

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 September 2001 (27.09.2001)

PCT

(10) International Publication Number
WO 01/70480 A1

(51) International Patent Classification⁷: **B29C 45/16**,
45/44, F16L 47/06

(21) International Application Number: PCT/GB01/01231

(22) International Filing Date: 21 March 2001 (21.03.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0006662.1 21 March 2000 (21.03.2000) GB
0007575.4 30 March 2000 (30.03.2000) GB
0105016.0 1 March 2001 (01.03.2001) GB

(71) Applicant and

(72) Inventor: **MULLAN, David** [GB/GB]; 2 Blacon Cottages, Snitterfield Lane, Norton Lindsey, Warwickshire CV35 8JJ (GB).

(74) Agent: **HARRISON GODDARD FOOTE**; Tower House, Merriam Way, Leeds LS2 8PA (GB).

(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, 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, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

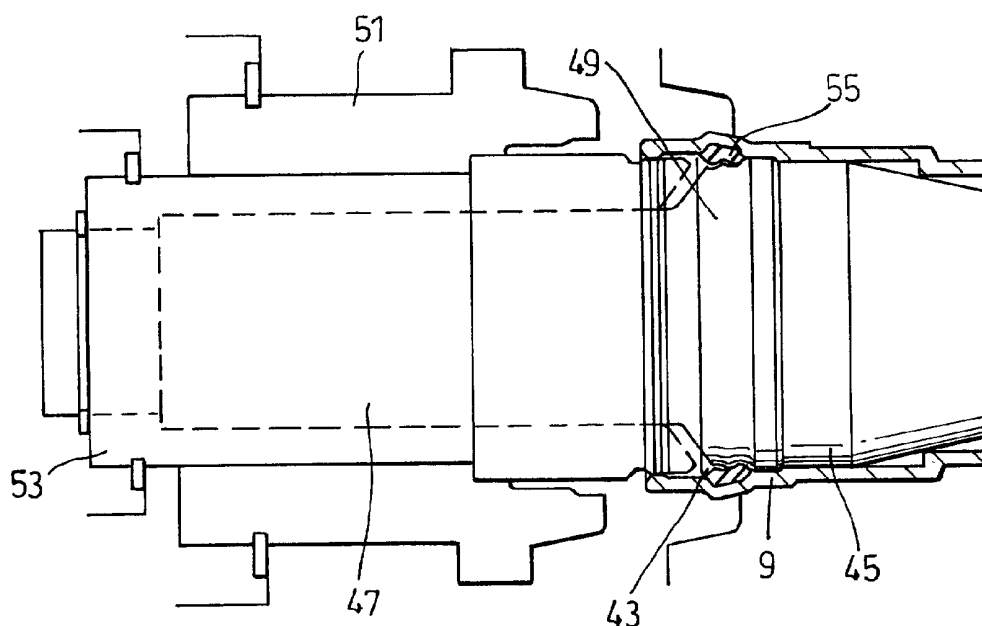
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML,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

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 "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PIPE COUPLINGS



(57) **Abstract:** The invention provides a method for making a pipe coupling which comprises a body portion including a socket (9) and an internal seal (43) located within said socket and which is for making sealing contact with the pipe end received in the socket. The method comprises, in a first stage, injection moulding the body portion using a first internal core and, in a second stage, injection moulding the seal within the socket using a second internal core. Seal material is injected in molten form through the wall of the body portion to a space defined by the body portion and said second core. Apparatus for carrying out the method is also provided.



WO 01/70480 A1

PIPE COUPLINGS

Field of the Invention

5 The invention relates to plastic pipe fitting provided with internal seals. The pipe fitting may be, for instance, a pipe (conduit), a pipe coupling which is straight or provides a bend of, for instance 90°, 135° or 180° or another tubular ended plastics arrangements such as a water trap. Reference will be made herein below to pipe coupling but it should be appreciated that the invention has application to any plastics
10 arrangement which includes at least one tubular socket having an internal seal.

Background to the Invention

Pipe couplings may include at least one socket for receiving a pipe end, the socket
15 having an internal seal for effecting sealing between the pipe coupling and the pipe end. Traditionally, the seal for such a pipe fitting is formed separately from the body of the coupling and the seal is then inserted into the socket and held therein with some form of retention member which prevents the seal being displaced during the fitting of the pipe length into the socket of the coupling.

20

More recently, methods have been proposed by which the seal is formed integrally with the socket, thereby avoiding the need for a retaining member and for the items to be assembled together. In GB2192578A, a pipe coupling is made by injection moulding a socket in a mould tool having inner and outer cores and a third core
25 defining an axially extending internal surface of the socket. Once the socket has been formed, the third core is moved axially in a direction towards the mouth of the socket to open up a space between the socket and the inner core into which seal material may be injected. The inner mould is then moved axially away from the socket and, in so doing, deforms the resilient seal. Core movement is effected while the mould tool
30 is closed.

Such a method is effective for a socket in which the only hindrance to removal of the inner core is a sufficiently resiliently deformable seal. However where the seal is not sufficiently deformable in a resilient manner and/or where the inner surface of the socket includes hindering internal projections, for instance because the seal is located
5 within a recessed spaced from the end of the socket, such a method is not satisfactory.

Statements of the Invention

10 According to the present invention there is provided a method for making a pipe coupling comprising a body portion including a socket and an internal seal located within said socket and for making sealing contact with a pipe end received in the socket, said body portion and said seal being formed of plastics materials, the method comprising, in a first stage, injection moulding said body portion using a first internal
15 core and, in a second stage, injection moulding said seal within said socket using a second internal core and by injecting material for the seal in molten form through the wall of said body portion to a space defined by said body portion and said second core, whereby, on solidifying, said second material adheres to said body portion.

20 Preferably, said first and second internal cores each include first and second axially separable parts and, after each stage of injection moulding, said first part is moved axially relative to the second part whereby said internal core is moved out of the body portion relatively easily compared with the removal of a corresponding single part core.

25 More preferably, the first part is provided with an external circumferential groove for accommodating an inwardly directed lip on the socket and said axial movement of said first part relative to said second part causes the lip to move out of the groove thereby widening the mouth of the socket sufficiently to enable relatively unimpeded
30 movement of said second part in a direction out of said socket.

The present invention also provides apparatus for making a pipe coupling comprising a body portion including a socket and an internal seal located within said socket for making sealing contact with a pipe end received in the socket, said body portion and said seal being formed of plastics materials, the apparatus comprising means for injection moulding said body portion using a first internal core and means for injection moulding the seal within said socket using a second internal core, said seal moulding means including means for injecting material for the seal in molten form through the wall of the body portion to a space defined by the body portion and said second core, whereby, on solidifying, said second material adheres to said body portion.

Detailed Description of the Invention

The present invention will now be described, by way of example only, with reference to the accompanying drawings.

Figure 1 of the accompanying drawings illustrates part of injection mould tooling which may be used in the method of the present invention. As illustrated in Figure 1, this part of the tooling is substantially in the form of a core block 1 rotatable about a vertical axis. Figure 2 illustrates the injection part of the moulding tool which allows the other components of the mould to be brought into alignment with those parts provided by the cavity block 1. The lower part of the tooling is shown in Figure 2, the internal core arrangement 3 being such that, when brought into alignment with the cavity block 1, the body part 5 of a pipe coupling is formed. In the top half of Figure 2 the core parts are such as to define a space into which the sealed material may be injected.

Accordingly a pipe coupling may be made, using tooling such as is illustrated in Figures 1 and 2, in a two-stage process involving a first stage injection moulding process, rotation of the cavity block 1 and a second stage procedure in which the internal seal is formed.

Figure 3 of the accompanying drawings shows in detail the arrangement of the mould parts around one of the sockets 9 of the pipe coupling. The mould parts included outer mould parts 11 and 13 and an inner core assembly 15. Assembly 15 includes outer and inner core parts 17 and 19 respectively. Each of these core parts has an enlarged head portion, 21 and 23 respectively. These head portions together define the inner surface of the mould. Head portion 21 of inner part 17 is provided with a circumferential groove 25 which defines an internal circumferential lip 27 formed as a result of the injection moulding of the body portion of the coupling. Head portion 23 of outer part 19 is located axially inwardly of head portion 21 and a surface 29 defines a neck portion 31, extending between head portion 23 and the remainder of inner part 15, is shaped so as to fit flush to a corresponding internal surface at the innermost end of head portion 21 of outer part 17.

Having formed the body portion of the coupling by injection moulding, including socket 9 illustrated in Figure 3, outer mould part 13 is then caused to move axially away from the socket 9 to the position shown in Figure 4.

Outer part 17 of core assembly 15 is capable of axial movement away from inner core part 19 and socket 9. The extent of this axial movement is limited by stop member 35. Once mould part 13 has been moved to the position illustrated in Figure 4, outer core part 17 is then axially moved until its left-hand extremity (as seen in Figures 3 and 4) abuts stop member 35. The position is then as illustrated in Figure 5 and it will be seen head portion 21 of inner core part 17 has separated from head portion 23 of outer core part 19 and that groove 25 of head portion 21 of outer core part 17 is now displaced from lip 27 of socket 9. As a result, the mouth of socket 9 has become enlarged. Due to the resiliently deformable nature of the plastic of the coupling, this enlargement of the socket mouth extends from lip 27 in a gradually decreasing manner to outer mould part 11 where this mould part maintains the original diameter of the socket. Accordingly, between mould part 11 and lip 27 the socket mouth is prised outwardly.

Extending from a position just inwardly of the left-hand edge of outer mould part 11 in a direction towards lip 27, socket 9 bulges outwardly at 37 to form a recess 39. This recess will accommodate the internal seal as will be discussed below. The inner surface of the recess is defined by an enlarged annular portion 41 of head portion 23 of inner mould part 13.

By expanding the mouth of socket 9 in the manner described above, the inner mould part 13, and in particular the head portion 23 carrying enlarged portion 41, can more easily be pulled or extracted from its moulding position. Figure 6 illustrates the position after the outer mould part 13 and inner core assembly 15 have been pulled completely away from the coupling. During the initial part of this step, that part of head portion 21 of inner mould part 11 which lies between groove 25 and the right-hand end of head portion 21 will maintain the mouth of socket 9 in its enlarged state since the lip 27 will be engaged with the outer surface of the end portion of head portion 21. This part of the pull is sufficient for the enlarged portion 41 of head portion 23 of outer mould part 13 to move out of recess 39. During subsequent extraction of the inner core assembly from the coupling, the enlarged portion 39 will move along the inner surface of the socket 9 between recess 39 and lip 27, and then past lip 27, following which the mouth of the socket, being resiliently deformable, will return to its original position while the remainder of head portion 23 of inner core part 19 is extracted from the coupling, as illustrated in Figure 6.

Accordingly, this multi-stage core extraction or pulling procedure allows that part of the core assembly which defines the inner surface of the recess for accommodating the seal to be easily removed from the body portion of the coupling.

Referring now to Figure 7 of the accompanying drawings, there is illustrated in detail the arrangement of the mould parts around one of the sockets 9 of the pipe coupling for that part of the tooling associated with the formation of the inner seal 43. The mould parts are essentially similar to those described above in connection with a first stage of the moulding procedure. The main differences are to the shape of head

portion 45 of inner core part 47. The right-hand end of this core part slopes inwardly to the right-hand edge, the original shape (of head portion 23 not being required to form part of the mould as was previously the case). Enlarged portion 39 of head portion 23 is now replaced by a reduced diameter portion 49, the outer surface of which is shaped to provide the desired inner surface of the internal seal. Accordingly, recess 43 is defined by the outer surface of portion 49 and the inner surface of socket 9.

Seal material is then injected into recess 43, the procedure for which will be described in greater detail below. Once this has been effected and the seal material has been allowed to solidify, the mould parts are then separated in a manner similar to that described above after the formation of the body portion of the coupling. Figure 8 shows the first step in this extraction procedure, namely, the removal of outer mould part 51. Figure 9 illustrates the second step, the separation of the outer and inner core parts 53 and 47 respectively. This results in the widening of the mouth of socket 9 and enables the head portion 45 of inner core part 47 to be moved past seal 55 without dislodging it from its location within recess 43.

Figure 10 illustrates the position when the inner core assembly and the outer mould part 51 have been completely removed from the coupling.

In the above-described procedure, core pulling takes place with the mould cavity closed.

Figure 11 illustrates in detail the injection of the seal material into recess 43. The wall of socket 9 is provided with a moulded-in channel 57 which extends from recess 43 axially along the inner surface of the socket away from its mouth. Channel 57 is defined by head portion 45 of inner core part 47 as well as the inner surface of the wall of socket 9. At the end of channel 57, the channel communicates with a radially outwardly extended hole 59 which terminates at an enlarged recess 61 on the outer surface of the wall of socket 9.

Molten seal material is introduced into recess 61 by means of an injection tool having a hot runner nozzle 63, the end of which is introduced into recess 61. Molten seal material is then forced down hole 59, along channel(s) 57 into recess 43. The seal material is then allowed to solidify so that it occupies the entire annular recess 43 as well as the channel(s) 57 and hole 59.

The material of the seal 43 can be any suitable thermoplastic elastomer.

Figure 12 of the accompanying drawings illustrates some alternative seal profile which may be made by a method, and apparatus, of the present invention.

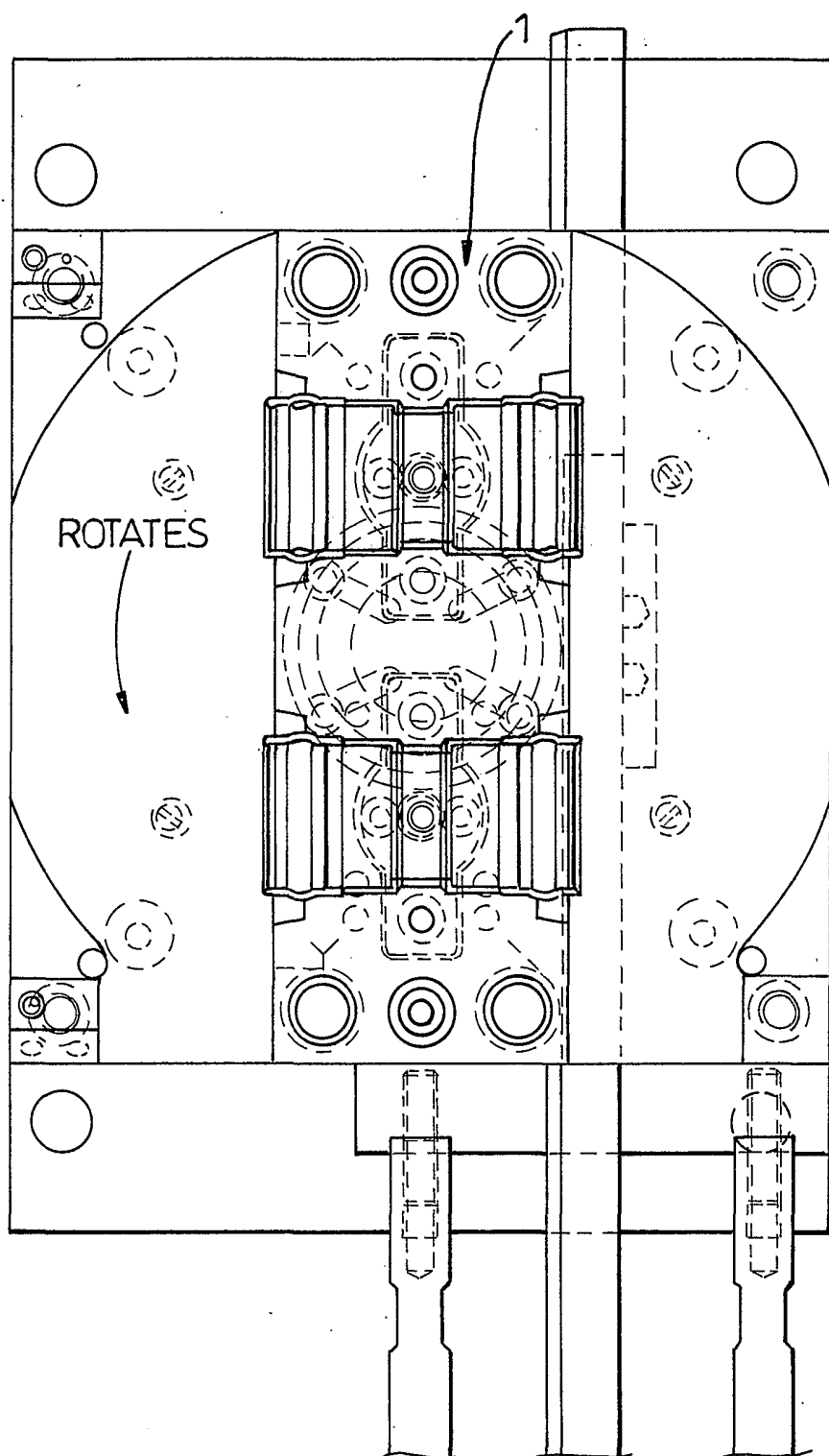
The material of the body of the pipe coupling may be, for instance, polypropylene. The seal material may be a thermoplastic elastomer referred to as a TPE-V material in BS/EN681-2. Such a material is very flexible with a Shore hardness of about 50.

CLAIMS:

1. A method for making a pipe coupling comprising a body portion including a socket and an internal seal located within said socket and for making sealing contact
5 with a pipe end received in the socket, said body portion and said seal being formed of plastics materials, the method comprising, in a first stage, injection moulding said body portion using a first internal core and, in a second stage, injection moulding said seal within said socket using a second internal core and by injecting material for the seal in molten form through the wall of said body portion to a space defined by said
10 body portion and said second core, whereby, on solidifying, said second material adheres to said body portion.
2. A method according to claim 1 wherein said first and second internal cores each include first and second axially separable parts and, after each stage of injection
15 moulding, said first part is moved axially relative to the second part whereby said internal core is moved out of the body portion relatively easily compared with the removal of a corresponding single part core.
3. A method according to claim 2 wherein said first part is provided with an
20 external circumferential groove for accommodating an inwardly directed lip on the socket and said axial movement of said first part relative to said second part causes the lip to move out of the groove thereby widening the mouth of the socket sufficiently to enable relatively unimpeded movement of said second part in a direction out of said socket.
- 25 4. Apparatus for making a pipe coupling comprising a body portion including a socket and an internal seal located within said socket for making sealing contact with a pipe end received in the socket, said body portion and said seal being formed of plastics materials, the apparatus comprising means for injection moulding said body
30 portion using a first internal core and means for injection moulding the seal within said socket using a second internal core, said seal moulding means including means

for injecting material for the seal in molten form through the wall of the body portion to a space defined by the body portion and said second core, whereby, on solidifying, said second material adheres to said body portion.

1/10

***Fig. 1***

SUBSTITUTE SHEET (RULE 26)

2/10

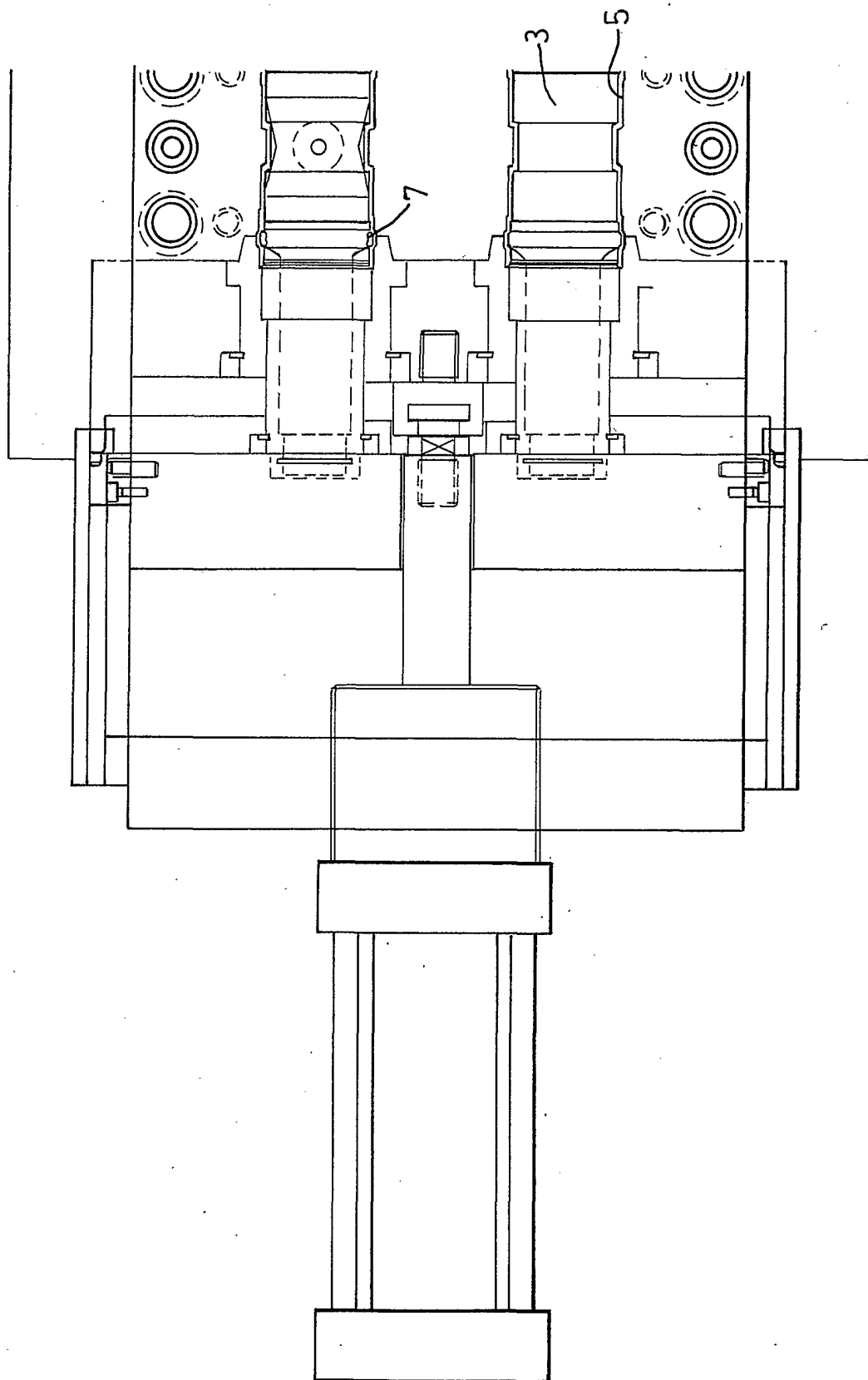


Fig. 2

3/10

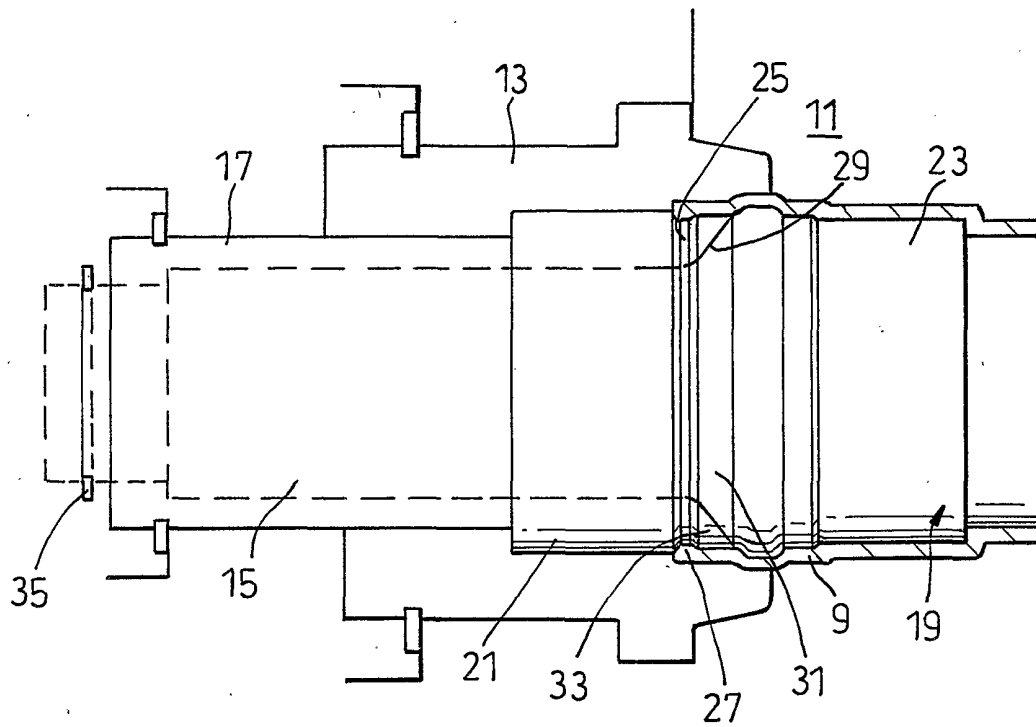


Fig. 3

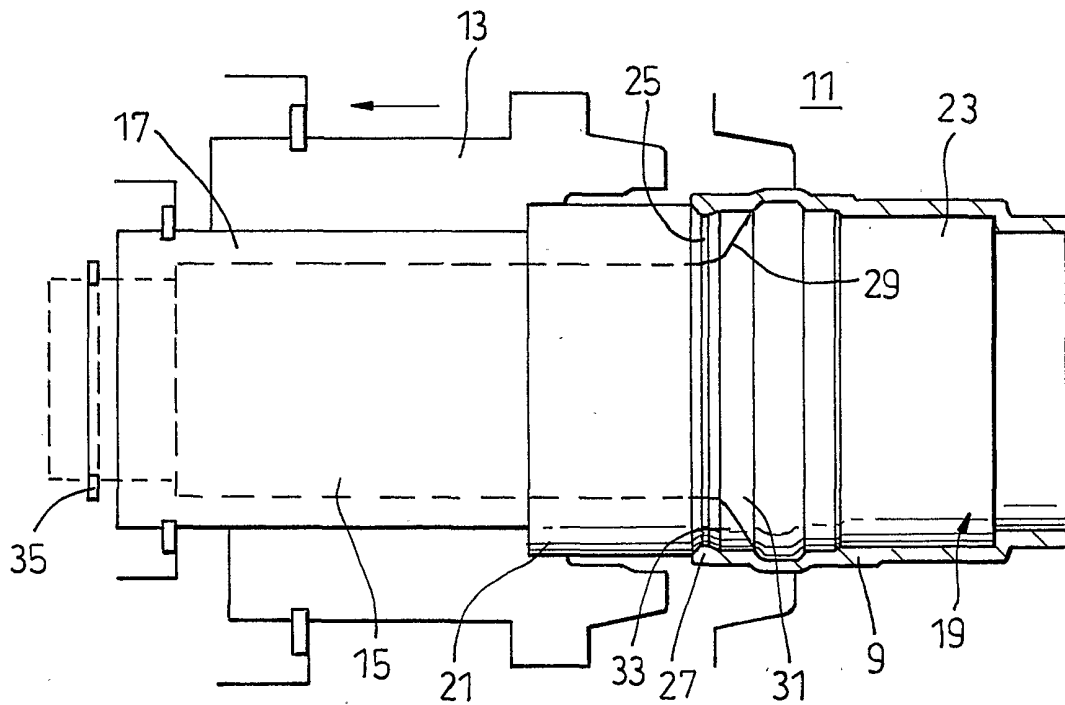


Fig. 4

4/10

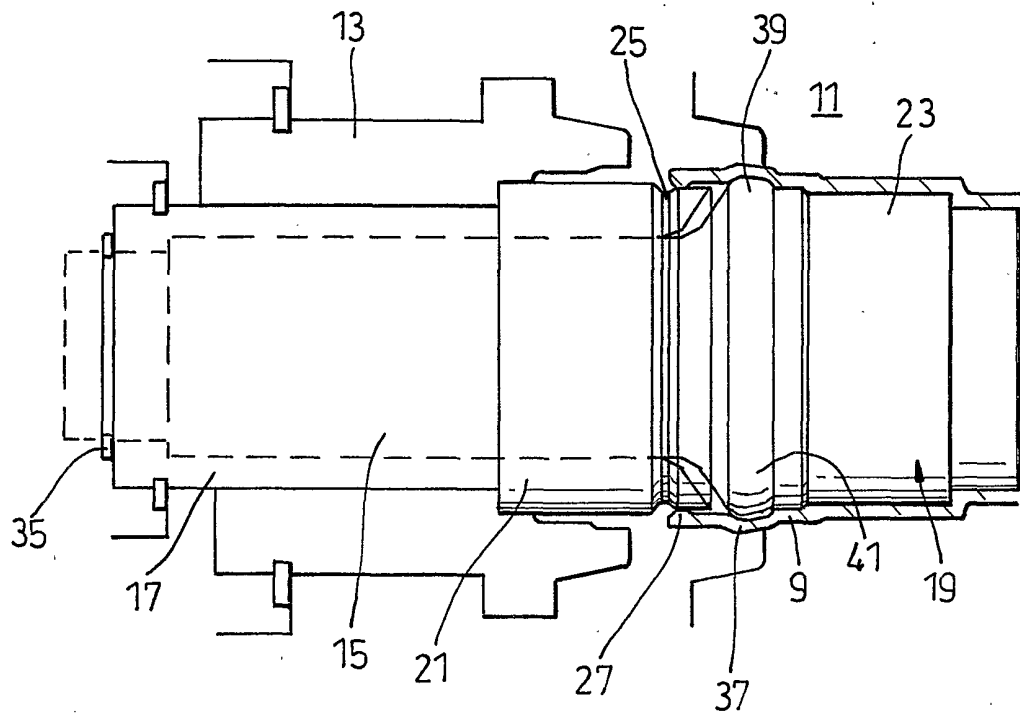


Fig. 5

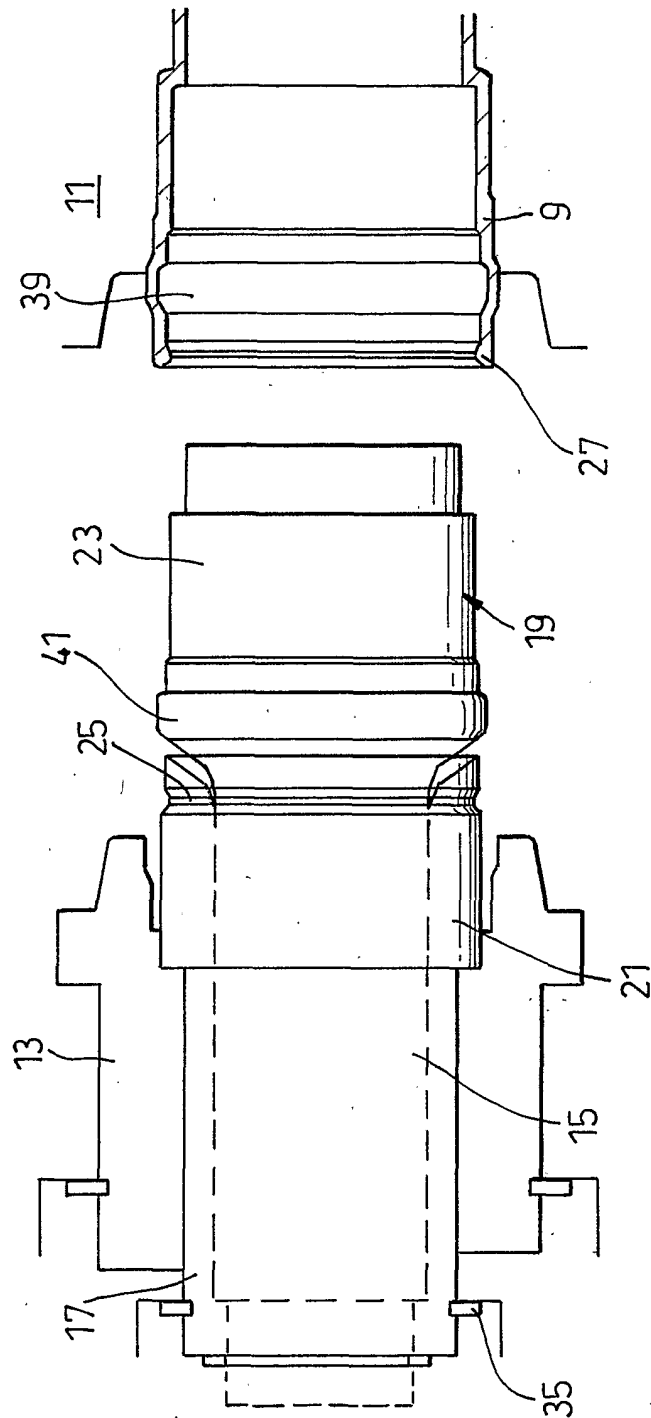


Fig. 6

6/10

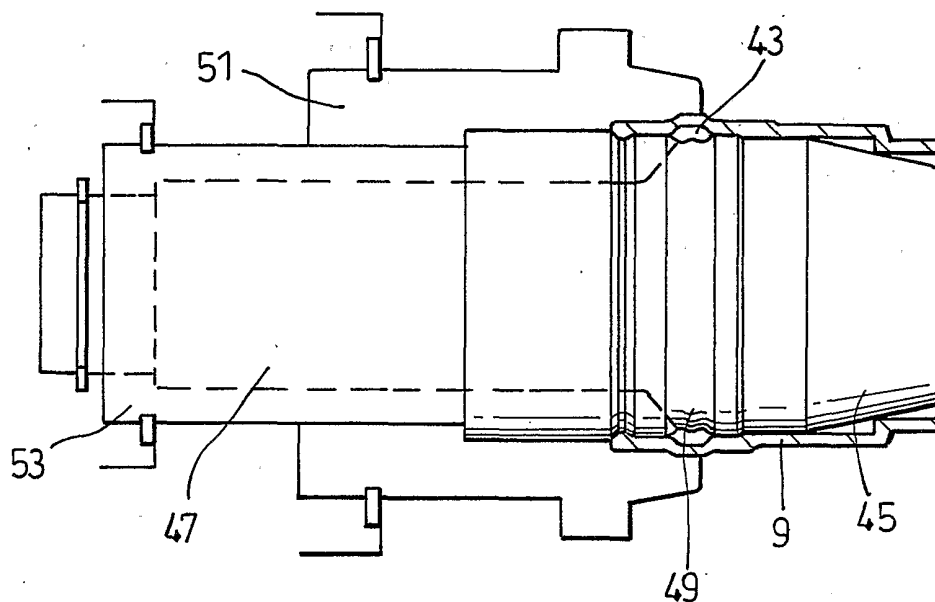


Fig. 7

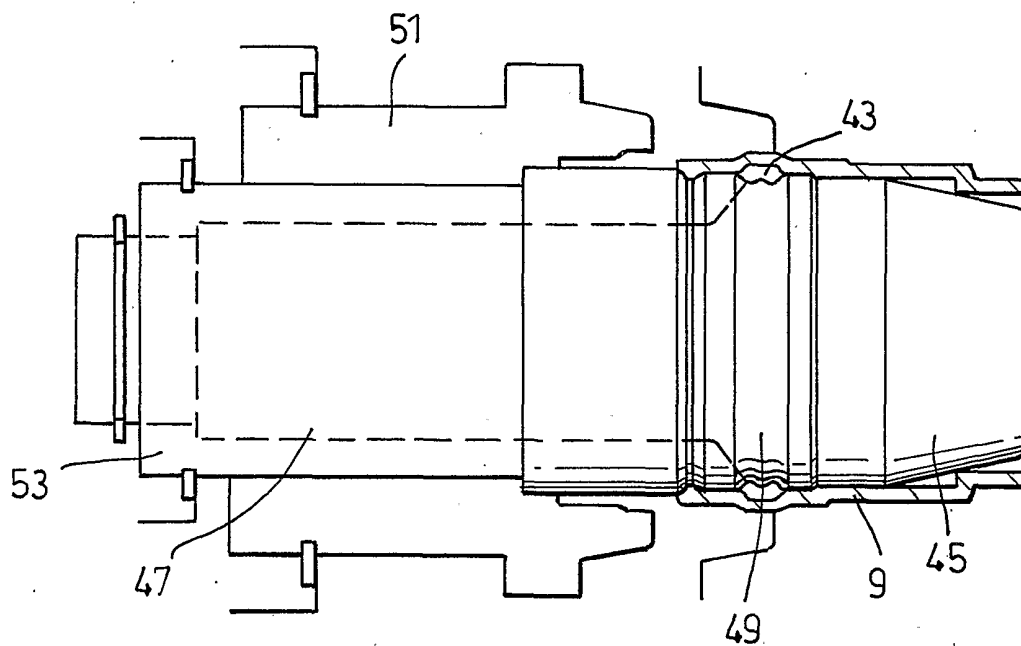


Fig. 8

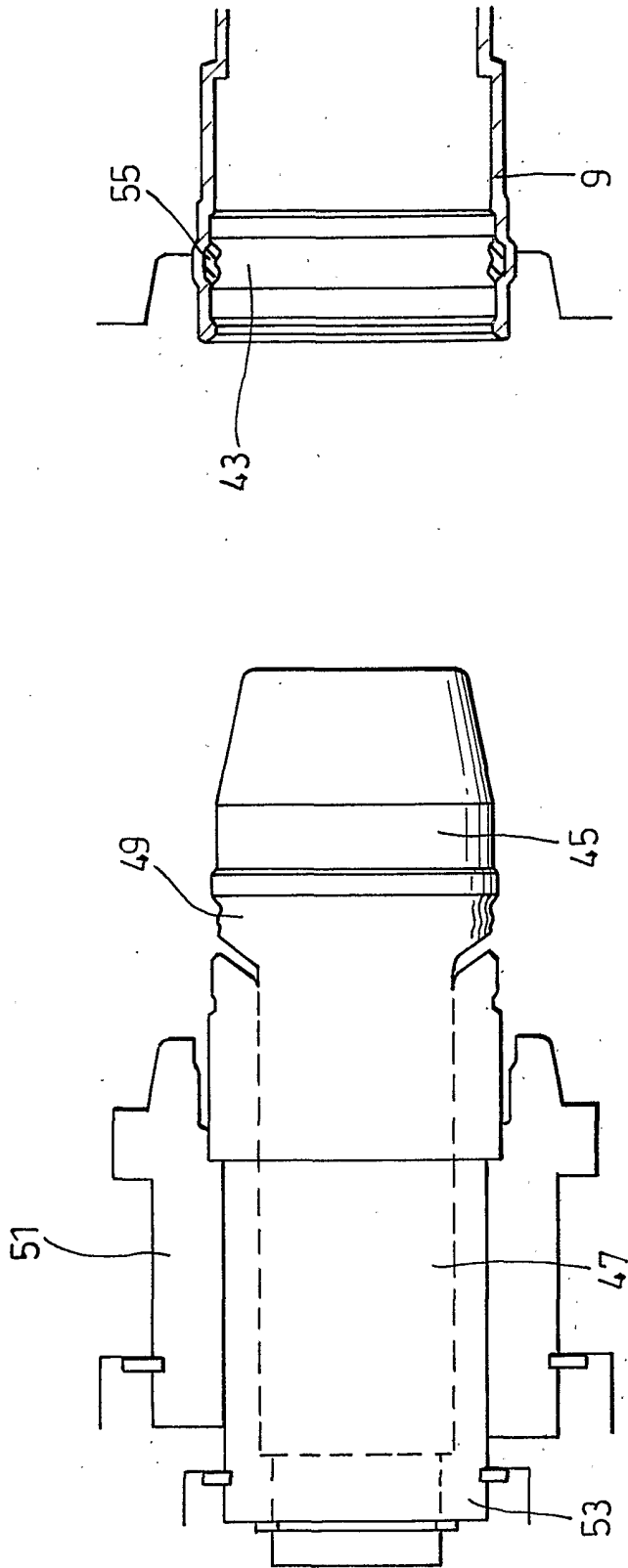


Fig. 10

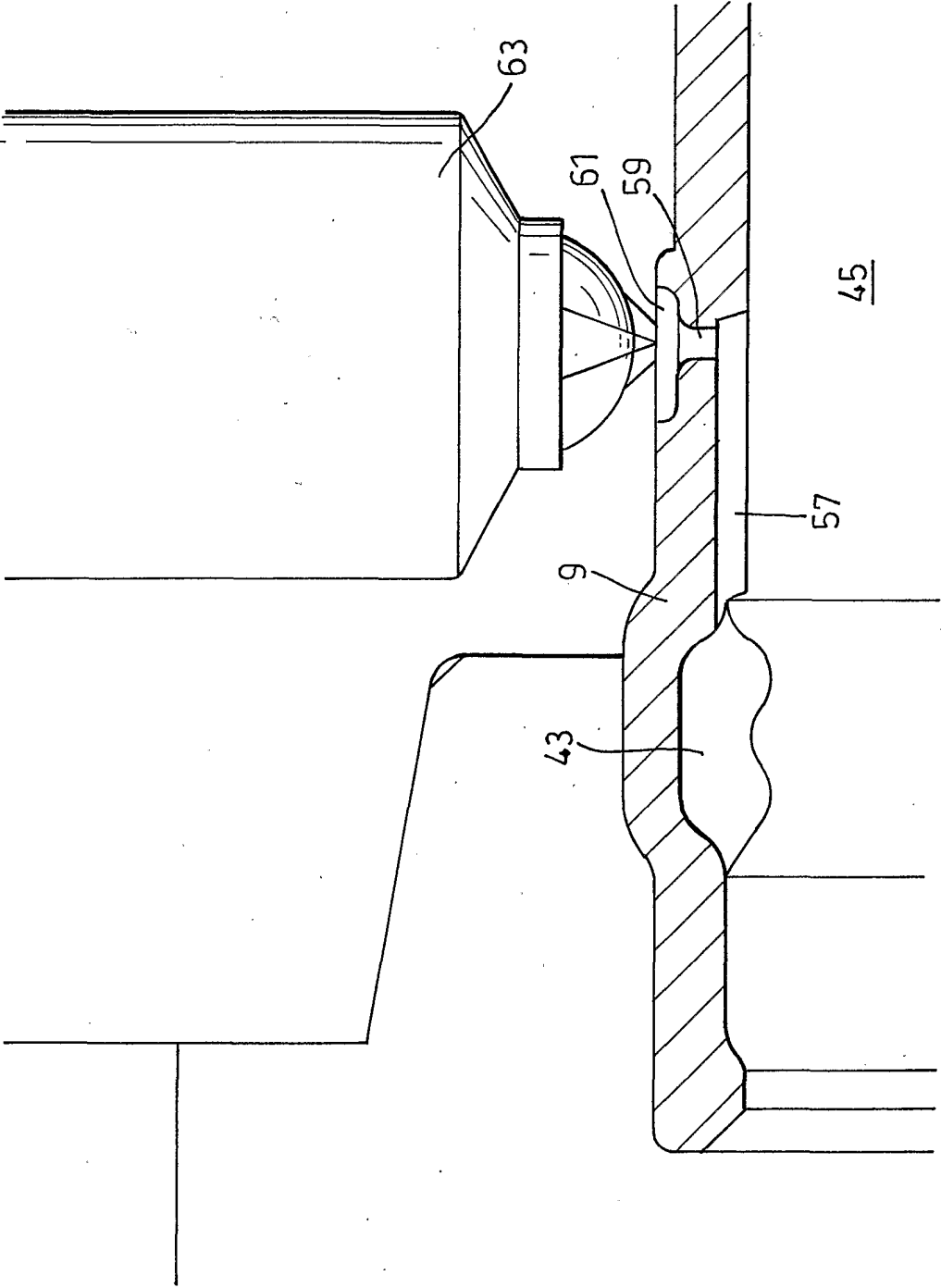


Fig. 11

10/10

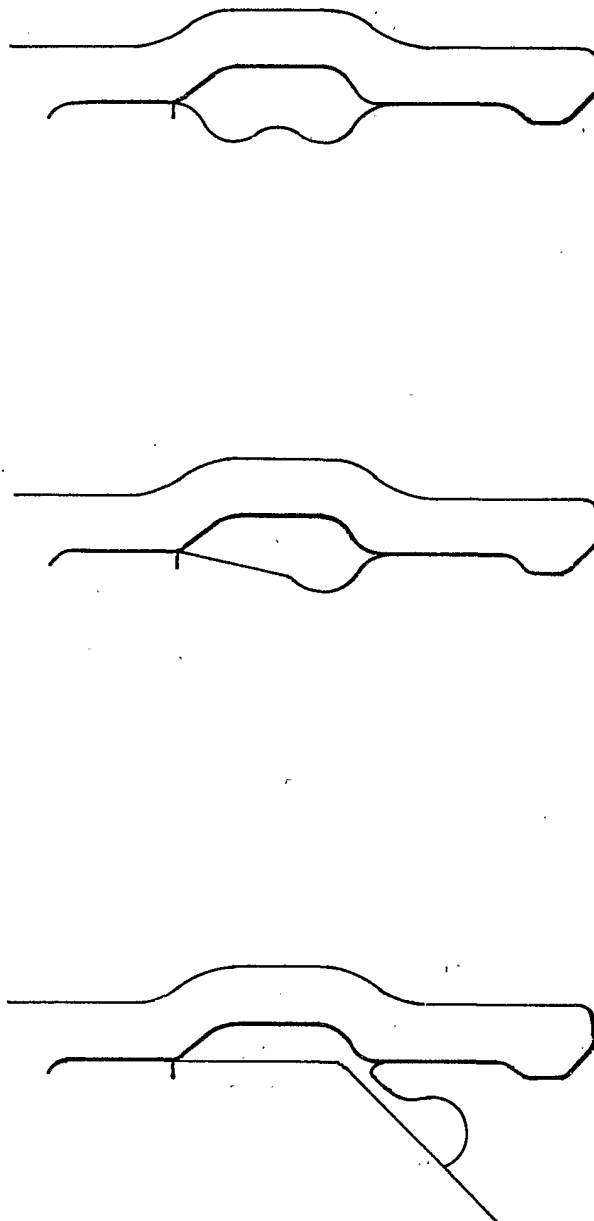


Fig. 12

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 01/01231

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B29C45/16 B29C45/44 F16L47/06

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 F16L B29C B29D

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 477 074 A (HEPWORTH IRON CO LTD) 22 June 1977 (1977-06-22) page 2, line 60 -page 3, line 19 ---	1,4
X	EP 0 936 046 A (INTER TOOLING SERVICES BV) 18 August 1999 (1999-08-18) column 4, line 34 -column 5, line 39 figures 7,8 ---	1,4
A	US 4 842 540 A (ENDO TAKAYOSHI ET AL) 27 June 1989 (1989-06-27) column 3, line 60 -column 5, line 8 ---	1,4
A	GB 2 035 192 A (BATTENFELD MASCHFAB) 18 June 1980 (1980-06-18) page 3, line 1 - line 49 figures 2-4 -----	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

19 July 2001

Date of mailing of the international search report

30/07/2001

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

Alink, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 01/01231

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1477074 A	22-06-1977	AU 500717 B	31-05-1979
		AU 1072176 A	11-08-1977
		BE 838058 A	14-05-1976
		BR 7600594 A	31-08-1976
		CA 1081419 A	15-07-1980
		CS 214730 B	28-05-1982
		DD 124239 A	09-02-1977
		DE 2603393 A	19-08-1976
		DK 30576 A, B	01-08-1976
		ES 444820 A	01-09-1977
		FI 760226 A	01-08-1976
		FR 2299143 A	27-08-1976
		IE 42251 B	02-07-1980
		IT 1057104 B	10-03-1982
		JP 1281526 C	13-09-1985
		JP 52017567 A	09-02-1977
		JP 60002168 B	19-01-1985
		NL 7600937 A	03-08-1976
		NZ 179865 A	03-04-1978
		PT 64746 A, B	01-02-1976
		SE 7600996 A	01-08-1976
		SU 673160 A	05-07-1979
		ZA 7600377 A	26-01-1977
EP 0936046 A	18-08-1999	NL 1008269 C	12-08-1999
		NL 1008949 C	12-08-1999
US 4842540 A	27-06-1989	JP 1814324 C	18-01-1994
		JP 5023030 B	31-03-1993
		JP 63221568 A	14-09-1988
		DE 3807797 A	27-10-1988
GB 2035192 A	18-06-1980	DE 2845308 A	24-04-1980
		DE 2936016 A	12-03-1981
		AT 378498 B	12-08-1985
		AT 668079 A	15-01-1985
		AU 532018 B	15-09-1983
		AU 5188979 A	24-04-1980
		BR 7906682 A	17-06-1980
		CH 643047 A	15-05-1984
		FR 2439077 A	16-05-1980
		IT 1123805 B	30-04-1986
		JP 55063232 A	13-05-1980
		NL 7907705 A	22-04-1980
		NO 793248 A	21-04-1980
		SE 7908591 A	19-04-1980
		US 4410479 A	18-10-1983
		US 4552384 A	12-11-1985