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(71) Applicant *(for all designated States except US):* SUNDS DEFIBRATOR AKTIEBOLAG [SE/SE]; S-851 94 Sundsvall (SE).

(72) Inventors; and
(75) Inventors/Applicants *(for US only) :* ÅKERBLOM, Bengt, O. [SE/SE]; Vårby Allé 23, S-143 00 Huddinge (SE). LÖFQVIST, Bengt, O. [SE/SE]; Wahlbergsgatan 2, S-121 46 Johanneshov (SE).

(74) Agent: ILLUM, Leif-Otto; Svenska Cellulosa Aktiebolaget SCA, Kungsgatan 33, S-111 56 Stockholm (SE).

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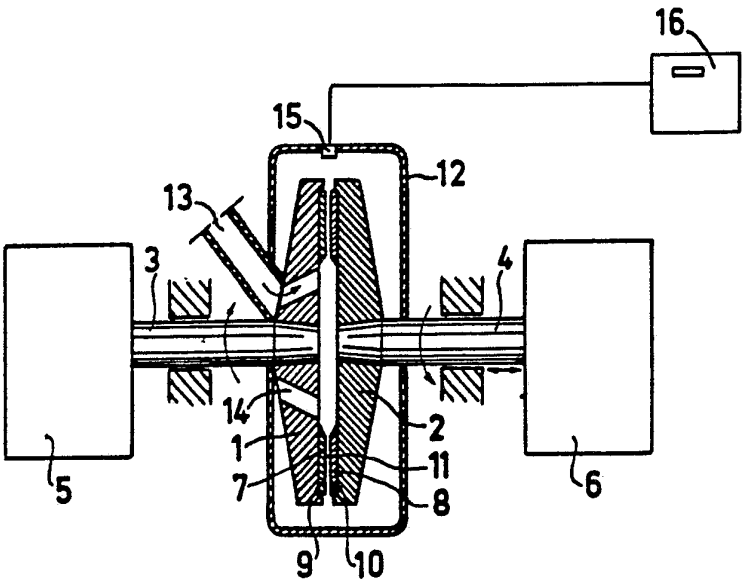
(54) Title: METHOD AND DEVICE FOR INDICATING THE CONTACT POSITION IN A REFINER



(57) Abstract

In a disc refiner with two opposed refining discs (1, 2) rotary relative to each other the contact position for the refining surfaces (9, 10) is indicated. The refining discs (1, 2) are moved against each other during relative rotation whereby the first contact of the refining surface (9, 10) with each other generates a heat radiation, which is detected by a transmitter (15). The place of detection is radially outside the refining discs (1, 2) in a refiner housing (12) enclosing the refining discs. Said transmitter emits an output signal, which is utilized for determining the contact position.

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Method and device for indicating the contact position in a refiner

This invention relates to a method and a device for indicating the contact position for the refining surfaces on two opposed refining discs rotating relative to one another in a disc refiner. Indication, thus, is to take place when the gap between the refining surfaces is zero.

A disc refiner comprises two opposed refining discs, which are provided with exchangeable refining elements constituting the refining surfaces of the refiner. In a disc refiner where wood chips are refined to paper-making pulp, the refining is carried out between the two refining discs, which are kept at a definite distance from each other. Depending on the type of refiner, one or both of the refining discs are mounted on a rotary axle. The axles are driven by motors with high effect, and the distance between the refining discs (gap) is adjusted by means of hydraulic and measured with special measuring systems. If due to faulty function in operation the refining surfaces contact each other, breakdown will occur or at least the refining surfaces will be subjected to great wear, which will reduce the operating time. It is, therefore, very important to accurately control the gap.

For measuring the distance between the refining surfaces accurately, measuring systems are applied which require preliminary adjustment of the zero point; for example after the exchange of refining elements. In order to be able to determine the zero point of the measuring system, the contact position must be known.

It is known previously that the contact position can be detected by using audio measuring apparatus. This method requires a transmitter to be mounted in connection to one of the two refining surfaces. When the refin-

ing surfaces contact each other, vibrations are propagated through the refining disc to the transmitter, which can be of the type microphone, impact pulsometer or vibrometer.

One disadvantage of this method is that the transmitter also measures other interference sources, for example axle bearings. This implies that it is difficult to detect a slight contact and, therefore, the signal must "drown" other interference sources. This technique neither can measure the phase position of the contact point, i.e. the point where the refining surfaces first come in contact with each other. Another disadvantage is that this principle presumes one of the two refining surfaces being stationary. In applications with two rotating refining surfaces there exists to-day no method of detecting the contact position.

The present invention relates to a method and a device, at which the aforesaid disadvantages are eliminated. According to the invention, the heat radiation from the contact of the refining surfaces is utilized for determining the axial contact position. The characterizing features of the invention become apparent from the attached claims.

The invention is described in greater detail in the following, with reference to the accopmanying Figures.

Figure 1 shows in a schematic manner an embodiment of the invention;

Figure 2 shows schematically the peripheral location of the transmitter according to an embodiment of the inventon;

Figure 3-5 shows output signals from the transmitter.

Figure 1 shows a disc refiner with two refining discs 1, 2, which are arranged on two axles 3,4 rotary in opposed directions. The axels are driven by motors 5,6 and one 4 of the axles is also axially movable. The refining discs are provided with exchangeable refinging elements 7,8.

Their refining surfaces 9,10 define a gap 11. The refiner discs 1,2 are enclosed by a refiner housing 12. Chips are supplied through an infeeder 13 and openings 14 in one refining disc 1. A transmitter 15 sensitive to heat radiation, for example a so-called photo-detector, is provided to detect the friction heat radiation arising when the reining surfaces 9,10 contact each other. The transmitter, therefore, can be positioned in the refiner housing 12 radially outside the gap 11. The transmitter is directed to the outermost edges of the refining surfaces 9,10, because the refining elements 7,8 are designed so that the distance between the refining surfaces 9,10 is smallest at the periphery.

The temperature in the refiner housing 12 possibly becoming very high, however, it may be advantageous to position the transmitter spaced from the refiner housing. The transmitter then can be coupled to a special conducting device connected to the refiner housing 12 radially outside the refining discs 1,2. This conducting device, for example, can be a so-called opto-fibre cable, which conducts the radiation from the place of detection to the transmitter.

When the refining discs 1,2 during their rotation approach each other, so that the refining surfaces 9,10 finally contact each other, the temperature increases and heat energy is generated in the point where the contact takes place. This rise of temperature is detected in the form of heat radiation in the transmitter 15. It is, thus, not the absolute temperature, but only the rise of the temperature which is detected. The transmitter then emits an electric output signal, which can be utilized for determining the contact position. Due to the rotation of the refining discs, the output signal of the transmitter will have the same frequency

as the rotation frequency. The amplitude and pulse width of the signal are proportional to the heat radiation.

As there are no other heat radiating objects, the sensitivity of the transmitter can be adjusted so that already a very slight contact is detected.

When the axles of the refiner are not aligned correctly, the parallelity of the refining surfaces 9,10 is affected. This implies that only a portion of the periphery of the refining surfaces get into contact first. The phase position and extension of the contact point, thus, are a measure of the parallelity between the refining surfaces.

By synchronizing the output signal to the rotation frequency of the axle and thereby of the refing disc, the phase position of the contact point of the refining surfaces can be determined. The pulse width of the output signal, furthermore, implies that the extension of the contact point can be determined. It is, thus, possible to utilize the output signal for measuring the alignment of the refining discs and thereby of the axles.

The transmitter, of course, can be coupled to an amplifier 16 where the output signal is presented visually and audially for calibrating the measuring system used.

Example

One of the axles in the shown disc refiner is procided with a mechanical flag 17 which during the rotation of the axle gives impulses to a second transmitter 18. Thus, the second transmitter 18 creates pulses which are synchronized eith the number of revolutions and which are repeated with a period time t_1. At a nominell rotation of 1500 rpm the period time is 40 ms.

The transmitter 15 sensitive to heat radiation is located peripherially offset in relation to the second transmitter 18. In figur 2 the location of these two transmitters 15, 18 are shown schematically. The heat radiation from the

contact point 19 on the refining surface will be detected by the transmitter 15 after the time t_2 when the contact point has rotated up to the transmitter 15. By studying the displacement of the signal pulses from the two transmitters 15,18, see figure 3, it is possible to determine the phase position of the contact point.

Depending on the peripheral extention of the contact between the refiner surface, the shape of the output signal varies. Figur 4 shows an output signal which can be regarded in an oscilloscope. The amplitude of the puls depends on how hard the contact is and its width depends on the extention of the contact. Figure 5 shows the signal from a hard contact from many different points. Thus, the output signals are indications on the parallelity between the refining discs and thereby the alignment of the axels.

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

Claims

1. A method of indicating the contact position for the refining surfaces on two opposed refining discs rotating relative to each other in a disc refiner, characterized in that the heat radiation from the first contact of the refining surfaces when they during relative rotation are moved against each other is detected and yields an output signal, which is utilized for determing the axial contact position.

2. A method as defined in claim 1, characterized in that the heat radiation yields an output signal, the amplitude and pulse width of which are proportional to the heat radiation.

3. A method as defined in claim 1 or 2, characterized in that the output signal is synchronized to the rotation frequency of the refining discs for determining the phase position of the contact point of the refining surfaces.

4. A method as defined in claim 2 or 3, characterized in that the pulse width of the output signal is indicated for determining the extension of the contact point of the refining surfaces and thereby the parallelity of the refining surfaces.

5. A method as defined in any one of the preceding claims, characterized in that the output signal is presented visually and audially.

6. A device for indicating the contact position for the refining surfaces (9,10) on two opposed refining discs (1,2) rotary relative to each other in a disc refiner, characterized in that it comprises a transmitter (15) sensitive to heat radiation for detecting the friction heat radiation arising when the refining surfaces (9,10) during relative rotation contact each other and where the place of detection is radially outside the refining discs (1,2) in a refiner housing (12) enclosing the refining discs.

7. A deviceas defined in claim 6, c h a r a c t e r i z e d i n that the transmitter (15) is located radially outside the refining discs (1,2) in the refiner housing (12).

8. A device as defined in claim 6, c h a r a c t e r i z e d i n that the transmitter is located spaced from the refining discs (1,2) outside the refiner housing (12) and that the transmitter is coupled to a special conducting device connected to the refiner housing (12) radially outside the refining discs (1,2).

9. A device as defined in any one of the claims 6-8, c h a r a c t e r i z e d i n that the transmitter (15)is connected to an amplifier where the output signal of the transmitter is presented visually and audially.

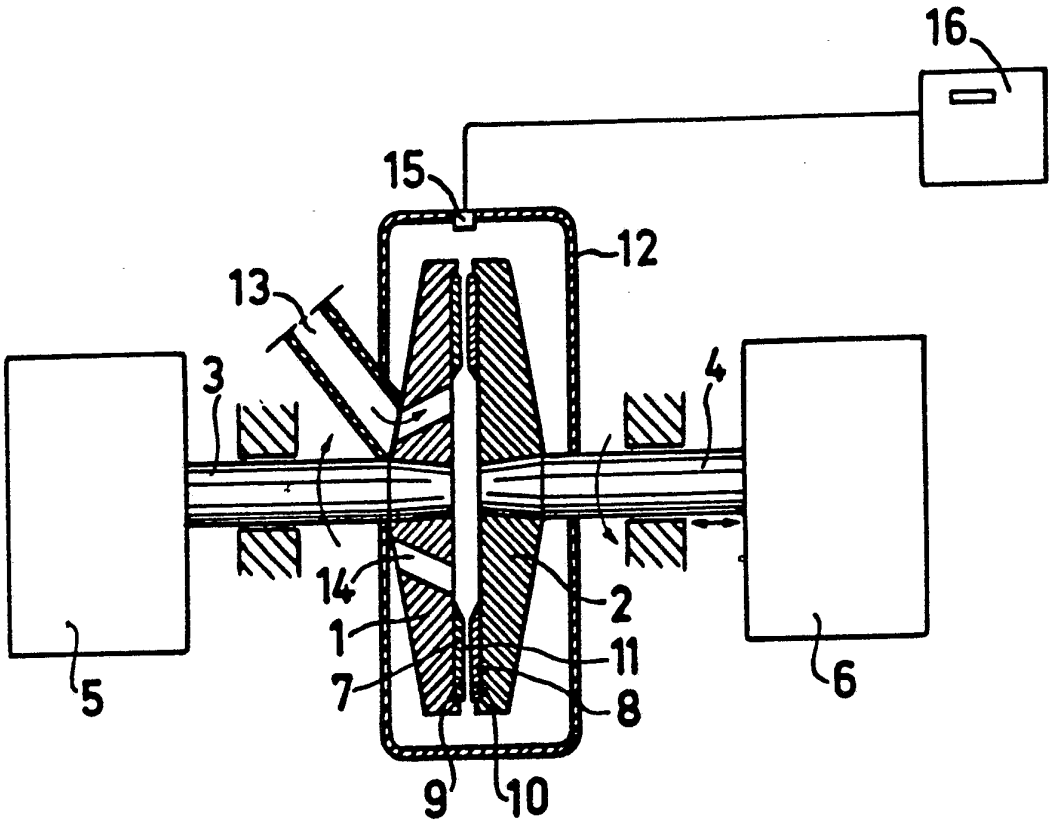

Fig 1

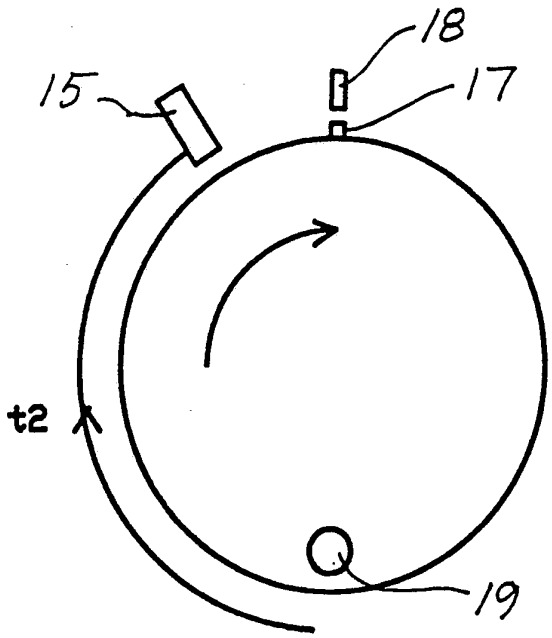

Fig 2

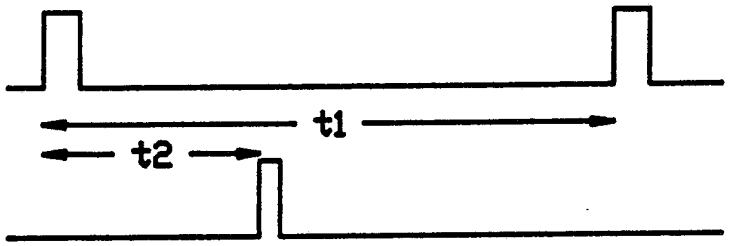

Fig 3

Fig 4

Fig 5

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00459

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC[4]

B 02 C 7/14, G 01 B 11/14

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	B 02 C 7/14, 23/04; D 21 D 1/30; G 01 B 11/14, /26, 15/00
US Cl	241: 33, 35, 37, 259.0-3; 356: 51, 138, 152, 189, 190, 375

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 4 441 817 (PRYOR) 10 April 1984	1-9
A	US, A, 3 434 670 (W D MAY) 25 March 1969	1

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
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Swedish Patent Office	Wiva Asplund