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(54) **METHOD OF GRINDING A PAPER WEB CARRYING SURFACE OF A TRANSFER BELT**

(57) The present invention concerns a method of grinding a paper web carrying surface (12) of a transfer belt (TB) of a paper machine, wherein during normal operation of the paper machine the transfer belt (TB) is installed in a press section of the paper machine, running together with the paper web carried thereon through a press nip of the press section, and wherein during normal operation of the paper machine a doctor blade (14) is applied against the paper web carrying surface (12) of the transfer belt (TB) to scrape off contamination from the paper web carrying surface (12) of the transfer belt (TB), wherein the grinding of the paper web carrying surface (12) of the transfer belt (TB) is done within the paper machine, without removing the transfer belt (TB) from the paper machine, the method comprising the following steps:

- stopping normal operation of the paper machine;
- attaching a grinding member (20) to the doctor blade (14) so that the grinding member gets into contact with the paper web carrying surface (12) of the transfer belt (TB); and
- running the transfer belt (TB) with a predetermined speed while pressing the grinding member against the paper web carrying surface (12) of the transfer belt (TB) with a predetermined load.

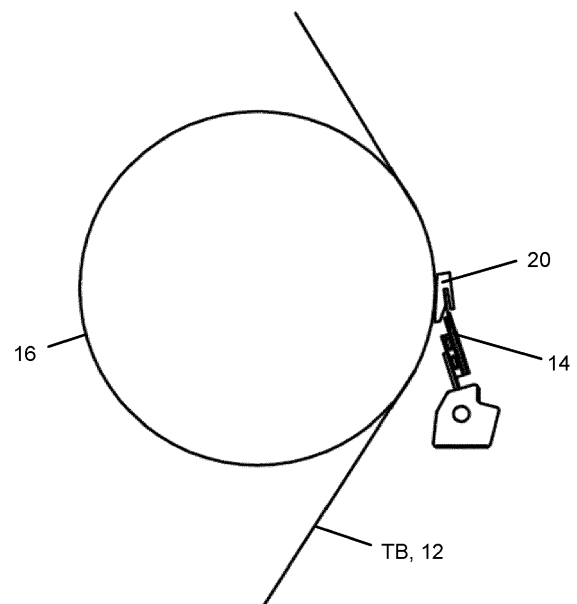


Fig. 3

## Description

**[0001]** The invention refers to a method of grinding a paper web carrying surface of a transfer belt of a paper machine, wherein during normal operation of the paper machine the transfer belt is installed in a press section of the paper machine, running together with the paper web carried thereon through a press nip of the press section, and wherein during normal operation of the paper machine a doctor blade is applied against the paper web carrying surface of the transfer belt to scrape off contamination from the paper web carrying surface of the transfer belt.

**[0002]** In the sense of the present invention, the terms "paper web" and "paper machine" should be understood in broad terms, namely as "fiber web" and "fiber web making machine", respectively. A fiber web comprises not only paper web in a narrow sense but also board web and tissue web.

**[0003]** Paper machines for removing moisture from the source material of paper are generally equipped with a forming section, a press section, and a drier section. These sections are disposed in the order of the forming, press, and drier sections along the direction in which a nascent paper web is conveyed. The press sections of some of these paper machines are equipped with a transfer belt that carries the paper web through at least one press nip of the press section. Differently to most other clothings within the paper machine, such as forming fabrics, press felts and drier fabrics, a transfer belt is to be understood as being impermeable to water. This has advantages in view of the re-wetting problematic existing with press felts after passing through a press nip.

**[0004]** A paper machine of the above-mentioned type is shown for example in figure 3 and described in paragraphs [0005] to [0012] of the patent application EP 2 581 493 A1, the content of which is herewith incorporated by reference.

**[0005]** The paper web carrying surface of such a transfer belt requires a certain surface roughness to ensure good adhesiveness and releasability of the wet paper web carried thereon. Problematic is that, during normal operation of the paper machine, i.e. when the paper web is produced, over the time contamination is accumulating on the paper web carrying surface. To scrap off such contamination, a so-called doctor blade is usually installed within the press section of the paper machine. However, such a doctor blade is not able to completely scrap the off the contamination from the paper web carrying surface of the transfer belt. Furthermore, with the doctor blade the original surface roughness of the paper web carrying surface is decreasing. In other words, the paper web carrying surface is contaminated and polished during lifetime which negatively affects machine runnability. To avoid production loss due to too low surface roughness and/or too much surface contamination, the transfer belt has to be deinstalled from the machine after a certain period of time. The deinstalled transfer belt is

either cleaned and grinded to regain the needed surface roughness or - more commonly - is replaced by a completely new transfer belt. All this costs time and money and, in the case of renewal, has a negative environmental impact.

**[0006]** Thus, it is the aim of the present invention to solve or at least mitigate the above-mentioned problems. To be more precise, it is an aim of the present invention to prolong the lifetime of the transfer belt and/or to reduce required shut-down times of the paper machine.

**[0007]** This aim is achieved by a method according to the independent claim. The dependent claims refer to advantageous embodiments of the present invention.

**[0008]** To be more precise, the object is achieved by a method of grinding a paper web carrying surface of a transfer belt of a paper machine, wherein during normal operation of the paper machine the transfer belt is installed in a press section of the paper machine, running together with the paper web carried thereon through a press nip of the press section, and wherein during normal operation of the paper machine a doctor blade is applied against the paper web carrying surface of the transfer belt to scrape off contamination from the paper web carrying surface of the transfer belt, wherein the grinding of the paper web carrying surface of the transfer belt is done within the paper machine, without removing the transfer belt from the paper machine, the method comprising the following steps:

- a) stopping normal operation of the paper machine;
- b) attaching a grinding member to the doctor blade so that the grinding member gets into contact with the paper web carrying surface of the transfer belt; and
- c) running the transfer belt with a predetermined speed while pressing the grinding member against the paper web carrying surface of the transfer belt with a predetermined load.

**[0009]** It is the merit of the inventors to have found out that the existing infrastructure in the press section of the paper machine, namely the existing doctor blade, can be advantageously used to carry out a grinding operation within the press section without mayor efforts. Consequently, the transfer belt can be effectively cleaned and the surface roughness of the paper web carrying surface can be re-established without the need of demounting the transfer belt from the paper machine. Thus, the standstill time of the paper machine can be reduced and its operation time can be increased. Furthermore, the lifetime of the transfer belt can be prolonged which is positive from an economical and ecological point of view.

**[0010]** Once the paper web carrying surface of the transfer belt has regained predetermined properties, the following steps may be carried out:

- d) stopping the paper machine again;
- e) detaching the grinding member from the doctor

blade; and

f) starting normal operation of the paper machine again.

**[0011]** The term "predetermined properties" may especially apply to a predetermined surface roughness. It may also refer to a predetermined purity of the paper web carrying surface.

**[0012]** In a preferred embodiment the grinding member is a grinding belt. A grinding belt is relatively inexpensive and can be easily adjusted to the corresponding machine width. The grinding may be supported on the doctor blade by means of an auxiliary support bar. The auxiliary support is preferably adapted to be fixed on the doctor blade and to provide a contact area with the transfer belt. The auxiliary support bar can be made from a polymeric material and may be reused for the next grinding operation within the paper machine. Thus, the auxiliary support bar provides structural stability to the grinding belt, facilitates the introduction of the grinding belt and enables an easy fixture to the doctor blade. For example, the auxiliary support bar may comprise a recess that is adapted to be mounted onto to scraping edge of the doctor blade.

**[0013]** The grain size of the grinding belt depends upon the requested surface roughness of the transfer belt. Preferably the grinding belt is a 80 to 800 mesh grinding belt. The mesh number indicates the roughness of grinding belt, wherein the following holds true: the larger the number, the smoother the surface of the grinding belt. The appropriate mesh number depends on the transfer belt surface roughness that is needed.

**[0014]** Test results have shown that preferably the predetermined speed in step c) is less than 300m/min to obtain good results. Furthermore, the tests have shown that preferably the predetermined load in step c) is less than 400N/m to obtain good results. Less than 400N/m means that a load with which the grinding member applies against the paper web carrying surface of the transfer belt is less than 400N per width meter of the transfer belt.

**[0015]** As mentioned above a transfer belt shall refer to a belt that is preferably impermeable to water. Such transfer belt can comprise at least one layer of polyurethane to achieve the impermeability. To provide the transfer belt with a good structural strength it preferably comprises a reinforcing yarn structure that is embedded inside.

**[0016]** To provide a good backing structure for the forces needed for the grinding operation, the grinding of paper web carrying surface of the transfer belt is preferably done in the paper machine at a place where the transfer belt is supported by a guiding roll on its side opposite the paper web carrying surface. Good accessibility is given if the guiding roll is the second guiding roll in the loop of the transfer belt after the press nip in the running direction of the transfer belt.

**[0017]** A transfer belt can be used to carry the paper web through an extended press nip. Such extended

press nip can be provided for example by a so-called shoe press. Dewatering of the paper web in an extended press nip is particularly efficient.

**[0018]** In an advantageous embodiment of the present invention, the press section of the paper machine comprises a further press nip for the paper web preceding the press nip in the running direction of the paper web. In other words, the press section may comprise two press nips. While the paper web is carried through both press nips, the transfer belt may only carry it through the second press nip.

**[0019]** An exemplary embodiment of the present invention is described in the following with respect to the schematic figures:

Fig. 1 shows the press section of a paper machine with a transfer belt;

Fig. 2 shows an enlarged view of a doctor blade applied against the paper web carrying surface of the transfer belt of Fig. 1;

Fig. 3 shows the grinding member attached to the doctor blade of Fig. 2; and

Fig. 4 shows an enlarged view of the auxiliary support bar with the grinding member.

**[0020]** Fig. 1 schematically shows a press section 10 of a paper machine with two extended press nips N1 and N2. A wet paper web P enters the press section 10 on the left-hand side and leaves the press section 10 on the right-hand side in Fig. 1. The first extended nip N1 is provided by a shoe press. The paper web P passes through the first extended nip N1 sandwiched between two press felts F1 and F2. Afterwards the paper web P is transferred to the second extended press nip N2 which is also provided by a shoe press. The paper web P passes through the second extended press nip N2 sandwiched between a third press felt F3 and a transfer belt TB. All clothings, i.e. the three press felts N1-N3 and the transfer belt TB are guided by several guide rolls located inside or outside of the corresponding loop of the clothing. Furthermore, there are provided four suction rolls in the press section 10 to pick up or hold the paper web P on the corresponding clothing. As only schematically indicated, some of the rolls shown in Fig. 1 are provided with doctor blades to scrap off contaminations.

**[0021]** While the press felts F1-F3 are all permeable to water with the capability to store a certain amount of water inside, the transfer belt TB is impermeable to water. Its outer surface 12 that gets into contact with the paper web P, therefore also called paper web carrying surface 12, does not comprise any grooves or holes or the like but is relatively plain, so that no water can be stored inside the transfer belt TB. This is advantageous to avoid re-wetting of the paper web P after passing through the second extended press nip N2. Nevertheless, the paper web carrying surface 12 has or requires a certain degree of surface roughness to ensure a good adhesiveness and releasability of the wet paper web P carried thereon.

**[0022]** To keep the paper web carrying surface 12 clean, a doctor blade 14 is applied against it. During normal operation, i.e. when the paper web P is produced, the doctor blades scraps off at least some of the contamination that is gathering on the paper web carrying surface 12. The doctor blade 14 is applied against the paper web carrying surface 12 at a location where the transfer belt TB is supported by a guide roll 16, as may be best seen in the enlarged view of Fig. 2.

**[0023]** Over its lifetime the surface roughness of the paper web carrying surface 12 of the transfer belt TB decreases. Therefore, from time to time it has to be deinstalled from the press section 10 of the paper machine and it has to be renewed to avoid a decline of productivity.

**[0024]** The method according to the present invention allows to prolong the lifetime of the transfer belt TB without the need to deinstall the transfer belt TB from the press section 10 of the paper machine. With respect to Fig. 3 and Fig.4, the method comprises the following steps:

- a) stopping normal operation of the paper machine;
- b) attaching a grinding member 18 to the doctor blade 14 so that the grinding member 18 gets into contact with the paper web carrying surface 12 of the transfer belt TB; and
- c) running the transfer belt TB with a predetermined speed while pressing the grinding member 18 against the paper web carrying surface 12 of the transfer belt TB with a predetermined load.

**[0025]** The grinding member 18 is cleaning the paper web carrying surface 12 of the transfer belt TB much more efficiently than the doctor blade 14, while at the same time providing the paper web carrying surface 12 with the required surface roughness. In the present embodiment, the grinding member 18 is a grinding belt 18 having a grain size suitable of this purpose. The grinding belt 18 is supported on the doctor blade 14 by an auxiliary support bar 20. The auxiliary support bar 20 provides structural stability to the grinding belt 18, facilitates the introduction of the grinding belt 18 and enables an easy fixture to the doctor blade 14. In the present embodiment, the auxiliary support bar 18 comprises a recess 22 that is adapted to be mounted onto to scrapping edge of the doctor blade 14. The auxiliary support bar 18 can be reused for the next grinding operation within the paper machine, wherein the grinding belt 18 may have to be replaced by a new grinding belt 18.

**[0026]** During the grinding operation of the transfer belt TB inside the paper machine, the transfer belt TB is preferably running with less than 300m/min. This is much slower than during normal operation. Furthermore, the grinding member 18 is preferably pressed against the paper web carrying surface 12 of the transfer belt TB with a load of less than 400N/m. The load may be adjusted with the aid of pressure hoses (not shown) that act on the doctor blade 14.

**[0027]** Once the paper web carrying surface 12 of the transfer belt TB has been cleaned and has regained its required surface roughness, the grinding member 18 and the auxiliar support bar 20 are deinstalled again from the doctor blade 14 and from the press section 10. Afterwards normal operation can re-start, and paper web can be produced again. The grinding operation can take place several times before the transfer belt TB finally has to be deinstalled from the paper machine to be replaced by a new transfer belt TB. This saves a lot of time, costs, and waste. At the same time, installing and deinstalling the grinding member can be achieved quite fast and easily by using the already existing infrastructure, namely the doctor blade, in the press section 10 of the paper machine.

## Claims

1. Method of grinding a paper web carrying surface (12) of a transfer belt (TB) of a paper machine, wherein during normal operation of the paper machine the transfer belt (TB) is installed in a press section (10) of the paper machine, running together with the paper web (P) carried thereon through a press nip (N2) of the press section (10), and wherein during normal operation of the paper machine a doctor blade (14) is applied against the paper web carrying surface (12) of the transfer belt (TB) to scrape off contamination from the paper web carrying surface (12) of the transfer belt (TB),

**characterized in that** the grinding of the paper web carrying surface (12) of the transfer belt (TB) is done within the paper machine, without removing the transfer belt (TB) from the paper machine, the method comprising the following steps:

- a) stopping normal operation of the paper machine;
- b) attaching a grinding member (18) to the doctor blade (14) so that the grinding member (18) gets into contact with the paper web carrying surface (12) of the transfer belt (TB); and
- c) running the transfer belt (TB) with a predetermined speed while pressing the grinding member (18) against the paper web carrying surface (12) of the transfer belt (TB) with a predetermined load.

2. Method according to claim 1, **characterized in that** the method further comprises the following steps that are carried out once the paper web carrying surface (12) of the transfer belt (TB) has regained predetermined properties:

- d) stopping the paper machine again;
- e) detaching the grinding member (18) from the doctor blade (14); and

- f) starting normal operation of the paper machine again.
3. Method according to claim 2,  
**characterized in that** the predetermined properties refer to a predetermined surface roughness. 5
  4. Method according to any one of the preceding claims,  
**characterized in that** the grinding member (18) is a grinding belt (18). 10
  5. Method according to claim 4,  
**characterized in that** the grinding belt (18) is supported on the doctor blade (14) by means of an auxiliary support bar (20). 15
  6. Method according to claim 4 or 5,  
**characterized in that** the grinding belt (18) is a 80 to 800 mesh grinding belt. 20
  7. Method according to any one of the preceding claims,  
**characterized in that** the predetermined speed in step c) is less than 300m/min. 25
  8. Method according to any one of the preceding claims,  
**characterized in that** the predetermined load in step c) is less than 400N/m. 30
  9. Method according to any one of the preceding claims,  
**characterized in that** the transfer belt (TB) is impermeable to water. 35
  10. Method according to any one of the preceding claims,  
**characterized in that** the transfer belt (TB) comprises at least one layer of polyurethane. 40
  11. Method according to any one of the preceding claims,  
**characterized in that** the transfer belt (TB) comprises a reinforcing yarn structure that is embedded inside. 45
  12. Method according to any one of the preceding claims,  
**characterized in that** the grinding of paper web carrying surface (12) of the transfer belt (TB) is done in the paper machine at a place where the transfer belt (TB) is supported by a guiding roll (16) on its side opposite the paper web carrying surface (12). 50  
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  13. Method according to claim 12,  
**characterized in that** the guiding roll (16) is the second guiding roll in the loop of the transfer belt (TB)
  14. Method according to any one of the preceding claims,  
**characterized in that** the press nip (N2) is an extended press nip.
  15. Method according to any one of the preceding claims,  
**characterized in that** the press section (10) of the paper machine comprises a further press nip (N1) for the paper web (P) preceding the press nip (N1) in the running direction of the paper web (P).

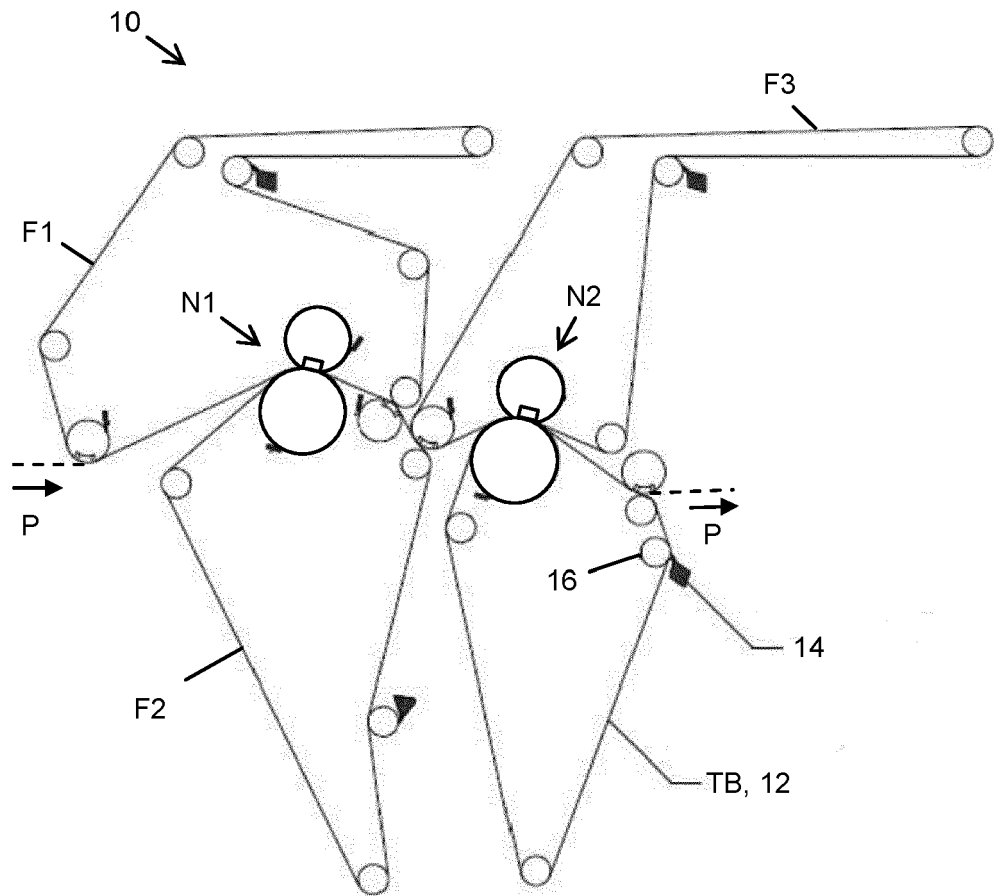


Fig. 1

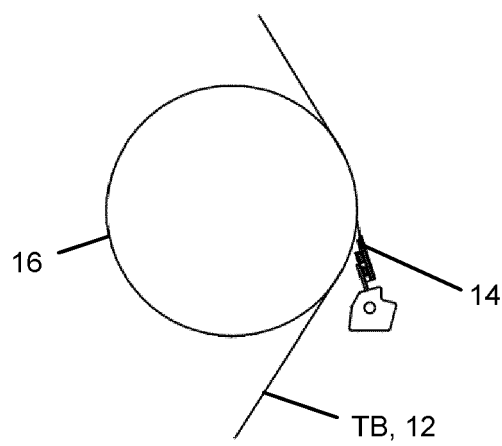


Fig. 2

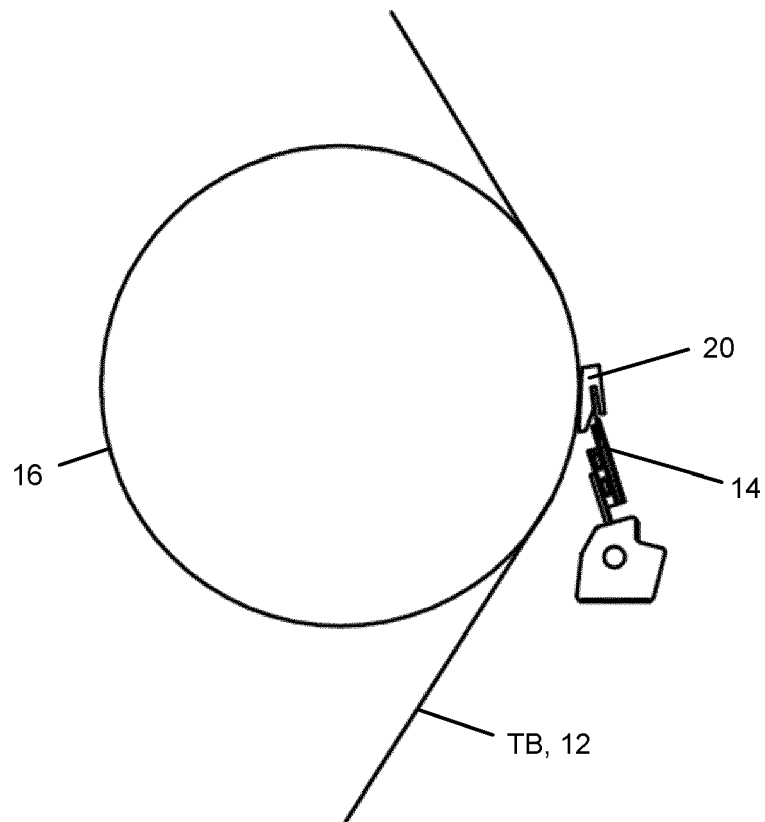


Fig. 3

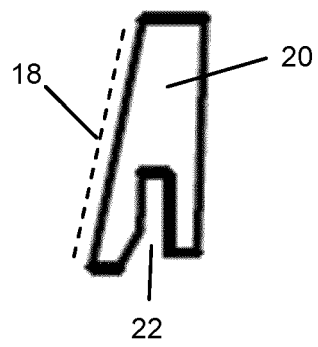


Fig. 4



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Application Number

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                        |                                                                                                                                                                                                                                                                                       |                                                      |
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| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                          | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC)              |
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|                                                                                                                                                                                                                                                        |                                                                                                                                                                        |                                                                                                                                                                                                                                                                                       | D21F<br>D21G                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                        |                                                                                                                                                                                                                                                                                       |                                                      |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                       |                                                                                                                                                                        | Date of completion of the search<br><b>31 August 2023</b>                                                                                                                                                                                                                             | Examiner<br><b>Pregetter, Mario</b>                  |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                        | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                      |



# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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