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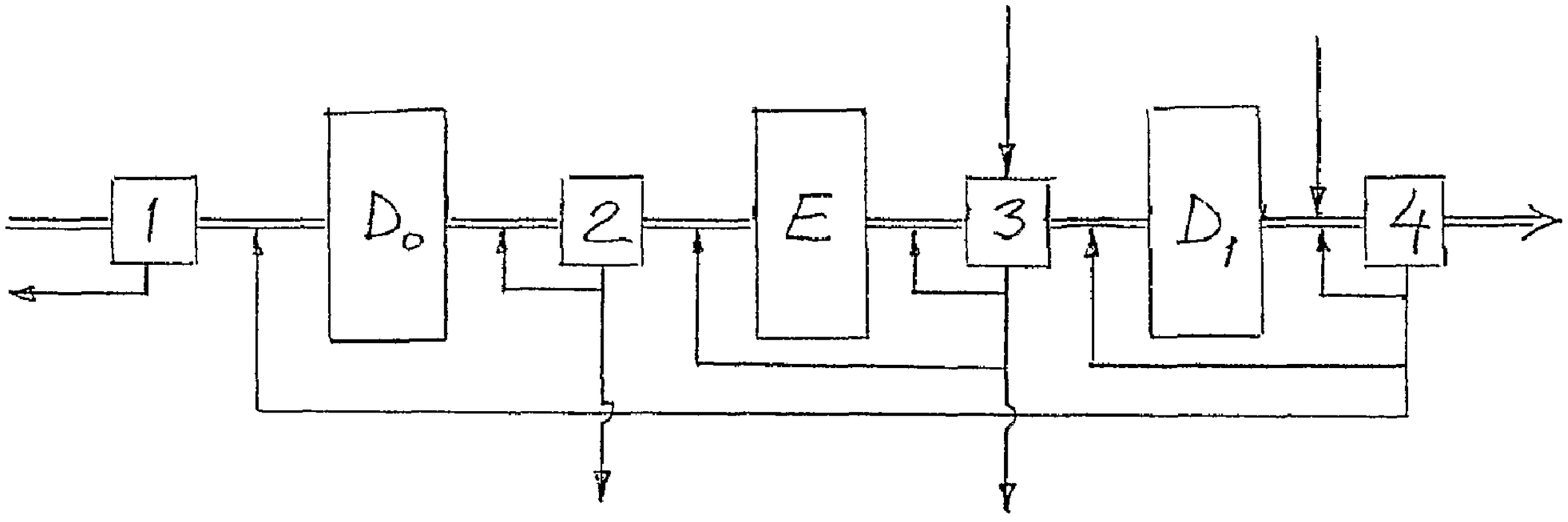
(54) Title: TWO-STAGE CHLORINE BLEACHING PROCESS WITH FILTRATE RECIRCULATION



(57) Abrégé/Abstract:
A method of bleaching chemical pulp, comprising two bleaching stages (D_0 and, respectively, D_1) with chlorine dioxide as dominating bleaching chemical and at least one intermediate alkaline bleaching stage (E). The ingoing pulp is dewatered to a concentration of 25-40% before the first chlorine dioxide stage (D_0) and to 10-40% after the second chlorine dioxide stage (D_1). Filtrate from the dewatering after the second chlorine dioxide stage (D_1) is re-cycled and utilized for controlling the pulp concentration to 8-15% of the dewatered pulp to the first chlorine dioxide stage (D_0).

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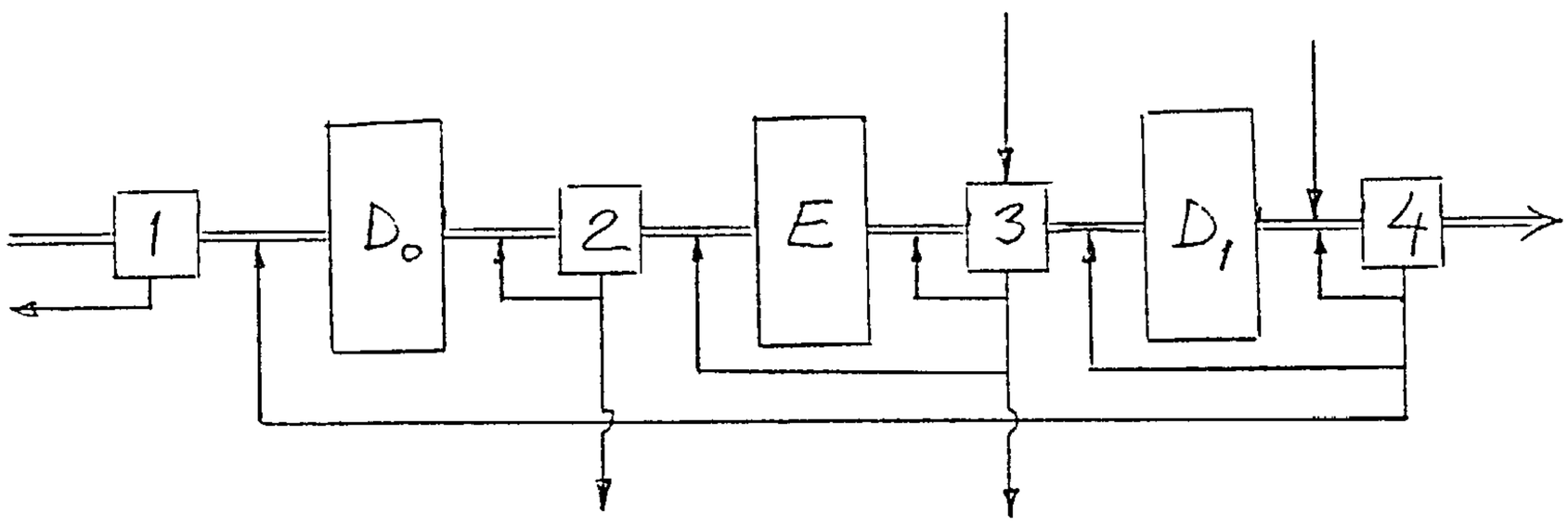
(54) Title: TWO-STAGE CHLORINE BLEACHING PROCESS WITH FILTRATE RECIRCULATION



(57) Abstract: A method of bleaching chemical pulp, comprising two bleaching stages (D_0 and, respectively, D_1) with chlorine dioxide as dominating bleaching chemical and at least one intermediate alkaline bleaching stage (E). The ingoing pulp is dewatered to a concentration of 25-40% before the first chlorine dioxide stage (D_0) and to 10-40% after the second chlorine dioxide stage (D_1). Filtrate from the dewatering after the second chlorine dioxide stage (D_1) is re-cycled and utilized for controlling the pulp concentration to 8-15% of the dewatered pulp to the first chlorine dioxide stage (D_0).

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TWO-STAGE CHLORINE BLEACHING PROCESS WITH FILTRATE RECIRCULATION

This invention relates to a method of bleaching lignocellulosic fibrous material in the form of chemical pulp. The invention comprises more specifically two bleaching stages with chlorine dioxide as dominating bleaching chemical and at least one intermediate alkaline bleaching stage.

Bleaching of chemical pulp is carried out in a sequence, which comprises several bleaching stages with different bleaching chemicals. A usual bleaching sequence comprises a first chlorine dioxide stage (D_0) followed by an alkaline bleaching stage (E) and a second chlorine dioxide stage (D_1). The chlorine dioxide stages normally are carried out only with chlorine dioxide, but alternatively the chlorine dioxide can be completed with other chemicals, for example ozone. The chemicals are added in different phases of the bleaching stage. The alkaline bleaching stage normally is an extraction stage with addition of oxygen gas and peroxide (EOP). The alkaline stage alternatively can be completed with an ozone phase, which then is carried out at acid conditions.

The bleaching of pulp has the object to increase the ISO-brightness of the pulp, which implies that impurities and discolouring matter are solved out of the pulp and removed by washing/dewatering before and after the bleaching stages by means of filters or presses. The filtrate from the dewatering can to a large extent be re-cycled and be used for washing and dilution in previous stages of the process in order thereby to minimize the emissions of solved substances. For environmental reasons a low effluent volume is desired, but the reflux of the filtrate causes a build-up of the substance content in the bleaching stages, with the resulting risk of increased chemical consumption.

In bleaching sequences of the aforedescribed kind the chlorine dioxide stages are carried out with a pulp of mean concentration (8-15%). As it is desired prior to the first chlorine dioxide stage (D_0) to the greatest possible extent to remove solved substances from previous treatment stages, the pulp is dewatered by pressing to high concentration

(25-40%). It is, therefore, necessary by dilution to lower the pulp concentration before the pulp is introduced into the bleaching stage. This dilution often is carried out with clean water, but by using instead the filtrate from the washing/dewatering directly after the bleaching stage (D_0) the filtrate flow, and thereby also the total effluent volume, from the process could be reduced.

This recycling of filtrate, however, has the disadvantage of deteriorating the ISO-brightness of the pulp. In order to compensate for this, increased chemical addition is required, which involves higher costs.

The present invention solves or at least mitigates the aforesaid problems by a more advantageous re-cycling of the filtrate in the process. Thereby an unfavourable build-up of the substance content in the bleaching process is avoided, and the ISO-brightness of the pulp is improved.

In one aspect, the invention provides a method of bleaching chemical pulp, comprising two bleaching stages (D_0 and, respectively, D_1) with chlorine dioxide as dominating bleaching chemical and at least one intermediate alkaline bleaching stage (E), where the pulp is dewatered to a concentration of 25-40% before the first chlorine dioxide stage (D_0) and to 10-40% after the second chlorine dioxide stage (D_1) characterized in that filtrate from the dewatering after the second chlorine dioxide stage (D_1) is re-cycled and utilized for controlling the pulp concentration to 8-15% of the dewatered pulp to the first chlorine dioxide stage (D_0).

The invention, thus, relates to a method of bleaching chemical pulp, comprising two bleaching stages with chlorine dioxide as dominating bleaching chemical and at least one intermediate alkaline bleaching stage. The

chlorine dioxide stages (D_0) and, respectively, (D_1) can be pure chlorine dioxide stages or bleaching stages where chlorine dioxide is completed with some other bleaching chemical, for example ozone, in different phases. The chlorine dioxide bleaching is carried out with pulp of mean concentration, 8-15%. Between the chlorine dioxide stages an alkaline bleaching (E) is carried out, which can be combined with the addition of oxygen gas (O) and/or hydroperoxide (P), so-called (EOP)-stage, or ozone (Z(EO)).

After the bleaching stages the pulp is washed by dewatering, at which liquid (filtrate) is removed by means of filters or presses. The dewatering can be carried out with or without the supply of washing liquid. The pressing suitably takes place in so-called roller presses, where the pulp is pressed between two rollers so that the pulp concentration is increased to 25-40%. At dewatering by means of filters, however, a pulp concentration of only 10-20% is obtained. After the dewatering the pulp is moved

to subsequent treatment stages, where the pulp concentration by liquid addition is adjusted to a level suitable for treatment in this stage.

At the method according to the invention, filtrate is re-cycled from the dewatering after the second chlorine dioxide stage (D_1) and utilized for controlling the pulp concentration of the pulp dewatered to 25-40% before the first chlorine dioxide stage (D_0). The pulp, thus, is diluted by this filtrate from 25-40% to the concentration suitable in this stage (D_0), i.e. 8-15%.

By utilizing in this way the filtrate from D_1, an unfavourable build-up of the substance content in D_0 can be avoided. It was, moreover, surprisingly found that the addition of filtrate from D_1 results in a lowering of the kappa number and an increase of the ISO-brightness of the pulp.

The invention is described in greater detail in the following, with reference to the accompanying drawing showing an embodiment of a flow sheet for a bleaching method according to the invention.

Chemical pulp, which can be oxygen gas delignified, is moved via a first roller press 1 to a first chlorine dioxide stage D_0. The pulp is thereafter via a second roller press 2 moved to an alkaline bleaching stage E and further via a third roller press 3 to a second chlorine dioxide stage D_1 and from there to a fourth roller press 4, from where the pulp is moved to a subsequent treatment stage. The second, third and fourth roller press 2,3,4 can possibly be replaced by filters. This, however, has the consequence, that the effluent volume increases.

Before the bleaching step in question, necessary chemicals are admixed in a conventional manner. To the E-stage suitably also oxygen gas and peroxide are added. The necessary amount of fresh water suitably is supplied to the third roller press and after the second chlorine dioxide stage D_1, see Figure. The filtrate, which is removed as effluent from the process, suitably is taken out from the second and third roller press 2 and, respectively, 3. The filtrate from the first roller press 1 is moved backward to

previous process stages. A small portion of the filtrates from every roller press 1-4 is re-cycled in a short circulation to the pulp before the respective press, for example as shown in the Figure. From the fourth roller press 4 the main part of the filtrate is re-cycled directly to the pulp in a position between the first roller press 1 and the first chlorine dioxide stage D_0.

In the first roller press 1 the pulp is dewatered to a concentration of 25-40%, in order as much as possible to reduce the content of undesired substances in the pulp before the D_0-stage. Thereafter the filtrate from the fourth roller press 4 is supplied for adjusting the pulp concentration to the level suitable for the D_0-stage , i.e. 8-15%. After the D_0-stage the pulp is dewatered, and the main part of the filtrate is removed from the process. The concentration of the pulp is controlled again with re-circulated filtrate from the subsequent roller press 3 to a concentration suitable for the E-stage where also oxygen gas and peroxide are added (EOP). Thereafter the pulp is dewatered and, after control to the desired concentration (8-15%), moved to the D_1-stage. The main part of the filtrate from this dewatering 3 is removed from the process. The D_1-stage can be a single chlorine dioxide stage or alternatively be carried out with chlorine dioxide in two phases with an intermediate neutralization. After the D_1-stage the pulp is again dewatered and advanced to subsequent treatment stages, while the main part of the filtrate is re-cycled to the pulp before the D_0-stage.

The invention, thus, implies that the bleaching process can be made more effective in that added bleaching chemicals are utilized effectively, at the same time as the effluent volume can be kept low, which is favourable from an environmental point of view.

In the following example a comparison is made between the method according to the invention and known state of art, whereby the surprising technical effect becomes apparent.

Example

An oxygen gas delignified coniferous wood pulp with kappa number 10.1 was pressed to a pulp concentration of 30% and bleached in a chlorine dioxide stage and subsequent

alkaline stage according to the sequence D (EO). Before the addition of chlorine dioxide to the D-stage, a dilution of the pulp to 10% was made. For the dilution were used clean water, filtrate from a D_0-stage and, respectively, filtrate from a D_1-stage. The result appears from the Table below.

Table

Chlorine dioxide bleaching of oxygen gas delignified pulp with kappa number 10.1, ISO-brightness 43% and viscosity 915 mL/g. The kappa factor in the bleaching stage was 1.8 kg active chlorine/kappa number. Final pH 2.3 – 2.5.

	After D(EO)		
Dilution with:	Kappa number	ISO-brightness	Viscosity ml/g
Clean water	2.7	71.6	887
D_o-filtrate	3.1	68.8	887
D_1-filtrate	2.5	72.0	894

The result shows an increase of the kappa number from 2.7 to 3.1 after D(EO) when the dilution was made with D_0-filtrate instead of clean water. When D_1-filtrate was used, the effect was the opposite one. The kappa number was lowered after D(EO)from 2.7 to 2.5.

The invention, of course, is not restricted to the embodiment shown, but can be varied within the scope of the attached claims.

CLAIMS:

1. A method of bleaching chemical pulp, comprising two bleaching stages (D_0) and, respectively, (D_1) with chlorine dioxide as dominating bleaching chemical and at least one intermediate alkaline bleaching stage (E), where the pulp is dewatered to a concentration of 25-40% before the first chlorine dioxide stage (D_0) and to 10-40% after the second chlorine dioxide stage (D_1) characterized in that filtrate from the dewatering after the second chlorine dioxide stage (D_1) is re-cycled and utilized for controlling the pulp concentration to 8-15% of the dewatered pulp to the first chlorine dioxide stage (D_0).

2. A method as defined in claim 1, characterized in that the dewatering of the pulp before the first stage (D_0) and after the second stage (D_1) is carried out by roller presses (1,4).

3. A method as defined in claim 1 or 2, characterized in that the bleaching in the intermediate stage (E) is carried out as an extraction stage with the addition of oxygen gas and/or hydroperoxide.

4. A method as defined in any one of claims 1 to 3, characterized in that a dewatering before and after the intermediate stage (E) is carried out by roller presses (2,3).

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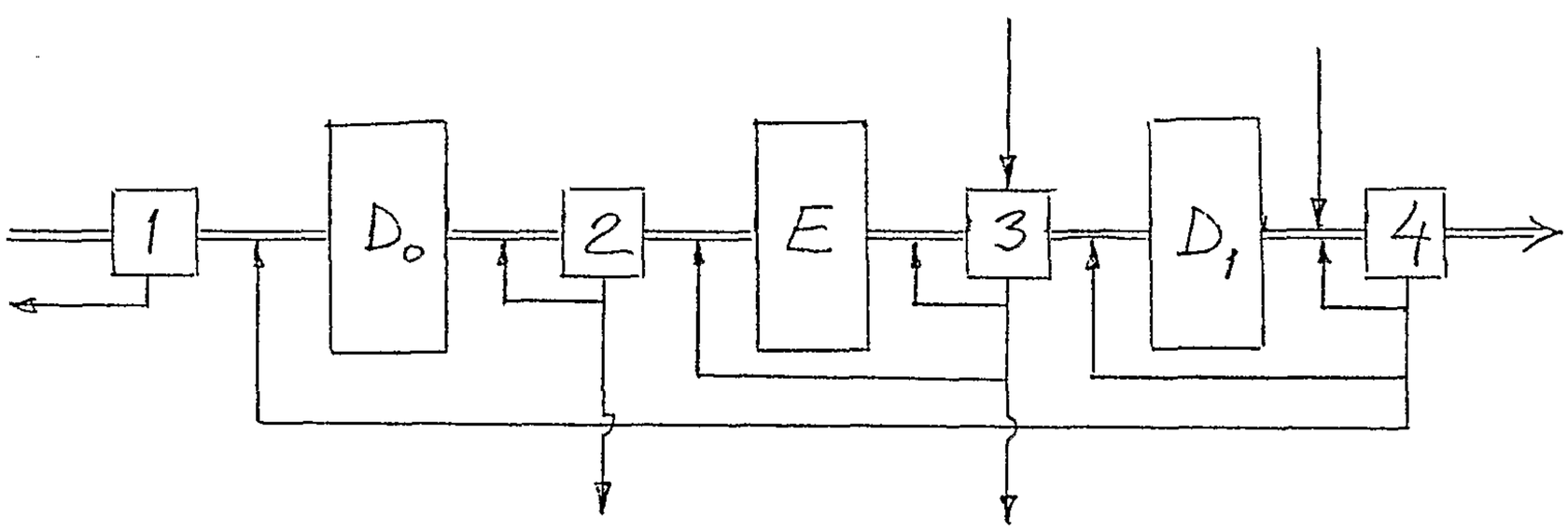
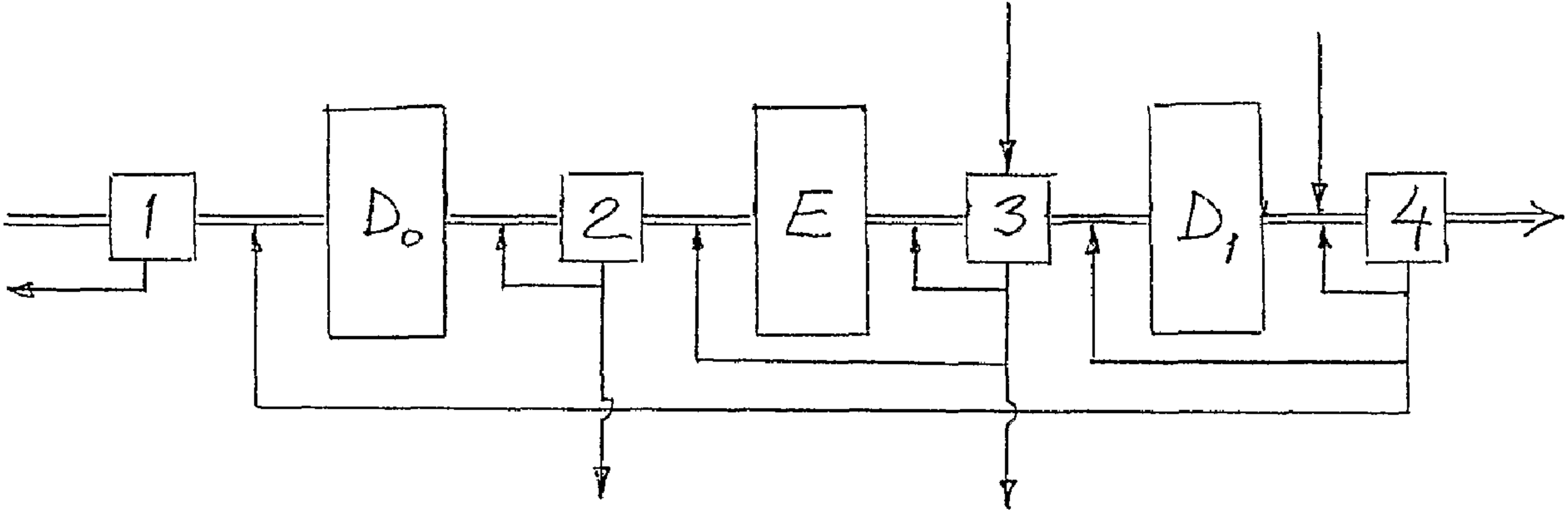

1
D_0
2
E
3
D_1
4


1
D_0
2
E
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D_1
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