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PATENTS ACT 1990

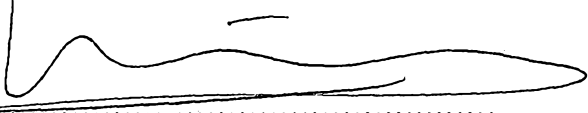
NOTICE OF ENTITLEMENT

We, GPT AXXICON B.V., of Kanaaldijk z.w. 7b, NL-5706 LD, Helmond, The Netherlands, being the applicant in respect of Application No. 89183/91, state the following:-

1. The person nominated for the grant of the patent has entitlement from the actual inventor by assignment.
2. The person nominated for the grant of the patent has entitlement from the applicant of the application listed in the declaration under Article 8 of the PCT by contract between the basic applicant, Plastron Corporation, and the inventor, and assignment from the inventor to the nominated person.
3. The basic application listed in the declaration under Article 8 of the PCT is the first application made in a Convention country in respect of the invention.

For and on behalf of

GPT AXXICON B.V.



(Signature)

19 aug 1994

(Date)

Name: ... B. J. van der Zand ...

Title: ... Managing Director ...

File: 16258.80

SHELSTON WATERS
55 CLARENCE STREET, SYDNEY, AUSTRALIA



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INJECTION MOULD
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GPT AXXICON B.V.
- (72) Inventor(s)
JURG FREI
- (74) Attorney or Agent
SHELSTON WATERS , 55 Clarence Street, SYDNEY NSW 2000
- (56) Prior Art Documents
EP 75043
- (57) Claim

1. Injection mould for manufacturing disc-shaped plastic articles with a central hole, said mould comprising:

- a first mould part;
- a second mould part displaceable relative to the first mould part by means of first displacing means; said two mould parts being displaceable between a closed first position, in which they together partially bound a mould cavity corresponding to the shape of an article to be manufactured, and an open second position in which a formed article can be taken out;
- a third mould part which, in the closed position of the first and second mould parts, extends through the mould cavity defined thereby and has a shape in the region of this mould cavity which corresponds to the shape of the central hole, the third mould part being axially displaceable by means of second displacing means by means of a guide sleeve forming part of the first mould part between a first position, in which it partially forms a

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bounding of the mould cavity, and a second retracted position; and

wherein said third mould part bounds a channel that is connectable at the free outside end to an injection nozzle of an injection moulding device, and at the other side debouches with an injection inlet into the region of the mould cavity in the first position of the first and the second mould parts and the first position of the third mould part, and in the second position of the third mould part debouches blind against the inner wall of the guide sleeve;

characterised by heating means for keeping plastic present in the channel in the plastic state, and the third mould part having a releasing form in the region of the mould cavity during moving of the third mould part from the first to the second position.

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 INTERNATI REATY (PCT)

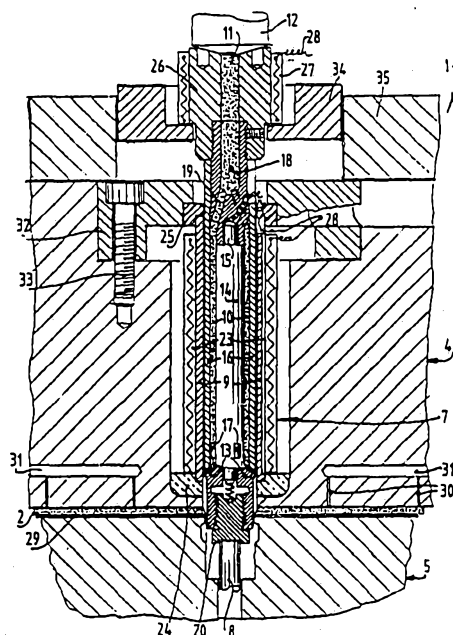
(51) International Patent Classification ⁵ : B29C 45/26, 45/28, 45/30		A1	(11) International Publication Number: WO 92/08597
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(21) International Application Number: PCT/NL91/00225 (22) International Filing Date: 8 November 1991 (08.11.91) (30) Priority data: 2/305618 9 November 1990 (09.11.90) JP (71) Applicant (for all designated States except US): GPT AXXI-CON B.V. [NL/NL]; Kanaaldijk z.w. 7b, NL-5706 LD Helmond (NL). (72) Inventor; and (75) Inventor/Applicant (for US only) : FREI, Jürg [CH/CH]; Kurvenstrasse 17, CH-8600 Dübendorf (CH). (74) Agent: SCHUMANN, Bernard, Herman, Johan; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		(81) Designated States: AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH (European patent), CI (OAPI patent), CM (OAPI patent), CS, DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GA (OAPI patent), GB (European patent), GN (OAPI patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU (European patent), MC, MG, ML (OAPI patent), MN, MR (OAPI patent), MW, NL (European patent), NO, PL, RO, SD, SE (European patent), SN (OAPI patent), SU ⁺ , TD (OAPI patent), TG (OAPI patent), US. Published With international search report. In English translation (filed in Dutch).	

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(54) Title: INJECTION MOULD

(57) Abstract

An injection mould for manufacturing disc-shaped plastic articles with a central hole comprises: a first mould part (4); a second mould part (5) displaceable relative to the first mould part by means of first displacing means; which two mould parts (4, 5) are displaceable between a closed first position, in which they together partially bound a mould cavity (6) corresponding to the shape of an article for manufacture, and an open second position in which a formed article can be taken out; a third mould part (7) which, in the closed position of the first and second mould parts, extends through the mould cavity (6) defined thereby and has a shape in the region of this mould cavity which corresponds to the shape of the central hole (3), which third mould part (7) is axially displaceable by means of a guide sleeve (9) forming part of the first mould part (4) between a first position, in which it partially forms a bounding of the mould cavity, and a second retracted position; which third mould part (7) bounds a channel (10) that is connectable at the free outside end (11) to an injection nozzle (12) of an injection moulding device, and at the other side debouches with an injection inlet (13) into the region of the mould cavity (6) in the first position of the first and the second mould part and the first position of the third mould part, and in the second position of the third mould part debouches blind against the inner wall of the guide sleeve (9); and heating means (23) for keeping plastic present in the channel in the plastic state.



INJECTION MOULD

The invention relates to an injection mould for manufacturing disc-shaped plastic articles with a central hole, which mould comprises:

a first mould part;

5 a second mould part displaceable relative to the first mould part by means of first displacing means;

which two mould parts are displaceable between a closed first position, in which they together partially bound a mould cavity corresponding to the shape of an article
10 to be manufactured, and an open second position in which a formed article can be taken out;

a third mould part which, in the closed position of the first and second mould parts, extends through the mould cavity defined thereby and has a shape in the region of this
15 mould cavity which corresponds to the shape of the central hole, which third mould part is axially displaceable by means of second displacing means by means of a guide sleeve forming part of the first mould part between a first position, in which it partially forms a bounding of the mould cavity, and
20 a second retracted position; and

which third mould part bounds a channel that is connectable at the free outside end to an injection nozzle of an injection moulding device, and at the other side debouches with an injection inlet into the
25 region of the mould cavity in the first position of the first and the second mould parts and the first position of the third mould part, and in the second position of the third mould part debouches blind against the inner wall of the guide sleeve.

30 Such an injection mould is e.g. known from EP-A-0 075 043 and EP-A-0 051 252.

According to these prior art references the third mould part has, in the region of the mould cavity during moving of



the third mould part from its first to its second position, a cylindrical shape. Due to that shape during displacement of the third mould part the cylindrical outer wall of this third mould part is in mechanical contact with the inner wall of the central hole of the formed article during the third mould parts' displacement. This may be disadvantageous for the correct and accurate shape of the central hole.

Furthermore, the plastic material in the channel is not subjected to a controlled heating, so that it is not automatically ensured that this material keeps to a sufficient and controlled degree in its desired plastic condition, in which it can easily be injected through the injection inlet into the mould cavity.

In view of the above disadvantages of the prior art, the invention provides an injection mould of the type mentioned in the preamble, which is, according to the proposal of the invention, characterized by heating means for keeping plastic present in the channel in the plastic state, and the third mould part having a releasing form in the region of the mould cavity during moving of the third mould part from the first to the second position.

Existing moulds have an ejector for ejecting the central sprue of a formed article after it has been punched out. Use can be made of this existing configuration within the framework of the invention. For this purpose the invention provides a mould of the said type having the feature that the second displacing means comprise an ejector extending through the second mould part.

A very good quality of the plastic article is assured with an embodiment in which the injection inlet comprises a plurality of arranged ordered injection inlet openings.

A completely homogenous inflow pattern of the heated plastic into the moulded cavity is assured with an embodiment with the feature that the injection inlet is embodied as an injection inlet opening extending around the entire periphery of the third mould part.

It is important to ensure that in the retracted, non-operational state of the third mould part the plastic present in the channel does not cool. To that end the device



preferably displays the characteristic that the third mould part comprises a first heating element.

For the best possible flow pattern and a homogenous heating of the plastic in the third mould part the special
 5 feature can be added that the third mould part is elongate in its moving direction, that the channel extends in lengthwise direction and has the form of a cylinder jacket over a portion of considerable length to the injection inlet, and that the first heating element is situated inside this
 10 cylinder jacket.

Easy manufacture of the third mould part is ensured with an embodiment with the characteristic that the cylinder jacket-like portion of the channel is bounded by an outer sleeve and an inner sleeve, which sleeves are held in their
 15 relative positions by spacers.

In a further variant the device has the feature that in the first mould part a second heating element is accommodated surrounding the third mould part.

In order not to heat the first mould part unnecessarily
 20 in this embodiment and to concentrate the available heat as much as possible on the third mould part the device can display the feature that the second heating element is thermally insulated from the first mould part.

For removing a formed plastic article use can be made
 25 of openings debouching on one of the flat walls of the mould cavity for passage of pressurized gas for removing a formed article in the second position of the first and the second mould parts. In this context attention is drawn to the fact that it is usual to use a separate insert, generally
 30 designated as a stamper, on which the information is present in negative form. This stamper, a nickel disc, is fixedly held by per se known means on a flat end wall of the disc-shaped mould cavity. The blow out openings as described above debouch on the other wall of the mould cavity.

35 For improving the flow properties of the channel still further the device can have the feature in a particular embodiment that the walls of the channel are provided with a heat resistant anti-stick layer.



The injection mould according to the invention can also be adapted for the simultaneous manufacturing of a plurality of plastic articles with or without central holes, such as plastic lenses. The central hole mentioned before can, in this case, be considered as a free space, and the central mould part in its retracted position separating the respective articles.

The invention will now be elucidated with reference to the annexed drawings, in which:

Figure 1 shows partially in cross-section and partially in broken away perspective a view of an injection mould according to the invention in the phase wherein plastic is injected for forming a disc-shaped information carrier;

Figure 2 shows a following operating position of the mould according to Figure 1, wherein the third mould part is situated in a retracted position;

Figure 3 shows the phase wherein the mould is opened for taking out a formed plastic article;

Figure 4 shows a cross-sectional view through the central heating element according to the preceding figures; and

Figure 5 is a partially broken away perspective view of the cylinder jacket-like heating element according to the Figures 1-3.

The figures show an injection mould 1 for manufacturing a disc-shaped information carrier 2 with a central hole 3. The mould 1 comprises a first mould part 4, a second mould part 5 displaceable relative to this first mould part 4 by means of first displacing means (not shown) which two mould parts 4, 5 are displaceable between a closed first position in Figure 1 wherein they together partially bound a disc-shaped mould cavity 6 corresponding to the shape of the information carrier 2 to be manufactured, and an open second position shown in Figure 3 wherein the formed information carrier 2 can be taken out; a third mould part 7 which in the closed position according to Figure 1 extends through the mould cavity 6



4a

defined by the mould parts 4, 5 and in the region of the
mould cavity 6 has a shape which corresponds to the shape
of the central hole 3, which third mould part 7 is axially
displaceable with the mould parts 4, 5 by means of an
5 ejector 8 by means of a guide sleeve 9 forming part of the
first mould part 4 between the first position shown in
Figure 1, in which it partially forms a bounding of the
mould cavity 6, and the second retracted position shown in
Figure 2, which third mould part bounds a cylinder
10 jacket-like channel 10 that is connectable at the free
outside end 11 to the injection nozzle 12 of an injection
moulding device and at the other side debouches with an
annular injection inlet -----



opening 13 into the region of the mould cavity 6 in the first position shown in figure 1 of the first and the second mould parts 4, 5 and the first position of the third mould part 7, and in the second position of the third mould part 7

5 debouches blind against the inside wall of the guide sleeve 9, as is shown in figure 2; and heating means to be described hereinafter for keeping the plastic present in the channel 10 in the plastic state.

The cylinder jacket-like channel 10 is bounded by a
10 cylinder-shaped core 14 in which is received an elongate heating element 15 and a sleeve 16 extending therearound. The core 14 and the sleeve 16 are held at a mutual distance by means of spacers 17. At the top the core 14 has a central coaxial bore 18 which, by means of borings 19, can transport
15 the plastic coming from the injection nozzle 12 via the free end 11 and the channel 10 to the annular injection inlet openings 13 for injection into the mould cavity 6.

Under the injection inlet opening 13 the core 14, and therewith the outside wall of the third mould part 7, has a
20 very slightly conical tapering shape, which serves for easy release of a formed information carrier. In the figures the conical shape is depicted somewhat exaggeratedly for the sake of clarity.

An access opening 21 closable by means of a threaded
25 plug 20 serves for admitting the central heating element 15.

Placed in a space 22 around the third mould part 7 is a cylinder jacket-like heating element 23, which can generate its heat to the third mould part 7 via the guide sleeve 9 for keeping the plastic present therein in the plastic state. The
30 heating element 23 and the guide sleeve 9 are supported on the underside by means of a wear-resistant carrier ring 24 of heat insulating, non-fibrous material, for example a ceramic material, titanium or plastic. At the top side the guide sleeve is carried by a wear-resistant, pressure-resistant
35 guide ring 25.

A heating element 27 is likewise placed around a connecting block 26 between the core 14 and the injection nozzle 12.



Connecting wires of the various heating elements are generally designated with 28. These are connected to a suitable power supply.

In this embodiment a stamper 29 is situated on the flat wall of the mould cavity 6 which forms part of the second mould part 5. This is held in position by known means not shown here. Such means can be based on underpressure, magnetic forces or take a mechanical form. For removing a formed plastic article openings for blowing in air 30 are present, which are connected via lines 31 to selectively energizable compressed air means (not drawn).

Shown in the drawing are various constructional details such as a ring 32 which is connected by means of bolts 33 to the first mould part 4 and serves for positioning of the guide and carrier ring 25.

The first mould part 1 is displaceable relative to the injection nozzle 12. A carrier ring 34 is slidably guided in the frame part 35 for this purpose.

In the situation shown in figure 1 the mould 4, 5, 7 is in its operational state for injecting plastic into the mould cavity 6.

In the situation shown in figure 2 the third mould part 7 is moved to a retracted position by actuating the ejector 8, wherein the injection inlet opening 13 ends blindly against the inside wall of the sleeve 16.

In the subsequent phase according to figure 3 the mould parts 4 and 5 are mutually separated so that the mould cavity 6 is accessible for removal of the formed information carrier 2.

Air 36 is blown through the openings 30 to remove this information carrier 2.

It will be apparent that all known and appropriate means can be used for the displacing means that provide the relative displacement of the various mould parts. Use can be made of pneumatic or hydraulic cylinders, while for retraction of the third mould part 7 from its position shown in figure 1 to its position shown in figure 2 the ejector 8 does not necessarily have to be used, but medium under pressure can for example be admitted into the space 37 which



is bounded by the first mould part 4, the frame part 35, the displaceable carrier ring 34 and the third mould part 7 with the connecting block 26. As a result of the thereby occurring pressure force a relative movement of the carrier ring 34
5 takes place whereby it is moved from the position shown in figure 1, carrying with it the third mould part 7.

The inner surface of the bores 18 and 19 and the channel 10 is provided with a heat resistant coating layer which prevents the adhesion of heated plastic.

10 Figure 4 shows the heating element 15 in detail. This heating element comprises a cylindrical body 38 which is of ceramic material and is ground to a round shape. The body 38 is closed off on the bottom with a cured mould mass 39 consisting of Al_2O_3 .

15 A heating wire 40 wound in spiral shape is received internally within the body 38 and receives its power supply via wires 28. Protruding at the bottom from the sealing mass 39 is a thermocouple 41 which is connected to connecting wires 42 and serves for adjusting the power supply through
20 the wires 28 for holding the temperature constant within determined limits.

The heating wire is embedded in Al_2O_3 .

The wires 28 are insulated by means of a temperature-resistant sheath with glass fibres.

25 Figure 5 shows the heating element 23. This comprises a cylinder jacket-like body 43 in which heating coils 45 mutually connected in series are received in lengthwise channels 44, which heating coils 45 receive their power supply from wires 28 which are insulated with a temperature-
30 resistant sheath with glass fibres.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Injection mould for manufacturing disc-shaped plastic articles with a central hole, said mould comprising:

a first mould part;

5 a second mould part displaceable relative to the first mould part by means of first displacing means; said two mould parts being displaceable between a closed first position, in which they together partially bound a mould cavity corresponding to the shape of an article to be manufactured, and an open
10 second position in which a formed article can be taken out;

a third mould part which, in the closed position of the first and second mould parts, extends through the
15 mould cavity defined thereby and has a shape in the region of this mould cavity which corresponds to the shape of the central hole, the third mould part being axially displaceable by means of second displacing means by means of a guide sleeve forming part of the first mould part
20 between a first position, in which it partially forms a bounding of the mould cavity, and a second retracted position; and

wherein said third mould part bounds a channel that is connectable at the free outside end to an
25 injection nozzle of an injection moulding device, and at the other side debouches with an injection inlet into the region of the mould cavity in the first position of the first and the second mould parts and the first position of the third mould part, and in the second position of the third mould part debouches blind against the inner wall of the guide sleeve;

characterised by heating means for keeping plastic present in the channel in the plastic state, and the third
35 mould part having a releasing form in the region of the mould cavity during moving of the third mould part from the first to the second position.



2. Injection mould as claimed in claim 1, characterized in that the second displacing means comprise an ejector extending through the second mould part.

5 3. Injection mould as claimed in claim 1, characterized in that the injection inlet comprises a plurality of peripherally arranged injection inlet openings.

10 4. Injection mould as claimed in claim 1, characterized in that the injection inlet is embodied as an injection inlet opening extending around the entire periphery of the third mould part.

5. Injection mould as claimed in claim 1, characterized in that the third mould part comprises a first heating element.

15 6. Injection mould as claimed in claim 5, characterized in that the third mould part is elongate in its moving direction, that the channel extends in lengthwise direction and has the form of a cylinder jacket over a portion with considerable length up to the injection inlet, and that the first heating element is situated
20 inside this cylinder jacket.

7. Injection mould as claimed in claim 6, characterized in that the cylinder jacket-like part of the channel is bounded by an outer sleeve and an inner sleeve, said sleeves being held in their relative positions by spacers.

25 8. Injection mould as claimed in claim 6, characterized in that a second heating element enclosing the third mould part is accommodated in the first mould part.

30 9. Injection mould as claimed in claim 8, characterized in that the second heating element is thermally insulated from the first mould part.

35 10. Injection mould as claimed in claim 1, characterized by openings debouching on one of the flat walls of the mould cavity for passage of pressurized gas for removing a formed article in the second position of the first and the second mould parts.

11. Injection mould as claimed in claim 1, characterized in that the walls of the channel are provided with a heat resistant anti-stick layer.



12. An injection mould substantially as herein described with reference to the accompanying drawings.

DATED this 30th day of September, 1994

GPT AXXICON B.V.

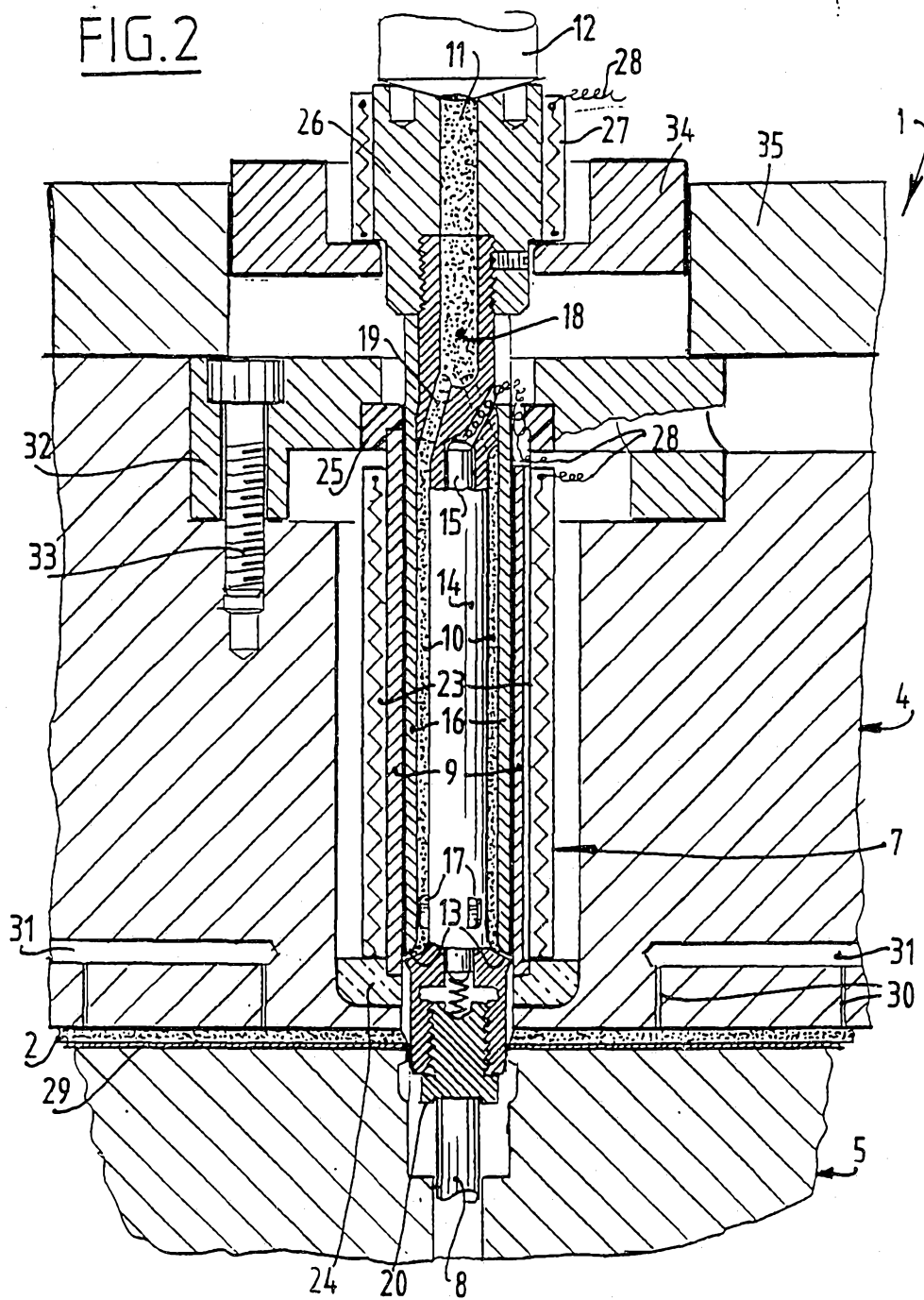
Attorney: JOHN B. REDFERN

Fellow Institute of Patent Attorneys of Australia
of SHELSTON WATERS



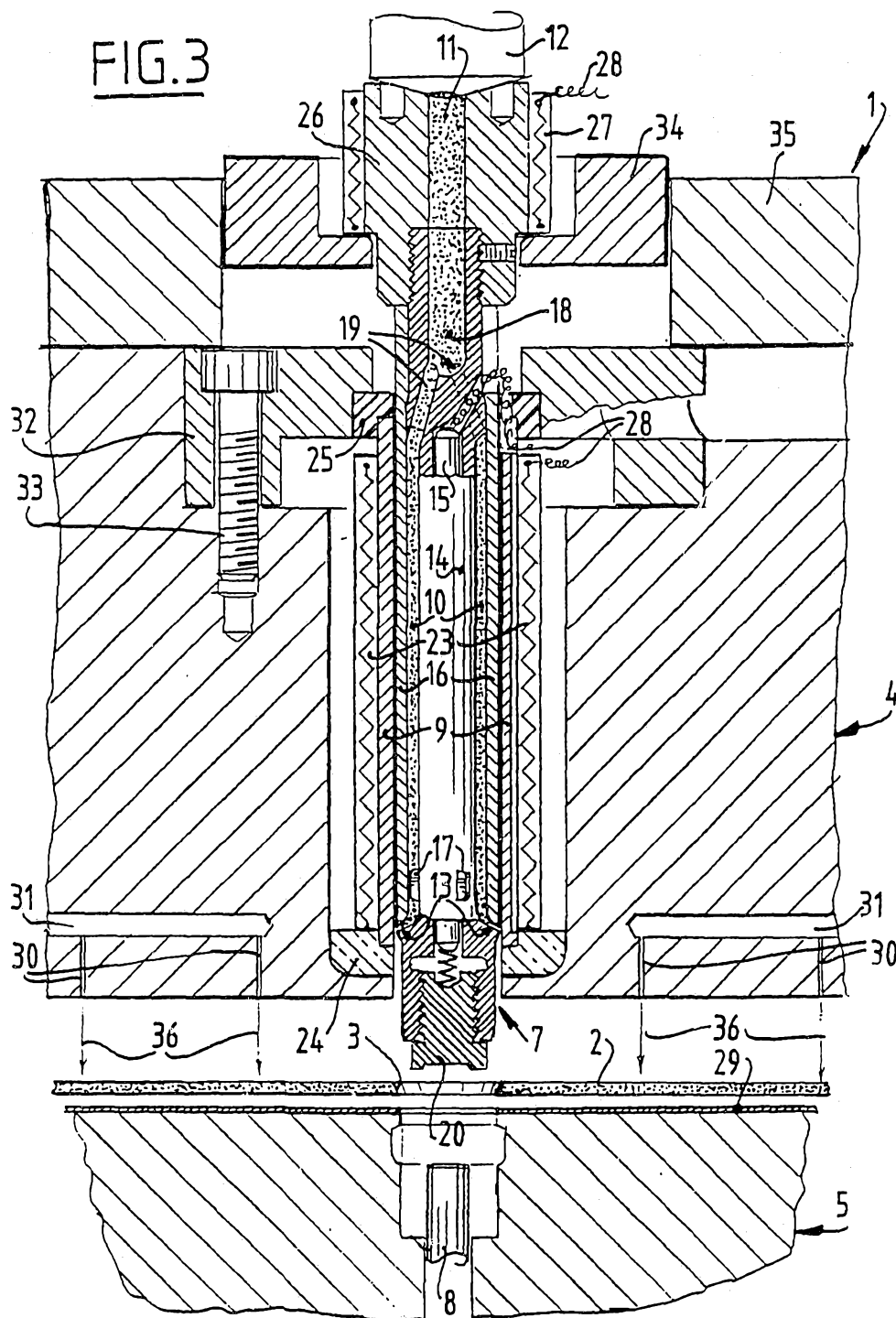
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FIG. 2



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FIG.3



4/4

FIG. 4

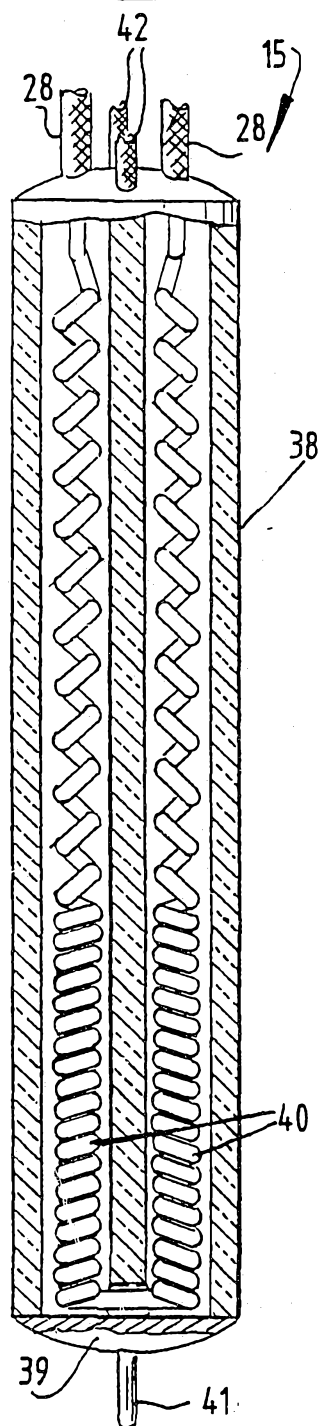
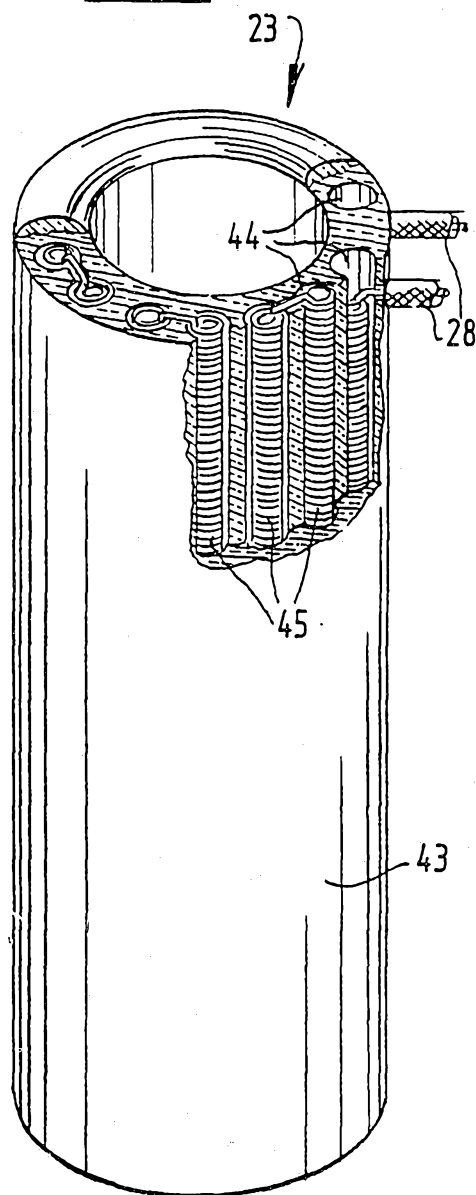


FIG. 5



INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 91/00225

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5	B29C45/26;	B29C45/28; B29C45/30
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	B29C ; G11B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ^o	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	EP,A,0 075 043 (DISCOVISION ASSOCIATES) 30 March 1983	1,5,6
Y	see the whole document	7,8
Y	EP,A,0 051 252 (DISCOVISION ASSOCIATES) 12 May 1982 see the whole document	1,3,6,11
Y	US,A,2 777 164 (STRAHM) 15 January 1957 see column 2, line 28 - line 36; figures	1,3,4
Y	US,A,4 900 560 (TRAKAS) 13 February 1990 see column 4, line 21 - column 5, line 18; figures 5-7	1,4,6-8
Y	GB,A,1 071 340 (DECCA) 7 June 1967 see page 3, line 23 - line 37; figures 1,2	11
-/-		
^o Special categories of cited documents : ¹⁰		
^{"A"} document defining the general state of the art which is not considered to be of particular relevance		
^{"E"} earlier document but published on or after the international filing date		
^{"L"} document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		
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^{"&"} document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
14 FEBRUARY 1992	04. 03. 92	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	BOLLEN J.A.G. 	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

NL 9100225
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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