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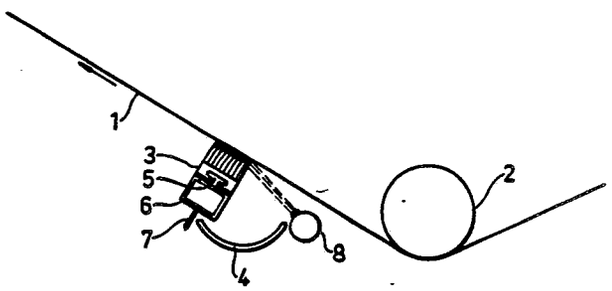
(54) **Method and device for cleaning the clothing in pulp, board and paper industry.**

(57) This invention relates to a method and a device for cleaning the clothings of pulp, board and papermaking machines, for example forming wires, fabric wires, press felts and drying wires. The pulp, board and paper industries at the manufacture of their products struggle with increasing problems of maintaining the efficiency of their machine clothings, for example forming wires, fabric wires, press felts and drying wires, as these to an ever increasing extent are affected by impurities. The machine clothings heterofore have been cleaned by means of various chemical preparations, such as dispersing agents, solvents or petroleum products. Amounts of cleaning chemicals of 30 to 40 m³/year are not unusual. It was found that the environmental requirements with respect to the handling of these cleaning chemicals are difficult to comply with. An alternative and improved cleaning is proposed to be carried out in operation by a brushing operation (3) against the surface of the clothing (1) which is in contact with the fibre web and along a line transverse to the running direction of the clothing in the machine in a zone where the fibre web has left the clothing.



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Method and device for cleaning the clothing in pulp, board and paper industry

The present invention relates to a method and a device for cleaning the clothings in pulp, board and papermaking machines, for example forming wires, fabric wires, press felts and drying wires.

The aforesaid industries, at their manufacture of pulp, board and paper, struggle with increasing problems of maintaining the efficiency of the clothings, such as forming wires, fabric wires, press felts and drying wires, as these to an ever higher degree are affected by impurities. This tendency has increased in recent years, primarily because of three different kinds of reasons:

1. For environmental reasons, the water circulation system from the machine must be closed, and only small amounts of process water can be conducted away. As a consequence, the amount of impurities in the process water increases and deposits to a large extent in the clothings.
2. A lack of pure fibre rawmaterial successively has developed and, therefore, recovered paper is used increasingly for the making of various types of papers. Recovered fibre pulp includes a great amount of impurities, of which primarily colouring pigments, latex, resins, bitumen etc. give rise to problems.
3. The clothings are manufactured to an ever increasing extent of synthetic materials, to which, as was observed, the impurities adhere stronger than to materials used previously. One example thereof is the change-over from metal wires of phosphor bronze to wires of synthetic material, primarily polyester.

At the methods heretofore used for overcoming these problems and for maintaining the clothings in desired condition, the production had to be stopped at regular intervals, which for some machines amounted to 5 to 10 per cent of

the production time. These interruptions, of course, imply varying costs, depending on the duration of the interruptions and on the production, but it may generally be said that these interruptions considerably limit the capacity range and profitableness.

The clothings have been cleaned heretofore by using different chemical preparations, for example dispersing agents, solvents or petroleum products. Amounts of 30 to 40 m^3/year of cleaning chemicals are not unusual. The environmental requirements imposed on the handling of these chemicals have proved difficult to comply with, in view of such large amounts, and entailing problems at the recovery of the chemicals, for example skin diseases of the labour force, allergies, damages on vital machine parts, not the least on rubber material, have generally been observed. Another cleaning method is the use of water by high-pressure sprayers of 30 to 40 bar which, however, can damage the clothings and in difficult cases do not yield a satisfactory cleaning, either. Besides, the investment costs for such sprayers, including pump and other peripheral equipment,for a medium-size machine are relatively high and amount up to 50 000 - 100 000 Swedish Crowns.

A further aspect with respect to the operation of clothings covered with impurities is a high frequency of web-breaks, caused by too poor drainage in the forming wire. A further consequence of this low drainage capacity is that suction boxes in the wet part must operate at a higher vacuum. This in its turn brakes the clothing, and the power output must be increased. As effects of these factors limitations as regards machine speed and quality of the product manufactured.are unavoidable. The service life of the clothings is shortened substantially when they cannot be maintained open and clean, and their main function in the respective position is restricted.

It is against this reality that the present invention for cleaning the clothings is to be judged. The effecta of the cleaning method according to the invention could be studied

at two parallel tests in papermaking machines, and the results measured at these tests substantially were as follows:

a) All cleaning chemicals for the clothings could be eliminated. The costs of the chemicals previously used at the test machines had been calculated generally to be about 5 Swedish Crowns per ton paper, corresponding to about 1000 Swedish Crowns per day for a medium-size papermaking machine. The costs include resin dispersing agents, talc and solvents.

b) Special interruption periods for cleaning the clothings amountimg to about 3 to 7 hours per week are saved.

c) The web-break frequency has decreased from 10 breaks to 6 breaks per day. This implies about 1 hour more production time per day.

d) Limitation of spray water and saved amount of freshwater.

e) Increase in the dry content after the couch roll.

f) Lower steam consumption.

g) Lower vacuum on the suction boxes and, as a result thereof, less wear of clothing and lower energy consumption for the operation of clothing.

For the test machines concerned, the savings made and the increase in production indicate total improvements in profitableness of 6 to 8 Mio Swedish Crowns per year and machine. This saving possibly may be still greater, when it is possible to evaluate the longterm effects.

The invention is characterized in that the clothing is cleaned in operation by applying a brush device against the clothing surface, which is in contact with the fibre web and along at least one line across the running direction of the clothing in the machine in a zone where the fibre web has left the clothing.

Two embodiments of the invention are described in the following, with reference to the accompanying drawings, which schematically illustrate a portion of a clothing web with a brush device according to the invention idea.

Fig. 1 shows a portion of a running clothing 1 for e.g. a papermaking machine, whereof only a conducting roller 2 for

the clothing is shown. In the portion shown the clothing is free from the fibre web, in that the fibre web either has left the clothing, or a new fibre web is to be applied in a subsequent place. Immediately after the conducting roller 2, seen in the running direction of the clothing, a brush device is provided which comprises a long plane brush 3 extending transversely to the running direction of the clothing from one edge to the other. The brush 3 abuts the surface of the clothing 1 which is in contact with the fibre web (not shown). Due to the continuous abutment of the brush 3 to the clothing surface, this surface is maintained clean, and impurities cannot accumulate. The impurities are brushed off from the clothing and drop down into a trough therebeneath, from which the impurities are conducted away in a suitable manner.

The long brush 3 is mounted movably on a rail 5 supported on the machine stand, so that the brush simply can be removed from and attached to the rail. The brush may comprise a plurality of brush members pushed-on one after the other. The rail 5 corresponds at least to the clothing width. It, thus, has a substantial length and, being supported only at its ends, the rail understandably deflects down at its centre by its own weight. As it is important that the brush 3 abuts the clothing along all of its length, measures are required for eliminating the deflection. The rail 5, therefore, comprises a beam 6, which is presetressed to extend with an upward curved line. This curvation line is straightened by the weight of the brush and the dead weight of the beam and rail at the mounting.

Fig. 1 shows schematically means for counteracting the deflection, consisting of a stay member 7, which is directed downward at the centre of the beam 6. A wire is stretched from one end of the beam 6 to the other via the stay member. By increasing the tension in the wire, the central point of the beam 6 at the stay member 7 can be bent upward, or, rather, the deflection tendency of the beam is counteracted by the tension in the wire.

The brushes pushed on the rail, thus, easily can be cleaned or exchanged. Experiments have been made so far with plane brushes, ground or not ground, which had a width of 150 mm and a height of the bristles of 40 mm. The diameter of the brush material was 0.50 mm. These measures, however, do not constitute a limitation for future applications, but other dimensions and forms of the brushes may be suitable.

The effect of the brush can be improved in certain cases, and especially the removal of the impurities can be facilitated by providing a low-pressure sprayer 8 immediately before the brush device and directed so that the spray jets meet the leading edge of the brush. The pressure may be about 6 bar.

It was found to be essential, that the brush is continuously active against the clothing already from the start, when the clothing goes into operation, in order to prevent spoiling of the clothing, because it was observed that in certain cases a clothing already spoiled is not cleaned by the brush as efficiently as an unspoiled clothing. The regularity of the brush action is deemed essential. Papermaking machines often operate within the speed range 100 to 1000 m/min, and the clothings normally have a length of 15 to 75 m. This implies that from one machine to the other the regularity for a stationary brush device can vary from about once per minute to about once per second. When the cleaning problems are of a difficult nature, two or more brush devices can be installed to operate to the side of each other against the clothing and thereby improve the effect by intensified cleaning work on the surface of the clothing. Also other variations of plane brushes can be imagined, for example a zigzag arrangement or the like.

In Fig. 2 another embodiment of the invention is shown, which differs from the one described above in that the plane brush has been replaced by a brush roller 9, which can be rotated in a suitable manner intermittently or continuously and preferably in the direction against the running direction of

the clothing. As in the case of the former embodiment, a low-pressure sprayer 8 and an underneath trough 4 for receiving the impurities are provided. It is understood that several brush rollers can be arranged one after and also one to the side of the other.

In Figs. 3-5 an especially suitable design of a brush is shown which consists of modules having a length of e.g. 1 m. It is thereby possible to adjust the length of the brush to different clothing widths between, for example, 2 m and 10 m. The modules are assembled detachably by means of a hook coupling 12 formed in the base member 11 of the brushes. Said coupling member extends obliquely to the longitudinal direction of the brush, i.e. owing to the bevel cut joints between the modules forming the hook coupling the modules overlap each other and prevent visibility of the joint between the brushes.

The idea of the invention is not restricted to the embodiments described above. It is obvious that the brush devices can be mounted in places other than those shown and, thus, the cleaning process must not be carried out against a clothing surface entirely directed downward, but the cleaning can be effected against a slightly inclined or vertical portion of the clothing. It is desirable that the brush device is positioned close to a conducting roller, so that the resistance of the clothing against the conducting roller and the plane of the clothing are as good as possible. It further is to be pointed out that the brush line transversely to the clothing need not be perpendicular to the same, but can form a certain angle to the running direction which, if deemed suitable, is smaller than 90°. A brush, furthermore, must not necessarily extend across the entire width, but for example may cover only half the width, and an adjacent brush covers the remaining clothing half. The rail 5 and beam 6 need not extend, either, across the entire width of the clothing, but may cover part of the width while the remainder of the width is covered by an additional rail and beam with brush. This applies, of course, also in the case when the

brushes consist of brush rollers.When the brush rollers are operated at continuous rotation speed, and the clothing has a substantial width, the length of the brush roller may suitably be divided into different sections in order to avoid too long shafts.

Claims

1. A device for cleaning the clothings of pulp, board and papermaking machines, for example forming wires, fabric wires, press felts and drying wires, which brush device has at least one linear contact surface with the clothing which extends transversely to the running direction of the clothing in the machine and corresponds in length to the width of the clothing, c h a r a c t e r i z e d i n that a brush device (3,9) is located only against the surface of the clothing (1) which is in contact with the fibre web, and that a sprayer means (8) is located at the brush device and sprays liquid jets against the brush (3,9) in the brushing zone.

2. A device as defined in claim 1, c h a r a c t e r - i z e d i n that the operative surface of the brush device (3,9) faces upward to the downward directed surface of the clothing (1).

3. A device as defined in claim 1, c h a r a c t e r - i z e d i n that a collecting means (4) is located adjacent the brush device (3,9) to receive impurities brushed off from the clothing.

4. A device as defined in claim 1, c h a r a c t e r - i z e d i n that the brush device (3) consists of a brush constituting at least one plane long operative surface extending across the width of the clothing.

5. A device as defined in claim 1, c h a r a c t e r - i z e d i n that the brush device consists of cylindric brushes with the longitudinal axis extending across the width of the clothing.

6. A device as defined in claim 5, c h a r a c t e r - i z e d i n that the brushes rotate in the direction opposed to the running direction of the clothing.

7. A device as defined in claim 4, c h a r a c t e r - i z e d i n that the brush device is supported on a beam structure, the deflection line of which due to dead weight and load can be stretched by a stretching means, so that the contact lines of the brushes across the width of the clothing are straight.

8. A device as defined in claim 4, c h a r a c t e r - i z e d i n that the brush consists of several modules in the longitudinal direction, which are assembled by a hook coupling (12), which is located obliquely to the longitudinal direction and formed by co-acting recesses in the base member (11) of the brush.

FIG.1

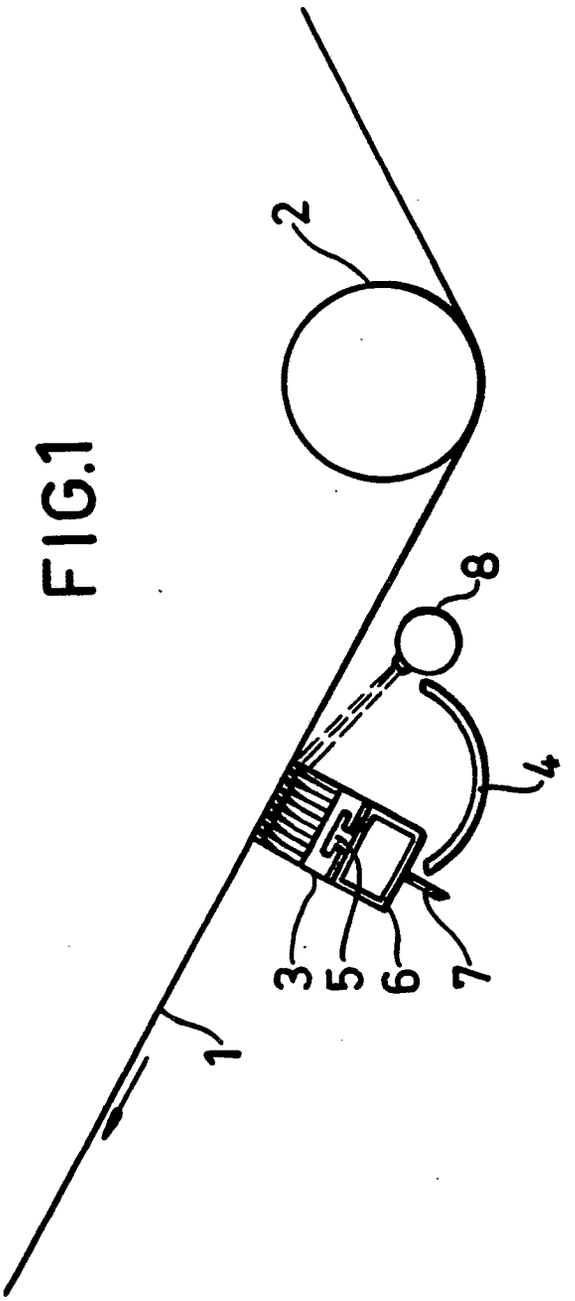

FIG.2

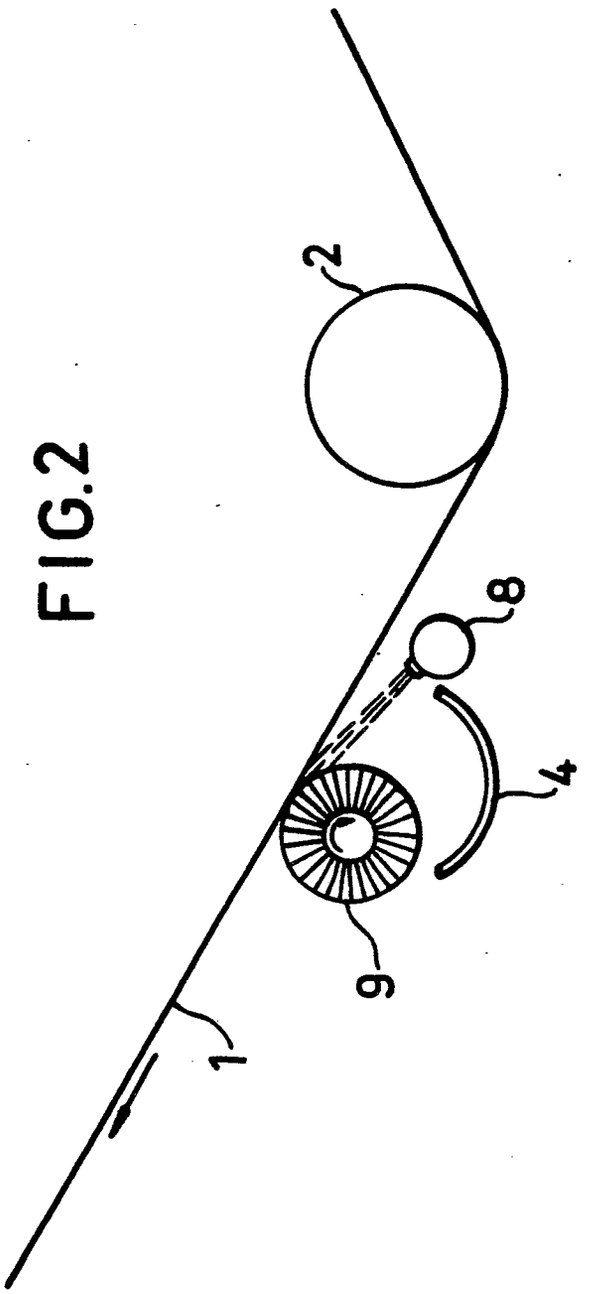

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FIG.4

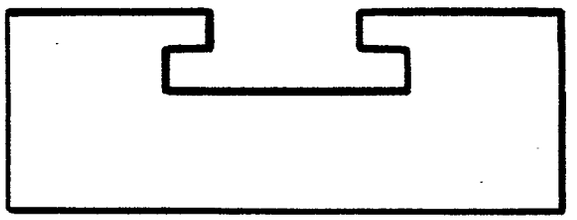


FIG.3

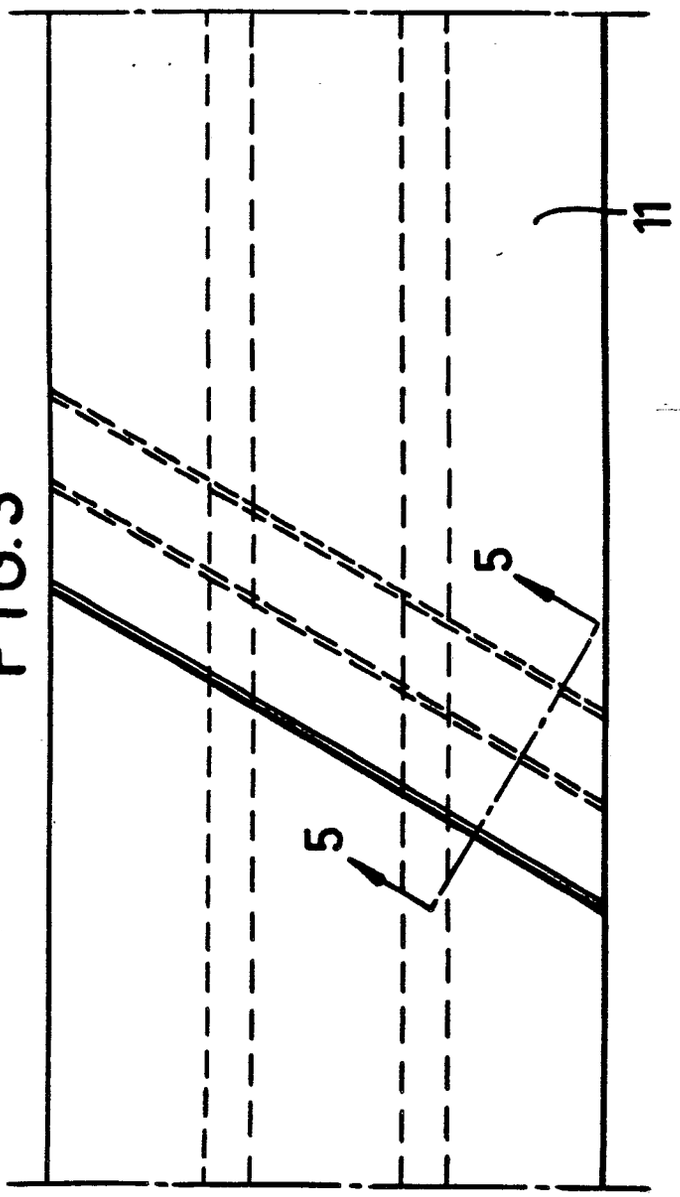
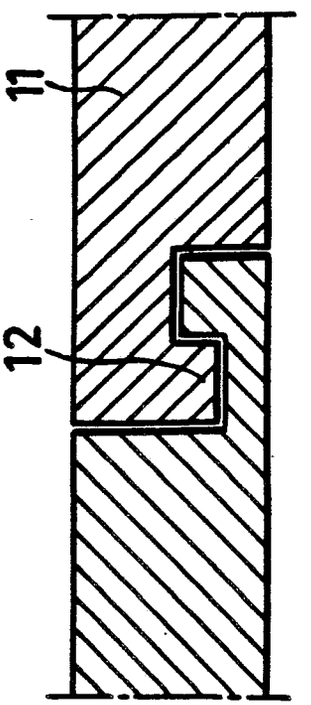


FIG.5



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EUROPEAN SEARCH REPORT

0053316
Application number
EP 81 10 9701

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	GB - A - 167 929 (HOWORTH) * the entire document *	1,2,5,6
A	US - A - 1 637 169 (YOUNG CHILD) * page 1, lines 1-106; page 2, lines 1-54; page 3, lines 21-56; figures 1-9 *	1,2,4,7
A	DE - C - 120 180 (KARNAT) * the entire document *	1,5,6
A	GB - A - 765 702 (MILLSPAUGH) * the entire document *	1,5
A	FR - A - 2 200 171 (RUHRKOHLE) * page 5, line 3 - page 6, line 11; figure 1 *	1-3,5,6

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

D 21 F 1/32

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

D 21 F
B 65 G

CATEGORY OF CITED DOCUMENTS

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X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	02-03-1982	DE RIJCK

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