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(54) Benævnelse: **FREMGANGSMÅDE TIL AT FREMSTILLE EN FORDYBNINGSPLADE**

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WO-A1-90/06797
WO-A1-2013/139362
DE-A1- 2 134 697
DE-A1- 3 636 792
US-A1- 2001 021 428

DESCRIPTION

TECHNICAL FIELD

[0001] The invention relates in general to filtering and in particular to a method for manufacturing a recess plate.

BACKGROUND ART

[0002] Recess plates are commonly known, inter alia from DE 10 2007 027 033 A1, WO 90/06797, and US 2001/0021428 A1. Recess plates must be capable to take unavoidable differential pressure, and to return back to original shape after deflection due to differential pressures. They must take huge closing and sealing forces and full process pressures, without being compressed. Machining must be possible to ensure dimensional accuracy, and installing sealing rings and membranes. Fixing and supporting areas must be sufficiently strong, and they must provide opportunity to include internal channels for filtrate, washing media, air etc. These days, such recess plates are mostly molded from polypropylene (PP), or even from steel, and subsequently machined to the final shape.

[0003] Both the limited number of PP plate manufacturers and limited size of molding presses technically and economically constrains both manufacturing and application of filter devices.

PROBLEM TO BE SOLVED

[0004] It is an object of the invention to suggest an alternative method for manufacturing recess plate.

SUMMARY OF INVENTION

[0005] The invention suggests a method for manufacturing a recess plate to be used in a filter device for filtering a suspension as defined in independent claim 1., the filter device having a stationary head piece and a movable end piece, and a pack including copies of the recess plate, having a filter chamber inside the pack, adjoining the recess plate, having a first pipe for filling the suspension into the filter chamber, having a filter cloth for collecting a solid content out of the suspension, and having a second pipe for discharging a liquid fraction of the suspension out of the filter chamber as a filtrate, wherein the filter device may be closed before filtering by forcing the end piece in direction of the head piece, and opened after filtering by releasing the end piece, and moving the end piece away from the head piece for removing the

filter cake from the filter cloth, wherein a first sheet is formed to provide a first surface of the recess plate at the filter chamber, and a second sheet is formed to provide a second surface of the recess plate vis-à-vis the first surface, and a spacing between the first sheet and the second sheet is filled by a rigid body. Alternatively, the rigid body may be formed by molding, and subsequently lined with the sheets.

[0006] Preferred embodiments of the method are presented in the dependent claims.

[0007] In the method according to the invention, the first surface and the second surface are formed by pressing the respective first sheet and second sheet to female solid molds. Forming the sheets in reusable female solid molds provides for reproducible shapes and large-scale production.

[0008] In the method, a protective sheet is arranged between the respective first sheet and the second sheet and the female solid molds, and removed from the first surface and the second surface, after forming. Such protective sheets are used to avoid soiling of both the female solid molds, and of the pressing agent with resin from the first and second sheets.

[0009] In the method according to the invention, the first surface and the second surface are formed by arranging the first sheet and the second sheet between two female solid molds, and inserting a fluid between the first sheet and the second sheet. Simultaneously forming both surfaces allows for streamlining the manufacturing process of the recess plate, and avoiding warehousing.

[0010] In the method according to the invention, a fluid is used for pressing the first sheet and the second sheet to the female solid molds. A fluid always adapts to, and thus in independent of the shape of the solid mold.

[0011] The fluid preferably is hot water. Hot water may assist in hardening the resin soaking the sheets.

[0012] Further preferred, in a method according to the invention, the rigid body is glued to at least one of the first sheet and the second sheet. Gluing provides for a durable connection of the rigid body to the sheet(s).

[0013] Even further preferred, in a method according to the invention, a foam is injected between the first sheet and the second sheet, that after hardening forms the rigid body. A foam, similar to a fluid for pressing, adapts to, and thus is independent of the shape of the rigid body. Alternatively, another fluid material may be filled between the sheets. Further alternatively, a prefabricated honeycomb composite rigid body may be arranged between the sheets.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] The recess plate according to the invention and the associated method are subsequently described in more detail with reference to the drawing figures, showing schematic cuts through the sheets, molds, and the resulting recess plate during four steps in the manufacturing process.

[0015] In manufacturing a recess plate 1 according to the invention, as shown in fig. 1, a stack of two sheets 2, 3 from glass-fiber reinforced fabric, soaked with liquid PE, each lined by two protective sheets 4, 5 - here: plastic foils - is inserted between two female solid molds 6.

[0016] The solid molds 6 are then pressed, and clamped (clamps not shown) together, to ensure sealing of the recesses 7 inside, as shown in fig. 2.

[0017] As shown in fig. 3, hot water 8 is then fed between the two sheets 2, 3, pressing the same into the recesses 7. After hardening of the PE, the hot water 8 is discharged, the solid molds 6 are opened. Until now, the first surface 9 of the first sheet 2 and the second surface 10 of the second sheet 3 are facing each other.

[0018] The sheets 2, 3, now having the shape of the respective recesses 7, and being dimensionally stable, are removed from the solid molds 6. The protective sheets 4 are removed from the flip sides 11 of the sheets 2, 3, and, as shown in fig. 4, and the sheets 2, 3 reversed to have the flip sides 11 of the sheets 2, 3 facing each other. The sheets 2, 3 are mounted to a prepared frame 12, containing all the drills and bores required for filtrate, wash water, air etc. Then the hollow space 13 between the sheets 2, 3 is filled with a structural foam 14 core material using a SAN polymer base featuring high toughness and impact resistant characteristics, e.g. available under the trade name *Corecell*™ M from Gurit Holding AG, Wattwil/Switzerland. After hardening, together with the frame 12, the foam 14 forms the rigid body 15 of the recess plate 1.

[0019] The protective sheets 5 remain on the first surface 9 and on the second surface 10, until delivery.

[0020] In the figures are

1
: recess plate

2
: first sheet

3
: second sheet

4
: protective sheet

5
: protective sheet

6 solid mold
7 recess
8 water
9 first surface
10 second surface
11 flip side
12 frame
13 hollow space
14 foam
15 rigid body

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE102007027033A1 **[0002]**
- WO9006797A **[0002]**
- US20010021428A1 **[0002]**

P A T E N T K R A V

1. Fremgangsmåde til at fremstille en fordybningsplade (1), der skal anvendes i en filterindretning til filtrering af en suspension, hvor filterindretningen har et stationært hovedstykke og et bevægeligt slutstykke og en pakning indbefattende kopier af fordybningspladen (1), som har et filterkammer inde i pakningen, der støder op til fordybningspladen (1), som har et første rør til fyldning af suspensionen i filterkammeret, der har en filterklud til opsamling af et fast indhold ud af suspensionen, og som har et andet rør til at udlede en væskefraktion af suspensionen ud af filterkammeret som et filtrat, hvor filterindretningen kan lukkes inden filtrering ved at tvinge slutstykket i retning af hovedstykket og åbnes efter filtrering ved at frigøre slutstykket og bevæge slutstykke væk fra hovedstykket til fjernelse af filterkagen fra filterkluden, hvor

a. et første ark (2) er dannet for at tilvejebringe en første overflade (9) af fordybningspladen (1) ved filterkammeret, og et andet ark (3) er dannet for at tilvejebringe en anden overflade (10) af fordybningspladen (1) vis-a-vis den første overflade (9),

b. ved at danne det første ark (2) for at tilvejebringe en første overflade (9) af fordybningspladen (1) ved filterkammeret og det andet ark (3) til at tilvejebringe en anden overflade (10) af fordybningspladen (1) vis-a-vis den første overflade (9) indbefatter at indsætte en stak af det første ark (2) fra stof, gennemblødt med hærdende harpiks og af det andet ark (3) fra stof, gennemblødt med hærdende harpiks, hver af det første ark (2) og det andet ark (3) er foret med to beskyttelsesark (4, 5) mellem to faste hunforme (6),

c. at presse og kræve de to faste hunforme (6) sammen for at forsegle fordybninger (7) inde i de faste hunforme (6),

d. at føde væske mellem det første ark (2) og det andet ark (3) til at presse det første ark (2) og det andet ark (3) ind i fordybningerne (7),

e. at udtømme væsken og åbne de to faste hunforme (6),

f. at fjerne beskyttelsesarkene (4) fra bagsiden (11) af det første ark (2) og det andet ark (3),

g. at vende det første ark (2) og det andet ark (3) for at få vippe arkene (11) af det første ark (2) og det andet ark (3) til at vende mod hinanden og at montere det første ark (2) og det andet ark (3) til en ramme (12) indeholdende alle de bor og boringer, der kræves til filtrat, vaskevand og luft, og

h. at udfylde en afstand mellem det første ark (2) og det andet ark (3) med et stift legeme (15), hvor et skum (14) indsprøjtes mellem det første ark (2) og det andet ark (3), som efter hærdning danner det stive legeme (15).

2. Fremgangsmåde ifølge krav 1, hvor væsken er varmt vand (8).

DRAWINGS

Fig. 1

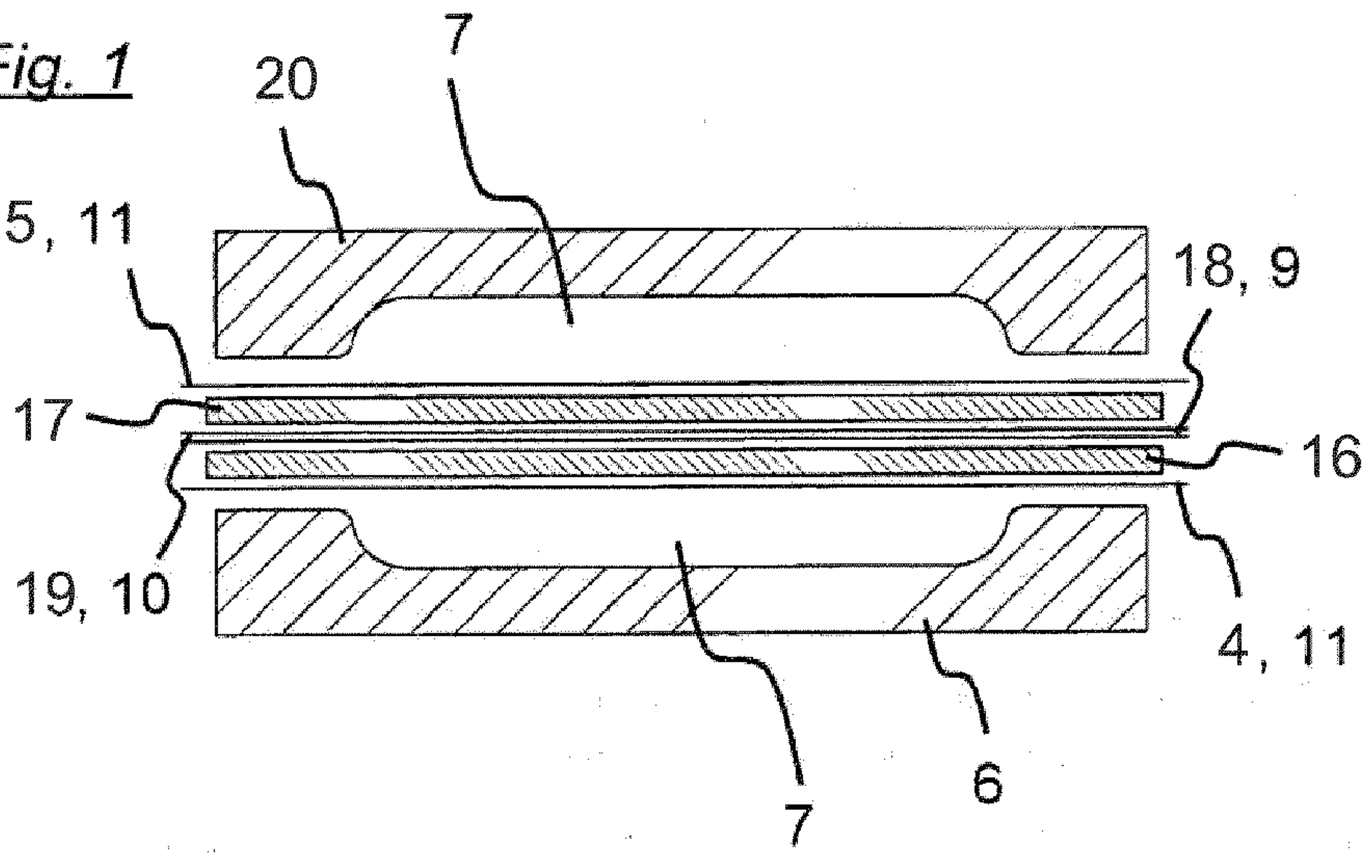


Fig. 2

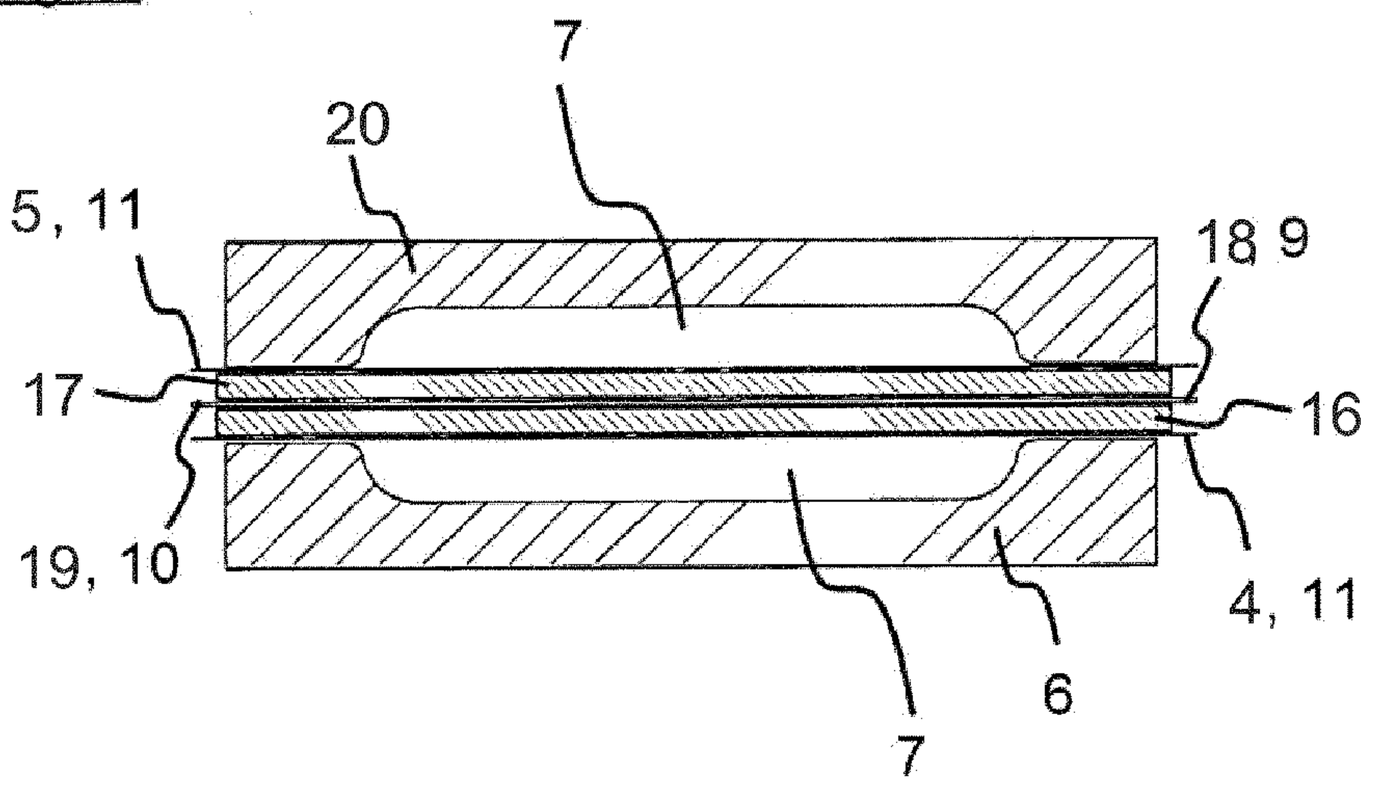


Fig. 3

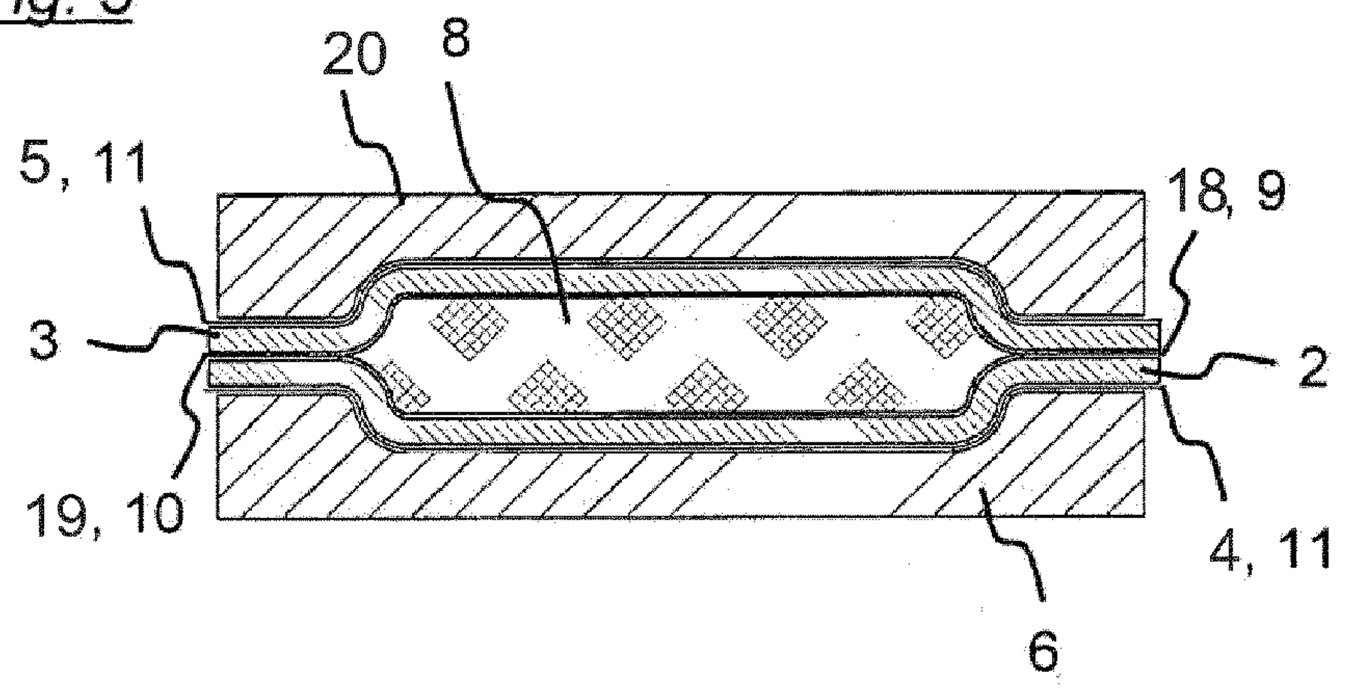


Fig. 4

