in the first duplex operating mode for the second printing unit (D2), the sheet-shaped material is transported via a discharge channel (52) for renewed printing, sheet-shaped material being transported from the first printing unit (D1) to the output section (42) thereover in the first, fast simplex operating mode.

21. Method according to one of the claims 17 and 18, comprising a third duplex operating mode wherein the sheet-shaped material is supplied from the input section (28) to the first printing unit (D1), is printed in a first color on one side therein and is supplied via the connecting channel (48) to the second printing unit (D2) for printing the one side with a second color, is subsequently turned over and resupplied to the first printing unit (D1) for printing a back side in the first color and, finally, is resupplied without being turned over to the second printing unit (D2) for printing the back side with the second color.

22. Method according to one of the claims 17, 18, and 21, whereby the return of the sheet-shaped material from the second printing unit (D2) in one of the duplex operating modes ensues via a discharge channel (52) via which sheet-shaped material is supplied to the output section in the fast simplex operating mode while bypassing the second

transfer printing transport path (46) of the second printing unit (D2).

23. Method according to claim 22, whereby the sheet-shaped material in the discharge channel (52) is transported in a first direction (P29) in a duplex operating mode of the second printing unit (D2) and is transported in a direction (P10) opposite thereto in the fast simplex operating mode.

24. Method according to one of the claims 14 through 16, whereby, in the first simplex operating mode, sheet-shaped material is supplied to the first printing unit (D1) only via a first transfer printing transport path (44) and is supplied to the second printing unit (D2) only via separate, second transfer printing transport path (46).

25. Method according to claim 24, whereby the sheet-shaped material is turned over by a turnover means during transport from the first transfer printing transport path (44) to the second transfer printing transport path (46) or vice versa.

26. Method according to claim 25, whereby one or two turnover means are provided at one or at both ends of a connecting channel (48) between the first transfer printing transport path (44) and the second transfer printing transport path (46).

27. Method according to one of the claims 14 through 26, whereby sheet-shaped material coming from the first or from the second printing unit (D1, D2) is output spaced from one another at the output section (42).

28. Method according to claim 27, whereby the sheet-shaped material coming from the first or from the second

printing unit (D1, D2) is output in alternation at the output section (42).

29. Method according to claim 14, whereby a first transfer printing transport path (44) of the first printing unit (D1) and a second transfer printing transport path (46) of the second printing unit (D2) are connected via a connecting channel (48) through which sheet-shaped material is conveyed to one or both of the first and second transfer printing transport paths.

30. Printer or copier having

a first electrographic printing unit (D1) that prints an image pattern onto a sheet-shaped material to which sheet-shaped material is individually successively supplied via an input section (28),

an output section (42) via which printed material is individually output in succession,

a second printing unit (D2) from which printed sheet-shaped material is output via the same output section (42),

that can be switched between

a) a first simplex operating mode with increased throughput of sheet-shaped material wherein sheet-shaped material for printing is supplied to the two printing units (D1, D2) in alternation, and

b) a first duplex operating mode wherein the sheet-shaped material that was printed on one side by one of the two printing units (D1, D2) is resupplied to the same printing unit (D1, D2) for printing a back side.

31. Printer or copier according to claim 30, whereby

- a first transfer printing transport path (44) is provided for the first printing unit (D1),

- a separate, second transfer printing transport path (46) is provided for the second printing unit (D2), and

- a discharge channel (52) is provided via which sheet-shaped material that was printed by the first printing unit (D1) can be supplied to the output section (42) in the first simplex operating mode and, in the first duplex operating mode, sheet-shaped material that was printed on one side by the second printing unit (D2) can be resupplied thereto for printing the back side.

32. Printer according to claim 31, whereby the sheet-shaped material in the discharge channel (52) can be transported in two opposite directions (P10, P29) dependent on the existing operating mode.

33. Printer according to one of the claims 31 or 32, whereby the two transfer printing transport paths (44, 46) are connected via a connecting channel (48) via which sheet-shaped material that was printed on one side by the first printing unit (D1) in the first transfer printing transfer path (44) in a second duplex operating mode is supplied to the second transfer printing transport path (46) of the second printing unit (D2) for printing the back side of the material.

34. Printer according to one of the claims 30 through 32, whereby the first transfer printing transport path (44) of the first printing unit (D1) and the second transfer printing transport path (46) of the second printing unit (D2) are connected via a connecting channel through which sheet-shaped material can be conveyed to both the first and second transfer printing transport paths.

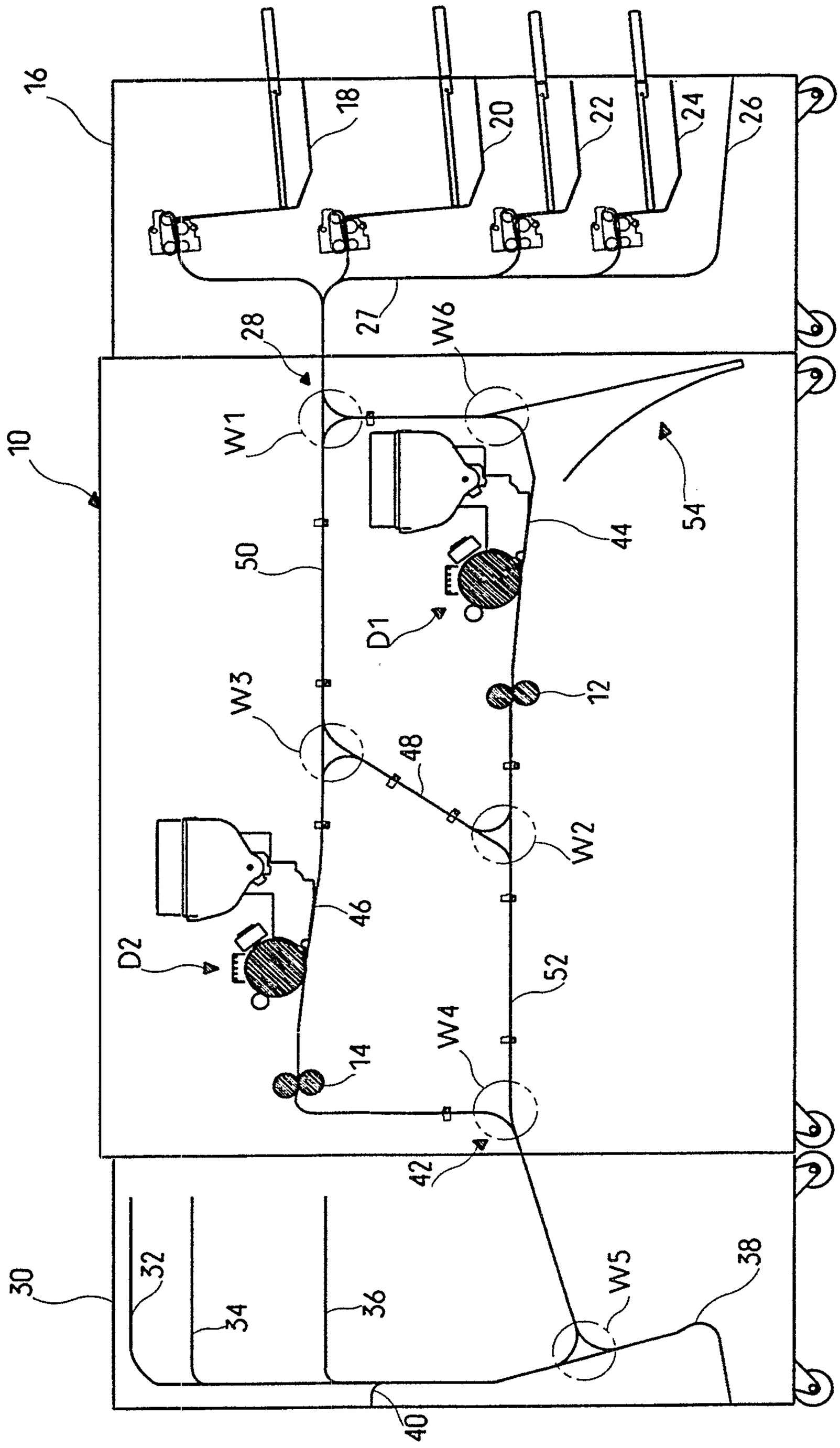

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Fig. 1

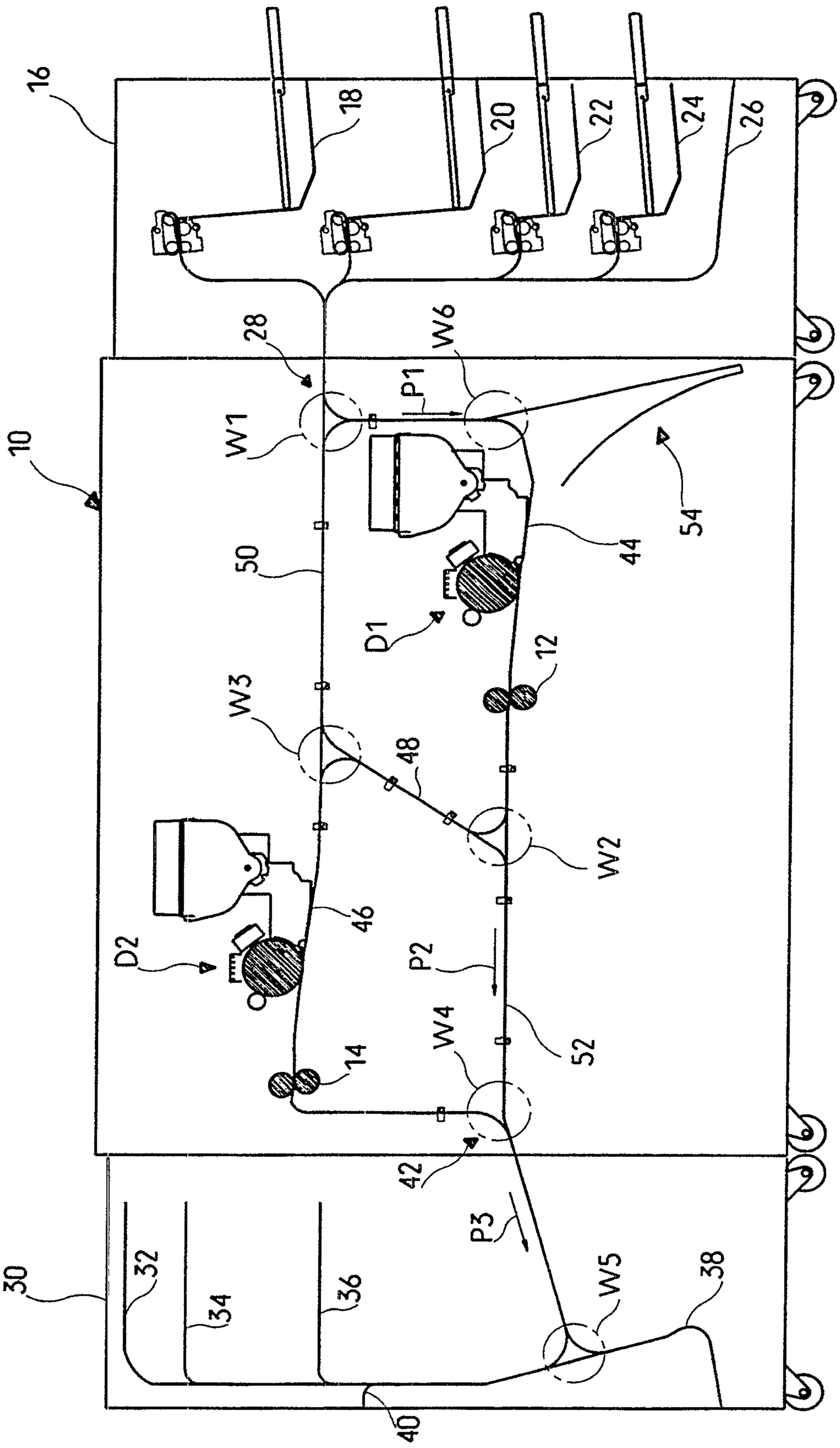
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Fig. 2

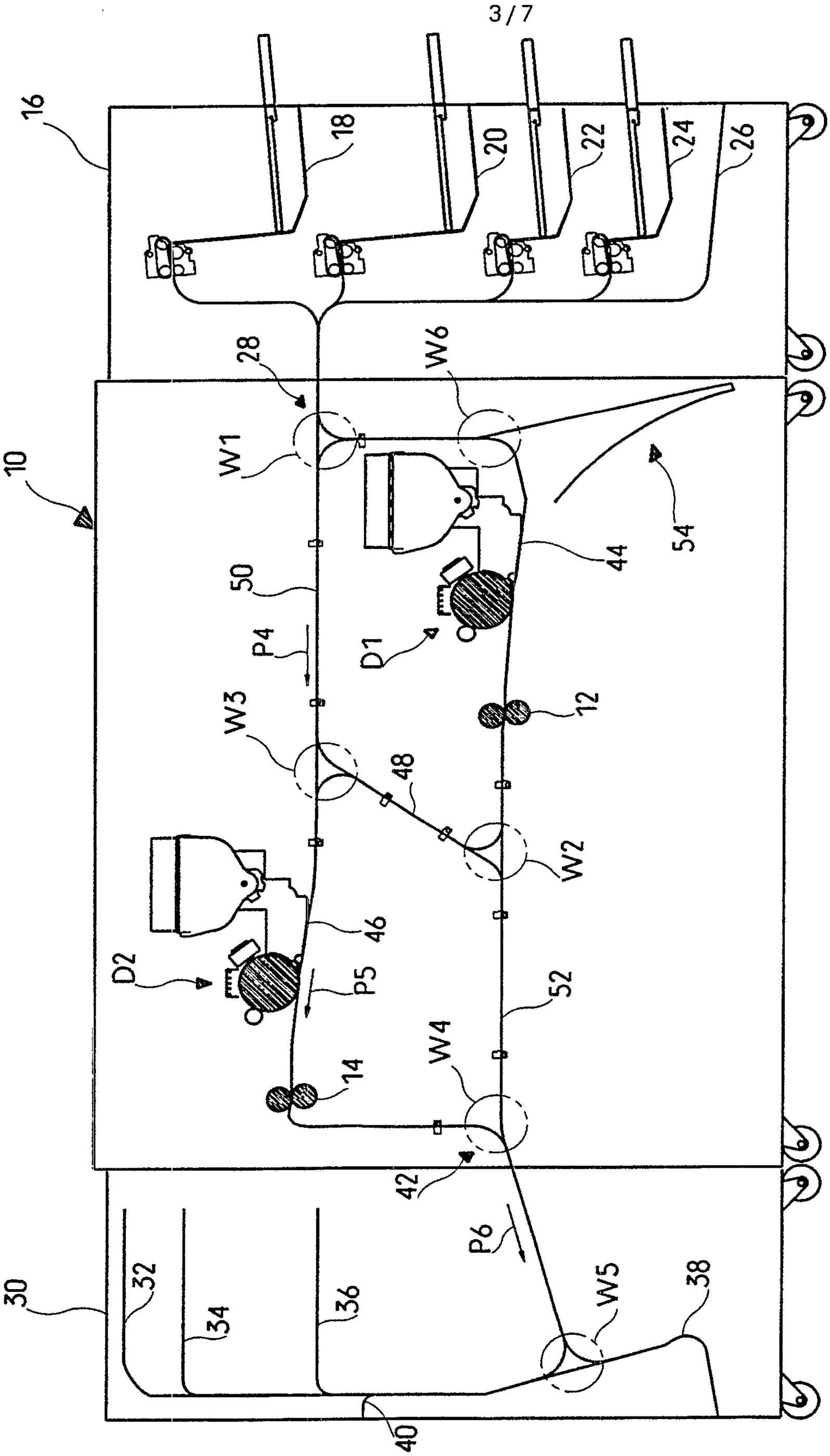
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Fig. 3

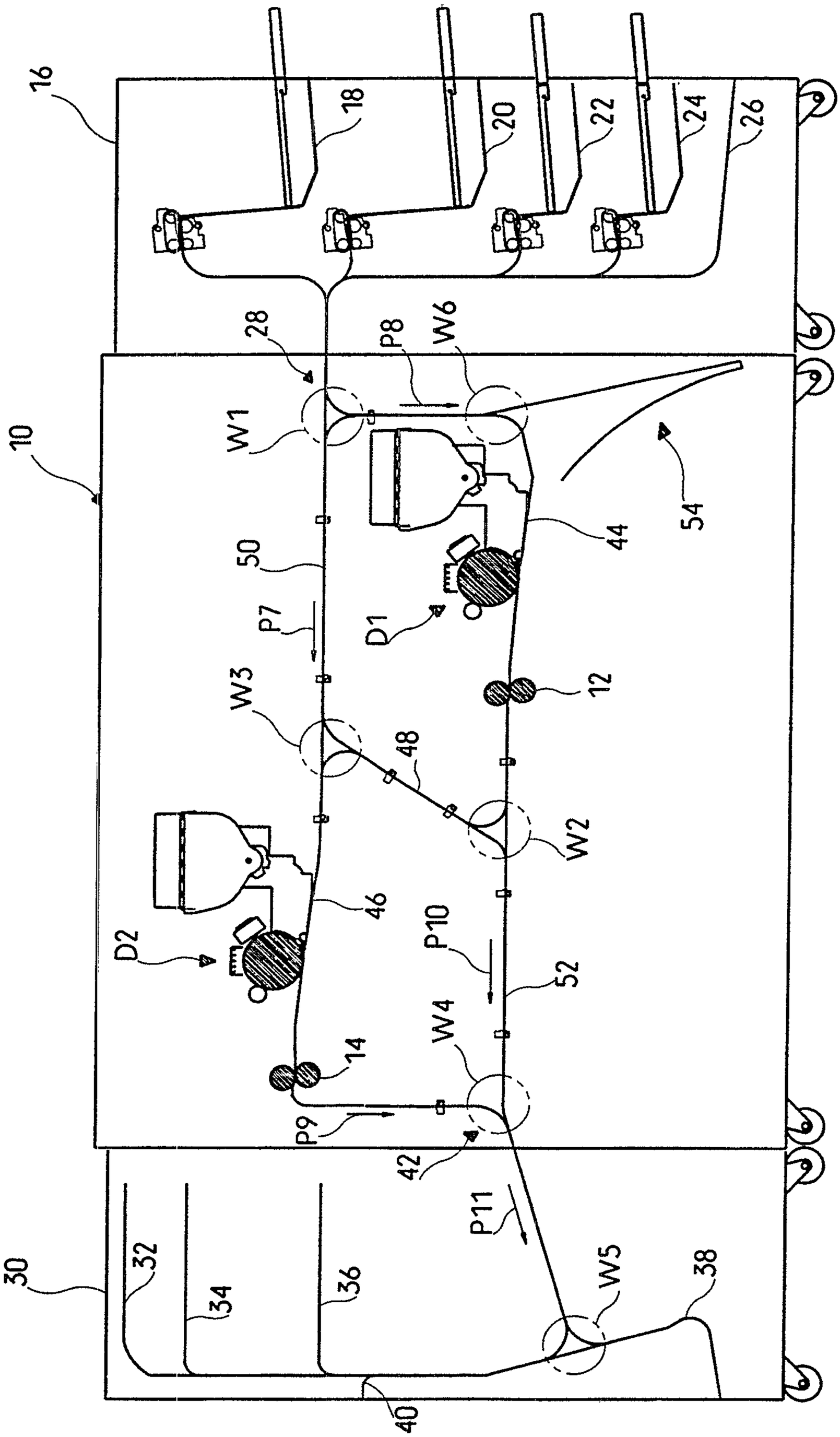
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Fig. 4

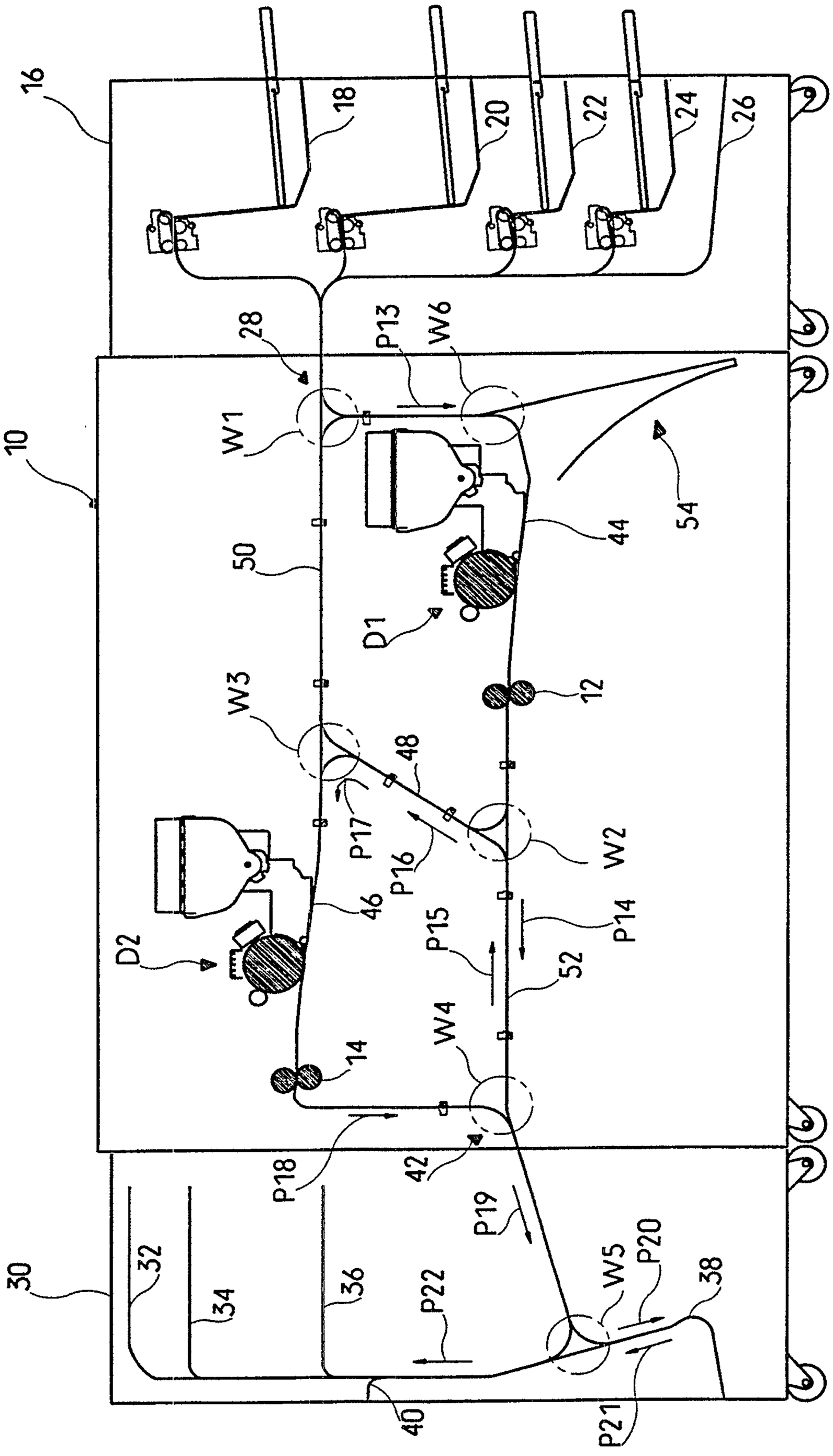
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Fig. 5

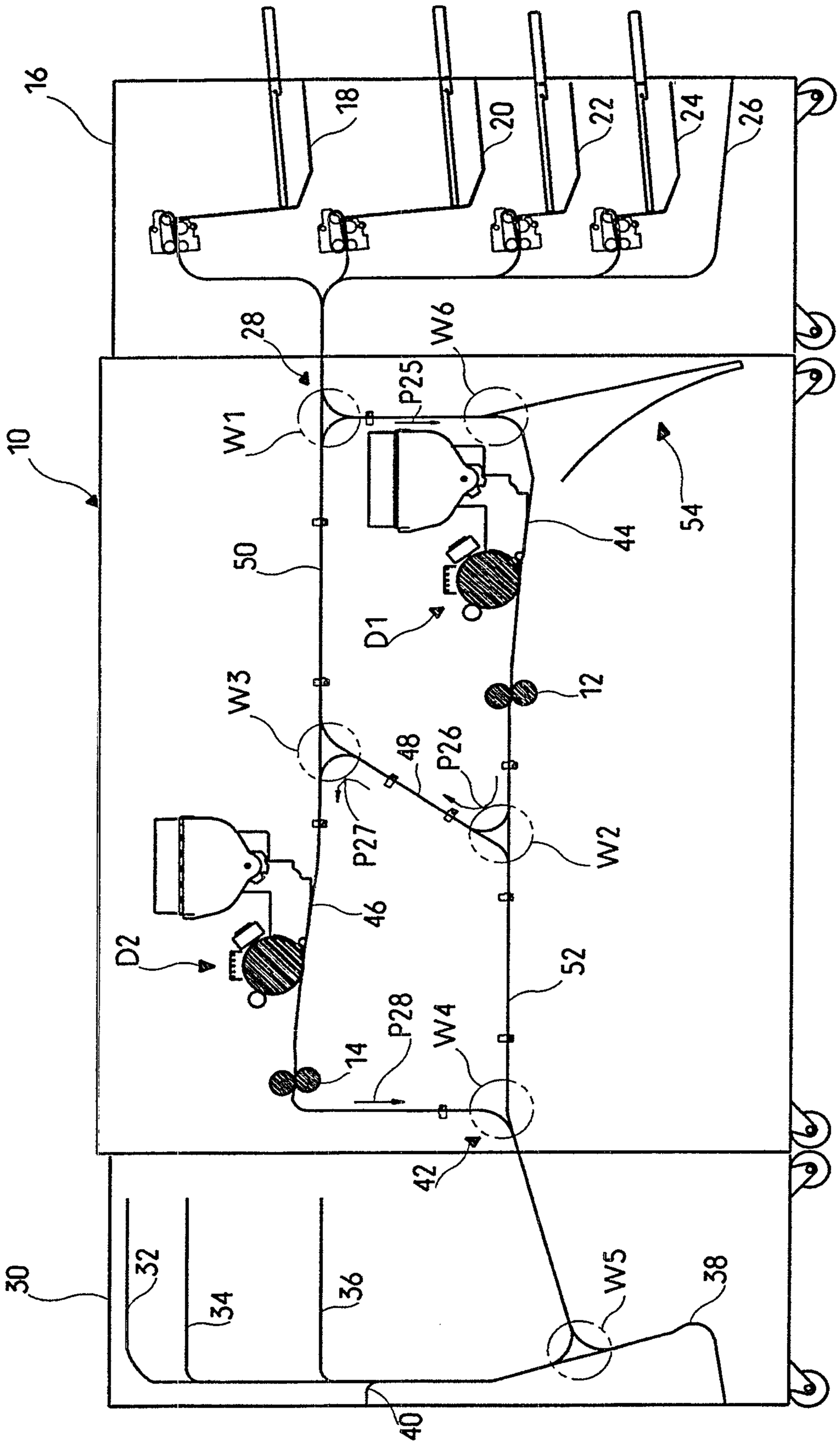
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Fig. 6

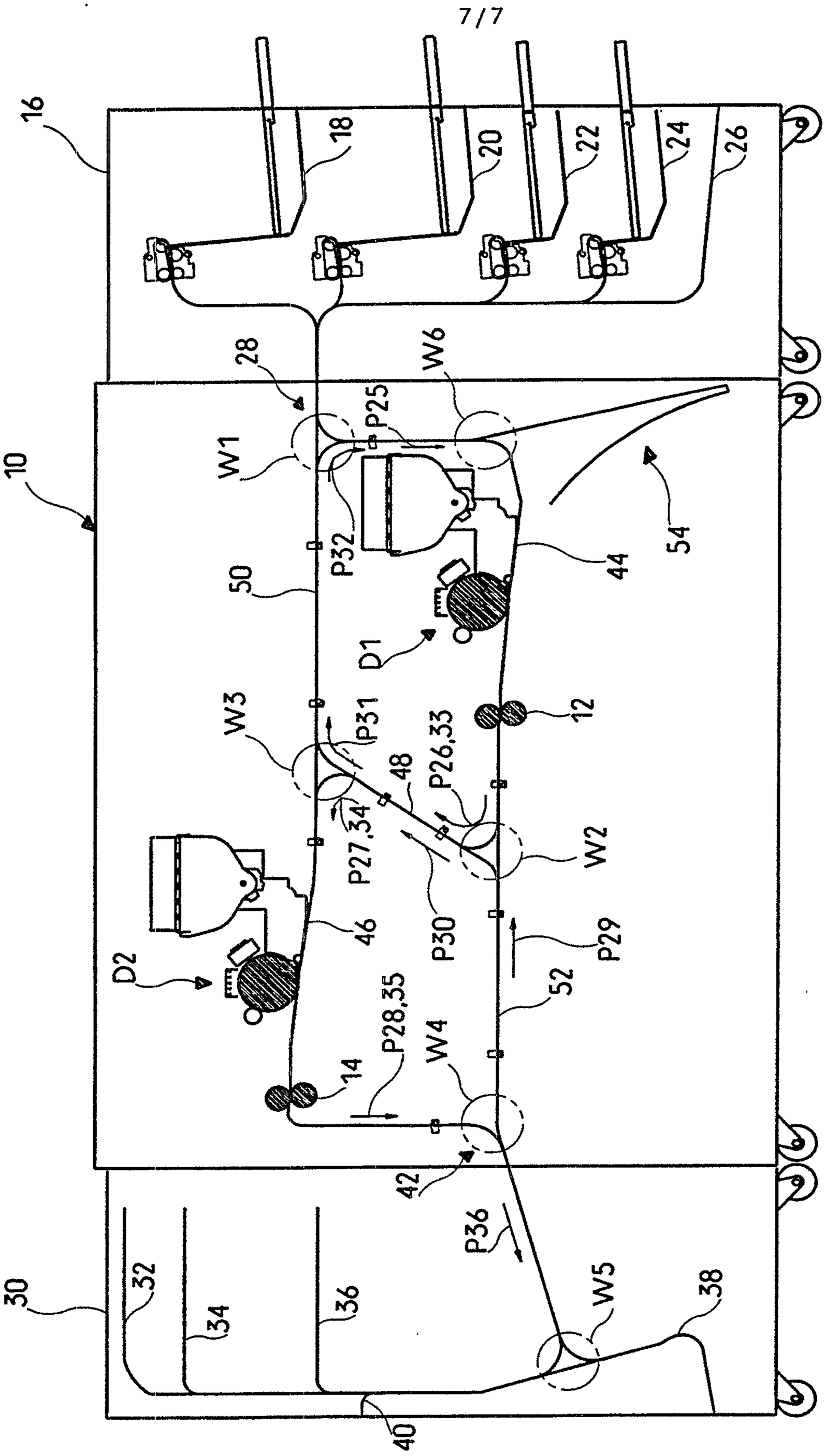
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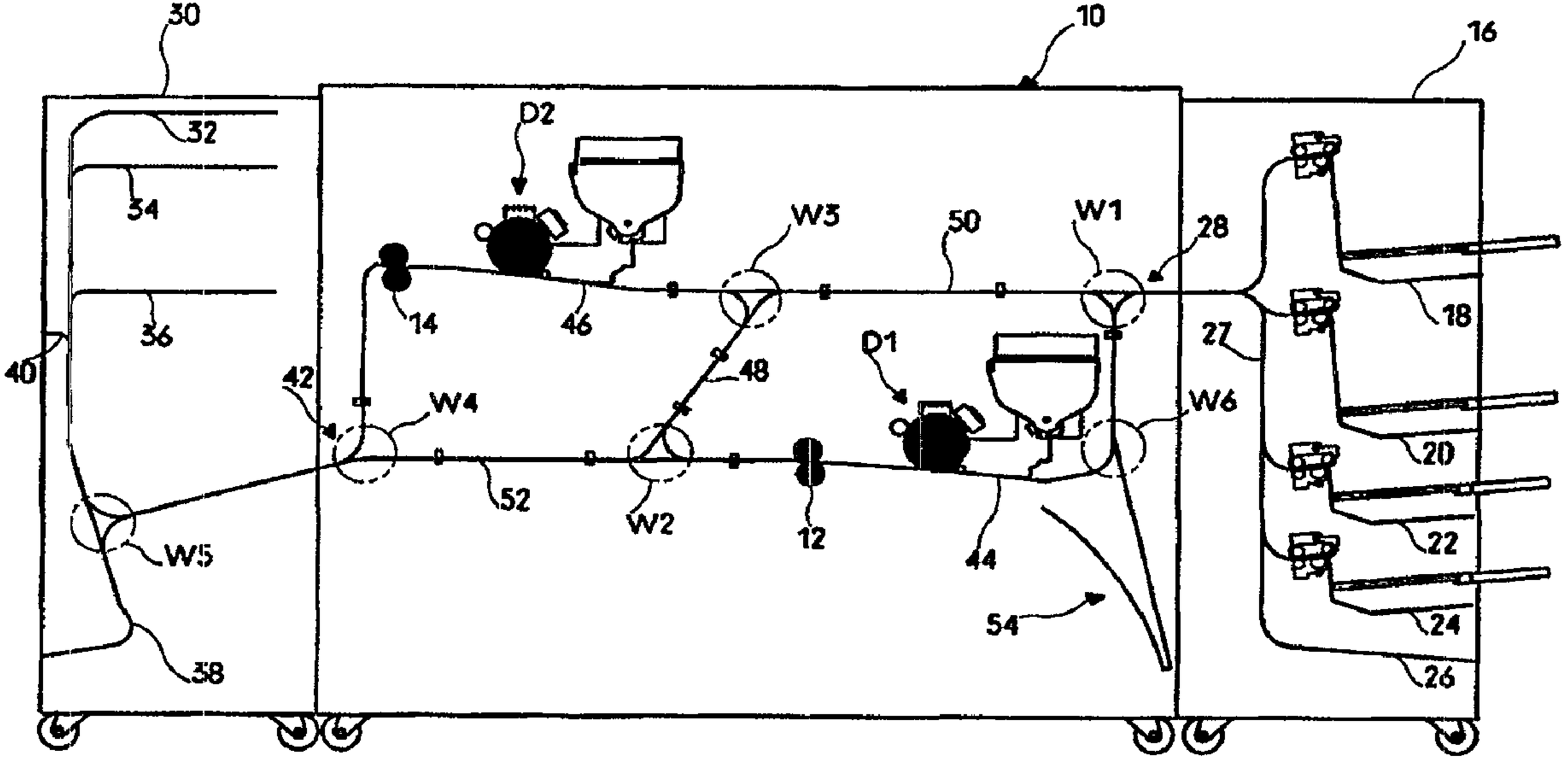
Fig. 7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