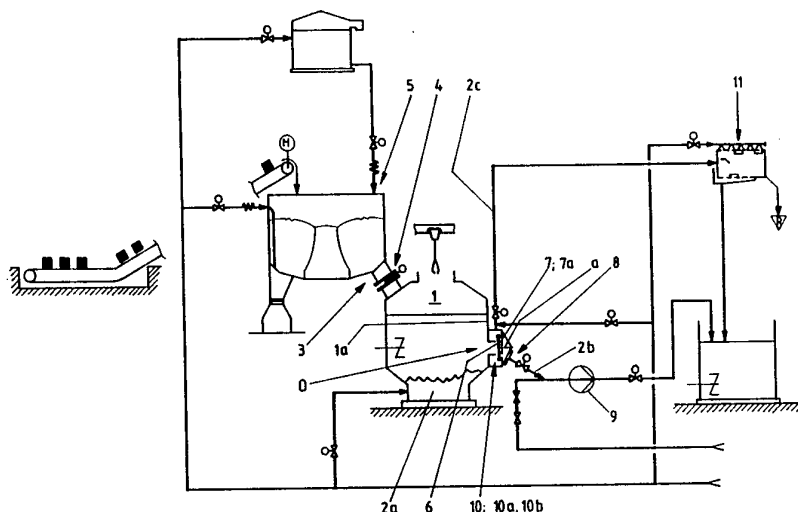


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : D21B 1/34	A1	(11) International Publication Number: WO 94/09202 (43) International Publication Date: 28 April 1994 (28.04.94)
<p>(21) International Application Number: PCT/FI93/00411</p> <p>(22) International Filing Date: 11 October 1993 (11.10.93)</p> <p>(30) Priority data: 924742 20 October 1992 (20.10.92) FI</p> <p>(71) Applicant (for all designated States except US): VALMET-TAMPELLA INC. [FI/FI]; P.O. Box 267, FIN-33101 Tampere (FI).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only) : VUORINEN, Timo [FI/FI]; Alaniemenkatu 10 B, FIN-33300 Tampere (FI).</p> <p>(74) Agents: KANGASMÄKI, Reijo et al.; Tampereen Patentitoimisto Oy, Kanslerinkatu 6, FIN-33720 Tampere (FI).</p>		<p>(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>

(54) Title: MIXING DEVICE IN PULPING



(57) Abstract

Mixing device in pulping which is intended to be placed in the second pulping space (1), such as a sieving or intermediate tank, basin or the like, for pulping at least at the second stage, the waste matter (2a) of the pulping material being accumulated on the bottom thereof for discharge. The second pulping space (1) is provided with flow means (3), such as a tube, channel or the like, preferably periodically by a valve arrangement (4) or the like, in connection with a first pulping space (5) for pulping at least at the first stage. The mixing device comprises a mixing means (6) with blades or the like which are arranged to rotate on the primary side of a sieving means (7). The pulped material, having passed through the sieving means (7), is arranged to be conveyed from the secondary side of the sieving means (7) for further processing via an outlet assembly (8). For increasing the efficiency of the mixing means (6), e.g. for bringing it essentially apart from the waste material (2a) accumulating on the bottom of the second pulping space (1), the mixing device is connected with the second pulping space (1) by a primary space (10) extending outwards from the wall limiting the second pulping space.

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Mixing device in pulping

The invention relates to a mixing device in pulping, which is intended to be placed in the second pulping space, such as a sieving or intermediate tank, basin or the like, for pulping at least at the second stage, the waste matter of the pulping material being accumulated on the bottom thereof for discharge. For receiving pre-pulped material, the second pulping space is provided with flow means, such as a tube, channel or the like, preferably periodically by a valve arrangement or the like, in connection with the first pulping space, such as a pre-slusher, pre-pulper or the like for pulping at least at the first stage. The mixing device comprises a mixing means with blades or the like which are arranged to rotate on the primary side of a sieving means, such as a punched plate, screen plate or the like, whereby the pulped material, having passed through the sieving means, is arranged to be conveyed from the secondary side of the sieving means for further processing via an outlet assembly by a suction effect, such as gravitation, a pump or the like.

A secondary pulping space to be filled periodically as described above is generally used in the processing of a relatively thick mass, whereby the dry matter content of pre-pulped mass preferably exceeds 10%. This kind of mass is produced e.g. in pre-pulping of waste paper. In multi-stage pulping, it is not necessary to use a sieve plate in the pre-pulper, whereby also crude mass can be well transferred to further pulping stages, where the actual sieving is carried out.

Finnish Patent Publication No. 75001 discloses an advanced method with regard to conventional methods, and a device for sieving out impurities mixed in paper pulp. In the method, the mixture is transferred

from the pre-pulper carrying out pulping at the first stage, periodically to a device equipped with a closed pulping space. This pulping space is provided with a sieve plate and a spiral mixer which rotates at a short distance from the surface of the sieve plate. The admitted mass is discharged behind the sieve plate e.g. by the suction effect of a discharge pump. For diluting the mixture, water is added upon feeding the mixture into the pulping space, whereby the addition of water is continued all the way to washing out the waste pulp, whereby the addition of water is discontinued and the pulping space is discharged of water. Next, the waste pulp accumulated to the bottom of the pulping stage is discharged by gravity through a wide opening at the bottom of the pulping space.

For certain parts, the solution described above undoubtedly excels prior techniques. This is firstly because the described solution can be used to make the pulping space substantially smaller than the pre-pulper, because the whole contents of the pre-pulper do not need to be received in the pulping space at a time. This is based on the fact that the mixer of the pulping space and the discharge pump are set into action when feeding of the mixture from the pre-pulper into the pulping space is started. Another advantage of the presented solution is that the pulping space can be arranged to be filled with water before mixture is fed thereinto, whereby the mixture can be started with a thin mixture.

The above-described solution entails, however, certain problems. Firstly, the closed construction of the pulping space causes a risk, particularly in the processing of crude masses. Consequently, upon discontinuing the ventilation of the pulping space, the disadvantages are significant for both the process and the device in question. Furthermore, because of the

closed construction and the discharge of waste material through the bottom, the exhausting of the device is not fully reliable. Also, like constructions of prior art with similar principles, waste material is accumulated on the bottom of the device in a way that it hampers the operation of the mixer, possibly in the end breaking the mixer blades. Due to the closed construction, the service and maintenance of the device are also relatively difficult.

It is an aim of the mixing device of this invention to achieve a decisive improvement to the problems presented above and thus to raise substantially the level of knowledge in the field. To achieve this aim, the mixing device of the invention is primarily characterized in that at least for increasing the efficiency of the mixing means, e.g. for bringing it essentially apart from the waste material accumulating on the bottom of the second pulping space, the mixing device is connected with the second pulping space by a primary space extending outwards from the wall limiting the second pulping space.

The most important advantages of the mixing device of the invention are simplicity, reliability and easiness to use, which are essential particularly in the demanding work environment in question. The mixing device of the invention is advantageous both in manufacture and in installation. Further, it allows for installation, service and maintenance work without causing notable stoppages in the total process, whereby the second pulping space equipped with a mixing device of the invention can be used continuously in comparison with present construction, only by changing the removably fixed mixing device. The mixing device of the invention reduces the service operations on the second pulping stage, because it is possible to eliminate the

contact of the waste material accumulated on the bottom thereof with the mixing means.

5 Advantageous embodiments of the mixing device of the invention are presented in the other dependent claims.

In the following description, the invention is illustrated in detail with reference to the appended drawings. In the drawings,

10

Fig. 1 shows a longitudinal section of an advantageous mixing device in principle, and

15 Fig. 2 shows a simplified operational chart of a process in which a mixing device of Fig. 1 is used.

The mixing device is intended for use e.g. in a pulping space 1, such as a sieving or intermediate tank, basin
20 or the like, for pulping at the second stage in a process of Fig. 2, the waste matter 2a of the pulping material being accumulated on the bottom thereof for discharge. For receiving the pre-pulped material, the second pulping space 1 is equipped with flow means 3,
25 such as a tube, channel or the like, periodically by a valve arrangement 4 or the like, in connection with the first pulping space 5, such as a pre-slusher, pre-pulper or the like, for pulping at least at the first stage. The mixing device comprises a mixing
30 means 6 with blades or the like which are arranged to rotate on the primary side of a sieving means 7, such as a punched plate, screen plate or the like, whereby the pulped material 2b, having passed through the sieving means 7, is arranged to be conveyed from the
35 secondary side of the sieving means 7 for further processing via an outlet assembly 8 by a suction effect, such as gravitation, a pump or the like. For improving the efficiency of the mixing means 6, e.g.

for bringing it essentially apart from the waste material 2a accumulating on the bottom of the second pulping space 1, the mixing device is connected with the second pulping space 1 by a primary space 10 extending outwards from the wall 1a limiting the second pulping space 1.

With reference to the longitudinal section principally shown Fig. 1, the mixing means 6 is disposed rotatable around a rotation axis a which is transverse to the sieving surface 7a of the sieving means 7. The primary space 10 thus comprises substantially a flow chamber 10a which is substantially parallel to the rotation axis a, the mixing means 6 and the sieving means 7 being arranged in connection with the primary space 10. Further, the flow chamber 10a of the primary space 10 is connected with the second pulping space 1 through an opening 0 substantially above the bottom in the wall 1a limiting the second pulping space 1 at its first end, whereby the mixing means 6 and the sieving means 7 are disposed in connection with the wall surface towards the second end of the flow chamber 10a.

In the presented embodiment, the mixing means 6 is arranged rotatable around the substantially vertical sieving surface 7a of the sieving means 7, whereby the primary space 10 comprises a flow chamber 10a which extends substantially in the horizontal direction from the opening 0 in the vertical wall 1a of the second pulping space and has a constant inner diameter.

With reference to Fig. 2, the pulping material for the process shown therein is arranged to be pre-treated before the mixing means 6 and the sieving means 7. It is thus conveyed from the second pulping space 1 to a cylindrical screen 11 operating as a pre-sieving means, whereby, the efficiency of the mixing means 6 being improved by primary sieving of the material

conveyed thereto, the preliminary sieving flow 2c of the pulping material is arranged to take place through the primary space 10. In an advantageous embodiment of the mixing device of the invention, the primary space 10 thus comprises, apart from the flow chamber 10a, also an entrance chamber 10b, whose flow conditions differ substantially from those in the flow chamber 10a for improving the efficiency of the primary sieving flow 2c through the entrance chamber 10b.

In an advantageous embodiment shown particularly in Fig. 2, the free cross-sectional area A1 of the flow chamber 10a is thus arranged to be totally smaller than the effective cross-sectional area A2 of the mixing means 6 towards the flow direction a. Further, the flow chamber 10a is arranged to convey the flow substantially to the middle part of the mixing means 6 and the entrance chamber 10b, in a corresponding manner, to act on the edge parts of the mixing means 6.

In an advantageous embodiment shown in Fig. 1, the mixing means comprises a frame 12 forming a substantially closed structure, which has a preferably circular cross-section in the flow direction a. The frame 12 is provided with elements forming at least part of the primary space 10, the mixing means 6, the sieving means 7 and the outlet assembly 8. In the embodiment shown in Fig. 1, the tubular element forming the flow chamber 10a is attached directly to the wall 1a of the second pulping space 1. The drawings shows also the wall arrangement of the frame in broken lines, whereby also the flow chamber can be integrated in the frame. As shown in Fig. 1, the mixing means is further arranged to be removably fixed by a screw connection 12a to the wall 1a of the second pulping space 1.

It is obvious that the invention is not limited to the embodiments presented above but it can be modified within the basic idea even to a great extent. The mixing device of the invention can naturally be attached to a variety of pulping spaces, whereby the consistency of the pulping mass will naturally be decisive in the applicability of the invention. The mixing means can thus be installed e.g. in a closed pulping space as described in the beginning of the description, or in a processing space for sieving or the like. The mixing device of the invention can naturally be arranged in the longitudinal direction to be e.g. curvilinear or in an inclined position. Thanks to the removable attachment of the mixing device, the device can be manufactured of a variety of materials by suitable manufacturing techniques.

Claims:

1. Mixing device in pulping, which is intended to be placed in the second pulping space (2), such as in a sieving or intermediate tank, basin or the like, for
5 pulping at least at the second stage, the waste matter (2a) of the pulping material being accumulated on the bottom thereof for discharge, wherein, for receiving pre-pulped material, the second pulping
10 space (1) is provided with flow means (3), such as a tube, channel or the like, preferably periodically by a valve arrangement (4) or the like, in connection with the first pulping space (5), such as a pre-slusher, pre-pulper or the like, for pulping at least at the
15 first stage wherein the mixing device comprises a mixing means (6) with blades or the like which are arranged to rotate on the primary side of a sieving means (7), such as a punched plate, screen plate or the like, whereby the pulped material (2b), having
20 passed through the sieving means (7), is arranged to be conveyed from the secondary side of the sieving means (7) for further processing via an outlet assembly (8), which mixing device is connected with the second pulping space (1) by a primary space (10) extending
25 outwards from the wall (1a) limiting the second pulping space (1), wherein the preliminary sieving flow (2c) of the pulping material is arranged to take place through the primary space (10) before the mixing means (6) and the sieving means (7) to a pre-sieving
30 means (11), such as a vibrating or cylindrical screen or the like, **characterized** in that the primary space (10) comprises apart from the flow chamber (10a) also an entrance chamber (10b), whose flow conditions differ substantially from those in the flow cham-
35 ber (10a) for improving the efficiency of the primary sieving flow (2c) through the entrance chamber (10b).

2. Mixing device according to claim 1, whose primary space (10) comprises a flow chamber (10a) which extends from an opening (0) in the vertical wall (1a) of the second pulping space substantially above the bottom and being placed preferably in the horizontal direction and having a constant inner diameter, **characterized** in that for formation of the entrance chamber (10b), the free cross-sectional area (A1) of the flow chamber (10a) is thus arranged to be totally smaller than the effective cross-sectional area (A2) of the mixing means (6) towards the flow direction (a).

3. Mixing device according to claim 1 or 2, **characterized** in that at least the flow point of the flow chamber (10a) towards the mixing means (6) is arranged substantially in connection with the middle part of the mixing means (6) and the entrance chamber (10b) in connection with the edge parts of the mixing means (6) accordingly.

4. Mixing device according to any of claims 1 to 3 above, comprising a frame (12) forming a substantially closed structure, which has a preferably circular cross-section in the flow direction (a), which frame (12) is provided apart from the primary space (10) at least the mixing means (6), the sieving means (7) and the outlet assembly (8), wherein the mixing means (6) is arranged to rotate around a rotation axis (a), which is transverse to the sieving surface (7a) of the sieving means (7), wherein the primary space (10) comprises the flow chamber (10a) placed substantially in the direction of the rotation axis (a), the first end of the flow chamber (10a) being connected with the wall (1a) of the second pulping space (1) and whereby in the flow chamber (10a) the mixing means (6), the sieving means (7) and the outlet assembly (8) are

disposed at the other end, **characterized** in that the frame (12) and/or the wall (1a) of the second pulping space (1) is equipped with elements forming the flow chamber (10a) and the entrance chamber (19b),
5 such as a tube or the like.

5. Mixing device according to any of claims 1 to 4 above, **characterized** in that the mixing device is arranged to be removably fixed by a screw connection (12a) to the wall (1a) of the second pulping
10 space (1).

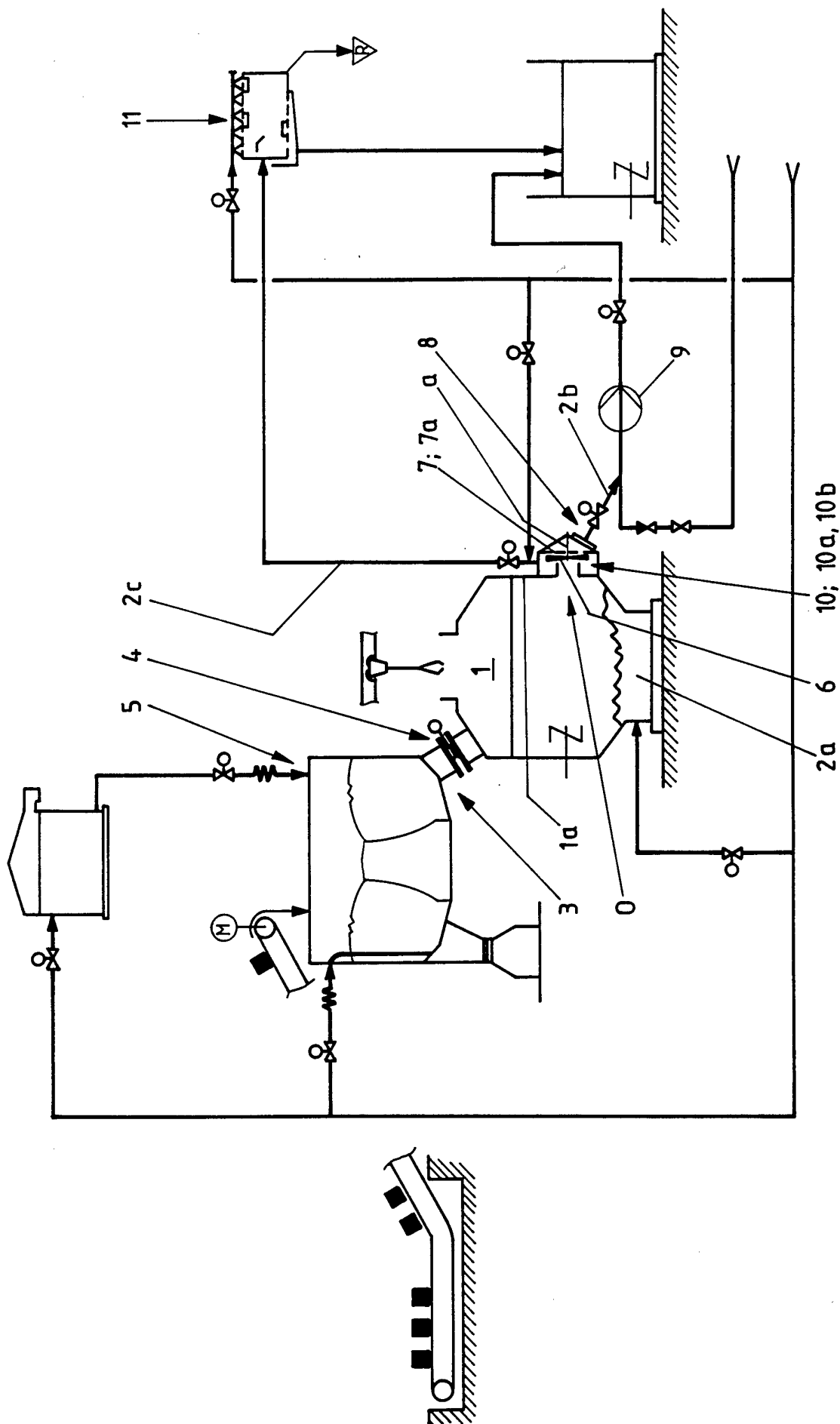


Fig 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 93/00411

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: D21B 1/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A1, 0279022 (SULZER-ESCHER WYSS GMBH), 24 August 1988 (24.08.88), figures 1,2, claims 1-4 --	1-5
A	DE, C2, 3440005 (J.M. VOITH GMBH), 8 October 1987 (08.10.87), column 3, line 40 - line 68, figures 1a,1b --	1
A	DE, C2, 3311082 (J.M. VOITH GMBH), 11 May 1989 (11.05.89), column 2, line 18 - line 47, the figure --	1

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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10 February 1994

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A1, 3334448 (J.M. VOITH GMBH), 19 April 1984 (19.04.84), page 9, line 1 - line 26, figure 2 -- -----	1

INTERNATIONAL SEARCH REPORT
Information on patent family members

30/12/93

International application No.
PCT/FI 93/00411

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0279022	24/08/88	DE-A,C- 3704461 DE-A- 3772967	28/07/88 17/10/91
DE-C2- 3440005	08/10/87	EP-A,B- 0186738	09/07/86
DE-C2- 3311082	11/05/89	DE-A- 3471704 EP-A,B- 0123068 SE-T3- 0123068	07/07/88 31/10/84
DE-A1- 3334448	19/04/84	AT-B- 387599 CA-A- 1226754 FR-A,B- 2534490 GB-A,B- 2128498 US-A- 4592513	10/02/89 15/09/87 20/04/84 02/05/84 03/06/86