AU9517528

(12) PATENT ABRIDGMENT (11) Document No. AU-B-17528/95
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 677149

(54) Title
PROCESS FOR FEEDING MATERIAL TO BE PRESSED TO A FILTER PRESS

International Patent Classification(s)
(51)[6] **B30B 009/22** **B30B 009/04**

(21) Application No. : **17528/95** (22) Application Date : **13.03.95**

(87) PCT Publication Number : **WO95/26265**

(30) Priority Data

(31) Number	(32) Date	(33) Country
895/94	**25.03.94**	**CH SWITZERLAND**

(43) Publication Date : **17.10.95**

(44) Publication Date of Accepted Application : **10.04.97**

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(56) Prior Art Documents
DE 2057300
US 5207154
GB 2016258

(57) Claim

1. A method to supply material to be pressed (37) to a filter press having a compression chamber (6) for the solids/fluid separation of the material to be pressed, wherein the material to be pressed is supplied to the compression chamber (6) and it is pressed there by means of a pressing element (2, 13, 33) subjected to a pressing force, characterised in that in a first stage (*P1*) the material to be pressed (37) is supplied to the compression chamber (6) continuously, wherein several pressings are carried out simultaneously by means of press strokes of the pressing element (2, 13, 33) and that in a second stage (*P2*) the pressings are continued while the supply of the material to be pressed (37) to the compression chamber (6) is interrupted during the pressings.

OPI DATE 17/10/95 APPLN. ID 17528/95
AOJP DATE 30/11/95 PCT NUMBER PCT/CH95/00054

AU9517528

(51) Internationale Patentklassifikation 6 :
B30B 9/22, 9/04

A1

(11) Internationale Veröffentlichungsnummer: WO 95/26265

(43) Internationales Veröffentlichungsdatum: 5. Oktober 1995 (05.10.95)

(21) Internationales Aktenzeichen: PCT/CH95/00054

(22) Internationales Anmeldedatum: 13. März 1995 (13.03.95)

(30) Prioritätsdaten:
895/94-5 25. März 1994 (25.03.94) CH

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(81) Bestimmungsstaaten: AU, BR, CA, CN, CZ, HU, JP, MD, NZ, PL, RU, SI, SK, UA, US, europäisches Patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Veröffentlicht
Mit internationalem Recherchenbericht.

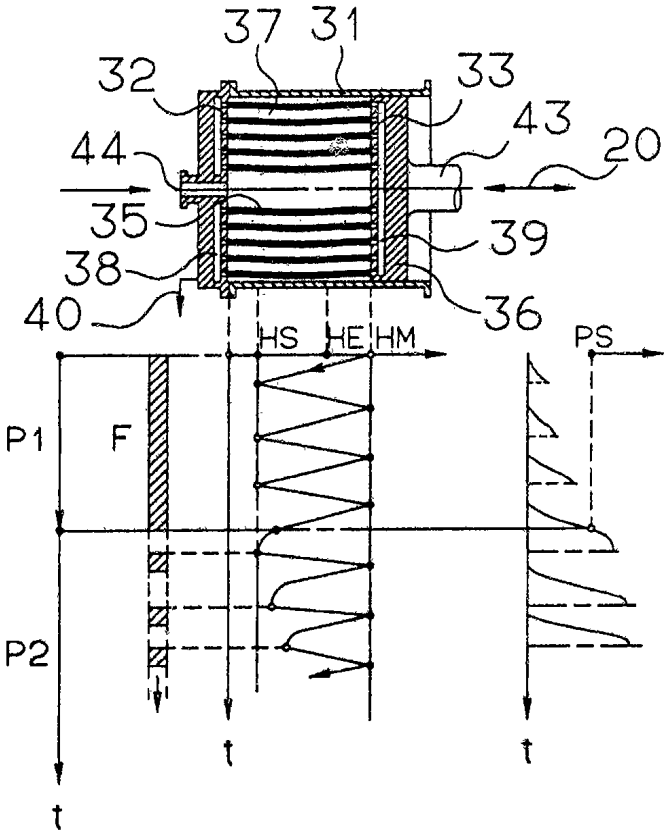
677149

(54) Title: PROCESS FOR FEEDING MATERIAL TO BE PRESSED TO A FILTER PRESS

(54) Bezeichnung: VERFAHREN FÜR DIE ZUFÜHRUNG VON PRESSGUT ZU EINER FILTERPRESSE

(57) Abstract

During a first feeding stage of material to be pressed (37) to the compression chamber of a filter press for separating the materials into solids and liquids, the material is continuously filled (F) through a filling opening (44). A pressing element (36) carries out several compression strokes up to a constant stroke position (HS). Only in a second stage of the process (P2) the filling process (F) is interrupted as soon as the compression pressure exceeds a threshold value (PS) and afterwards the compression strokes resume but are shortened. This process allows the pre-filling time to be automatically adapted to the compressibility of the material, so that materials having very different compressibilities may be automatically pre-filled into a filter press without any predetermined set values and an optimum yield and juice extraction capacity may be achieved.



(57) Zusammenfassung

Bei der Zuführung von Pressgut (37) in den Pressraum einer Filterpresse zur Fest-Flüssigtrennung erfolgt der Füllvorgang (F) an einer Einfüllöffnung (44) in einem ersten Schritt (P1) unterbrechungsfrei. Dabei führt ein Presselement (36) mehrere Abpressungen bis zu einer konstanten Hubposition (HS) aus. Erst in einem zweiten Verfahrensschritt (P2) wird der Füllvorgang (F) unterbrochen, sobald der Pressdruck einen Grenzwert (PS) überschreitet, wobei die Abpressungen mit verkleinerten Hüben fortgesetzt werden. Das Verfahren bietet eine automatische Anpassung der Vorfüllzeit an die Pressbarkeit der Ware. Damit wird ermöglicht, sehr unterschiedlich pressbares Gut automatisch und ohne Sollwertvorgabe so vorzufüllen, dass in Bezug auf die Ausbeute und die Entsaftungsleistung einer Filterpresse ein optimales Verhalten erreicht wird.

A method to supply material to be pressed to a filter press

The invention concerns a method to supply material to be pressed to a filter press having a compression chamber for the solids/fluid separation of the material to be pressed, wherein the material to be pressed is supplied to the compression chamber and it is pressed there by means of a pressing element subjected to a pressing force.

In case of discontinuous filter presses of this type the fluid component of the material to be pressed is discharged to the outside through a filter under the influence of pressing power. At the same time the pressing power is applied to the material to be pressed directly by a rigid pressure plate or pneumatically or hydraulically via a flexible diaphragm. At the commencement of the supply of the material to be pressed the question arises as to what quantity has to be pre-filled into the pressure chamber to obtain an adequate pressing cushion for the first pressing. At the same time it must also be taken into consideration that in the forward position of the pressure plate or of the diaphragm the ratio between the effective filter area and the instantaneous compression chamber capacity is greater than when the pressing element is withdrawn.

The press is overfilled when due to a too large a pressing cushion the ratio between the effective filter area and the instantaneous compression chamber becomes too small and consequently a deterioration of the juice extracting capacity will occur. In the known pressing method the supply of the material to be pressed is carried out so that the filling will be carried out during a constant pre-filling time chosen on the basis of experimental values. Experience teaches that the pre-filling time for products difficult to press require only a fraction of the time what is required for an easily compressible product. In particular it is too difficult to determine an optimum pre-filling time when pressing fruit, since the product's compressibility varies to a great degree from charge to charge.

For this reason the object of the invention is to indicate a method for the supply of material to be pressed to a filter press which will result in an optimum output and yield of the solids/fluid separation.

According to the invention this objective is achieved by that in a first stage the material to be pressed is supplied to the compression chamber continuously, wherein several pressings are carried out simultaneously by means of press strokes of the pressing element and that in a second stage the pressings are continued while the supply of the material to be pressed to the compression chamber is interrupted during the pressings.

Advantageous embodiments of the method become apparent from the patent claims.

Embodiments of the invention are explained in detail in the following description and figures of the drawing. The following is shown in:

Fig.1 - a section across a pneumatically operated press of a known type,

Fig.2 - a section across a chamber filter press of a known type,

Fig.3 - a section across a filter press with a press piston together with a graphic illustration of the chronological progress of the piston strokes, pressing power and supply of the material to be pressed, and

Fig.4 - a flow-chart for a first step of the filling method according to the invention.

Fig.1 shows a pneumatically operated press of a known type to carry out the method according to the invention. It comprises an elongated cylindrical pressure tank 1, in the central plane of which a flexible diaphragm 2 is fastened. The diaphragm 2

divides the pressure tank 1 lengthwise into a pressure chamber 3 and a compression chamber 6. Compressed air is supplied to or from the pressure chamber 3 through an opening symbolised by a double arrow 4. The material to be pressed is supplied to the compression chamber 6 through an opening 5. Under the influence of the compressed air on the diaphragm 2 in the pressure chamber 3 the fluid component of the material pressed flows through a filter 7 in the pressure tank 1 to a collecting channel 8, where from it is conveyed to the outside through a line 9. To carry out the supply of the material to be pressed according to the invention in a first stage the material to be pressed is supplied continuously through the opening 5 to the compression chamber 6, while simultaneously several pressings will be carried out by means of compression strokes of the diaphragm 2.

Fig.2 shows a sectioned chamber filter press of a known type. A filter 11 is installed as a carrier at a distance above the bottom 10 of the chamber, against which filter a pressure diaphragm 13 is placed spaced by an intermediate frame 12 and fastened by a chamber cover 14 as carrier. The supply of the material to be pressed is carried out continuously through an opening 15 in the intermediate frame 12, while under the influence of the compressed air which is supplied to or from through an opening 16 in the chamber cover 14 several compressions are carried out simultaneously by means of compression strokes of the pressure diaphragm. On this occasion the fluid component of the material to be pressed is conveyed to the outside through an opening 26 in the bottom 10 of the chamber. The unit of the chamber filter press described so far is held together by external clamping forces, which are symbolised by the arrows 17. To discharge the compressed residues a separation will take place between the bottom 10 of the chamber and the intermediate frame 12 in the position designated by 18 after the removal of the clamping forces 17.

Fig.3 shows schematically a horizontal filter piston press of a known type, which is detachably connected with a pressure plate

32. Inside of the press casing 31 opposite the pressure plate 32 there is the second pressure plate 33, which is fastened on a piston rod 43 over a press piston 36. The piston rod 43 is displaceably mounted in a hydraulic cylinder, as indicated by the arrow 20, and carries out the pressing operations by means of the press piston 36. The material to be pressed is supplied between the pressure plates 32 and 33 via a closeable filler opening 44, with a plurality of drainage elements 35 extending through the material to be pressed.

During the pressing operation the drainage elements 35 convey the fluid phase of the material to be pressed 37 into collecting chambers 38 and 39, which are provided behind the pressure plates 32 and 33. The material to be pressed may be fruit and consequently the fluid phase may be fruit juice. Under the pressure of the press piston 36 the fluid phase from the material to be pressed 37 reaches the discharge lines 40 through the collecting chambers 38, 39. The pressure force is generated in the hydraulic cylinder, while between the front pressure plate 32 together with the press casing 31 and the cylinder a force-locked connection is present which is not illustrated. After the end of the pressing operation the emptying of the press takes place by loosening and axially displacing the press casing 31 from the pressure plate 32.

In a normal case the known progress of the pressing is the following:

Filling operation:

- the press casing 31 is closed by the pressure plate 32,
- the press piston 36 is withdrawn,
- the material to be pressed 37 is filled through the opening 44.

Pressing operation:

- the entire press unit shown in Fig.3 is rotated about the centreline,
- the press piston 36 is displaced forward under pressure,

- the juice is separated from the material to be pressed by pressing,
- the pressing power is switched off.

Loosening operation:

- the press piston 36 is withdrawn while rotating the entire press unit shown in Fig.3, due to which the remaining material is loosened and pulled apart.

Further press operation:

- the pressing and loosening stages of the operation are repeated several times as compressions for each charge of the material to be pressed until a desired final compressed state is achieved.

Emptying operation:

- the pressed residues are emptied by opening the press casing 31 by the pressure plate 32.

In the case of a filter piston press the process according to the invention is described in detail based on Fig.3. In addition to the already described diagram of the filter piston press associated graphic illustrations are shown here, which show for the two stages *P1* and *P2* according to the invention the piston strokes between the positions *HM* and *HS*, the corresponding progress of the pressing power with the limit value of *PS* and the filling function *F* as a function of time *t*. As illustrated by the time-diagram next to the press casing 31, by giving the "start filling" command, at the beginning the material to be pressed 37 will be supplied continuously by means of a pump to a compression chamber through the opening 44. At the same time the pressure plate 33, starting from the position *HM* moves in the direction of the arrow 20 towards the opening 44 and when reaching the position *HS* it is withdrawn immediately to its starting position *HM*.

During the first stage, designated by *P1*, this process will be repeated until the pressing power in the filled-in material 37

reaches a pre-determined value of *PS* during the forward movement of the pressure plate 33, as this is shown in the time-diagram for the pressing power. A bar designated by *F* shows the continuous filling process taking place simultaneously.

When the target pressure *PS* is reached, the pre-filling and consequently stage *P1* of the filling process ends. After this time in a second staged designated by *P2* the filling is carried out only in discontinuous phases, which commence on each occasion with the withdrawal of the pressure plate 33. Although this cannot be seen in the diagram, by usefully withdrawing the pressure plate 33 a vacuum can be produced in the compression chamber, which has a cleaning effect on the filter provided on the drainage elements 35. The position *HS* corresponds to a constant stroke position of the pressure plate 33 and thus to a press capacity reduced to a constant value. This has the advantage that according to the invention at the repeatedly reached stroke position *HS* there is a favourable ratio in the press between the filter area of the drainage elements 35 and the quantity of the filled material to be pressed 37.

In case of a version of the method not illustrated in Fig.3 the forward movement of the pressure plate 33 to the constant position *HS* will be dispensed with. Instead of this in the first stage *P1* the pressure plate will move forward at each pressing only that far until the pressure in the material to be pressed reaches one which is below or is the same as the supply pressure of the material to be pressed during the filling operation *F*. On this occasion the pressure plate 33 reaches positions as the filling progresses which are always further away from *HS*. In this case the continuous filling process *F* is interrupted when a limit position *HE* is reached, whereupon the second stage *P2* of the process commences.

In a further version of the method it could be advantageous for the compressibility of the material to be pressed if during the first stage, after having reached the limit value for the press

stroke or the pressing power, the force introduced to the pressing element is reduced until the pressing power is reduced to a value which is below the supply pressure of the material to be pressed. The pressing power is held subsequently at this value for a pre-determined period almost constant, before the withdrawal of the pressing element is carried out.

Fig.4 shows a flow-chart for the first stage *P1* as a summary of the supply method described in Fig.3. When the pressure plate 33 is pressed with press strokes to the constant position *HS* the loop is travelled via "Pressure plate forward" - "Has pre-determined stroke *HS* been reached?" - "Has pre-determined pressure *PS* been reached?" - "Return pressure plate" - "Pressure plate back?" - "Pressure plate forward". When the pre-determined pressure *PS* is reached the command "Stop filling" and "End of stage 1" follows.

The method described so far for the supply of the material to be pressed having the two stages according to the invention provides a solution for an automatic adjustment of the pre-filling time to suit the compressibility of the product. In the first stage only that much material is filled as much is necessary to produce an adequate pressing cushion. At the same time an overfilling of the press is prevented. Thus it will be feasible to pre-fill materials having very different compressibilities automatically and without a nominal value in such a manner that a filter press will achieve an optimum ratio with regard to the yield and the juice extracting capacity.

Patent claims

1. A method to supply material to be pressed (37) to a filter press having a compression chamber (6) for the solids/fluid separation of the material to be pressed, wherein the material to be pressed is supplied to the compression chamber (6) and it is pressed there by means of a pressing element (2, 13, 33) subjected to a pressing force, characterised in that in a first stage (*P1*) the material to be pressed (37) is supplied to the compression chamber (6) continuously, wherein several pressings are carried out simultaneously by means of press strokes of the pressing element (2, 13, 33) and that in a second stage (*P2*) the pressings are continued while the supply of the material to be pressed (37) to the compression chamber (6) is interrupted during the pressings.

2. A method according to claim 1, characterised in that the commencement of the second stage (*P2*) is carried out by an interruption of the supply of the material to be pressed (37) to the compression chamber (6) as soon as a pre-determined pressure limit value (*PS*) is reached during a pressing process in the compression chamber.

3. A method according to claim 1, characterised in that in the first stage (*P1*) the pressing strokes by the advancement of the pressing element (2, 13, 33) are chosen so during the pressings that the pressing power in the material to be pressed (37) reaches only a limit value which is below the supply pressure of the material to be pressed (37) and that a vacuum is produced in the compression chamber by the withdrawal of the pressing element (2, 13, 33) after carrying out the advancements.

4. A method according to claim 3, characterised in that the commencement of the second stage (*P2*) by an interruption of the supply of the material to be pressed (37) to the compression chamber (6) takes place as soon as the pressing element (2, 13, 33) in a pressing process reaches a pre-determined minimum press stroke (*HE*) in the compression chamber (6).

5. A method according to claim 1, characterised in that in the second stage (*P2*) the supply of the material to be pressed (37) to the compression chamber (6) is interrupted when the pressing power in the compression chamber increases.

6. A method according to claim 1, characterised in that in the first stage (*P1*) the press strokes are chosen so by the advancement of the press element (2, 13, 33) during the pressing that the capacity of the compression chamber is reduced only to a limit value (*HS*) and that the withdrawal of the pressing element will commence after reaching the limit value (*HS*).

7. A method according to claim 6, characterised in that in case of a piston press as the filter press the reaching of the limit value (*HS*) of the capacity of the compression chamber is determined by enquiring a nominal value for the piston stroke.

8. A method according to one of the claims 3 or 6, characterised in that in the first stage the introduced pressure force on the pressing element (2, 13, 33) is reduced after reaching the limit value of the capacity of the compression chamber (*HS*) or of the pressing power, until the pressing power is reduced below the supply pressure for the material to be pressed (37) and that this pressing power is held almost constant for a period before the withdrawal of the pressing element is carried out.

FIG. 1

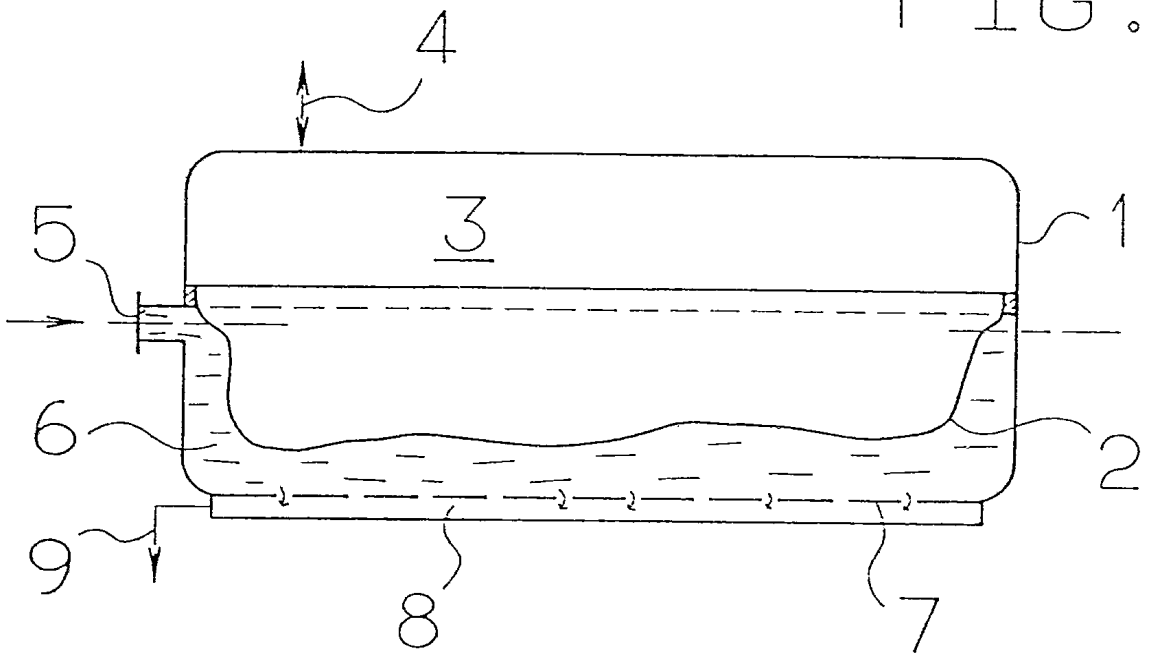


FIG. 2

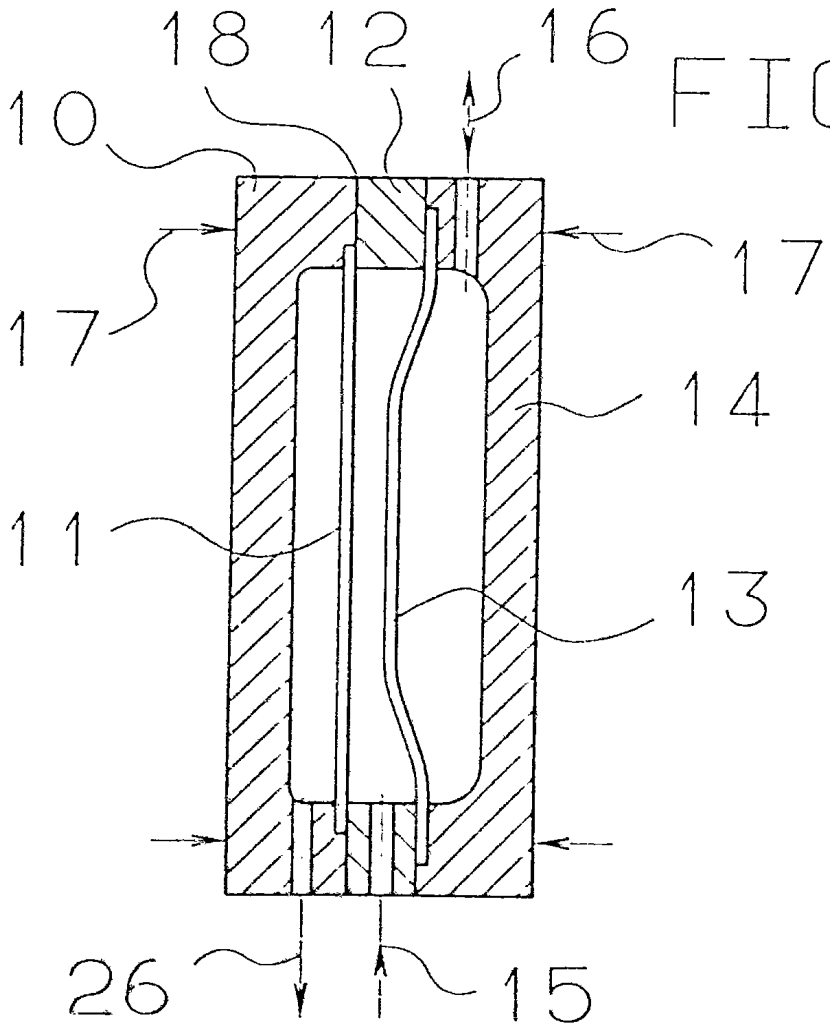


FIG.3

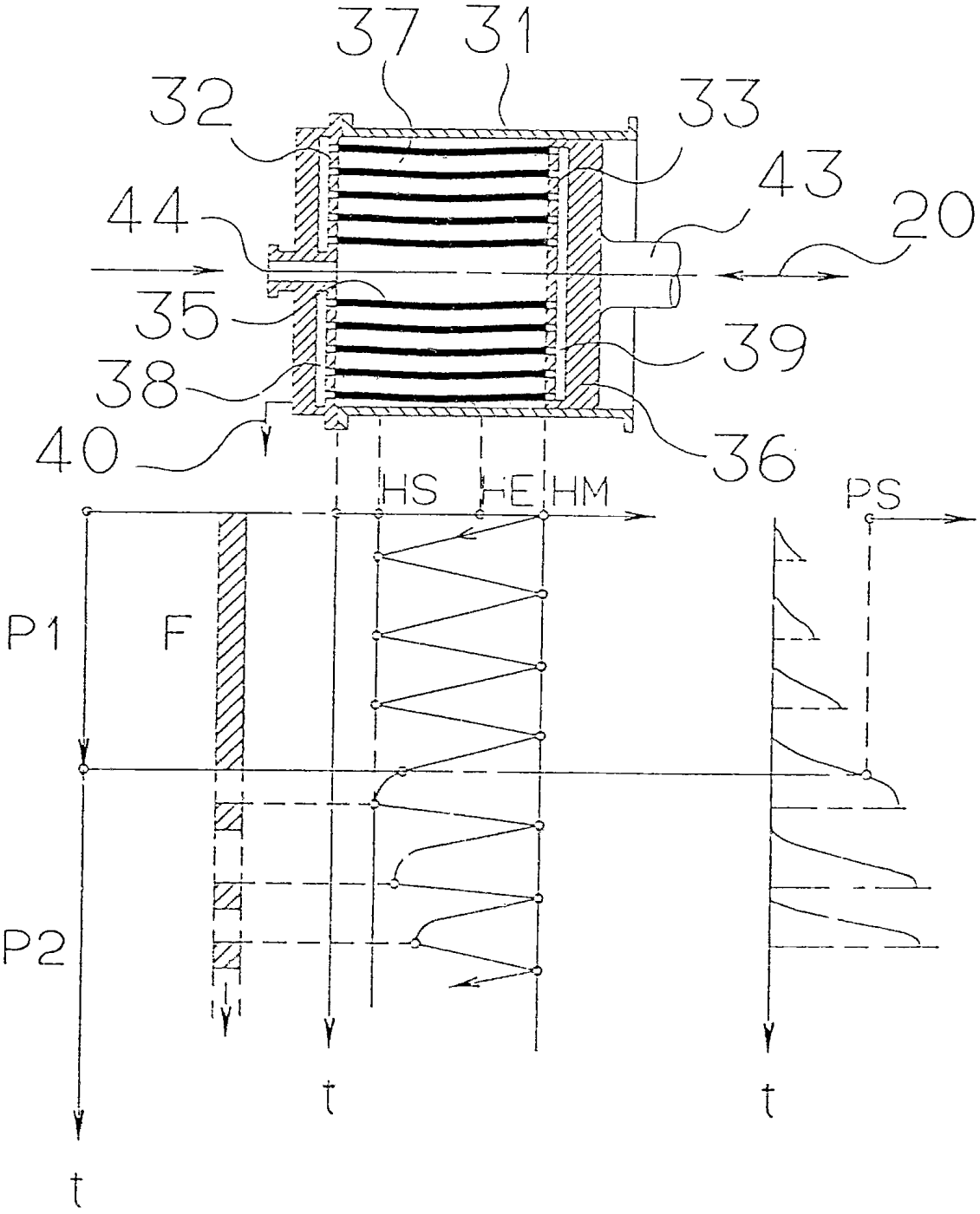
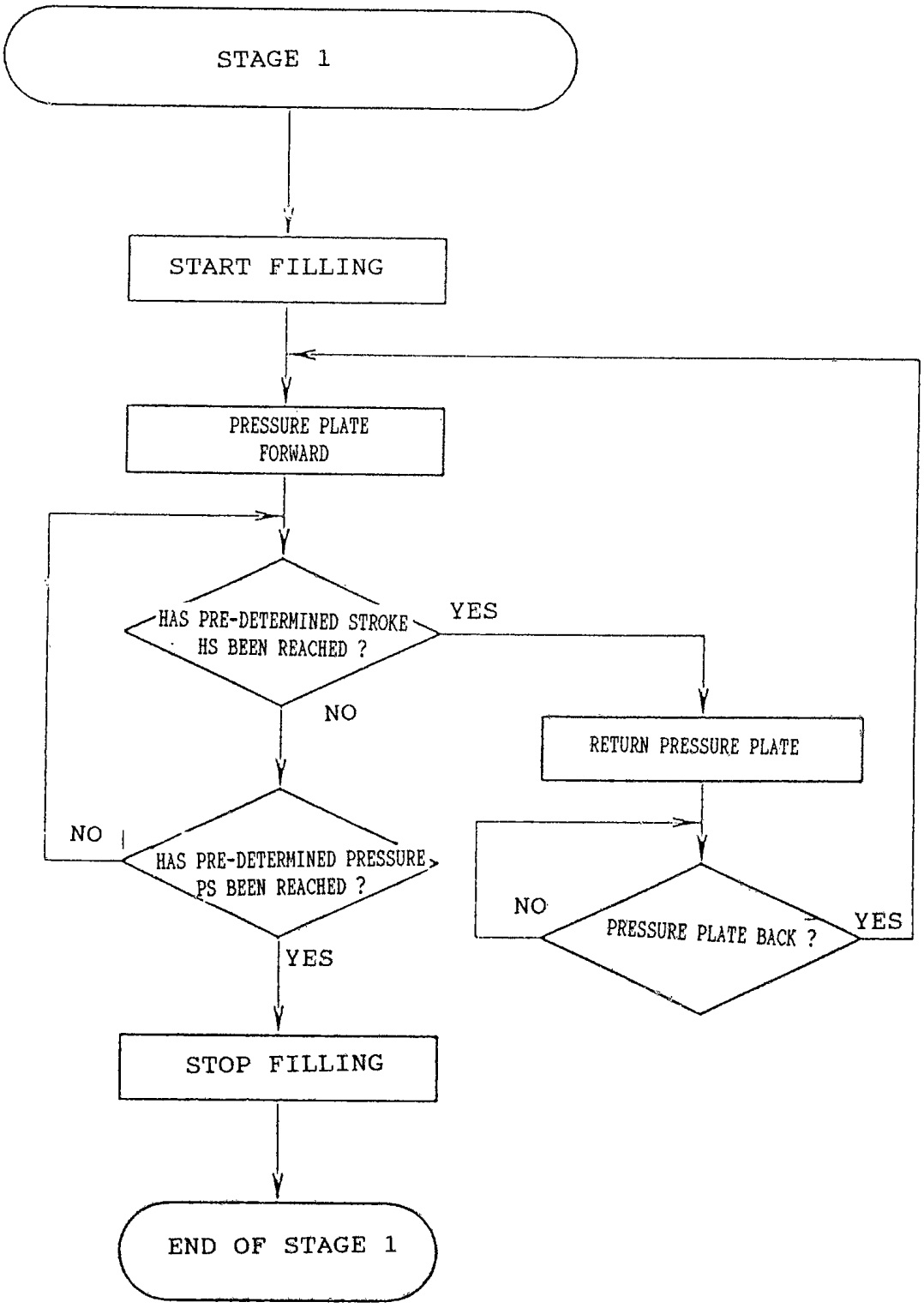


FIG. 4


STAGE 1
START FILLING
PRESSURE PLATE FORWARD
HAS PRE-DETERMINED STROKE HS BEEN REACHED ?
YES
NO
RETURN PRESSURE PLATE
NO
HAS PRE-DETERMINED PRESSURE PS BEEN REACHED ?
NO
PRESSURE PLATE BACK ?
YES
YES
STOP FILLING
END OF STAGE 1

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CH 95/00054

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B30B9/22 B30B9/04

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)
IPC 6 B30B

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

Electronic data base consulted during the international search (name of data base and, where practical, 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	DE,A,20 50 597 (MÖRTL) 31 May 1972 see page 2, line 1 - page 3, line 25; claims; figure ---	1,2
A	DE,A,20 57 300 (MÖRTL) 31 May 1972 see page 1, line 20 - page 2, line 9; figure ---	1,2
A	DE,A,15 02 180 (MASCHINENFABRIK JOHANN BUCHER) 7 August 1969 see claims; figure ---	1
A	FR,A,2 411 699 (BUCHER-GUYER AG) 13 July 1979 see page 4, line 14 - page 5, line 32 --- -/--	1

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
9 May 1995	21. 06. 95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Voutsadopoulos, K

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 485 901 (CONTRUCTIONS MECA-METALLIQUES CHALONNAISES) 20 May 1992 see claims 1,11-13 ---	1
A	GB,A,2 016 258 (HOLDING M BROUWER & CO BV) 26 September 1972 see claims; figure -----	1

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-2050597	31-05-72	NONE		
DE-A-2057300	31-05-72	NONE		
DE-A-1502180	07-08-69	NONE		
FR-A-2411699	13-07-79	AT-B-	358395	10-09-80
		DE-A-	2848446	21-06-79
		JP-A-	54089071	14-07-79
EP-A-0485901	20-05-92	FR-A-	2669266	22-05-92
		AT-T-	109723	15-08-94
		AU-B-	650289	16-06-94
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GB-A-2016258	26-09-79	NL-A-	7802947	19-09-79
		DE-A-	2910394	27-09-79

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen
PCT/CH 95/00054

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 6 B30B9/22 B30B9/04

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 6 B30B

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	DE,A,20 50 597 (MÖRTL) 31. Mai 1972 siehe Seite 2, Zeile 1 - Seite 3, Zeile 25; Ansprüche; Abbildung ---	1,2
A	DE,A,20 57 300 (MÖRTL) 31. Mai 1972 siehe Seite 1, Zeile 20 - Seite 2, Zeile 9; Abbildung ---	1,2
A	DE,A,15 02 180 (MASCHINENFABRIK JOHANN BUCHER) 7. August 1969 siehe Ansprüche; Abbildung ---	1
A	FR,A,2 411 699 (BUCHER-GUYER AG) 13. Juli 1979 siehe Seite 4, Zeile 14 - Seite 5, Zeile 32 --- -/--	1

[X] Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

[X] Siehe Anhang Patentfamilie

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9. Mai 1995	21. 06. 95

Name und Postanschrift der Internationale Recherchenbehörde	Bevollmächtigter Bediensteter
Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Voutsadopoulos, K

C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	EP,A,0 485 901 (CONTRUCTIONS MECA-METALLIQUES CHALONNAISES) 20. Mai 1992 siehe Ansprüche 1,11-13	1
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