

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
29 January 2004 (29.01.2004)

PCT

(10) International Publication Number  
WO 2004/009317 A1

(51) International Patent Classification<sup>7</sup>: B29C 31/06,  
43/08, 43/34 // 45/06, B30B 15/30

(21) International Application Number:  
PCT/EP2003/007325

(22) International Filing Date: 30 June 2003 (30.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
RE2002 A 000058 19 July 2002 (19.07.2002) IT

(71) Applicant: SACMI - COOPERATIVA MECCANICI  
IMOLA - SOC. COOP. A.R.L. [IT/IT]; Via Selice Provin-  
ciale, 17/A, I-40026 Imola (IT).

(72) Inventors: ALBERGHI, Pier, Carlo; Via Volpaccino, 49,  
I-48018 Faenza (IT). BORGATTI, Maurizio; Via Giudei,  
38, I-40026 Imola (IT). BUSACCHI, Pietro; Via Murri,  
45, I-40137 Bologna (IT).

(74) Agents: CORRADINI, Corrado et al.; Via Dante  
Alighieri, 4, I-42100 Reggio Emilia (IT).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,  
SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,  
UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**

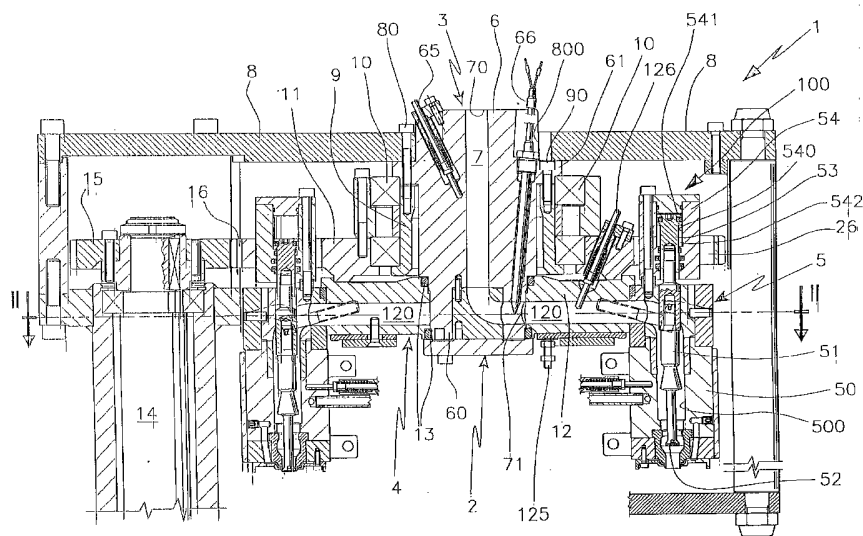
— as to applicant's entitlement to apply for and be granted a  
patent (Rule 4.17(ii)) for all designations

**Published:**

— with international search report  
— before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: DEVICE FOR FORMING PREDETERMINED QUANTITIES OF SYNTHETIC MATERIAL



(57) Abstract: Device (1) for forming predetermined quantities of synthetic material comprising a rotary turntable (4, 34) carrying on its periphery a plurality of dispensing devices (5), and means for feeding the material in the molten state to said dispensing devices; the plant also comprises a fixed part (3, 32) directly connected to the molten material feed, a rotary sealed joint (2, 31) connecting said fixed part (3, 32) to the rotary turntable (4, 34), operating means (100, 88, 99) positioned on the rotary turntable (3, 34) for interacting with the dispensing devices positioned on the rotary turntable to operate them in the sense of opening and closing them in response to the rotations of the turntable, and means (14) for rotating the turntable.

WO 2004/009317 A1

## DEVICE FOR FORMING PREDETERMINED QUANTITIES OF SYNTHETIC MATERIAL

This invention relates to a plant for forming predetermined quantities  
5 of synthetic material intended to be subsequently used for example  
in compression moulds for moulding a final product.

Known compression moulding machines can be of continuous or  
alternating type.

With the first type of machine the predetermined quantities are  
10 produced continuously by the cutting action of a series of knives  
which are rotated on a turntable synchronous with a compression  
moulding turntable. Each of said knives cuts the plastic material  
emerging from a nozzle at constant throughput; the predetermined  
quantity cut off in this manner is conveyed by suitable devices rigid  
15 with the turntable into the deposition and moulding zone (cavity).

In contrast, in alternating compression moulding machines the  
predetermined quantity is produced by a single dispenser fixed  
relative to the moulds which rotate on an intermittent turntable.

When the mould pauses, it halts in correspondence with the  
20 dispenser to receive the predetermined quantity cut off by an internal  
shutter. The mould then closes and the plastic material is  
compressed; in this case the instantaneous throughput leaving the  
dispenser varies mainly on the basis of the position of the shutter  
(open or closed).

25 The productivity of known plants is little flexible and not adequate for  
current commercial production requirements.

An object of this invention is to provide a dispenser of predetermined quantities of synthetic material for feeding moulding devices, which is reliable, flexible and able to easily adapt to the production requirements of the plant.

5 This and further objects are attained according to the invention by the device the characteristics of which are defined in the claims. Specifically, the invention provides a plant for forming predetermined quantities of synthetic material comprising a plurality of forming devices disposed on a turntable and spaced angularly equidistant  
10 apart, they being fed with synthetic material in the molten state through a rotary joint.

Said joint consists of a fixed part comprising the feed conduit for the material in the molten state, and a part rotatable about the fixed part, with which said forming means are associated.

15 According to a first embodiment of the invention said movable part is provided with feed conduits for the forming devices in a number equal to the number of devices themselves, the fixed part being provided with a single feed conduit which feeds said devices one at a time in succession during the rotation of the movable part about the  
20 fixed part.

In a second alternative embodiment of the invention, all the forming devices are fed simultaneously.

These latter comprise a shutter rod which is opened by suitable mechanical, hydraulic, pneumatic or electrical operating means, in  
25 accordance with the angular position of the rotary part of the turntable.

In both said embodiments the quantity of material dispensed by the forming devices depends mainly on the time for which they are open, so that the dimensions of the predetermined quantity being formed can be regulated.

- 5 Moreover, the forming plant according to the invention can be associated with a usual compression moulding turntable for the predetermined quantities formed.

The operational and constructional characteristics of the invention will be more apparent from the ensuing description of various preferred embodiments thereof, given by way of non-limiting  
10 example and illustrated in the accompanying drawings.

Figure 1 is an axial section through a first embodiment of the invention.

Figure 2 is the section II-II of Figure 1.

- 15 Figure 3 shows a first variant of the first embodiment of the invention, for forming cylindrical predetermined quantities.

Figure 4 shows a second variant of the first embodiment of the invention.

Figure 6 shows an enlarged portion of Figure 5.

- 20 Figures from 7 to 9 show alternative forms of the rotary joint illustrated in Figure 6.

Figures from 10 to 12 show alternative forms of a constructional detail of the second embodiment of the invention illustrated in Figure  
5.

- 25 Figure 13 is an axial section through a further variant of the invention.

Figure 14 is a schematic view of the invention combined with a turntable for the compression moulding of the predetermined quantities formed.

Said figures show the plant 1, comprising a rotary joint 2 consisting  
5 of a fixed part 3 and a movable part 4.

The fixed part 3 is connected to usual feed means, not shown, for the synthetic material in the molten state, there being associated with the movable part 4 a plurality of identical usual devices 5 for forming cylindrical predetermined quantities of synthetic material.

10 With reference to Figure 1, the fixed part 3 comprises a fixed body 6 provided with an inner axial conduit 7 acting as the material feed conduit, its entry mouth 70 opening in correspondence with the upper end of the body 6, and its discharge mouth 71 opening in a direction perpendicular to the axis of the mouth 70, in proximity to the  
15 side wall of the lower cylindrical stem 60 of the body 6.

The body 6 is inserted into the central hole 800 of a plate 8, to which the body 6 is fixed. The body 6 upperly presents an annular shoulder 61 which rests against the lower surface of the fixed plate 8, to which the body is rigidly connected by screws 80.

20 The body 6 is provided with usual electrical resistance elements, not shown, to heat the body in order to prevent cooling of the molten synthetic material which flows into the conduit 7. The body 6 is also provided with sensors 65 and 66 for measuring the temperature of the molten material, located in correspondence with the discharge  
25 mouth 71 of the conduit 7.

With reference to Figure 2, the conduit 70 in that portion adjacent to the discharge mouth 71 has a diverging shape for the reasons explained hereinafter.

A cylindrical sleeve 9 is mounted on the outside of the body 6 and is  
5 fixed to the annular shoulder 61 by screws 90.

Said sleeve 9 carries two rolling bearings 10 with which the movable part 4 of the rotary joint 2 is associated.

With said bearings 10 there is associated an annular part 11, to the underside of which there is fixed a ring 12 mounted on the lower  
10 stem 61 of the body 6 by way of suitable seal gaskets 13.

The ring 12 is provided with a plurality of radial conduits spaced angularly equidistant apart, their axes being coplanar with the axis of the discharge mouth 71 of the conduit 7.

That mouth of the conduits 120 which opens into the outer surface  
15 of the ring 12 communicates with the feed port of the forming devices 5 which are fixed to the ring 12.

Instead, that mouth of the conduits 120 which opens into the inner surface of the ring is brought into communication, during the rotation of the movable part 4 about the fixed part of the joint 2, with the  
20 discharge mouth 71 of the conduit 7 at each complete revolution of the ring 12.

The ring 12 is provided with resistance elements for heating the body of the ring to prevent cooling of the material fed to the forming devices 5.

In the embodiment shown in Figure 1, an annular resistance element 125 can be seen fixed to the lower side of the ring in correspondence with the conduit 120.

The movable part 4 of the joint, which comprises the forming devices 5, the annular part 11 and the ring 12, is connected to a suitable geared motor, of which only the shaft 14 is shown in the figures.

A pinion gear 15 is keyed onto the shaft 14 of said geared motor and engages a mating ring gear 16 rigid with the annular part 11, to rotate this latter.

10 The devices 5 are provided in a number equal to the number of conduits 120 and are positioned in correspondence with the discharge mouths of these conduits.

Each device 5 comprises a lower body 50 fixed to the ring 12 and provided with a central hole 500 within which a rod 51 slides, with the 15 lower end of which there is associated a shutter 52 intended to shut off the lower mouth of the hole 500 from the inside.

The upper end of the rod 51 is associated with suitable operating means 100 for the rod itself. These means comprise a cylinder-piston unit consisting of a piston 53 which slides within a cylindrical 20 cavity 540 in a socket-shaped body 54. Said piston 53 is provided with a lower stem rigid with the upper end of the rod, so that the axial translations of the piston 53 within the cavity 540 determine axial translations of the rod 51. Specifically, the piston 53 divides the internal volume of the cavity into two chambers 541 and 542, at each 25 of which there terminates a fluid feed conduit, not shown. Feeding fluid into one of the cavities causes the piston 53 to translate.

The devices enable the duration of each delivery, and hence the dimensions of the predetermined quantities formed, to be regulated in a simple and rapid manner, without the need for mechanical intervention on the plant.

- 5 The operating means can also be of different type, such as shown in Figures 3 and 4.

With reference to Figure 3, this shows that the rod operating means, indicated by the reference numeral 88, are of mechanical type and comprise a socket-shaped body 23 associated with the upper end of  
10 the rod 51. At its free end, the socket-shaped body 23 carries an idle cam follower wheel 24 arranged to interact with an overlying cam 25.

The circular cam 25 is rigid with the plate 8, and as a result of the rotation of the plate 12 and of the relative devices 5 causes the rod  
15 51 and hence the shutter to translate cyclically, to discharge the predetermined quantity of material.

The socket-shaped body 23 slides within a guide sleeve 26 rigid with a lower part 18 and inserted into a hole provided in the annular part 11. The sleeve 26 is provided with an upper ring which acts as a  
20 stop element for the travel of the socket 23, which is normally maintained against said ring by virtue of a spring 27 positioned inside the socket-shaped body and mounted about the rod 51.

The lower end of the spring 27 rests on a guide element 28 for the rod 51, whereas the upper end of the spring rests against an upper  
25 enlargement of the rod 51.

Figure 4 shows operating means 99 of electrical type. With reference to this figure, the rod 51 is provided with a cylindrical upper portion of magnetic material, and is arranged to slide within a socket-shaped body 44 with which a coil 45 is associated. Energizing the  
5 coil, done by totally usual means, not shown, causes the rod carrying the shutter to translate upwards, to hence enable the predetermined quantity of material to be formed.

Finally, said operating means can also be of hydraulic type, and constructionally totally similar to the pneumatic operating means  
10 shown in Figure 1.

Figures 5, 6 and 7 show a second embodiment of the invention, which differs substantially in terms of its construction and the position of the rotary joint.

In the description of the second embodiment of the invention, those  
15 components already described and illustrated in the first embodiment are indicated by the same reference numerals.

Figure 5 shows the plant 30 which comprises a rotary joint 31 consisting of a fixed part 32, connected to the means for feeding the material in the molten state, and an underlying movable part 33 with  
20 which the forming devices 5 are associated, by virtue of a part 34.

As better shown in Figure 6, the fixed part 32 of the rotary joint 31 comprises a portion 321 of a conduit 320 sealedly screwed into the part 310 which contains the molten material feed conduit.

With the portion 321 (Figure 6) of said conduit 320 there is  
25 associated a first socket-shaped body 322 rigid with an outer hollow body 323 carrying a lower inner flange 324.

On the flange 324 there rests a rolling bearing 325, the upper ring of which carries a compression spring 331.

The spring 331 elastically supports a second socket-shaped body 332 rigid with the conduit 333 fixed to the part 34.

- 5 Two annular seal pads, 335 and 335' respectively, are positioned between the first socket-shaped body 322 and the second socket-shaped 332.

Said pads provide a seal for the molten material when the movable part 33 rotates about the fixed part 32.

- 10 An electrical resistance element 336 maintains the temperature of the movable part 33.

Figure 7 shows an executive variant of the joint 31.

- In said variant, to the lower part 321 of the conduit 320 there are fixed an annular flange 3210 and an axially slidable socket-shaped  
15 body 3211, between which a compression spring 3212 maintains the body 3211 urged against a socket-shaped body 3320 fixed to the portion 333 of the conduit 320.

A seal ring 3250 is associated with the body 3210 and rests on an identical ring 3251.

- 20 This latter rests on the socket-shaped body 3320 rigid with the portion 333 which is fixed to the part 34.

Electrical resistance elements 3360 maintain the temperature of those conduit portions associated with them.

- Figures 8 and 9 illustrate two different alternative solutions for sealed  
25 rotary joints interposed between the conduit 333 and the part 310 shown in Figures 4 and 5.

In the embodiment of Figure 5, the part 34 comprises an enlarged base 34', to the circular peripheral edge of which are fixed the devices 5 and which centrally presents a cylindrical portion 34" rigid with said movable part 33 of the rotary joint 31.

5 The cylindrical portion presents a central material feed conduit 35 which opens into a cavity 38 at the centre of the enlarged base, into which a cylindrical insert 37 is inserted (Figures 5 and 13).

Said insert presents a central chamber 36 from which there originate a plurality of radial conduits 39 through which the molten material is  
10 fed to the devices 5.

Figures 11 and 12 show alternative embodiments of the insert 37 which prevent the synthetic material in the molten state from settling in the interior of the insert.

The description of the devices 5 is omitted as these are identical to  
15 those fully described in the first embodiment of the invention.

The operation of the invention will now be described with reference to Figures 1 and 2, this also enabling the expert to understand the operation of the other embodiments.

The geared motor maintains the movable part 4 of the joint rotating  
20 about the fixed part 3 while the material feed means simultaneously feed the material in the molten state into the conduit 7 under pressure. As the conduits 120 of the ring 12 progressively face the discharge mouth 71 of the conduit 7, the material is fed into the conduit 120 by virtue of the pressure to which it is subjected, to  
25 cause the predetermined quantity of synthetic material to emerge through the aperture created by the axial translation of the rod 51.

In this respect, the conduits 120 face the mouth 71 at the moment in which the rod 51 is made to translate axially.

As can be seen from Figure 3, the discharge mouth of the conduit 7 is of divergent shape, such that while the feed to one conduit 120  
5 terminates, the feed to the next conduit 120 commences, in order to limit the maximum pressure within the conduit 7.

Figure 13 shows the invention with devices for forming annular predetermined quantities applied. In the ensuing description components identical to those already described and illustrated carry  
10 the same reference numerals.

Each of the devices essentially comprises a lower part 18 fixed to the ring 12 and provided with a central hole within which there slides a profiled rod 21 which is associated upperly with suitable operating means 88, and lowerly presents a forming head 22 acting as a  
15 shutter.

The upper end of the rod 51 is inserted into the cavity in a socket-shaped body 23 which upperly carries an idle cam follower 24 arranged to interact with an overlying cam 101.

The cam 25 is rigid with the plate 8, and as a result of the rotation of  
20 the plate 12 and the relative devices 5 causes the rod 21 to cyclically lower and open the shutter for discharge of the predetermined quantity of material.

The socket-shaped body 23 slides within a guide sleeve 26 rigid with the lower part 18 and inserted into a hole provided in the annular  
25 part 11. The sleeve 26 is provided with an upper ring which acts as a stop element for the travel of the socket-shaped body 23, which is

normally maintained against said ring by a spring 27 positioned within the socket-shaped body and mounted about the rod 21.

The lower end of the spring 27 rests on a guide element 28 for the rod 21, whereas the upper end of the spring rests against an upper  
5 enlargement of the rod 21.

It should be noted that the operating means for the rod 21 can also be of different type, for example the rod 21 can be driven translationally by operating means of mechanical type shown in Figure 3, or of electrical type shown in Figure 4.

10 Finally, Figure 14 shows the combination of the described forming plant with a compression moulding turntable 69 provided with a plurality of moulds 70. As can be seen from the figure, the predetermined quantity is dispensed when one of the devices 5 lies above the female portion of the mould 70.

15 The rotation of the plant 1 is hence synchronous with the rotation and opening of the mould 70 on the turntable, the shutter rod operation being activated by an encoder positioned on the turntable (if its operation is not mechanical).

## CLAIMS

1. A plant for forming predetermined quantities of synthetic material comprising a rotary turntable carrying on its periphery a plurality of dispensing devices presenting a shutter, and means for feeding the material in the molten state to said dispensing devices; characterised by comprising a fixed part directly connected to the molten material feed, a rotary sealed joint connecting said fixed part to the rotary turntable, operating means for interacting with the dispensing devices positioned on the rotary turntable to operate them in the sense of opening and closing them in response to the rotations of the turntable, and means for rotating the turntable.
2. A plant as claimed in claim 1, characterised in that the fixed part comprises a central body traversed by the material feed conduit and terminating in a cylindrical stem into which said conduit opens radially, the rotary turntable being sealedly mounted on said stem by way of interposed seal means.
3. A plant as claimed in claim 2, characterised in that said material feed conduit diverges in proximity to the mouth which opens radially into said stem.
4. A plant as claimed in claim 2, characterised in that the rotary turntable comprises a number of radial conduits equal to the number of dispensing devices and arranged to face in succession the radial end of the feed conduit.
5. A plant as claimed in claim 1, characterised in that the fixed part comprises an upper body from which the material feed conduit leaves and is connected to an axial conduit of the rotary turntable by

an axial rotary joint comprising a fixed seal element rigid with the fixed part, and a rotary seal element facing the fixed element and rigid with the turntable.

5 6. A plant as claimed in claim 5, characterised in that the fixed seal element and the rotary seal element are two axially facing rings.

7. A plant as claimed in claim 6, characterised in that the fixed seal element and the rotary seal element are maintained elastically pressed one against the other.

8. A plant as claimed in claim 5, characterised in that the fixed  
10 seal element presents a cylindrical cavity into which the rotary element is fixed, between these latter there being interposed a seal element.

9. A plant as claimed in claim 8, characterised in that the seal element is a labyrinth.

15 10. A plant as claimed in claim 8, characterised in that the seal element is a cylindrical sleeve of elastomer.

11. A plant as claimed in claim 1, characterised in that the operating means arranged to interact with the dispensing devices positioned on the rotary turntable to operate them in the sense of  
20 opening and closing them in response to the rotations of the turntable are rigid with the fixed part.

12. A plant as claimed in claim 11, characterised in that said seal means comprise a cup cam coaxial with the turntable and arranged to interact with a cam follower wheel rigid with said rod.

25 13. A plant as claimed in claim 1, characterised in that said operating means arranged to interact with the dispensing devices

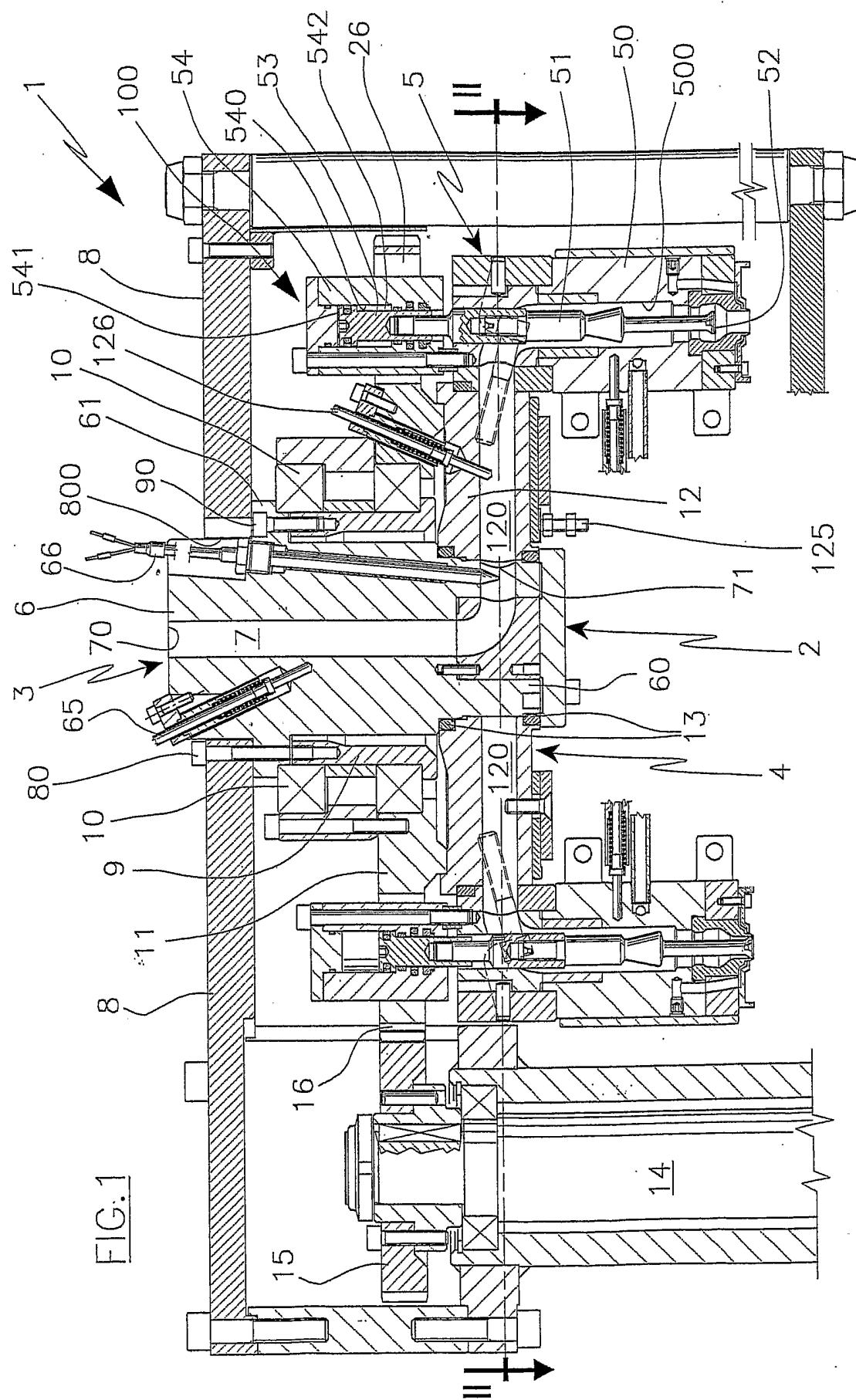
positioned on the rotary turntable to operate them in the sense of opening and closing them in response to the rotations of the turntable comprise a cylinder-piston unit, the rod of which is associated with the shutter.

5 14. A plant as claimed in claim 1, characterised in that said operating means arranged to interact with the dispensing devices positioned on the rotary turntable to operate them in the sense of opening and closing them in response to the rotations of the turntable are of electrical type.

10 15. A plant as claimed in claim 14, characterised in that said operating means of electrical type comprise a coil, the state of energization of which determines the translations of the rod of said dispensing devices.

15 16. A plant as claimed in claim 1, characterised by being associated with a turntable provided with a plurality of moulds for compression moulding the predetermined quantities formed by said dispensing devices.

17. A plant as claimed in claim 16, characterised in that the positioning of the dispensing devices relative to said moulds is  
20 controlled by an encoder associated with said turntable.



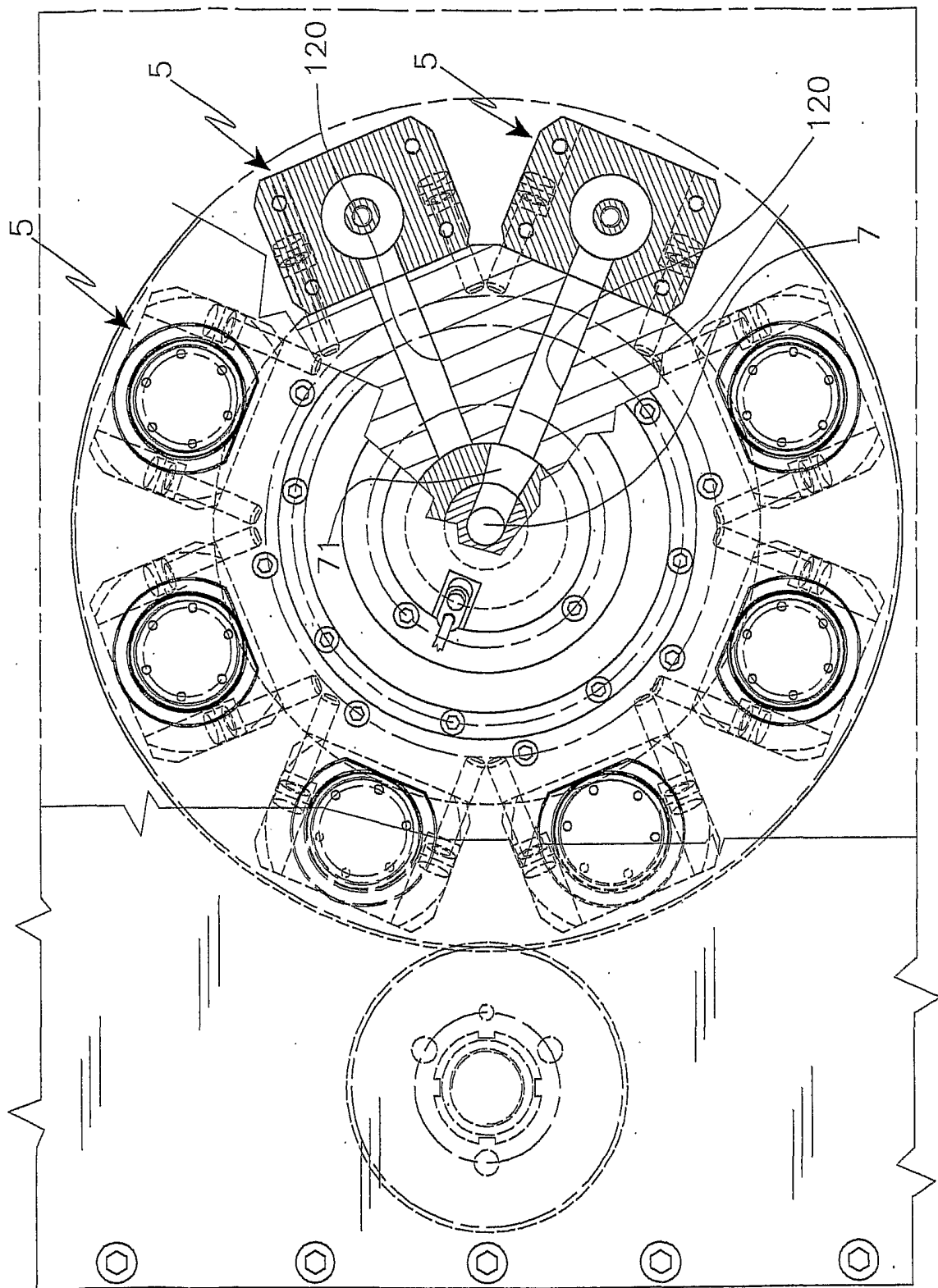


FIG. 2

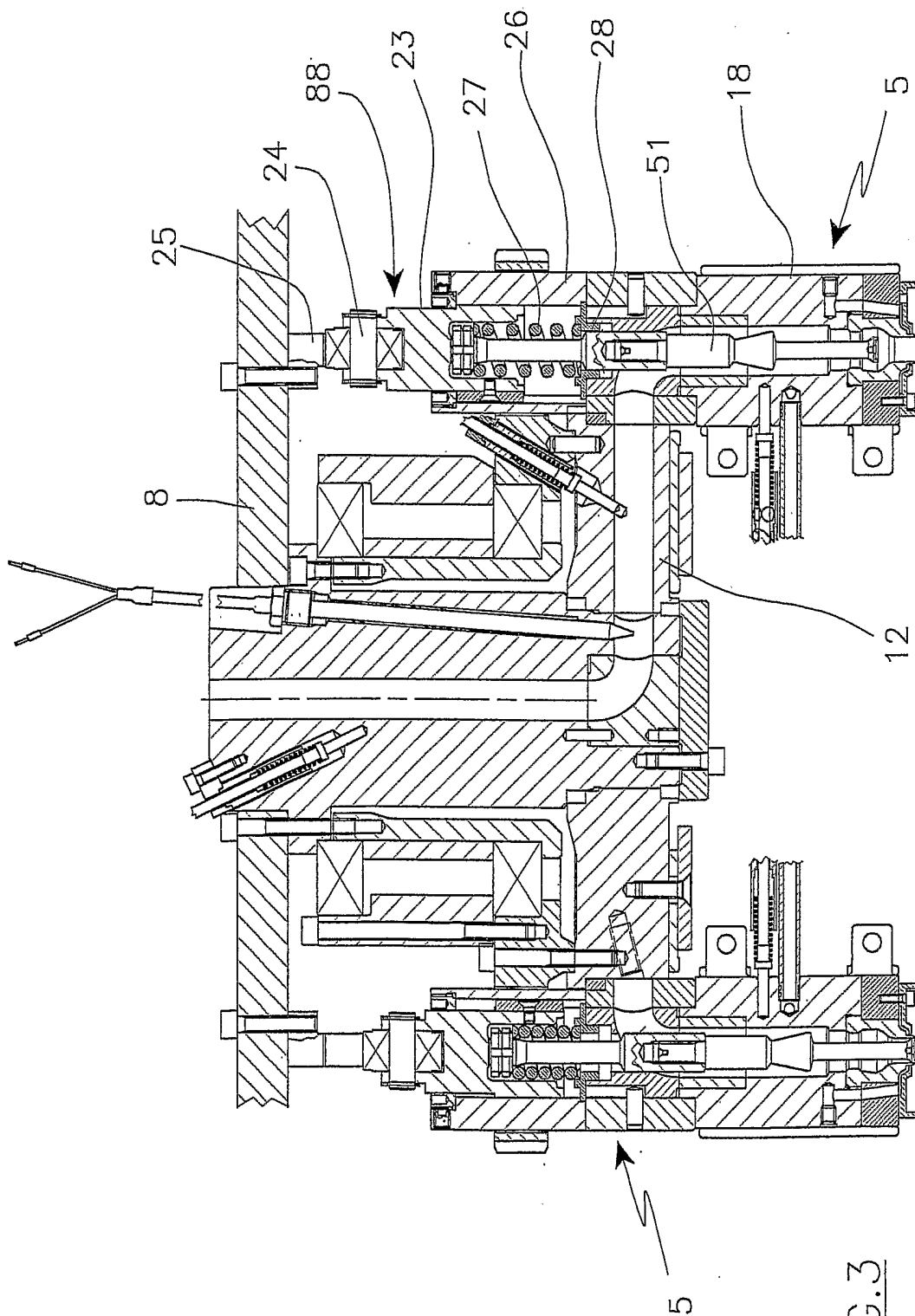


FIG. 3

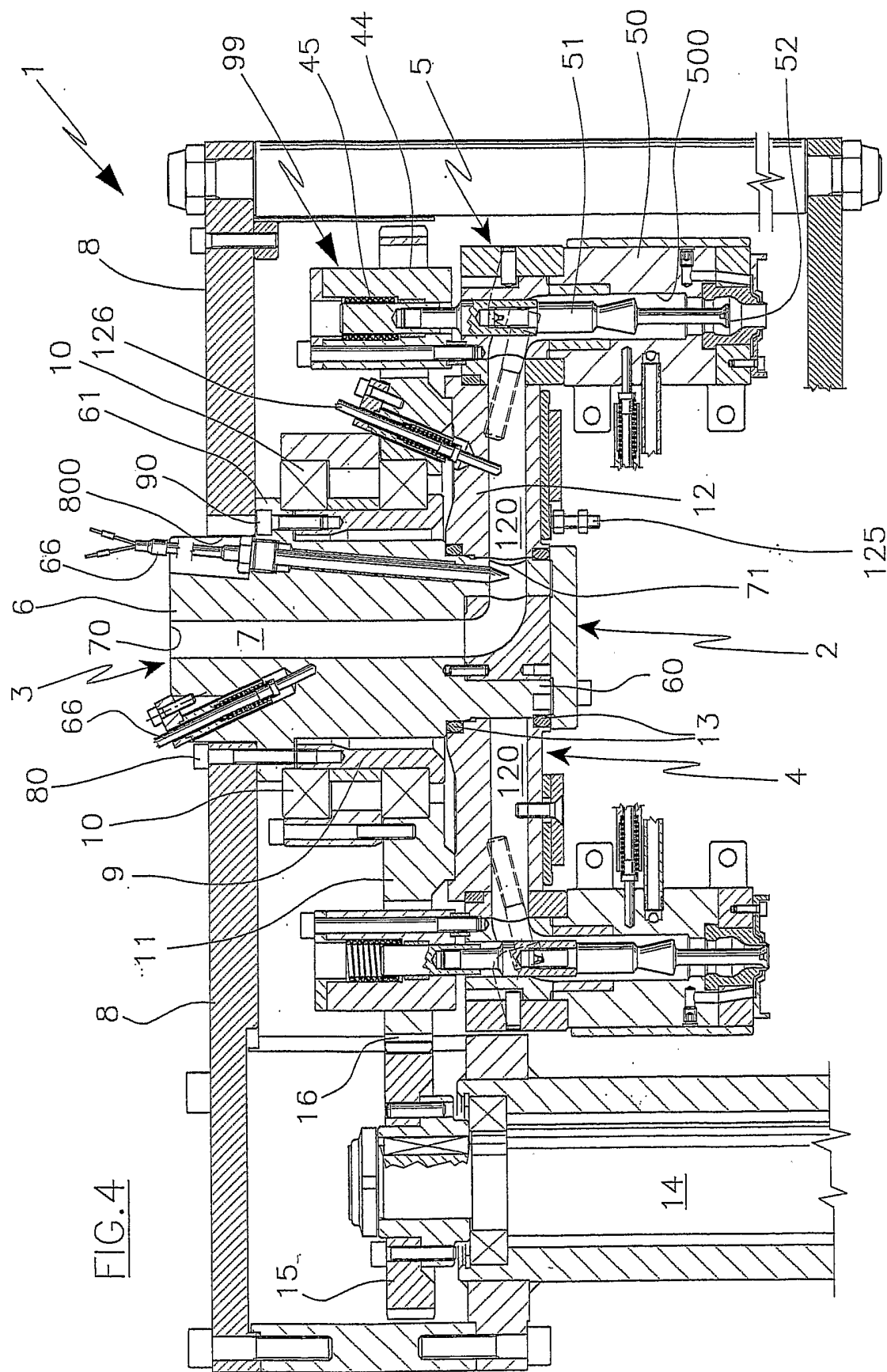


FIG. 4

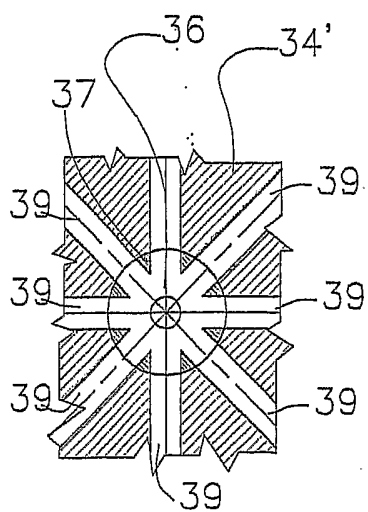
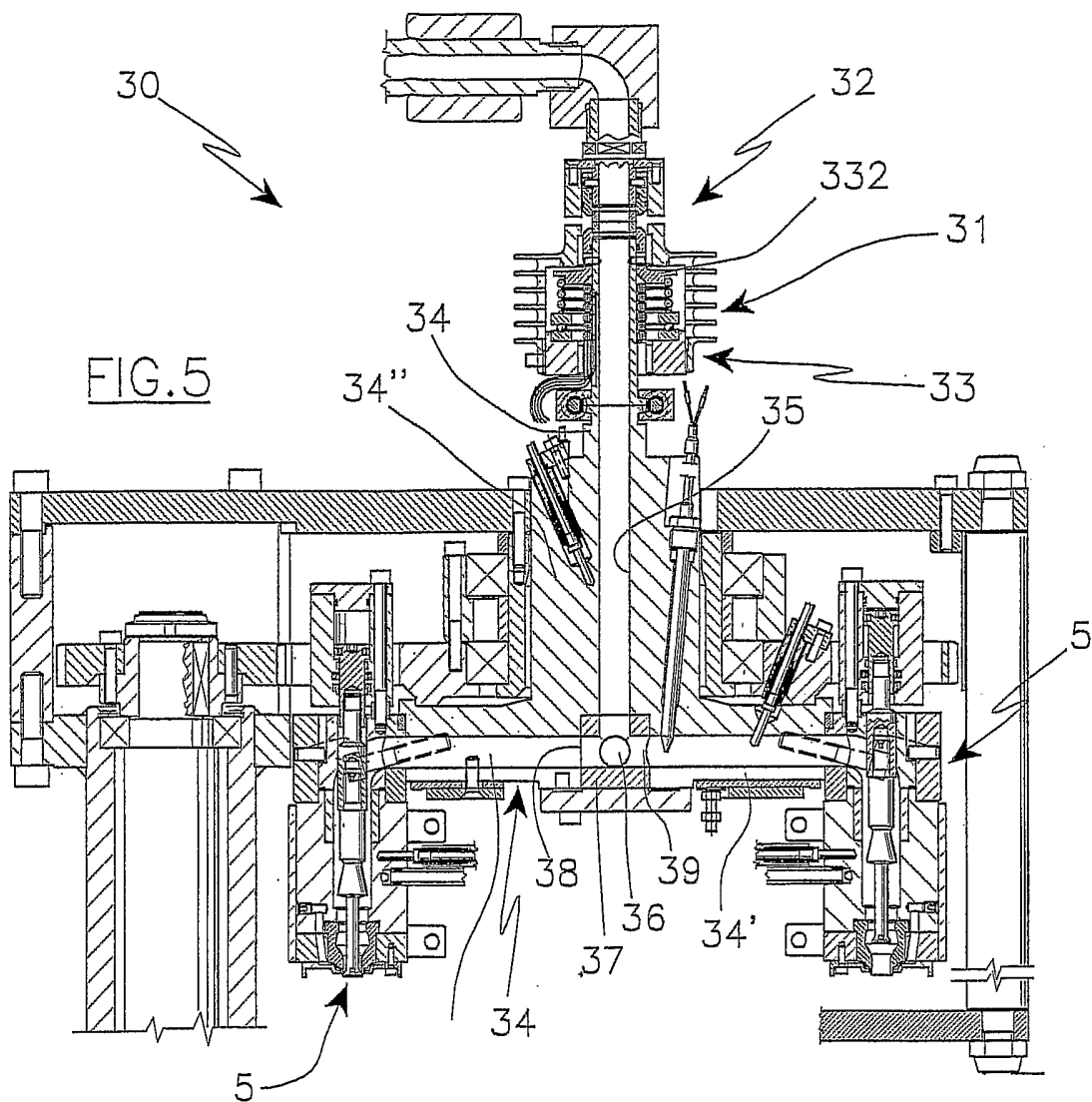


FIG. 10

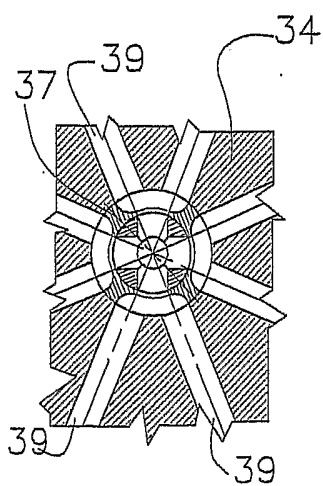


FIG. 11

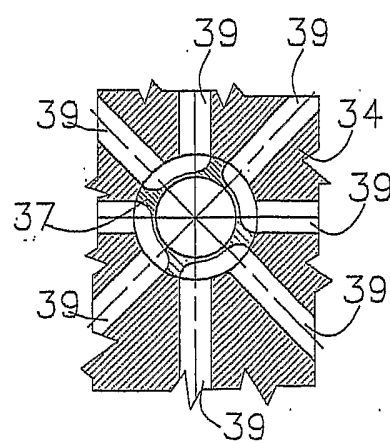


FIG. 12

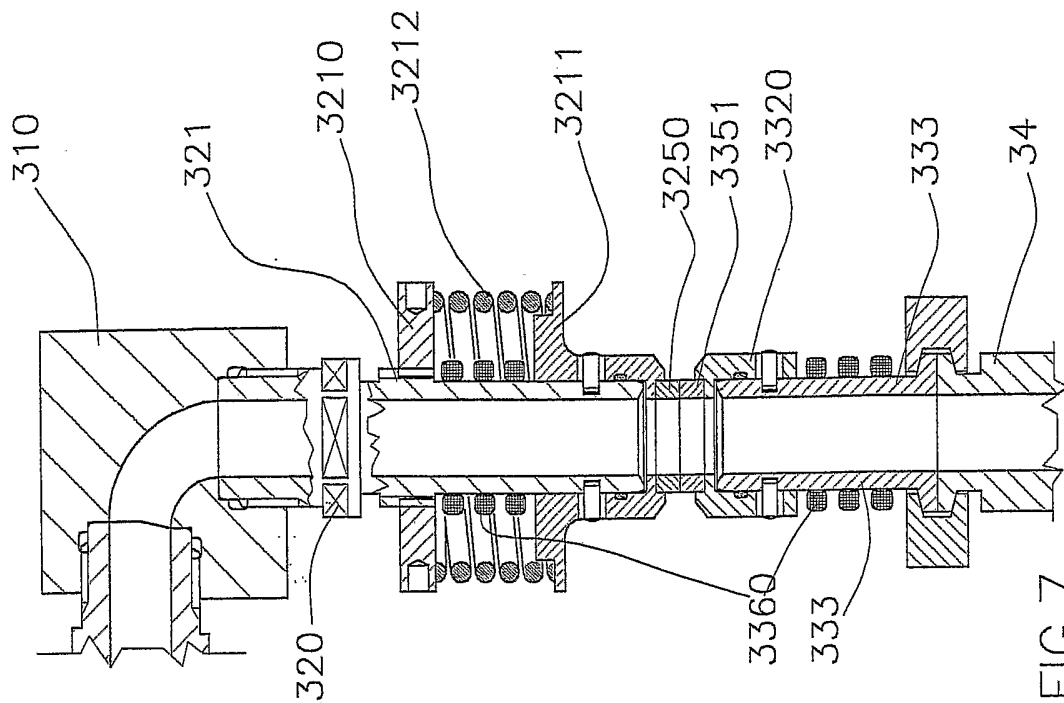


FIG. 7

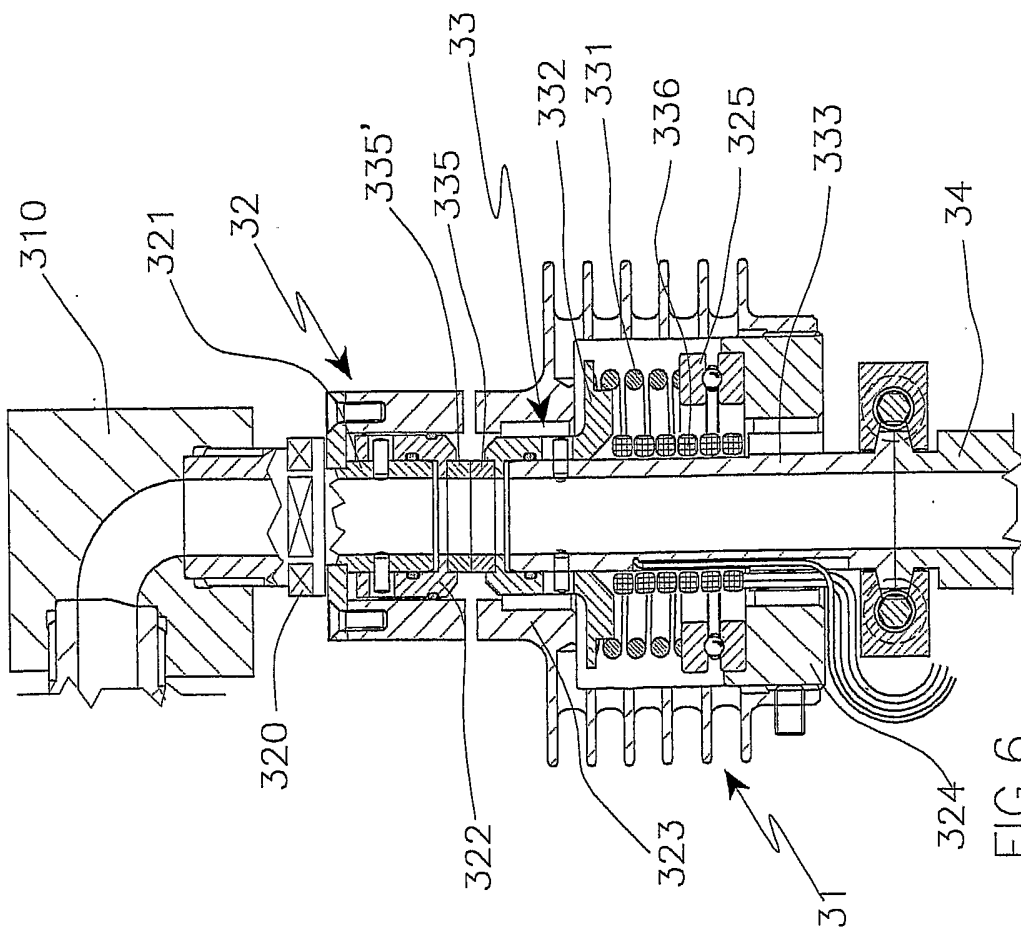


FIG. 6

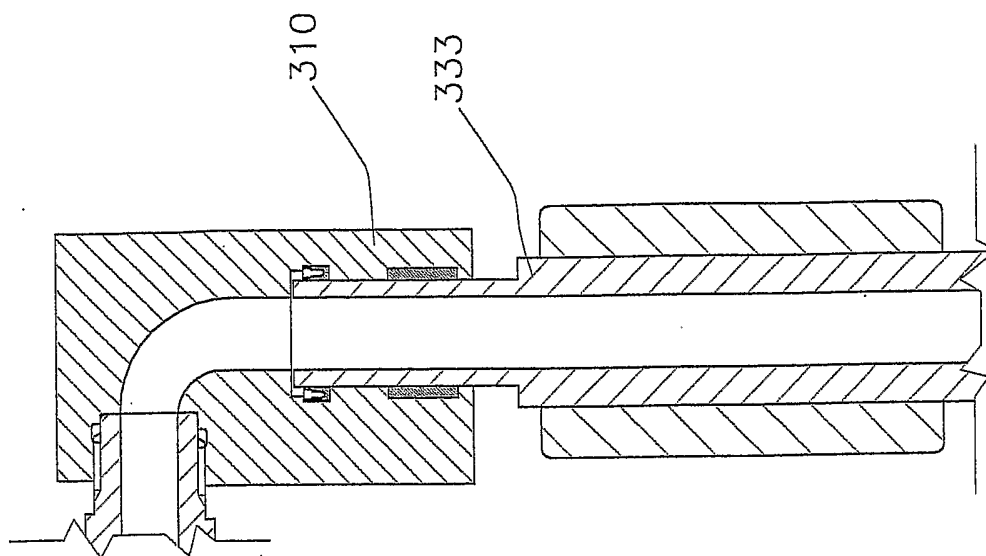


FIG.9

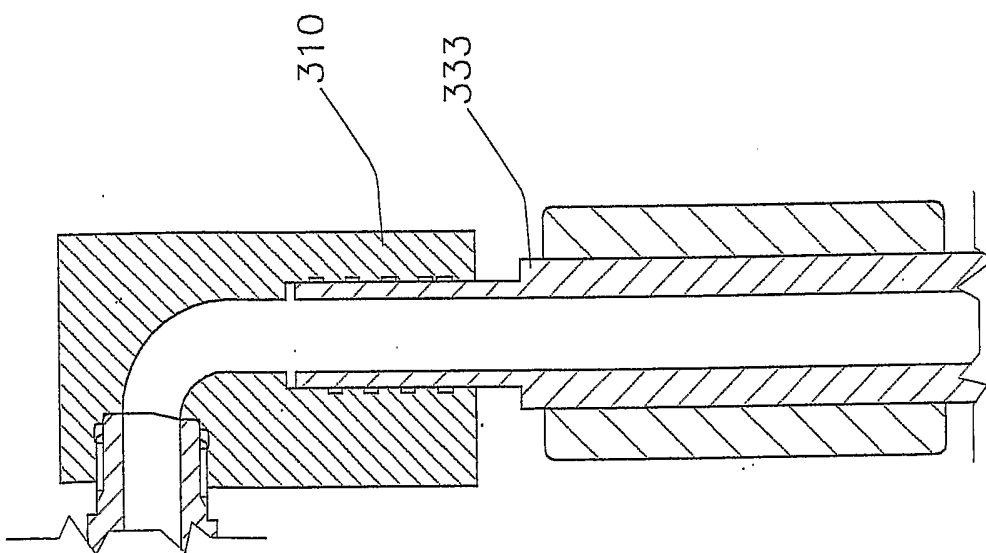
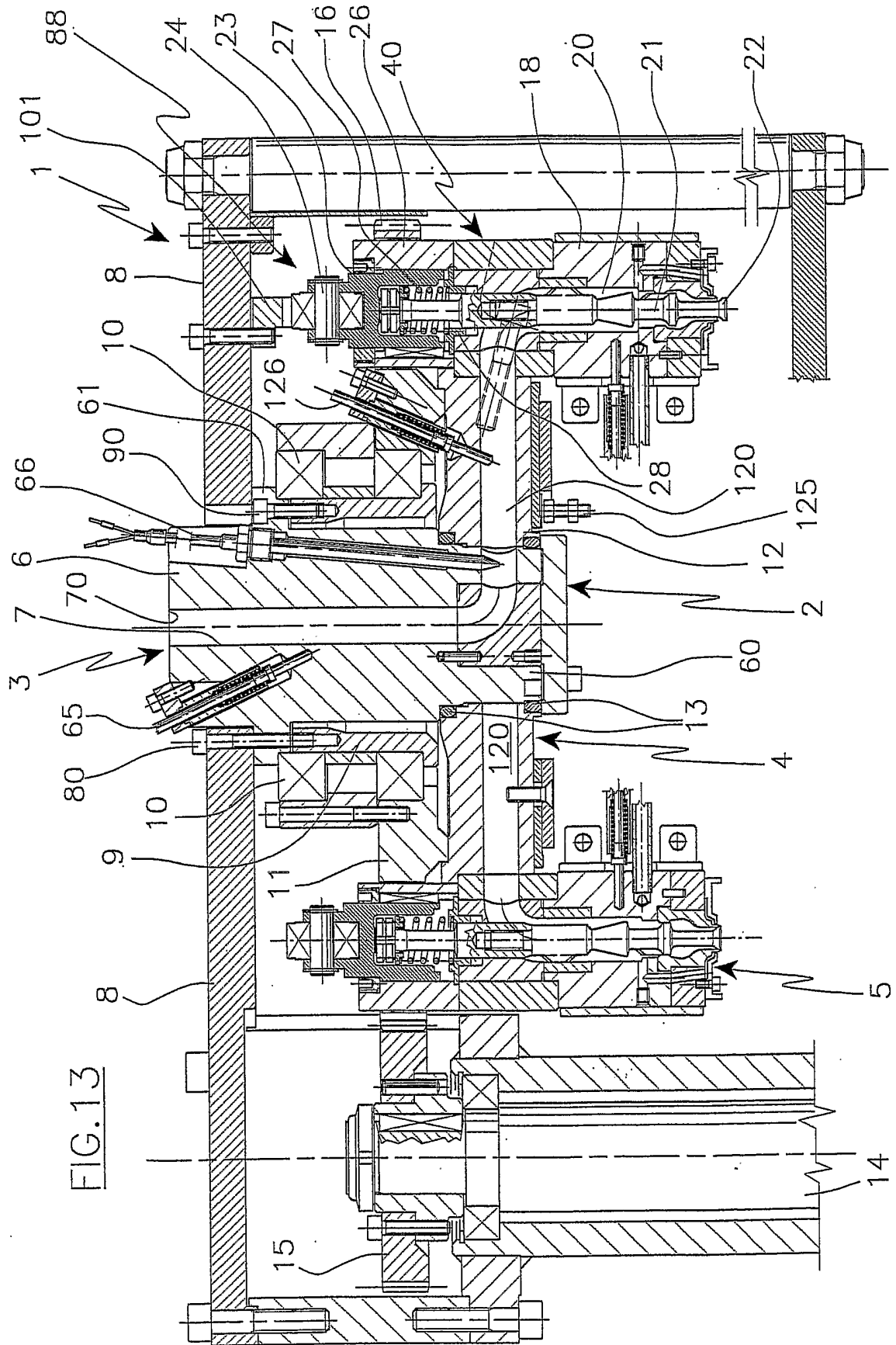
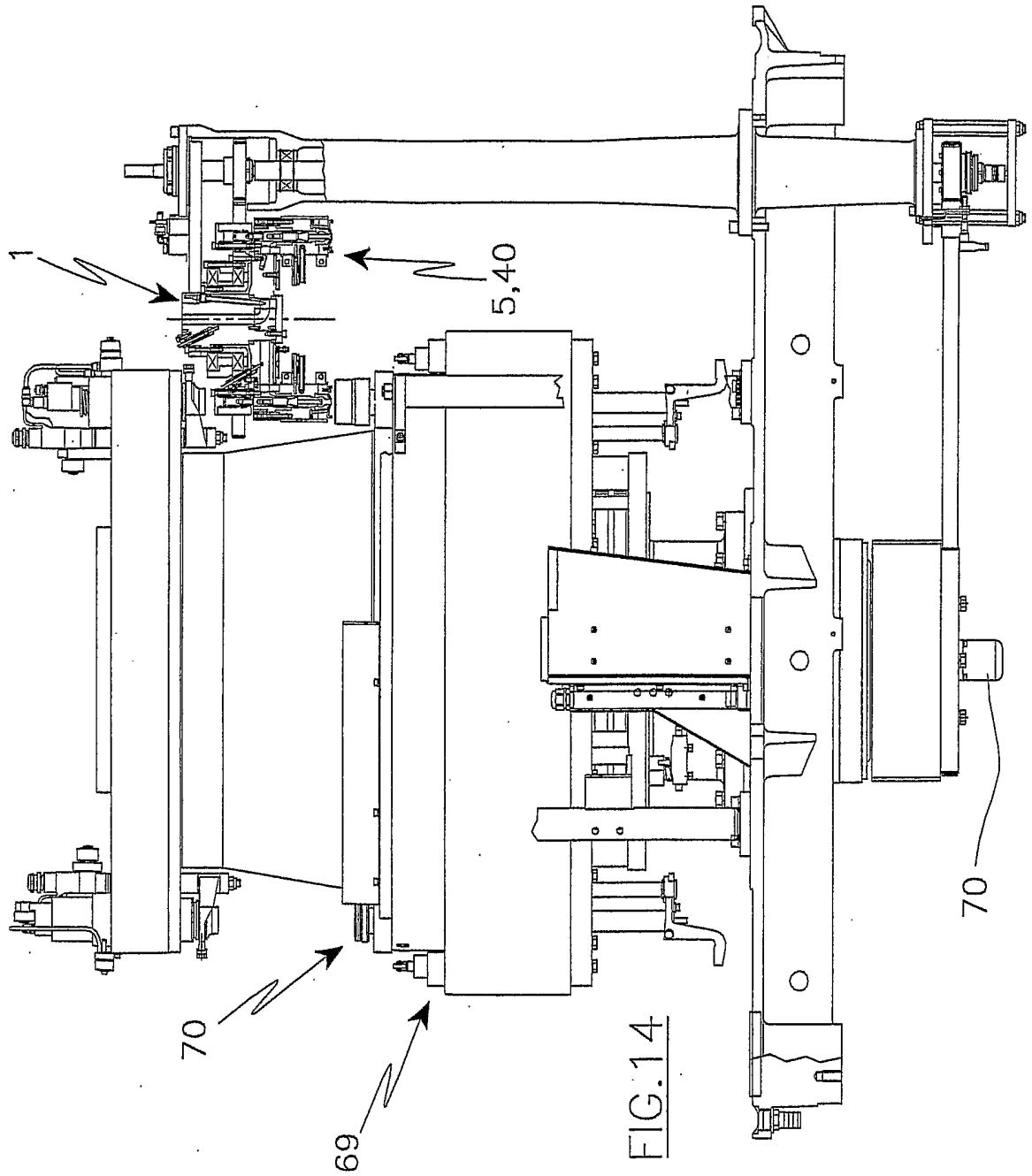


FIG.8





# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 03/07325

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B29C31/06 B29C43/08 B29C43/34 //B29C45/06, B30B15/30

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 7 B29C 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)

EPO-Internal, PAJ, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 412 797 A (MURAYAMA KASHIWA) 1 November 1983 (1983-11-01) column 5, line 48 -column 8, line 17; figure 3 ---	1-17
A	US 6 402 504 B1 (HAHN JOHN J ET AL) 11 June 2002 (2002-06-11) column 3, line 16 - line 58; figures 1,2,8 ---	1
A	US 2 808 859 A (HEINZELMAN EARL E ET AL) 8 October 1957 (1957-10-08) column 2, line 3 -column 3, line 15; figure 1 --- -/--	1-4

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- \*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)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* & \* document member of the same patent family

Date of the actual completion of the international search

28 November 2003

Date of mailing of the international search report

12/12/2003

Name and mailing address of the ISA

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

Authorized officer

Topalidis, A

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/07325

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>DATABASE WPI                      Section Ch, Week 199125                      Derwent Publications Ltd., London, GB;                      Class A32, AN 1991-183753                      XP002263315                      -&amp; SU 1 599 221 A (POWER EQUIP DES-TEC),                      15 October 1990 (1990-10-15)                      abstract</p>	1-4
A	<p>US 3 102 304 A (FOORD DIVERS REGINALD                      ALBERT) 3 September 1963 (1963-09-03)                      column 6, line 68 -column 7, line 62;                      figures</p>	1-4
A	<p>PATENT ABSTRACTS OF JAPAN                      vol. 013, no. 462 (M-881),                      19 October 1989 (1989-10-19)                      &amp; JP 01 180314 A (NISSEI PLASTICS IND CO),                      18 July 1989 (1989-07-18)                      abstract</p>	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/07325

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
US 4412797	A	01-11-1983	NONE	
US 6402504	B1	11-06-2002	NONE	
US 2808859	A	08-10-1957	NONE	
SU 1599221	A	15-10-1990	SU 1599221 A1	15-10-1990
US 3102304	A	03-09-1963	NONE	
JP 01180314	A	18-07-1989	JP 5015529 B	01-03-1993