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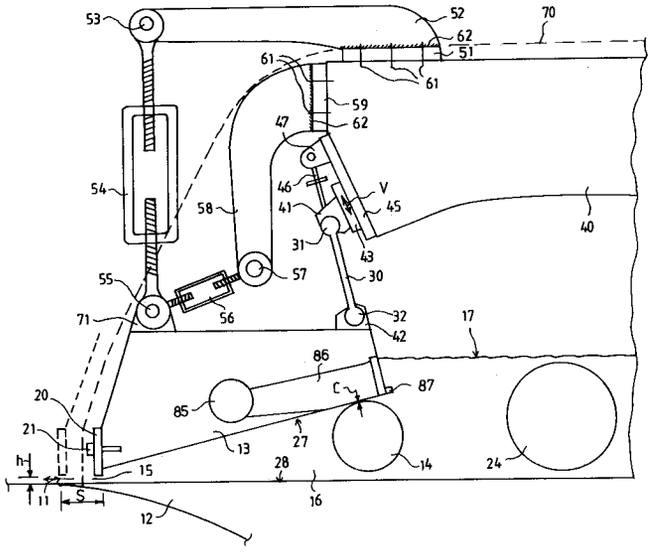
(54) Adjusting device for the top lip beam of a headbox.

(57) The invention concerns an adjusting device for the top lip beam of the headbox of a paper machine, board machine, or wet-lap pulp machine, by whose means the position of the top lip beam (13) is changed for regulation of the height (h) and position (s) of the discharge opening (15). The top lip beam (13) is included in a headbox in whose discharge duct (16) there is a perforated roll (14) as an equalizing member, and between which perforated roll (14) and the top lip beam (13) of the headbox there is a gap (C). The adjusting device comprises adjusting members (54,56) for changing the position of the top lip beam (13) and adjusting members for regulating the gap (C) between the top lip beam (13) and the perforated roll (14). The members for adjusting the gap (C) between the top lip beam (13) and the perforated roll (14) consist of a mobile, rigid partition wall (30), which is by one end linked (32) with the top lip beam (13) and by the other end linked (31) with a part (43) which is arranged mobile in the vertical direction (V) in relation to the stationary front wall (40). The partition wall (30) closes the opening between the stationary front wall (40) and the top lip beam (13).



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The invention concerns an adjusting device for the top lip beam of the headbox of a paper machine, board machine, or wet-lap pulp machine, by whose means the position of the top lip beam is changed for regulation of the height and position of the discharge opening and which top lip beam is included in a headbox in whose discharge duct there is a perforated roll as an equalizing member, and between which perforated roll and the top lip beam of the headbox there is a gap, said adjusting device comprising adjusting members for changing the position of the top lip beam and adjusting members for regulating the gap between the top lip beam and the perforated roll.

As a background for the present invention, it is ascertained that, by means of the geometric shape of the headbox of a paper machine or equivalent and by means of equalizing members placed in the flow path of the pulp suspension, attempts are made to equalize pressure variations, to eliminate macro-vortexes and other flow faults, and to homogenize any pulp suspension that has been reflocculated after the mixing pump and the cleaner and to keep said pulp suspension homogeneous. For this purpose, in some headboxes in paper machines, above all in open headboxes, various perforated rolls are fitted, by whose means it is possible to affect the flow pattern on the wire to a considerable extent. The conduct of the flow passing through said perforated rolls is affected by a number of parameters, such as the gap between the mantle of the perforated roll and the headbox walls and the uniformity of said gap. Said gap should be as small and uniform as possible, for in the contrary case a significant proportion of the pulp suspension will flow directly through the gap, producing macro-turbulence and distorting the flow profile. Said perforated rolls are placed in the slice part of the paper machine, whose principal function is to produce a homogeneous pulp jet of uniform thickness and direction.

In order that the desired dilution could be achieved, the height of the discharge opening must be adjustable. This so-called area regulation is frequently performed by displacing the whole front wall of the headbox. The angle between the jet and the wire and the point of impingement between the jet and the wire are factors effective in the sheet formation, and therefore their regulation is necessary. As is well known, the starting angle of the jet can be adjusted by shifting the top lip in the direction of the machine. It is also known in prior art to change the point of impingement by means of a single regulation operation by shifting the breast roll in the direction of the machine. It is also known in prior art to use a lower lip that can be displaced in the direction of the machine during running. Also, it is known in prior art to arrange the whole headbox as tiltable on hinge joints as well as to arrange the headbox displaceable both vertically and horizontally and, at the same time, also tiltable.

In particular in wide machines, the front wall of the headbox must be dimensioned rigid to prevent deformations caused by the internal pressure, because otherwise a deflection of the upper lip will change the flow conditions, e.g. the impingement angle and the point of impingement between the jet and the wire, which thus become dependent on the pressure.

Numerous different solutions for the headbox of a paper machine of equivalent are known, and in respect of the prior art related to the headboxes of different paper machines or equivalent, reference is made, for example, to the FI Patents 36,355, 42,915, 45,883, 46,415, and 47,210.

In respect of the prior art closely related to the present invention, reference is made to the FI Patent 66,219, wherein a device for regulation of the front wall beam of the headbox of a paper machine is described, by whose means the position of the front wall beam is changed to adjust the height of the discharge opening and the impingement angle between the pulp jet and the wire, said front wall beam belonging to a headbox in whose slice part a perforated roll is used as an equalizing member, in which solution it is novel that the front wall beam is supported so as to be pivoted by means of power units on support of a horizontal pivot shaft transverse to the paper machine at such a point that a plane placed through said pivot shaft and through the axis of rotation of said perforated roll passes substantially at the point at which the gap between the circumference of the perforated roll and the front wall beam is smallest.

Further, in respect of the prior art closely related to the present invention, reference is made to the FI Patent 62,371, wherein a headbox of a paper machine is described whose discharge cone part or equivalent flow part, which becomes narrower in the flow direction of the pulp suspension, is defined by a lower-lip construction and by an upper-lip construction and in which headbox, permanently mounted inside the discharge cone part, there is a perforated roll or an equivalent turbulence member, above which, with a certain flow gap, an upper-lip plate is placed, whose front edge is attached to the front wall beam of the upper lip by means of an articulated joint, and in which it has been considered novel that the upper-lip plate has a continuous and unified flow guide face and that the upper-lip plate construction is supported on the front wall constructions by means of such a support fitting, for example groove-projection fitting, that the flow gap between the guide face of the lip plate of the upper lip and the perforated roll remains substantially invariable when the lip is adjusted, with dif-

ferent positions of the upper-lip plate.

As is well known, in the prior-art solutions, the gap space between the front wall of the headbox displaceable up and down and the stationary front wall is closed by means of a rubber plate. Such a rubber plate, however, readily becomes brittle at a high temperature and starts leaking, first at its edges placed against the side walls of the headbox.

Moreover, in the prior-art solutions, at the proximity of said rubber plate, regulating members are placed, by whose means the discharge opening is adjusted by changing the position of the front wall, whereby the gap between the upper wall and the perforated roll is also changed based on the need for adjustment. As is well known, in order that a headbox should operate correctly, this gap should be as small and as uniform as possible.

The construction of the rubber-plate regulating-member combination described above is complicated, and the time that the rubber plate remains in operating condition in the headbox solutions is short, which results in extra standstills and complicated servicing operations. Further problems are caused by the fact that the conduct of thermal expansion/shrinkage of a rubber material is not easily predictable.

Further, from the point of view of the manufacturing technique, owing to its elastic properties, a rubber plate is difficult to dimension so that its size is correct when it is installed in its place. Usually, a rubber plate cannot be fitted correctly until at the installation stage, in which connection new experiments are necessary to make the dimensions of the rubber plate correct.

The object of the invention is to suggest a solution in which the above drawbacks and problems related to the prior-art solutions do not occur. A further object of the invention is to improve the tightness of the headbox and to suggest a solution whose service life is longer and whose servicing is simpler than in the case of the prior-art solutions.

In view of achieving the objectives stated above and those that will come out later, the adjusting device in accordance with the invention for the top lip beam of a headbox is mainly characterized in that the members for adjusting the gap between the top lip beam and the perforated roll consist of a mobile, rigid partition wall, which is by one end linked with the top lip beam and by the other end linked with a part which is arranged mobile in the vertical direction in relation to the stationary front wall, and that the partition wall closes the opening between the stationary front wall and the top lip beam.

The construction of the adjusting device in accordance with the invention is simple, and by means of articulated joints, sufficient degrees of freedom are achieved so that the plate can move to the necessary extent in the direction of the discharge flow and in the direction up and down when necessary.

The solution in accordance with the invention is stable, because in the parts of the headbox that are filled with liquid, no stretching members are used, which might maintain detrimental pressure oscillations in the liquid quantity. In the solution in accordance with the invention, the rigid wall provides an attenuation of the pressure oscillations.

Further, the service life of the plate in accordance with the invention is considerably longer than that of the rubber member employed in the prior-art solutions.

Also, the sealing of a metallic plate in view of elimination of leakages is considerably easier than in the prior-art solutions, because the conduct of a metallic material at different temperatures is considerably better known than that of rubber materials.

Further, the installation of an adjusting device in accordance with the invention in its place is considerably easier than the installation of the prior-art devices, and no separate stages of fitting are required in connection with the installation work.

By means of the device in accordance with the invention, adjustment of the gap between the perforated roll and the top lip wall is achieved by means of a simple arrangement.

In the following, the invention will be described in more detall with reference to the figure in the accompanying drawing, which is a schematic sectional view of a headbox.

In the exemplifying embodiment shown in the figure, the headbox of a paper machine is shown as a schematic sectional view with a side wall removed. The side wall is illustrated schematically with the dashed line 70. To the stationary front wall beam 40, i.e. frame, of the headbox, a cantilever bracket 52 is attached by means of a fastening piece 51 and fastening members 61, 62, e.g. screws 61 and a weld joint 62. To the cantilever bracket 52, an adjusting member 54, e.g. a turnbuckle, is linked 53, whose opposite end is linked 55 to a fastening piece 71 fixed to the mobile front wall of the headbox, i.e. to the mobile top lip beam 13. To the fastening piece 71, a second adjusting member 56, e.g. a turnbuckle, is also linked, whose opposite end is linked 57 to a second cantilever bracket 58. The second cantilever bracket 58 is fixed, e.g. by means of a weld joint 62, to the fastening piece 59, which is fixed to the stationary front wall beam 40, e.g., by means of screws.

The rigid partition wall 30 between the pivot shafts 31 and 32 supports the mobile front wall beam, i.e. top lip beam 13, and at the same time

closes the opening between the top lip beam 13 and the stationary front wall construction 40.

Thus, the top lip beam 13 is fitted on support by means of the rigid partition wall 30 and the cantilever bracket 52 and the adjusting member 54, and the position of the top lip beam 13 in the lateral direction is determined by the intermediate of the cantilever bracket 58 and the adjusting member 56.

The discharge duct 16 of the headbox is defined by the bottom face 27 of the mobile top lip beam 13, and the lower part of the discharge duct 16 is defined by the top face 28 of the lower lip beam 12 of the headbox. The cross-sectional area of the discharge duct 16 becomes narrower towards the discharge opening 15, and the discharge jet 11 passes out of the discharge opening 15. To the top lip beam 13, a profile bar 20 is attached by means of fastening members 21. The height of the discharge opening 15 is denoted with the reference h, and the denotation s represents the position of the discharge opening 15 in the horizontal direction in relation to the bottom face 28. In the opposite end of the discharge duct 16, opposite in relation to the discharge opening 15, a perforated roll 14 is placed, which stirs and equalizes the pulp flow. In the headbox, further perforated rolls 24 are also placed to produce the necessary turbulence in the pulp flow. The liquid level of the pulp in the headbox is denoted with the reference numeral 17.

The overflow trough of the headbox is denoted with the reference numeral 86 and the discharge opening of the overflow trough with the reference numeral 85. Into the overflow trough 86, the proportion of the pulp flow is discharged over the dam 87 that is not passed into the discharge duct 16. In this way, sedimentation of the pulp suspension is prevented.

The discharge opening quantities h and s are regulated so that the height h of the discharge opening 15 is adjusted by means of the adjusting member 54, by whose means the top lip beam 13 is shifted vertically, whereas an adjusting member 56 is provided for lateral adjustment, i.e. for adjustment of the position s of the discharge opening 15, the top lip beam 13 being shifted in the lateral direction by means of said adjusting member 56.

For adjustment of the gap C that remains between the perforated roll 14 and the top lip beam 13, an adjusting device is fitted between the top lip beam 13 and the stationary front wall beam 40, which adjusting device consists of a mobile rigid partition wall 30, which is, at both of its ends, linked by means of horizontal pivot shafts 31 and 32. The pivot shaft 32 is attached to the top lip beam 13 by means of a link socket 42, and the pivot shaft 31 is attached to the part 43, such as a slide, by means of a link socket 41, which slide 43 is arranged mobile in relation to the stationary front wall, for example vertically mobile on a prism 45 in the way indicated by the arrow V. The magnitude of the gap C between the top lip beam 13 and the perforated roll 14 is adjusted by means of the adjusting member 46, e.g. an adjusting screw. The adjusting member 46 is, by one end, attached to the front wall beam 40 by means of the fastening piece 47, and by the opposite end to the link socket 41 of the pivot shaft 31. Thus, by means of the adjusting member 46, the position of the part 43 is shifted in relation to the front wall beam 40. The pivot shafts 31 and 32 are fitted to turn in their link sockets 41 and 42 to the extent required by the adjustments of the top lip beam 13, for example about 30°.

The constructions, cantilever brackets 52, adjusting members 54, and other parts related to them and provided for vertical adjustment of the top lip beam 13, i.e. for adjustment of the height h of the discharge opening 15, are fitted as a number of at least 2 pcs. as equally spaced in the horizontal direction in the headbox, and so are the members, adjusting members 56, cantilever brackets 58, and other parts related to them and provided for lateral adjustment of the top lip beam 13, i.e. for adjustment of the position s of the discharge opening 15. There is one arrangement provided for the adjustment of the gap C, i.e. the mobile rigid partition wall 30 extends across entire width of the headbox. This rigid partition wall 30 is sealed against the side walls 70 of the headbox at both sides of the headbox.

Thus, the device for adjusting the top lip beam 13 of a headbox consists of a rigid, mobile partition wall 30, for example a steel wall, which is linked by its ends by means of horizontal pivot shafts 31 and 32. The pivot shaft 31 is connected to the part 43, which is fitted to move up and down at the top end of the partition wall 30 in relation to the front wall 40, as is indicated by the arrow V.

As was described above, the quantities h and s that define the discharge opening 15 are regulated so that the top lip beam 13 is shifted vertically by means of the adjusting member 54 and laterally by means of the adjusting member 56. Thus, adjustment of the discharge opening 15 also affects the magnitude of the gap C, in which case it may also be necessary to adjust the gap C, which is, thus, adjusted by means of a part, e.g. a slide 43, moving on the stationary front wall beam 40, e.g. on a prism 45, and by means of the adjusting member 46. Adjustment of the gap C also affects the height h and the position s of the discharge opening 15 slightly.

As the material of the rigid wall 30, it is possible to use, e.g., steel. As was mentioned above, other metallic materials are also possible. As the partition wall, preferably a thick, plane steel sheet

is used.

In the following, the patent claims will be given, and the various details of the invention may show variation within the scope of the inventive idea defined in said claims and differ from what has been stated above for the sake of example only.

Claims

1. Adjusting device for the top lip beam of the headbox of a paper machine, board machine, or wet-lap pulp machine, by whose means the position of the top lip beam (13) is changed for regulation of the height (h) and position (s) of the discharge opening (15) and which top lip beam (13) is included in a headbox in whose discharge duct (16) there is a perforated roll (14) as an equalizing member, and between which perforated roll (14) and the top lip beam (13) of the headbox there is a gap (C), said adjusting device comprising adjusting members (54,56) for changing the position of the top lip beam (13) and adjusting members for regulating the gap (C) between the top lip beam (13) and the perforated roll (14), **characterized** in that the members for adjusting the gap (C) between the top lip beam (13) and the perforated roll (14) consist of a mobile, rigid partition wall (30), which is by one end linked (32) with the top lip beam (13) and by the other end linked (31) with a part (43) which is arranged mobile in the vertical direction (V) in relation to the stationary front wall (40), and that the partition wall (30) closes the opening between the stationary front wall (40) and the top lip beam (13).

2. Adjusting device as claimed in claim 1, **characterized** in that the horizontal pivot shafts (31,32) fitted at both ends of the mobile, rigid partition wall (30) are fitted to turn to the extent required by the adjustments of the top lip beam (13), typically 30°.

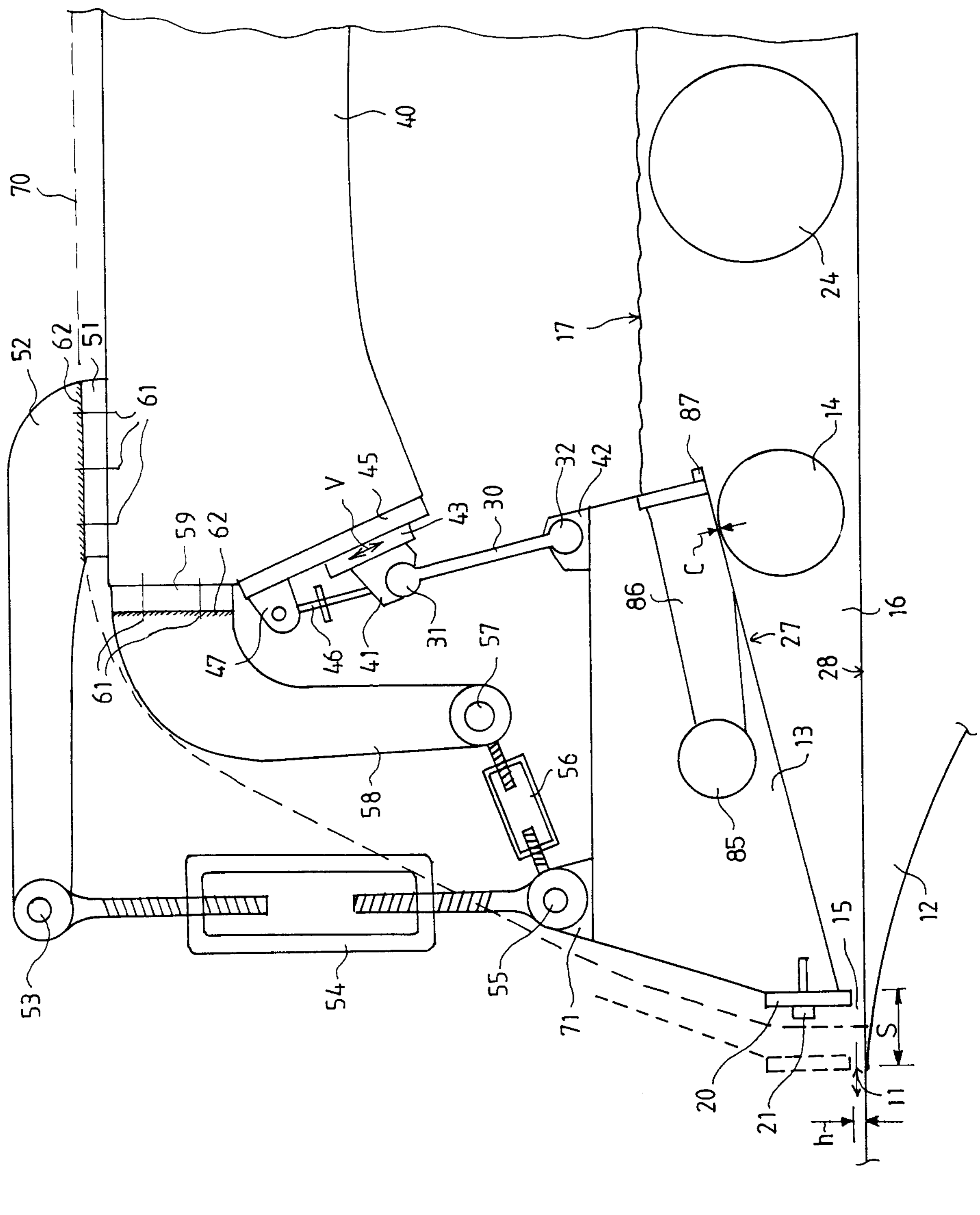
3. Adjusting device as claimed in claim 1 or 2, **characterized** in that the position of the part (43), which is arranged mobile in the vertical direction (V) in relation to the stationary front wall (40), is fitted to be determined by means of the adjusting members (46).

4. Adjusting device as claimed in any of the claims 1 to 3, **characterized** in that the rigid partition wail (30) supports the top lip beam (13) from the end opposite in relation to the discharge opening (15).

5. Adjusting device as claimed in any of the claims 1 to 4, **characterized** in that the adjusting members (54,56) for changing the position of the top lip beam (13) are formed by means of adjusting members (54,56) attached to the stationary front wall (40) by means of articulated joints, the position of the top lip beam (13) being changed by means of one (54) of said adjusting members to adjust the height (h) of the discharge opening (15), and the position of the top lip beam (13) being adjusted by means of the other one (56) of said adjusting members to determine the position (s) of the discharge opening (15).

6. Adjusting device as claimed in any of the preceding claims, **characterized** in that the rigid partition wail (30) is sealed at its opposite ends against the side walls of the headbox so that the opening that remains between the stationary front wall (40) and the top lip beam (13) is closed as liquid-tight.

7. Adjusting device as claimed in any of the preceding claims, **characterized** in that the part (43) is a slide, which is arranged as mobile in the vertical direction (V) on a prism (45) fitted on the stationary front wall (40).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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 91120791.8

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	FI - B - 66 219 (VALMED OY) * Fig.; claim 3 * --	1,2,4, 5	D 21 F 1/02
A D	GB - A - 1 276 040 (A. AHLSTROM OSAKEYHTIO) * Totality * & FI-B-45 883 --	1,4	
A	DE - A - 3 730 775 (VALMED OY) * Totality * --	1,3	
D,A	FI - B - 36 355 (BELOIT) * Claims 2,3; fig. 1,2 * ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
D 21 F 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	05-03-1992	KRUMPSCHMID

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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