



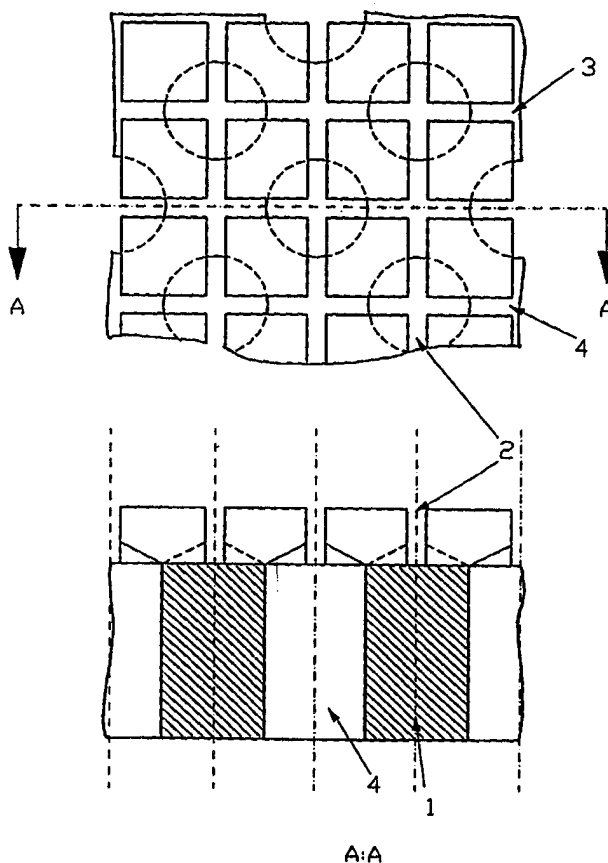
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(21) International Application Number: PCT/SE97/00694 (22) International Filing Date: 25 April 1997 (25.04.97) (71) Applicant (for all designated States except US): AB KNUT-SILPLÄTAR [SE/SE]; S-467 21 Grästorp (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): FREDRIKSSON, Börje [SE/SE]; Barrvägen 13, S-863 35 Sundsbruk (SE). (74) Agent: SUNDQVIST, Hans; Sunds Defibrator Industries AB, Strandbergsgatan 61, S-112 51 Stockholm (SE).		(81) Designated States: AU, BR, CA, JP, NO, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.

(54) Title: BARRIER FOR DEWATERING FIBROUS SUSPENSIONS

(57) Abstract

The invention relates to a barrier for draining at the dewatering of fibrous suspensions. The barrier has the object to retain the fibers and to permit the filtrate to be discharged through openings in the barrier. The driving force for the dewatering can be either a mechanical pressure or a hydraulic pressure difference. The problem at dewatering is to retain the fibers and at the same time to facilitate the discharge of the dewatered filtrate from the boundary layer of the formed pulp cake. The device implies that the fiber side of the barrier (1) is provided with a pattern of narrow channels (2, 3) with a width of < 1 mm, preferably < 0.5 mm, which are placed so that the surface layer of the barrier has an openness of at least 20 %, preferably at least 40 %, of the boundary surface toward the fibrous suspension. The filtrate is drained via these channels to openings (4), which permit passage to the filtrate side of the barrier. The channels on the fiber side of the barrier preferably can be intersecting and extend in at least two directions, none of which need to be perpendicular to the direction of movement of the barrier.



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Barrier for dewatering fibrous suspensions

This invention relates to the thickening and dewatering of suspensions and sludges of fibers and other network-forming materials, especially suspension of papermaking pulp.

At dewatering a fibrous suspension against a barrier, the barrier has the function of retaining the fibers, while the liquid (filtrate) or gas is discharged through openings in the barrier. The driving force for the dewatering can be a mechanical and/or hydraulic pressure, which presses the filtrate out of the fiber bed formed on the barrier. At the dewatering of fibrous suspension, mainly two different types of barriers are used today, partly woven material, so-called wire, partly perforated plates. When the process conditions require barriers with high resistance against mechanical and chemical agitation, drilled plates are used.

The invention relates to a novel type of barrier, which yields a more effective drainage of the boundary layers of the fiber bed than the barriers known today, especially at draining under stressing mechanical and chemical conditions.

Conventional drilled plates have a relatively low open area in the surface facing the drained fiber bed, and the holes in the barrier have a large diameter compared to the length of the fibers. Due to the low proportion of open area, the flow rate of the filtrate through the openings of the holes in the surface of the barrier plate is high. The high rate, in combination with the large diameter of the holes in relation to the fiber length, implies that a much too great proportion of the fibers passes through the barrier, i.e. the retention is low. This is especially obvious at the pressing of pulps with low medium fiber length and high dewatering resistance at rapid pressing procedures, i.e. press nips with short stay-time, for example a press nip between two rotating rolls. At this type of pressing, the fiber cake often is crushed in the press nip, i.e. the fiber network is partially broken up by the dewatering pressure. Where crushing occurs, the fibers are freed, and the probability of their passing the barrier increases.

Drilled press plates normally have holes of a diameter between 0,8 and 1,4 mm. Certain short fiber pulps, for example hardwood and recycled-fiber pulps, have medium fiber lengths of the same magnitude as the hole diameter in this type of plates. The retention, for this reason, will be low. This applies especially to dewatering from low pulp concentrations in short press nips.

In order to overcome these problems, rolls with drilled shell plate have been coated with woven wire cloth, usually made of a synthetic material. This has yielded the intended effect from a dewatering and retention point of view, but the service life of the cloth has been much too short. In many cases it does not endure the rough treatment in the press nip. It is mangled out, lengthened, pulled oblique, folded and broken up. It also happens usually, that the wire cloth is clogged by fine material and small fibers from the fibrous suspension, and after some time of operation it becomes so dense, that the draining capacity is reduced. The draining capacity of the wire cloth decreases with increasing operation time also because it is compressed mechanically by the press pressure and thereby becomes denser and more difficult to be penetrated by the filtrate.

In several industrial processes it is impossible to use wires made of synthetic materials due to the pH value and/or high temperature of the fibrous suspension. It is, moreover, often of great interest, especially at the manufacture of pulps and paper of a higher quality, to avoid to the greatest possible extent the use of synthetic materials in the process, because of the risk that this foreign material can contaminate the final product.

The aforesaid problems with conventional technique can be overcome by lowering the flow rate in the boundary layer between the fiber bed and barrier, and by reducing the width of the openings in the barrier surface.

The desired reduction in rate is achieved by the present invention, in that channels are milled out in the barrier surface, so that the area to the fibrous suspension open for draining is increased. These channels open

into and are drained to through openings, which extend through the thickness of the barrier to its outlet side. The openings can be holes drilled from the rear side, which meet the system of the front side of draining channels or millings in the form of channels on the rear side of the barrier plate, which meet the channels from the fiber side, so that openings for the filtrate are obtained through the barrier.

The characterizing features of the invention are apparent from the attached claims.

Examples of known barriers for use at the dewatering and screening of fibrous suspensions are described in USA patent No. 4,259,136 and in the European application No. 82103801.5. The USA patent describes a method of building a barrier of bars, between which parallel gaps are formed in one direction. This method yields smaller openings in the boundary surface, but also a very small open surface and thereby high flow rates and poor drainage of the surface layer of the drained fiber cake. The method, therefore, cannot be used in short intensive press nips.

The European application describes a method of manufacturing a screen plate for screening fibrous suspensions by providing the surface of a plate with parallel slits and to provide the other side with depressions to such a depth, that through openings are formed. The invention is characterized in that every depression is so great as to cover many slits. A barrier of this type has the same disadvantage of small open area as the one described in the above USA patent. Besides, a barrier of this type has not sufficient mechanical strength to be used for dewatering fibrous suspensions by means of high mechanical pressure.

The invention is described in greater detail in the following by way of 6 embodiments illustrated in the accompanying Figures 1,2,3,4,5 and 6.

At the first four of these embodiments, one surface of a plate is sawn with a pattern of fine grooves, which can have different depths. The grooves extend in at least two directions, so that a regular system of intersection points between the grooves is formed. The surface has now a

dense channel system and a high proportion of open area to the fibrous suspension to be drained. The narrow grooves, thus, cover a large portion of the surface of the plate, preferably between 30 and 70 %.

Fig. 1 shows a variant of a barrier according to the invention. A plate 1 has been provided in two directions with crossing channels 2,3 in the surface, to which the fibrous suspension shall be dewatered. From the filtrate side of the plate have been drilled to every second intersection of these channels holes 4 of such a depth, that through openings are formed. The holes can be straight or conical.

Fig. 2 shows a variant of a barrier according to the invention with great openness in the surface compared to the variant in Fig. 1. The barrier plate is in certain parts similar to that shown in Fig. 1, but has been provided with additional channels 5,6 in two directions. This new channel system is shallower than the previous one and is drained in the deeper channels 7,8, which in their turn are drained in the holes 4 drilled from the filtrate side.

Fig. 3 shows a variant of the barrier in Fig. 2, where the shallower channels 9,10 have been drawn diagonally to the deeper channels 11,12 in order to additionally increase the open surface and to facilitate the draining.

An alternative to draining the fine channel system on the fiber side of the barrier by means of drilled holes is to mill grooves from the rear side (filtrate side) of the barrier plate to a depth where these channels meet the deepest channels on the fiber side. Fig. 4 shows a variant of this type of barrier with crossing channels of different depths where the shallower channels 13,14 and the deeper channels 15,16 have been drawn at an angle of 45° to the coarser grooves 17 of the filtrate side.

Figs. 5a and 5b show variants of dewatering barriers, which are manufactured of bars 18 instead of a plate. Between these bars, which are joined together by welding or another technique, through gaps 19 are formed, into which the channels 20,21,22 worked on the fiber side open. The worked

channels can be carried out in one direction, Fig. 5b, or in several directions, Fig. 5a.

Fig. 6 shows a simpler form of barrier where holes 23 are drilled entirely through the plate. The channels 24,25 increase the openness of the boundary layer to the fiber bed to be drained, and thereby the dewatering is improved. The through holes, however, imply that the barrier yields a lower fiber retention than the variants shown in Figs. 1-5.

It applies to all the aforescribed variants of barriers for dewatering fibrous suspensions, that the channels on the fiber side of the barriers can be carried out at such an angle to the direction of movement, that a continuous bearing surface to a linear-formed load is obtained, for example a doctor with the object to scrape off the dewatered fiber cake.

1. A barrier (1), the object of which is to separate the fiber from the filtrate at the dewatering of network-forming suspensions, for example papermaking pulp, characterized in that the surface to the fibrous suspension is provided with a pattern of narrow channels (2,3) with a width of < 1 mm, preferably < 0.5 mm, which yield an openness in the boundary layer, which covers at least 20%, preferably at least 40% of the boundary surface of the barrier to the fibrous suspension, and that the filtrate is drained entirely or partially via these channels toward the filtrate side of the barrier by means of through openings (4) opening on the filtrate side.
2. A barrier as defined in claim 1, characterized in that the surface toward the fibrous suspension is provided with a pattern of intersecting narrow channels (2,3) in at least two directions.
3. A barrier as defined in claim 2, characterized in that the channels on the fiber side (5-8) have different depths, and that only the deeper channels (7,8,11,12) meet the openings (4) from the rear side of the barrier and form passages for the filtrate flow.
4. A barrier as defined in claim 2, characterized in that the channels are drained through the barrier via openings, preferably holes (4), which are drilled from the filtrate side to such a depth, that they break through the bottom of the channels and bring about openings through the barrier to the filtrate side.
5. A barrier as defined in claim 4, characterized in that the drainage holes (4) on the rear side of the barrier are drilled to the meeting points of the channels (3,4).
6. A barrier as defined in claim 4, characterized in that the drainage holes on the rear side of the barrier are drilled to the meeting points of the deepest channels (7,8,11,12).
7. A barrier as defined in claim 3, characterized in

that the channel system (13,14,15,16) of the fiber side is drained via channels (17) arranged on the filtrate side in a substantially diagonal direction in relation to the channel pattern on the fiber side, and that the deepest channels (15,16) on the fiber side break through the drainage channels (17) on the filtrate side and form openings through the barrier.

8. A barrier as defined in claim 2 with channels in two directions, c h a r a c t e r i z e d in that the channels are directed at 30 - 60 degrees to the direction of movement of the barrier, so that a movable contact line across the barrier surface always rests against the solid surfaces between the channels.

9. A barrier as defined in claim 1 built up of longitudinal bars (18) separated by narrow gaps (19), c h a r a c t e r i z e d in that the surface of the bars toward the fibrous suspension is provided with narrow channels (20,21,22), which are drained to the gaps (19) between the bars (18).

10. A barrier as defined in claim 9, c h a r a c t e r i z e d in that the bars (18) have such cross-section, that the gaps (19) formed between the bars widen toward the filtrate side.

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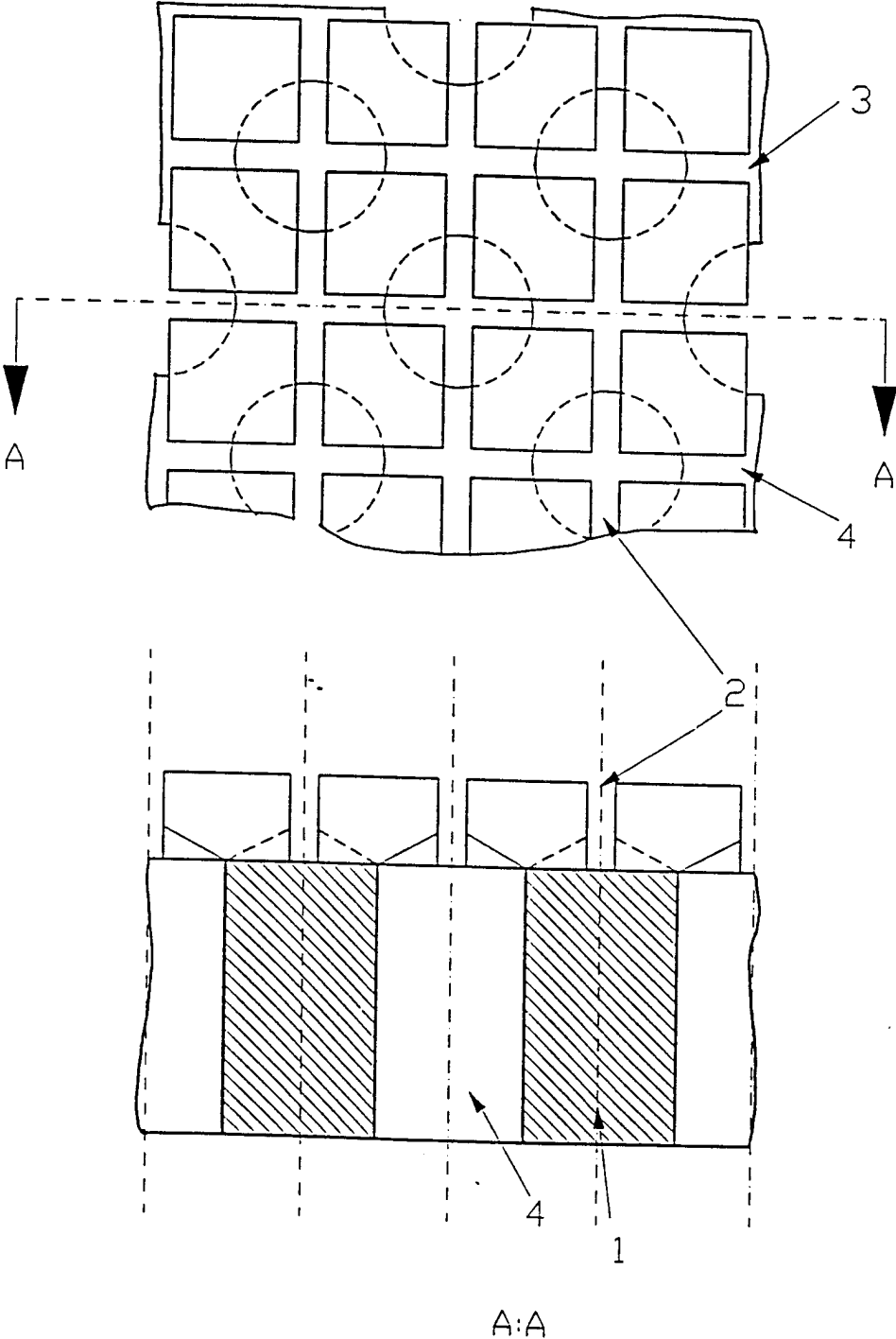


Figure 1

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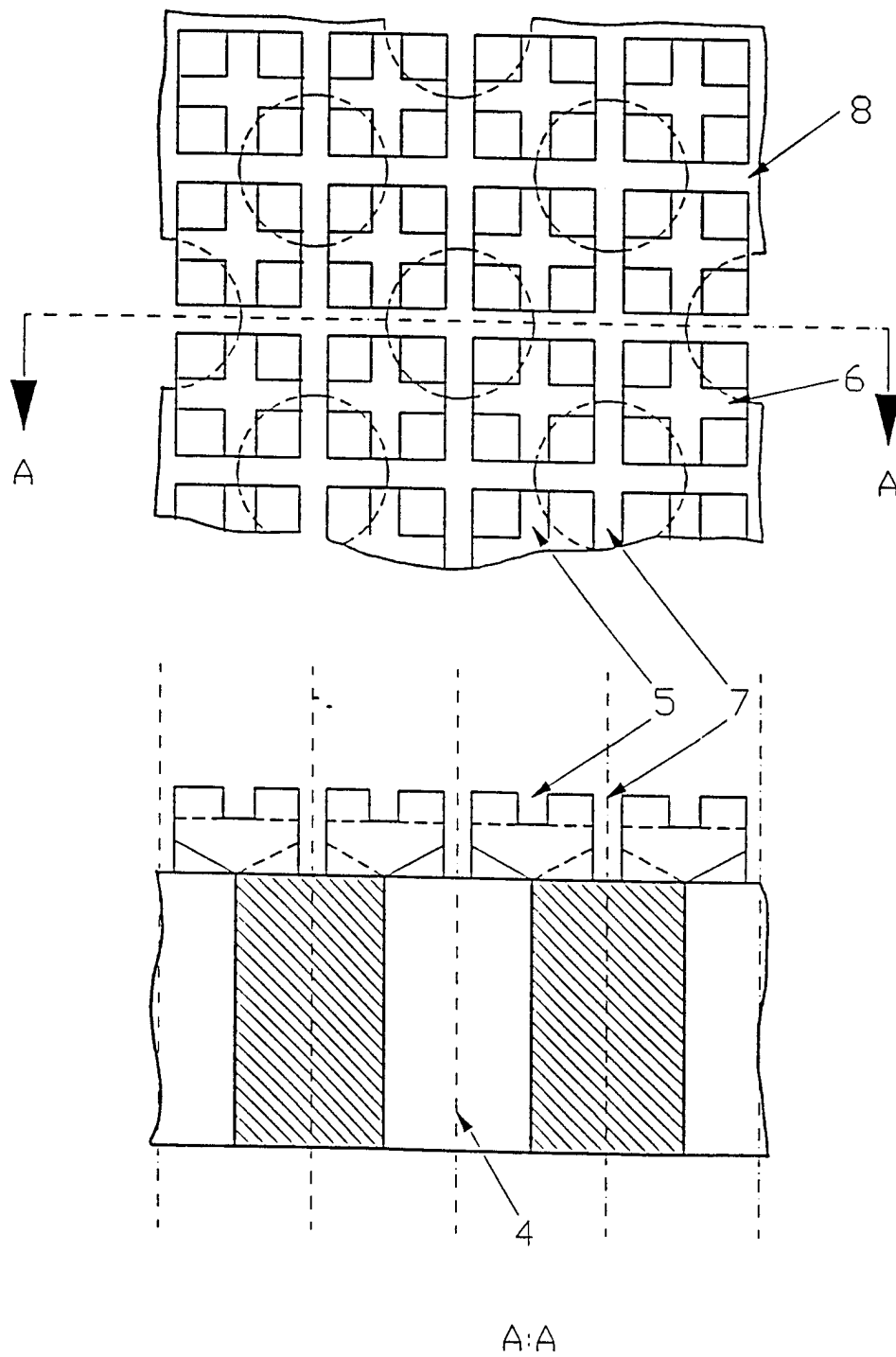


Figure 2

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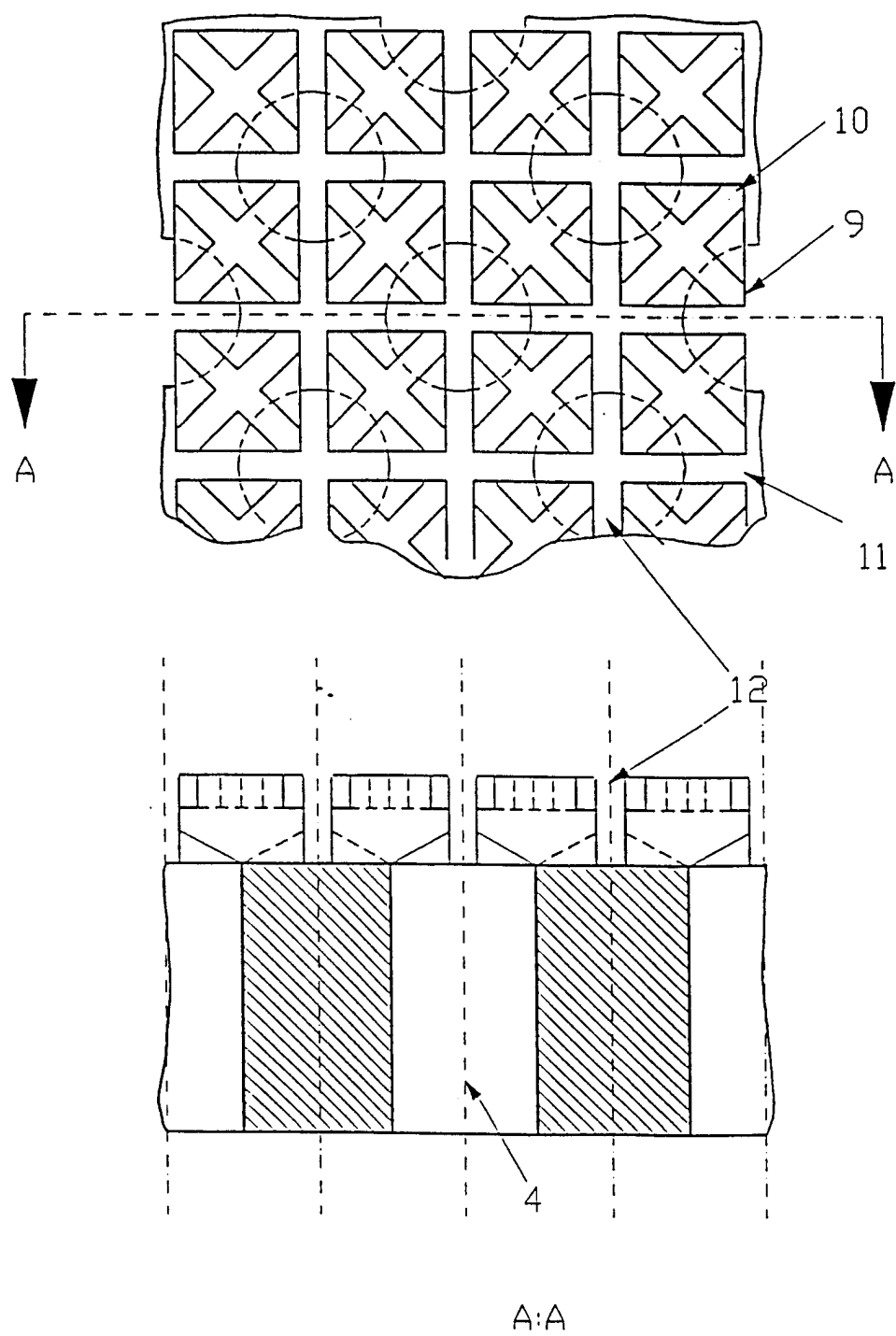


Figure 3

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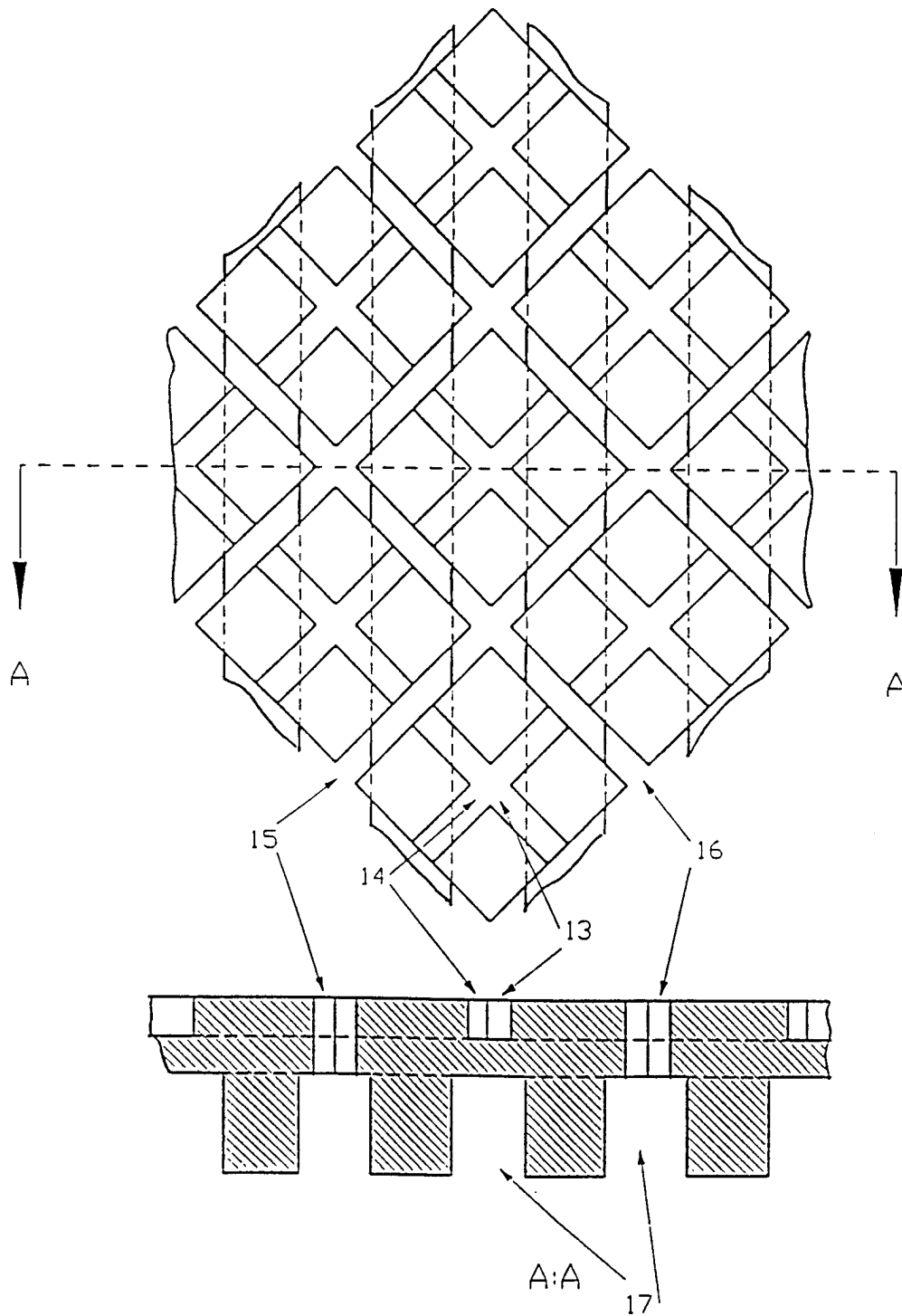


Figure 4

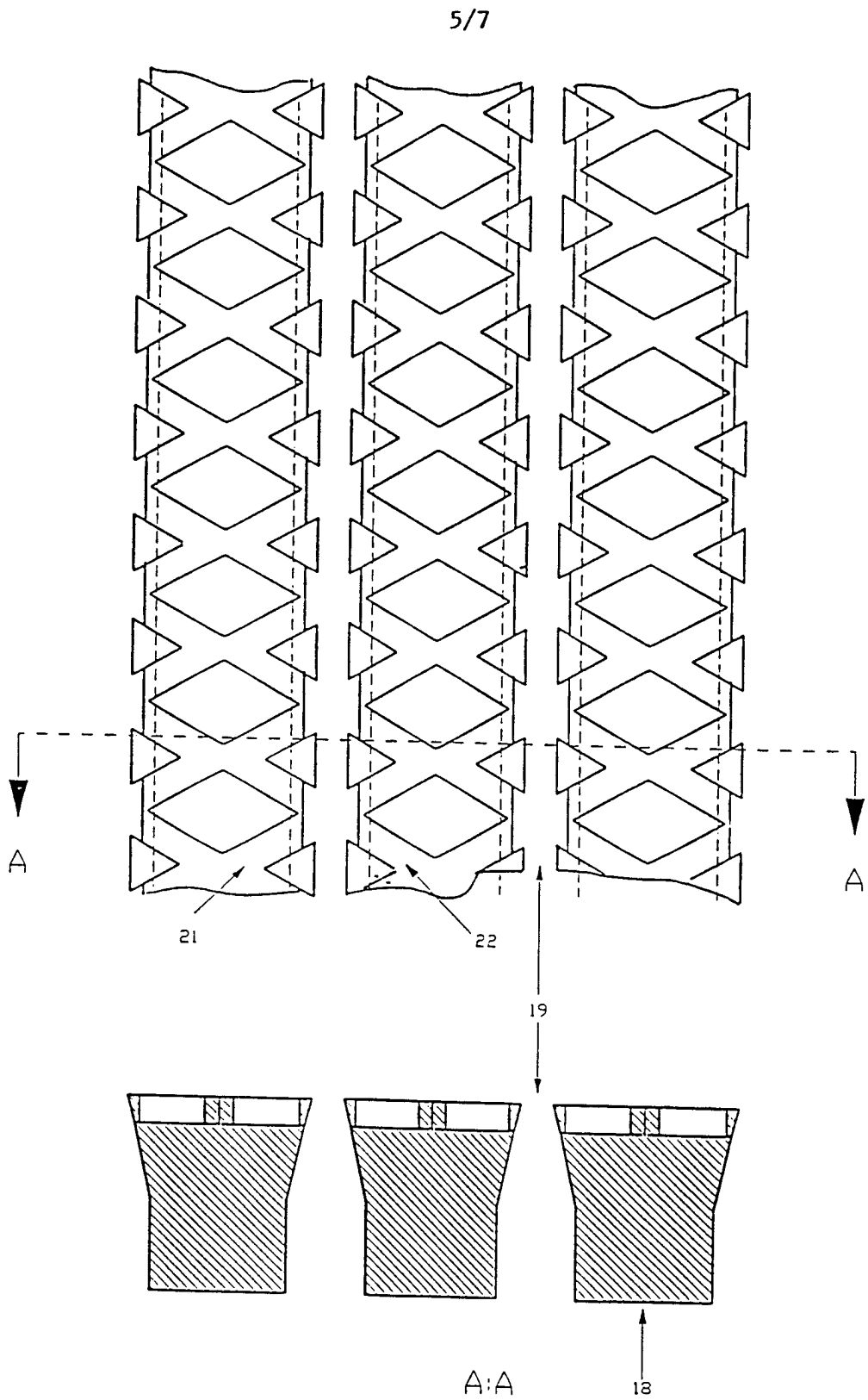


Figure 5a

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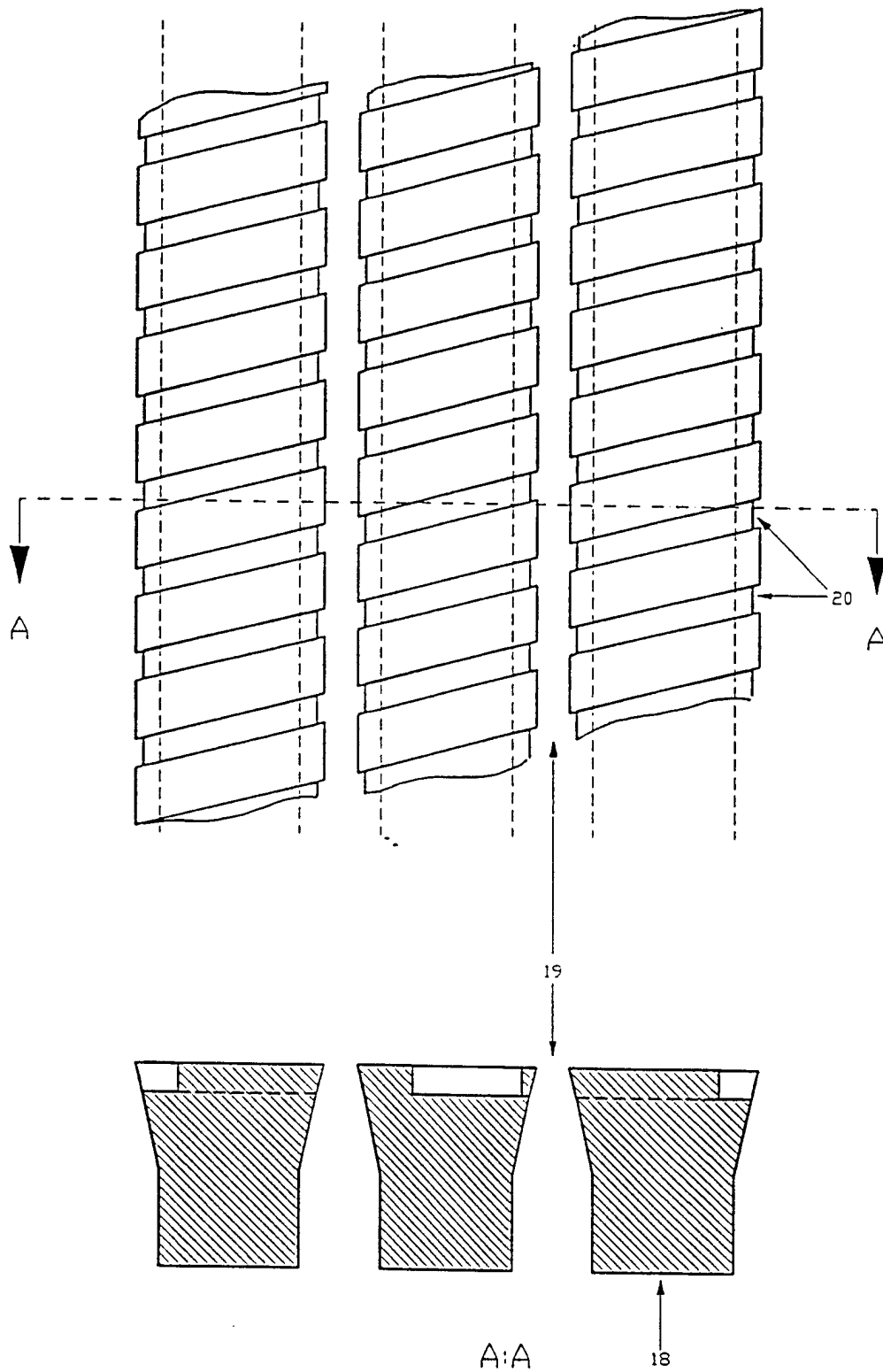
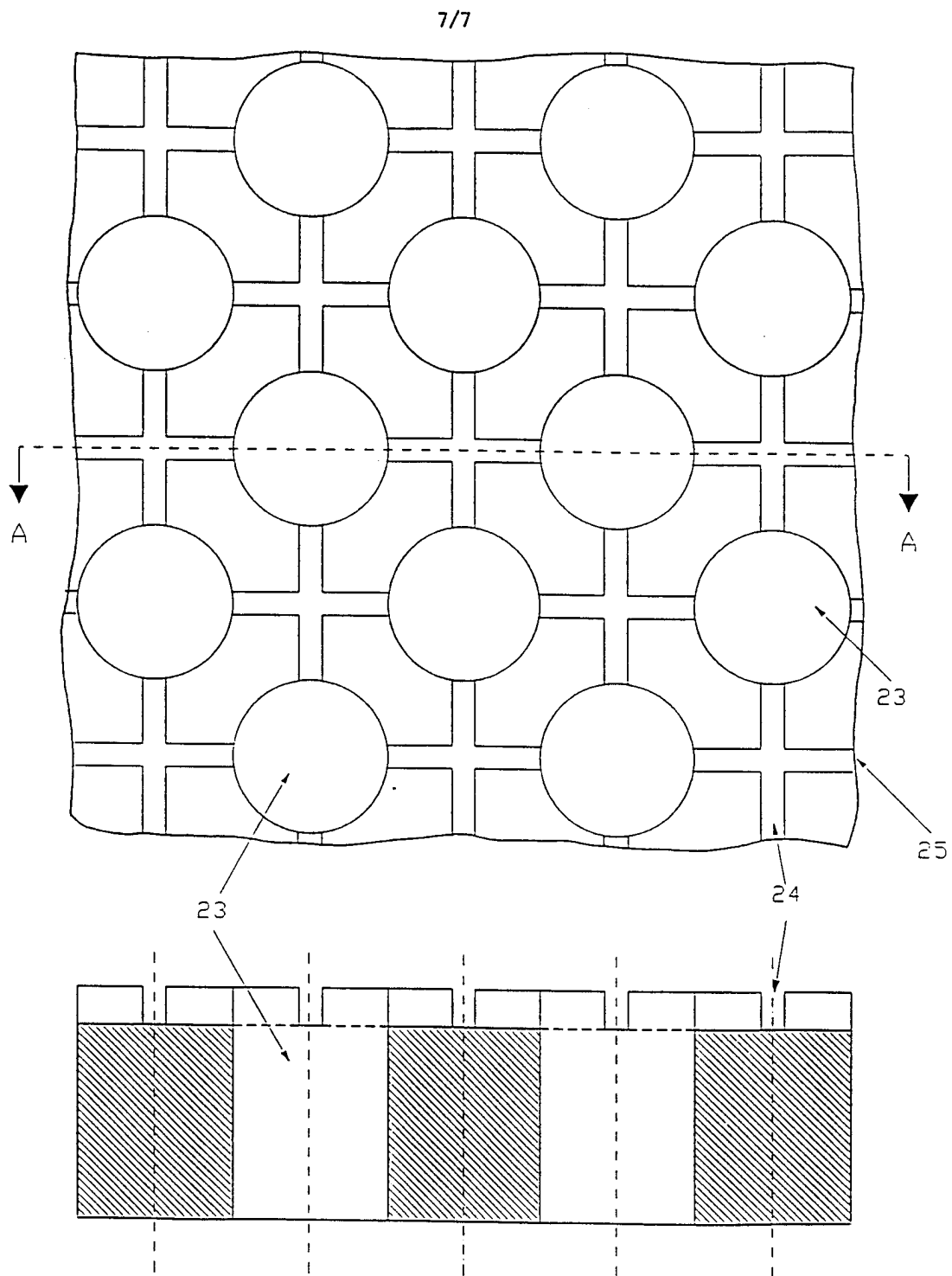


Figure 5b



A:A

Figure 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00694

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21D 5/16, D21F 1/66

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

B. FIELDS SEARCHED

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IPC6: D21D, D21F

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

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4529520 A (HARRY LAMPENIUS), 16 July 1985 (16.07.85) --	1

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

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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02/12/97

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