629437

AUSTRALIA

The Patents Act 1952

CONVENTION APPLICATION FOR A PATENT

We, PAUL WURTH S.A., of 32 rue d'Alsace, L-1122 Luxembourg, Luxembourg, hereby apply for the grant of a Patent for an invention entitled:

"APPARATUS FOR INSTALLING OR REMOVING SHAFT FURNACE TUYERES OR TYMPS"

which is described in the accompanying complete specification.

This application is a Convention application and is based on Application No. 87 676 for a patent or similar protection made in Luxembourg on 14th February, 1990.

Our address for service is care of CALLINAN LAWRIE, Patent & Trade Mark Attorneys, of 278 High Street, Kew, Victoria 3101, Australia.

D A T E D this 14th day of December 1990.

PAUL WURTH S.A.

By their Patent Attorneys

CALLINAN LAWRIE

To: The Commissioner of Patents.

M 023501 171290

Form 7 Regulation 11 (2)

Patents Act 1952-1973

Declaration in Support of (a) A Convention Application ~~(b) An Application~~ for a Patent ~~or Patent of Addition~~

(a) Delete for Non-Convention Application.

(b) Delete for Convention Application.

In support of the ~~Application~~/Convention Application made by

(c) Insert Full Name of

(c) PAUL WURTH S.A. hereinafter termed "the said Company"

for a patent/~~Patent of Addition~~ for an invention entitled:

(d) Insert Title of Invention.

(d) "APPARATUS FOR INSTALLING OR REMOVING SHAFT FURNACE TUYERES OR TYMPS"

(e) Insert Full Names of Declarant(s).

~~I~~/We (e) GILBERT BERNARD and CARLO PAQUET

(f) Insert Address(es) of Declarant(s).

of (f) 32, rue d'Alsace, L-1122 Luxembourg, Luxembourg

do solemnly and sincerely declare as follows:—

(g) Delete when Applicant is a Company.

1. (g) ~~I am/we are the Applicant(s) for the patent/Patent of Addition~~

or

(h) Delete when Applicant is an Individual. Fill in Name of Applicant if a Company.

(h) ~~I am~~/we are authorised by PAUL WURTH S.A.

the applicant for the patent ~~Patent of Addition~~ to make this declaration on its behalf.

(i) For Non-Convention Application, delete. For Convention Application, fill in details of basic application.

2. (i) The basic application(s) as defined by Section 111 of the Act was ~~were~~ made in Luxembourg on the 14th day of February, 1990 by PAUL WURTH S.A.

(j) Delete for Non-Convention Application by Assignee of Inventor and for Convention Application.

(k) Delete for Non-Convention Application by Inventor and for Convention Application by Assignee.

3. (j) ~~I am/we are the actual inventor(s) of the invention~~

or

(k) ~~I am/we are the actual inventor(s) of the invention referred to in the basic application.~~

or

PIERRE MAILLIET, of 1 allee Drosbach, L-1423 Howald. Grand Duchy of Luxembourg

(l) Delete for Application by Inventor. For Application by Assignee, insert name, address and occupation of Inventor.

(l)

~~He~~

is/~~are~~ the actual inventor(s) of the invention and the facts upon which ~~I am/are the~~/the said Company is entitled to make the application are as follows:
The said Company would, if a patent was to be granted upon an application made by the said actual inventors, be

(m) Insert details of Assignment, etc. Date of Assignment only is insufficient.

(m) entitled to have the patent assigned to it.

(n) Delete for Non-Convention Application.

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

(n) Insert place and date of signature.

(n) Declared at Luxembourg this 29th day of November 1990

SIGN HERE x PAUL WURTH S.A.

BERNARD Gilbert

To: The Commissioner of Patents.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-68138/90
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 629437

(54) Title
APPARATUS FOR INSTALLING OR REMOVING SHAFT FURNACE TUYERES OR TYMPS

(51)[5] International Patent Classification(s)
F27B 001/10

(21) Application No. : 68138/90 (22) Application Date : 17.12.90

(30) Priority Data

(31) Number	(32) Date	(33) Country
87676	14.02.90	LU LUXEMBOURG

(43) Publication Date : 15.08.91

(44) Publication Date of Accepted Application : 01.10.92

(71) Applicant(s)
PAUL WURTH S.A.

(72) Inventor(s)
PIERRE MAILLIET

(74) Attorney or Agent
CALLINAN LAWRIE , Private Bag 7, KEW VIC 3101

(56) Prior Art Documents
US 4087084
FR 2321543
DE 2530180

(57) Claim

1. Apparatus for installing or removing shaft furnace tuyeres or tymps, which includes a hydraulic ram mounted on a movable support designed to be placed in line with the axis of a tuyere or tymp so as to bear on the furnace wall and to act on a gripper composed of two telescopic members respectively displaceable relative to one another in the axial direction of the tuyere or of the tymp in order to ensure the support of the latter, said gripper being axially displaceable through the action of said ram, wherein said hydraulic ram is a double-piston ram including a traction piston acting on a pulled member of the gripper and a thrust piston acting on a propelled member of the gripper.

629437

AUSTRALIA

Form 10

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:
Lodged:

Complete Specification - Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: PAUL WURTH S.A.

Address of Applicant: 32 rue d'Alsace, L-1122 Luxembourg, Luxembourg

Actual Inventors: Pierre Mailliet

Address for Service: CALLINAN LAWRIE, Patent & Trade Mark Attorney, 278 High Street, Kew, Victoria 3101, Australia.

Complete Specification for the invention entitled:

"APPARATUS FOR INSTALLING OR REMOVING SHAFT FURNACE TUYERES OR TYMPS"

The following statement is a full description of this invention, including the best method of performing it known to me:-

---

APPARATUS FOR INSTALLING OR REMOVING SHAFT FURNACE TUYERES OR TYMPS

The present invention relates to an apparatus for installing or removing shaft furnace tuyeres or tymps, which comprises a hydraulic ram mounted on a movable support designed to be placed in line with the axis of the tuyere or tymp so as to bear on the furnace wall and to act on a gripper composed of two telescopic members respectively displaceable relative to one another in the axial direction of the tuyere or of the tymp in order to ensure the support of the latter, said gripper being axially displaceable through the action of said ram.

An apparatus of this kind is known from Luxemburg Patent No. 65 246. Although this apparatus operates to the satisfaction of its users, the aim of the present invention is to provide a novel, improved apparatus of this kind which gives better performance and is suitable for all forms of tuyeres and tymps.

In order to achieve this aim, the apparatus proposed by the present invention is essentially characterised in that the hydraulic ram is a double-piston ram comprising a traction piston acting on a pulled member of the gripper and a thrust piston acting on a propelled member of the gripper.

The pulled member is preferably a cylindrical rod which has a cross-section smaller than the smallest passage cross-section of the tuyere and which passes axially through the ram from one end to the other. This rod is fixed on a first coaxial sheath passing leak-tightly through the rear face of the ram and, inside the ram, comprises said traction piston.

At its end near the furnace, this rod may be provided with a notch forming a hook intended to grip the inside edge of the tuyere.

The propelled member of the gripper preferably consists of a second coaxial sheath extending around said rod and partly around the first sheath and leaktightly passing through the front face of the ram, this sheath

comprising, inside the ram, the aforesaid thrust piston.

A cylindrical extension may be provided for fastening on the free end of said second sheath, so as to bear against the outside edge of the tuyere.

The hydraulic ram support is preferably provided with means for modifying the inclination of the ram relative to the horizontal.

For the purpose of manipulating the tymp, a grab is provided for hooking the tymp to the gripper, said grab being designed to be fixed on the propelled member of the gripper and to be actuated by the pulled member.

This grab preferably comprises three pairs of convergent legs adapted to be engaged in the tymp, three claws housed respectively between each of the three pairs of legs and distributed regularly at intervals of 120° around the pulled member. By their ends near the ram, these claws bear on an end plate fixed on the propelled member and at the opposite end are adapted to open out and retract radially towards respective closed and open positions through the action of an axial displacement of the pulled member.

The three claws can be opened out by means of three curved spring blades provided on a sleeve fixed on the pulled member, while the retraction of the claws against the action of the spring blades can be effected by means of cams provided on said sleeve and associated with inclined ramps on the claws, through the action of an axial displacement of the pulled member.

In addition, each claw is preferably axially displaceable between stops provided on the corresponding legs.

In order to facilitate the unlocking both of the tuyere and of the tymp, it is preferable to provide a compressed-air percussion hammer fixed on said first sheath and acting directly on the rod of the pulled member.

Further features and characteristics will emerge from the description of several preferred embodiments, which are described below by way of illustration and with

reference to the accompanying drawings, in which:

Figure 1 shows schematically a longitudinal section of a simplified version of the apparatus according to the present invention, in the introduced position for the extraction of the tuyere;

Figure 2 is a similar view showing the apparatus in the horizontal position;

Figure 3 is a similar view of the apparatus when the ram is operated to hook the tuyere;

Figure 3a is a vertical section in the sectional plane A-A in Figure 3;

Figure 4 is a horizontal section in the plane B-B in Figure 3;

Figures 5 and 6 illustrate two successive phases of the extraction of the tuyere;

Figure 7 is a vertical section of a preferred embodiment provided with a device for hooking the tymp;

Figures 7a, 7b, 7c and 7d are respectively sections in the sectional planes A-A, B-B, C-C, D-D in Figure 7;

Figure 8 is a similar view to that shown in Figure 7, in the tymp-release phase;

Figures 9 to 13 illustrate the operation of a first embodiment of a hydraulic ram with the aid of partial axial sections showing different phases of the operation;

Figure 14 is a longitudinal section of the first embodiment of the hydraulic ram;

Figure 15 shows a second embodiment of the hydraulic ram;

Figure 16 shows a first modification of the first or second embodiment of the hydraulic ram;

Figure 17 shows a second modification of the first or second embodiment of the hydraulic ram.

The first embodiment of the apparatus according to the present invention is illustrated in Figures 1 to 6 and is shown in connection with its implementation for the extraction of a tuyere 20 wedged in a tymp 22, which in turn is held in the main arch 24 of the shaft furnace

wall 26.

The apparatus comprises essentially a double-piston hydraulic ram 28 for actuating a gripper 30 composed of telescopic members. This gripper 30 comprises a pulled member 32 consisting of a long cylindrical rod 32 and a pushed or propelled member 34. The rod 32 passes axially right through the hydraulic ram 28 and its rear end is fixed to a first sheath 36 lying coaxially around the rear portion of the rod 32 and housed leaktightly in the rear face of the ram 28. This sheath 36 is designed, inside the ram 28, in the form of a hydraulic piston 38 acting on the rod 32. The propelled member 34 is designed in the form of a second cylindrical sheath 40 disposed coaxially around the rod 32 and around the front portion of the first sheath 36. This second sheath 40 is housed leaktightly in the front face of the ram 28 and forms, inside the latter, a propelled hydraulic piston 42. By virtue of this design of the hydraulic ram, of which several embodiments will be described below, it possible to actuate the two members 32 and 34 of the gripper 30 either separately from one another or together.

The propelled member 34 of the gripper 30 may be extended by a cylindrical extension 44 lying around the rod 32 and intended to bear against the outer face of the tuyere 20. The rod 32 is in turn provided at its free end with an oblique notch 46 forming a hook adapted to be engaged around the inside edge of the tuyere 20.

A description will now be given, with reference to Figures 1 to 6, of the different phases of the extraction and removal of the tuyere. In this context, it should first be recalled that tuyeres are generally disposed in such a manner as to inject hot air downwards into the furnace, so that, as illustrated in the figures, the tuyeres are so disposed that their longitudinal axis forms an angle of the order of 5° to the horizontal.

For the purpose of removing a tuyere 20, the apparatus, which is mounted on a movable carriage (not shown), is brought to the tuyere in question and is

inclined in such a manner that the axis of the rod 32 is situated in line with the axis of the tuyere 20, this being achieved with the aid of a support 48 shown schematically, without details, in Figure 3 and making it possible in a manner known per se to vary the inclination of the ram 28 and gripper 30. The apparatus is then moved in the direction of the axis of the tuyere 20 in order to cause the rod 32 to penetrate through the latter, as illustrated in Figure 1, the end of the rod 32 preferably being pointed to assist its penetration into the tuyere 20. From the position shown in Figure 1, the ram 28 can be straightened to occupy a horizontal position axially in alignment with the tymp 22 and the main arch 24.

In the position shown in Figure 2, the ram 28 is put into action, thereby, having regard to the particular arrangement of the pistons 38 and 42, giving rise to a movement of the latter in the opposite direction, as illustrated by comparison of Figures 2 and 3. This operation of the ram 38 consequently brings about the forward movement of the propelled member 38 until the extension 44 comes into contact with the outer surface of the tuyere 20, and the backward movement of the pulled member 32 of the gripper 34 until the notch 46 comes into contact with the inside edge of the tuyere 20, so that the latter is hooked by a crescent-shaped surface 52 of the notch 46, as shown in Figure 3a. The tuyere 20 is from then on held between the movable members of the gripper 30. At that moment the phase of extraction of the tuyere 20 starts. For this purpose, the hydraulic pressure between the two pistons 38 and 42 is maintained, while the chamber at the rear of the piston 38, around the sheath 36, is decompressed, so that the hydraulic pressure of the ram 42 is converted into traction on the rod 32. In order to restrain the counterreaction of this tractive force, it is preferable to provide the ram 28 with a bracket 50 bearing against the main arch 24. On the other hand, in view of the fact that when the tuyere (or the tymp) is forced into place the counterreactions

take place in the opposite direction, it is preferable that the bracket 50 should be so designed that it can also be hooked onto the main arch.

The traction on the rod 32 first frees the tuyere 20 from its seat inside the tymp 22, as shown in Figure 5, and extracts it through said tymp until the traction piston 38 has completed its stroke. From this position, which is illustrated in Figure 5, the tuyere 20 can be completely disengaged by the recoil of the carriage (not shown) on which the apparatus is mounted. The installation of a new tuyere 20 comprises the same phases of operation as are described above, but of course in the reverse order.

Before a new tuyere 20 is installed, it is also possible to remove the tymp 22. For this purpose, the extension 44 used for removing the tuyere 20 is replaced by a grab 60, which is shown in Figures 7 to 8 and which is fixed on the free end of the propelled member 34 and makes it possible to grip and support the tymp 22.

Apart from the presence of the grab 60, the embodiment illustrated in Figures 7 and 8 differs from the embodiment shown in the preceding figures through the presence of a compressed-air percussion hammer 62. A percussion hammer of this type, which is known per se can be fixed outside the ram 28 on the first sheath 36, while the rod 32 is extended into the interior of the hammer 62, where it is actuated directly by the latter. The aim of this percussion hammer 62 is to assist the ram 28 in the initial phase of the disengagement of the tymp 22 for the purpose of freeing it from its seat. It is obviously possible to use the apparatus shown in Figure 7 with a percussion hammer 62 for the disengagement of the tuyere 20 after replacing the grab 60 by the extension 44.

The grab 60 is composed of a support consisting of three pairs of legs 62, 64 fixed in a star pattern on a plate 66 attached to the end of the propelled member 34 of the gripper 30. These three pairs of legs extend axially around the rod 32 and converge slightly towards

the end of the latter to match the frustoconical shape of the tymp 22. These legs 62, 64 are in addition encircled by a collar 68 in order to give them rigidity and to bear against the outer edge of the tymp 22 (see also Figure 7-D).

The grab 60 also comprises three claws 70 provided respectively between each of the three pairs of legs 62, 64 and designed in the form of elongate flat levers, one end of which bears against the end plate 66, while the opposite end is designed in the form of a hook 72 which, in the closed position of the grab 60 as shown in Figure 7, is hooked behind the inside edge of the tymp 22. In this position the tymp is consequently held between the collar 68 and the three hooks 72 of the three grippers 70.

Comparison of Figures 7c and 7d shows that the outside part of the claws, at the end near the end plate 66, is relatively narrow, while the inside part at the opposite end is thicker. The transition between the narrow part and the wider part of each of the claws 70 is formed by at least one inclined ramp 74, preferably two such ramps, one on each side of each of the claws 70 (see Figure 7). Each of the three claws 70 is in addition provided with two lateral snugs 76, 78 intended respectively to cooperate with stops 80, 82 provided on the corresponding opposite inside faces of the legs 62, 64.

The operation of the claws 70 of the grab 60 is effected with the aid of a hollow member engaged on the end of the rod 32 and consisting of a cylindrical sleeve 84 fastened to a plate 86. This member is held in place with the aid of a key 88 engaged through a diametrical opening in the rod 32 and corresponding openings in two lugs 90, 92 extending from the end plate 86 in a direction parallel to the rod 32 towards the end of the latter (see Figures 7a and 7b).

Three longitudinal grooves 94 on the cylindrical sleeve 84 extend radially towards the outside and are regularly distributed at intervals of 120° around the

sleeve 84 to correspond respectively to each of the pairs of legs 62, 64 and to contain respectively each of the three claws 70. Cams 96 are disposed on the inside flanks of the three grooves 94 (see Figure 7) and are intended to cooperate with the inclined ramps 74 of each of the claws 70. Each of the three grooves 94 also contains spring blades 98 (see Figures 7 and 7c) provided on the sleeve 84, the elasticity of said springs tending to curve them as shown in Figure 7.

Comparison with Figures 7 and 8 will show that the grab 60 is operated by radial opening-out or retraction of the inside ends of each of the claws 70, this operation being brought about by the axial displacement of the rod 32 through the action of the ram 28, the operation of said rod being as follows: for the purpose of freeing the tymp 22 from the closed position of the gripper 30 and of the grab 60, the rod 32 is displaced to the right in Figure 7, the member 34 remaining in place. When the rod 32 is displaced in this manner, the end plate 86 first frees the inside end of each of the three claws 70, while the cams 96 move nearer to the ramps 74 of the claws. From the moment when the cams 96 come into contact with the ramps 74, the claws 70, which are not fixed to the grab support either in the longitudinal direction or in the radial direction, are also driven to the right until the snugs 76, 78 on the claws 70 are halted by the stops 80, 82 on the legs 62, 64. This axial translation of the claws 72 is sufficient to disengage them axially from the inside face of the tymp 22. Continuation of the movement of the rod 32 to the right in Figure 7 causes the cams 96 to act on the inclined ramps 74 in view of the fact that the claws 70 are now halted by the stops 80, 82. As shown in Figure 8, this brings about the radial retraction of each of the claws 70 against the action of the spring blades 98, which are flattened and yield to the force of the cams 96 on the inclined ramps 74. When the claws 70 are completely retracted and occupy the position shown in Figure 8, the gripper 30 and the grab 60 can be extracted

axially through the tymp 22, displacing first the member 34 under the action of the ram 28 to the left and then the ram 28 with the gripper 30.

The removal of a tymp comprises the same sequences as the installation of a tymp, but in the reverse order. However, this removal will be described below in greater detail with reference to Figures 7 and 8 and with the assistance of Figures 9 to 13, which show schematically partial views of the ram, for the purpose of explaining the operation of the embodiment of the ram which is illustrated in the preceding figures. As shown in Figure 9, the piston 38 defined for the needs of the description as a traction piston slides leaktightly inside the ram 28, where it forms two annular chambers 100 and 102. Each of these chambers 100 and 102 is connected to a hydraulic liquid pipe, 104 and 106 respectively, these pipes being designated P when the pipe is connected to the hydraulic pump and T when it is connected to the reservoir, that is to say when it is not under pressure. The piston 42, referred to hereinafter as a thrust piston, moves in the chamber 102. Unlike the traction piston 38, the thrust piston 42 has a cross-section smaller than the cross-section of the chamber 102 and does not move leaktightly in the latter. On the other hand, the thrust piston 42 can slide leaktightly on the sheath 36 to which the traction piston 38 is fastened.

For the purpose of removing the tymp 22, the apparatus is brought into the position shown in Figure 8, the gripper 30 being in the open position, that is to say the claws 70 are retracted. The penetration of the gripper 30 through the tymp 22 is achieved through the action of the hydraulic ram 28. For this purpose, the first chamber 100 is pressurised through the pipe P, while the second chamber 102 is depressurised through T. Consequently, the piston 38 is propelled to the right in Figure 9, driving the piston 42 with it, which means that the two members 32 and 34 move forward together to the right in Figure 8, but that their mutual positions do not change. This movement is continued as far as the position

shown in Figure 8, which corresponds for example to the positions of the pistons 38 and 42 shown in Figure 9.

In this position, the hydraulic connection 106 of the second chamber 102 is changed over to the pressure P (see Figure 10). The pressure of the hydraulic liquid is consequently the same in the two chambers 100 and 102, which means that the piston 38 is subjected to the same pressure on both sides. However, since its exposed surface in the chamber 102 is greater than that exposed to the pressure of the chamber 100, this piston 38 is subjected to a differential force which moves it to the left in Figure 9. As regards the piston 42, for the same reasons, that is to say because its exposed surface on the left is greater than that exposed on the right, this piston is subjected to a differential force towards the right, but since the grab 60 is wedged on the tymp 22 by the collar 68 and since the member 34 of the gripper 30 cannot move in that direction, the thrust piston 42 remains in place despite the differential force to which it is subjected.

The displacement of the piston 38 gives rise to traction on the rod 32, which consequently is displaced to the left from the position shown in Figure 8. This movement effects the disengagement of the cams 96 from the inclined ramps 74 of the claws 70, in order to free the latter from the action of the spring blades 98. The elastic deformation of these blades 98 to the position shown in Figure 7 and the continuation of the movement of the rod 32 bring about the sliding of the claws 70 through the action of the end plate 86, to the left to the position shown in Figure 7, in which the tymp 22 is hooked between the claws 70, on the one hand, and the collar 68 on the other hand.

From that moment it is possible to actuate the percussion hammer 62 in order to free the tymp 22 from its seat on the main arch 24. At the same time, the chamber 100 is depressurised by connecting the pipe 104 to T (see Figure 11).

The piston 38 is consequently subjected to the

full pressure of the chamber 102, so that it is pushed back to the left up to the position shown in Figure 12. This means that the tymp 22 is extracted from the main arch 24 through the action of the traction of the rod 32 and of the plate 86. The piston 42 must obviously follow the movement of the piston 38 through the action of the traction applied to the gripper 30 by the rod 32, despite the fact that it is exposed to a differential force towards the right, which force in addition holds the gripper closed. During this extraction phase, the ram is held bearing against the main arch by means of the bracket 50 shown in Figure 4 and not shown in Figures 7 and 8. Figure 12 illustrates the end of the operation of the ram 28 during the phase of removal of the tymp 22. The operation of the ram 28 during the removal of a tuyere 20 is comparable to that described above (Figures 1 to 5).

Figure 13 illustrates the operation of the ram 28 during the installation of a tuyere or a tymp wedged in the closed gripper 30. For this purpose, the chamber 100 is placed under hydraulic pressure by connecting the pipe 104 to P in order to push back the piston 38 and also the rod 32 to the right in Figure 13. However, during this movement phase it is not possible to connect the chamber 102 to T, because it is necessary for the piston 42 to be subjected to a certain pressure towards the right so that the gripper remains closed. It is likewise not possible to connect the chamber 102 to P, because it is necessary that the piston 38 should be able to be pushed back towards the right. The compromise consists in maintaining in the chamber 102 an intermediate pressure by connecting the pipe 106 to a pressure equivalent to a fraction of the pressure P, for example one third of P.

Figures 14 to 17 illustrate different forms of construction of the hydraulic ram intended for operating the gripper. Each of these figures shows the top part of the ram in the closed position of the gripper, and the bottom part in the open position of the gripper. Figure

14 shows once again the ram already described with reference to Figures 9 to 13, the only difference being the renaming of the pipes 104 and 106 as A and B respectively. In this figure the top part of the ram, above the longitudinal axis, corresponds to the position illustrated in Figure 10, whereas the bottom part, below the longitudinal axis, corresponds to the position shown in Figure 9. Figure 15 illustrates a second form of construction of a ram 128, whose essential difference from the form of construction shown in Figure 14 is the fact that the two pistons 138 and 142 have the same diameter and are both guided leaktightly in the cylinder of the ram 128. These two pistons 138 and 142 can consequently define between them, depending on their positions, a third chamber 144 which is connected to the hydraulic circuit by a third pipe C. The closing of the gripper 30 is effected by pressurising the chamber 144 by connecting C to P and connecting the outer chambers A and B to the reservoir T. The gripper thus closed can be introduced together with the tymp or the tuyere into the main arch 24 by connecting A to P, or be withdrawn from the main arch 24 by connecting B to P. The opening of the gripper 30 is effected by depressurising the chamber 144 to T of the reservoir and connecting the communications A and B to the hydraulic pressure P. The open gripper can then be moved on one side or the other, depending on whether it is A or B which is connected to the pressure T of the reservoir. In this embodiment, illustrated in Figure 15, the pistons 138 and 142 are therefore no longer subjected to differential pressure effects, so that lower hydraulic pressures are sufficient to actuate them. This embodiment also has the advantage of offering more operating possibilities and easier control.

The table below is a summary table of the operation of the rams shown in Figures 14 and 15 for all the possible movements, with an indication of the connection of the connections A, B or C either to the hydraulic pressure P or to the reservoir pressure T.

	Figure 14	Figure 15
1. Gripper closed	A : P B : P	A : T B : T C : P
a. Introduced	A : T B : P	A : T B : P C : P
b. Withdrawn	A : P B : 1/3 P	A : P B : T C : P
2. Gripper open	A : P B : T	A : P B : P C : T
a. Introduced	A : P B : T	A : P B : T C : T
b. Withdrawn	only by displacement of the entire apparatus	A : T B : P C : T

Figures 16 and 17 illustrate two variants of the embodiment shown in Figure 15, each having a means of limiting the amplitude of the closing of the gripper. This means that the gripper cannot be closed beyond a certain limit, the purpose of this being in particular to prevent accidents when the gripper is not loaded with a tuyere or a tymp.

In the variant shown in Figure 16, the means limiting the closing movement of the gripper 30 is composed of the sheaths 136 and 140, which are respectively fastened to the pistons 138 and 142. As shown in Figure 16, the end of the sheath 136 on the side of the gripper 30 has a projecting edge 136a which extends into a corresponding internal widening 140a of the sheath 140. The closing movement of the gripper 30 consequently stops when the inside edge of the projection 136a is halted by the corresponding edge of the widening 140a, which means that the reserve of movement indicated by 146 has disappeared.

In the variant shown in Figure 17, the movement-limiting means consists of the pistons 138 and 142. In this variant, one of the pistons, in this particular case the piston 138, has a diameter smaller than the inside diameter of the hydraulic cylinder, while the other piston, in this particular case the piston 142, is extended in the direction of the piston 138 by a tube 148 which extends through the annular space between the piston 138 and the inside wall of the cylinder of the ram 128 and which, beyond the piston 138, ends in a radial edge forming a circular opening of a diameter smaller than the outside diameter of the piston 138, so that the latter is halted, in its movement closing the gripper 30, by this edge 148a. The piston 138 must of course be guided leaktightly inside the tube 148.

The movement-limiting means shown in Figures 16 and 17 have been illustrated in connection with the embodiment shown in Figure 15. However, they can equally well be provided in the embodiment shown in Figure 14.

The claims defining the invention are as follows:

1. Apparatus for installing or removing shaft furnace tuyeres or tymps, which includes a hydraulic ram mounted on a movable support designed to be placed in line with the axis of a tuyere or tymp so as to bear on the furnace wall and to act on a gripper composed of two telescopic members respectively displaceable relative to one another in the axial direction of the tuyere or of the tymp in order to ensure the support of the latter, said gripper being axially displaceable through the action of said ram, wherein said hydraulic ram is a double-piston ram including a traction piston acting on a pulled member of the gripper and a thrust piston acting on a propelled member of the gripper.

2. Apparatus according to claim 1, wherein in said pulled member is a cylindrical rod whose section is smaller than the smallest passage section of the tuyere and which passes axially through the ram from one end to the other, said pulled member being fixed on a first coaxial sheath passing in a substantially leaktight manner through the rear face of the ram and, inside the ram, includes the said traction piston.

3. Apparatus according to claim 2, wherein said rod is provided, at its end near the furnace, with a notch forming a hook intended to grip the inside edge of the tuyere.

4. Apparatus according to anyone of claims 1 to 3, wherein said propelled member is composed of a second coaxial sheath extending around said rod and partly around said first sheath and in a substantially leaktight manner passing through the front face of the ram, said sheath including, inside the ram, said thrust piston.

5. Apparatus according to claim 4, wherein a cylindrical extension is adapted to be fixed on the free end of said second sheath, so as to bear against the outside of the tuyere.

6. Apparatus according to any one of the preceding claims, wherein said support of the ram is provided with means for modifying the inclination of the ram relative to the horizontal.

7. Apparatus according to any one of the preceding claims, including a grab for hooking the tymp to the gripper, said grab being designed to be fixed on the propelled member of the gripper and to be actuated by the pulled member.

8. Apparatus according to claim 7, wherein said grab includes three pairs of convergent legs adapted to be engaged in the tymp, three claws housed respectively between each of the three pairs of legs and distributed regularly at intervals of 120° around the pulled member, said claws bearing, by their ends near the ram, on a plate fixed on the propelled member and being at the opposite end adapted to open out and retract radially towards respective closed and open positions through the action of an axial displacement of the pulled member.

9. Apparatus according to claim 8, wherein the opening out of the three claws is ensured by three curved spring blades provided on a sleeve fixed on the pulled member, and wherein the retraction of the claws against the action of the spring blades is effected by cams provided on said sleeve and associated with inclined ramps on the claws and through the action of an axial displacement of the pulled member.

10. Apparatus according to claim 9, wherein each claw is axially displaceable between stops provided on the corresponding legs.

11. Apparatus according to any one of claims 1 to 10, including a compressed-air percussion hammer fixed on said first sheath and acting directly on the rod of the pulled member.

12. Apparatus according to any one of claims 1 to 11, wherein said traction piston and said thrust piston have a differential action, and wherein said thrust piston has a smaller diameter than said traction piston.

13. Apparatus according to any one of claims 1 to 11, wherein said traction piston and said thrust piston are identical to one another and define three hydraulic chambers disposed respectively on either side of and between the pistons.

14. Apparatus according to claim 12 or claim 13, wherein said ram is provided with a means limiting the amplitude of the closing of the gripper.

15. Apparatus according to claim 14, wherein said limiting means consists of corresponding stops provided respectively on the first and second sheaths.

16. Apparatus according to claim 14, wherein said limiting means consists of a cylindrical tube fastened to one of the pistons and extending beyond the other piston, said tube being provided with a projecting edge holding back the latter.

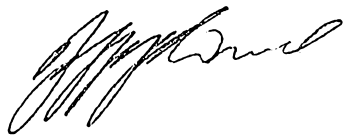
17. Apparatus for installing or removing shaft furnace tuyeres or tymps, substantially as described herein with reference to the accompanying drawings.

DATED the 14th day of December, 1990

PAUL WURTH S.A.

by their Patent Attorneys

CALLINAN LAWRIE



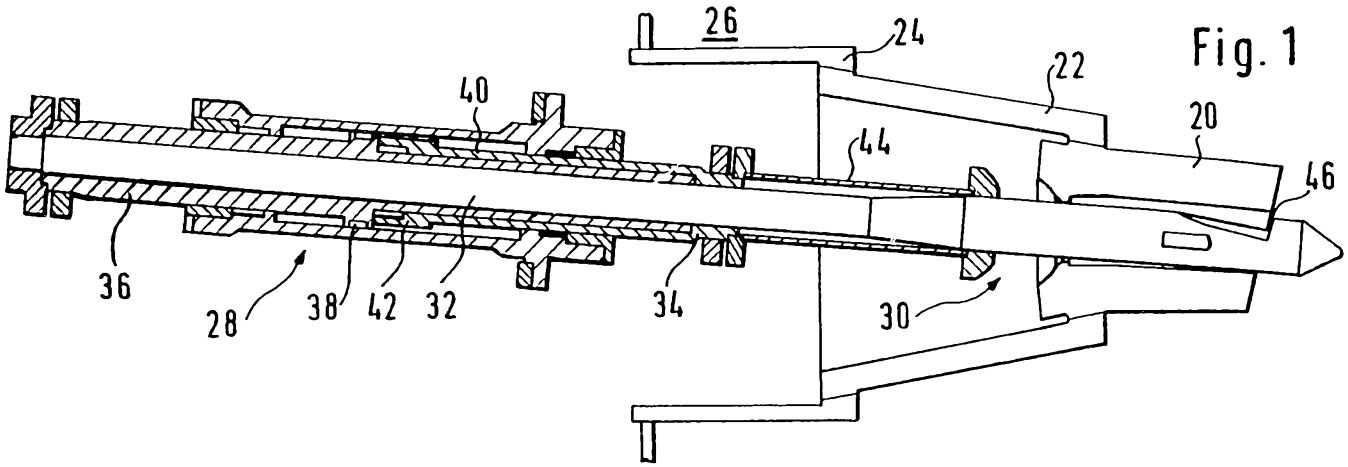


Fig. 1

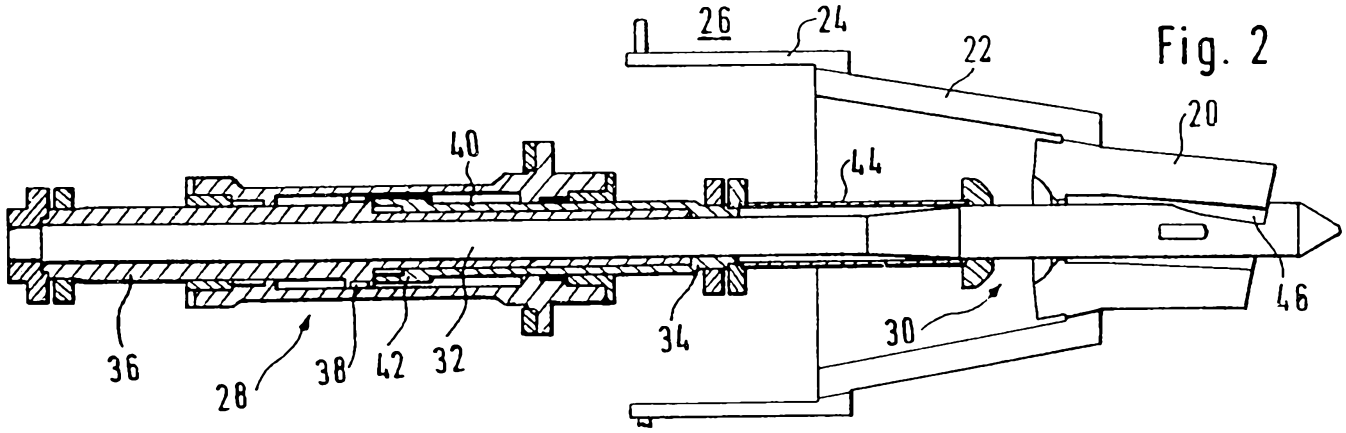


Fig. 2

68138/90

17 12 90 64138

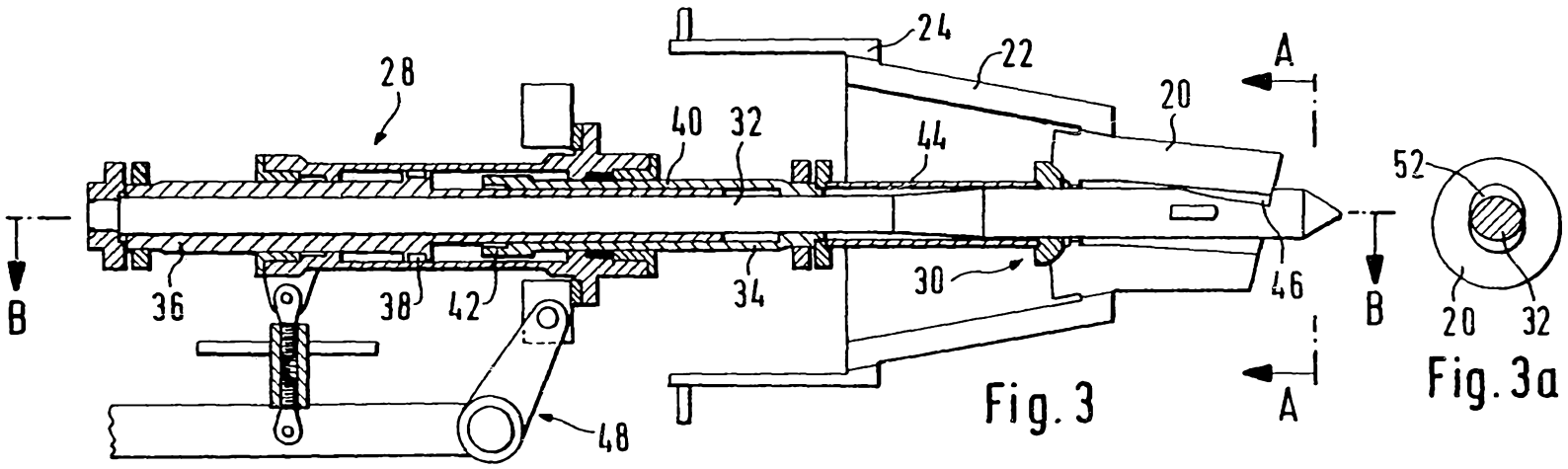


Fig. 3

Fig. 3a

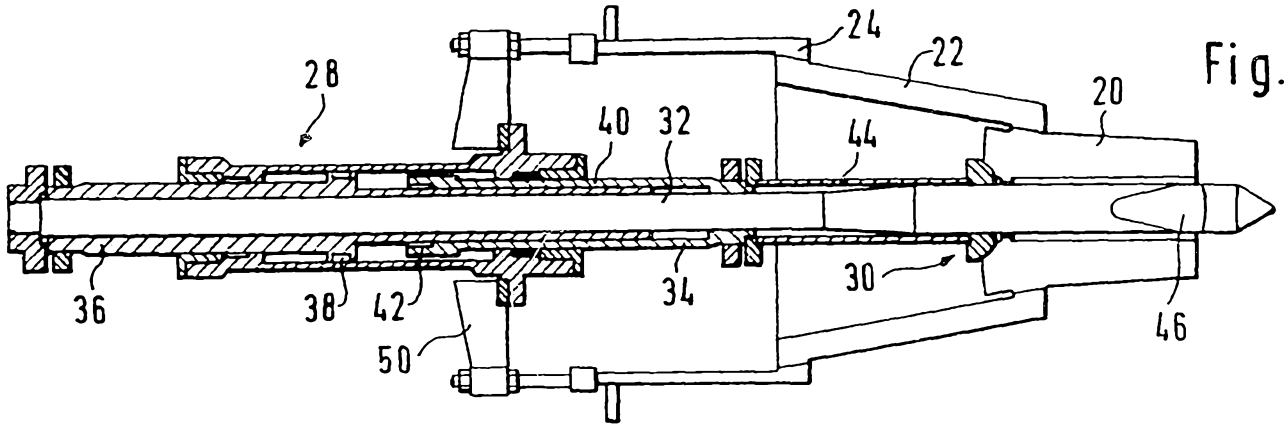


Fig. 4

Fig. 5

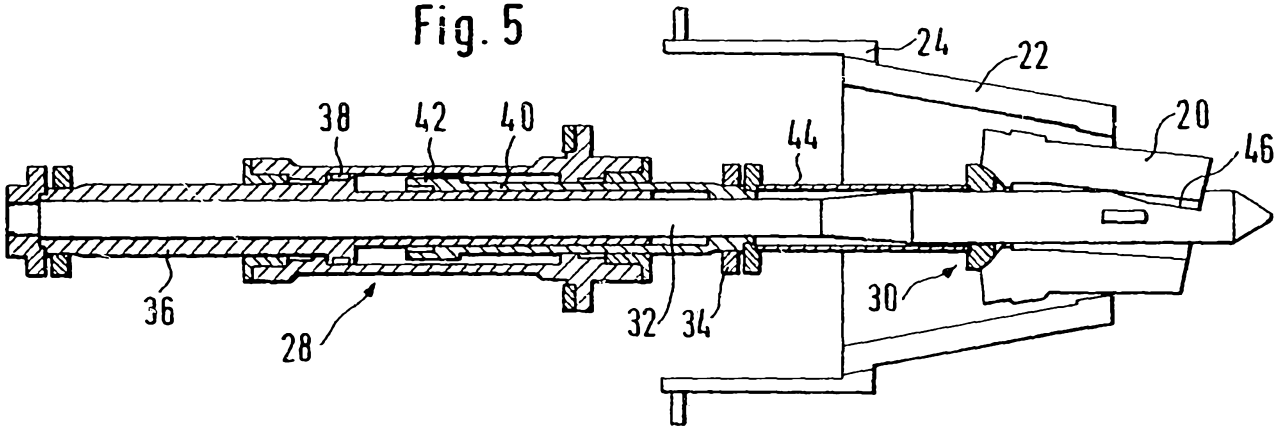
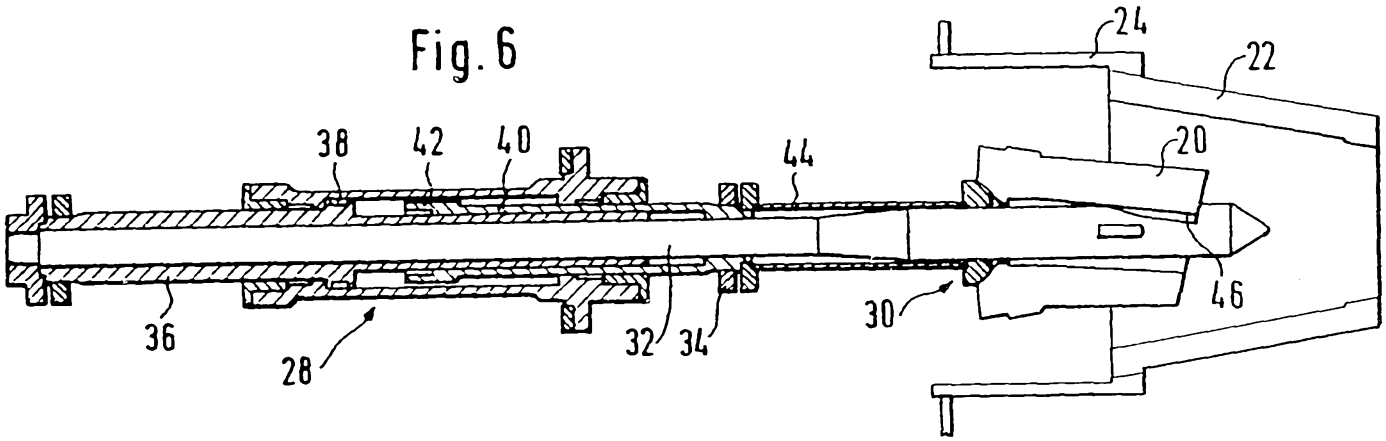


Fig. 6



681538/90

Fig.7

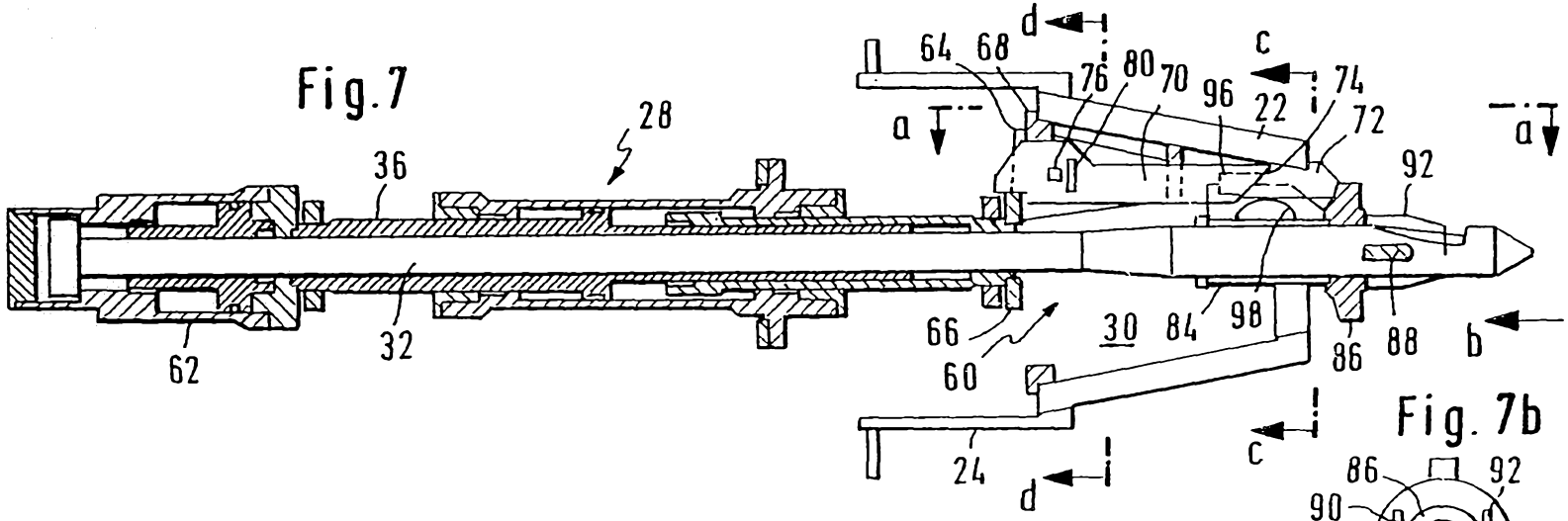
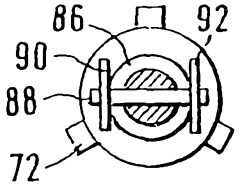


Fig.7b



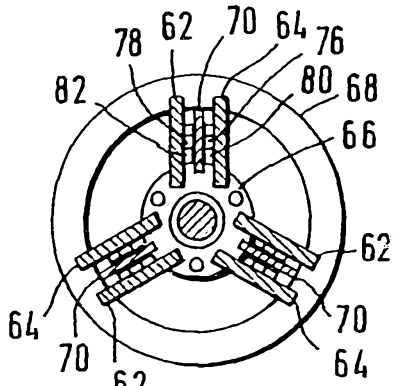


Fig.7d

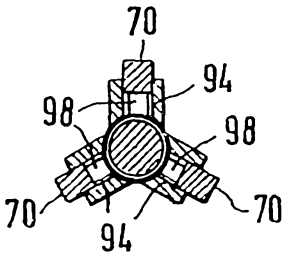


Fig.7c

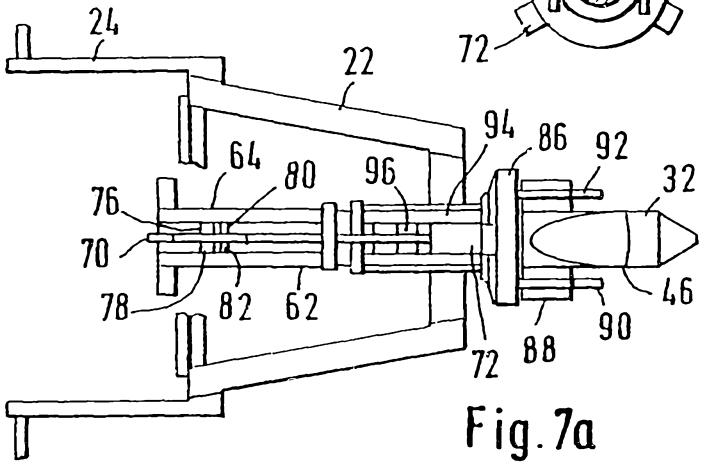


Fig.7a

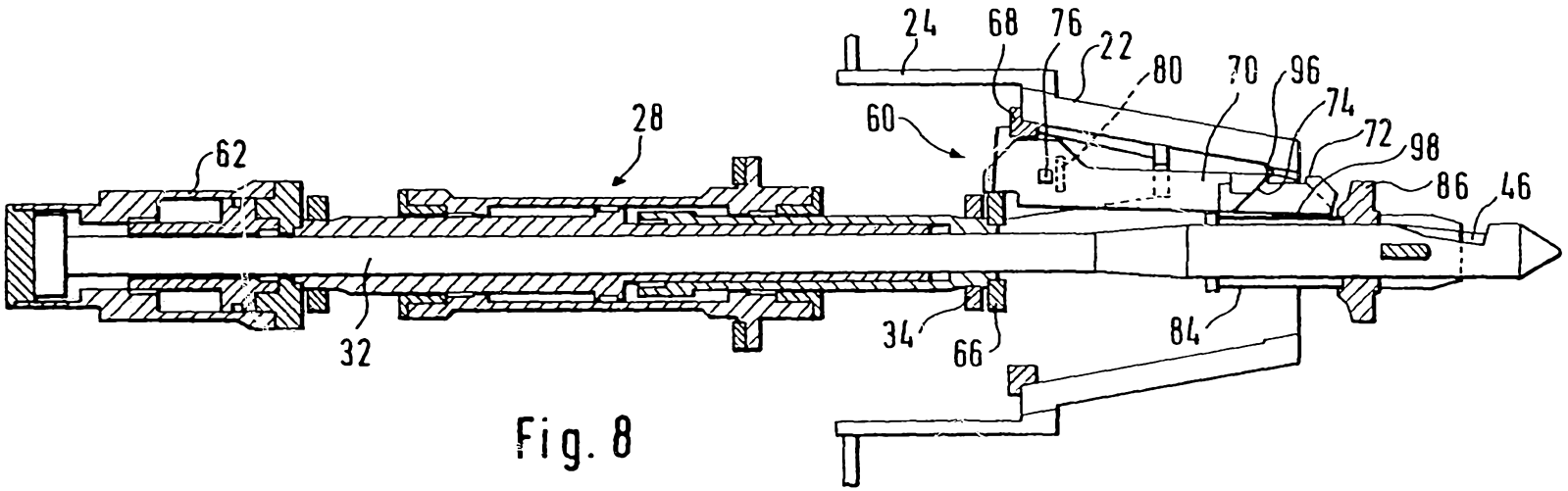


Fig. 8

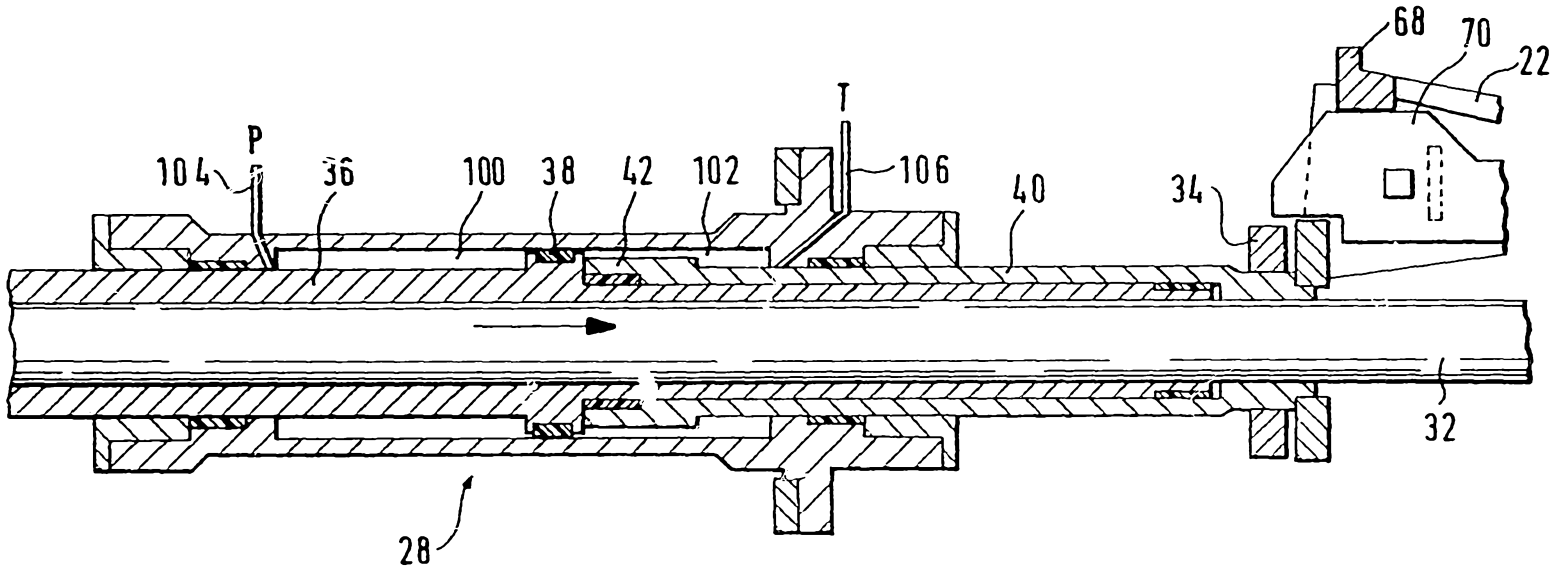


Fig. 9

17 12 90 64138

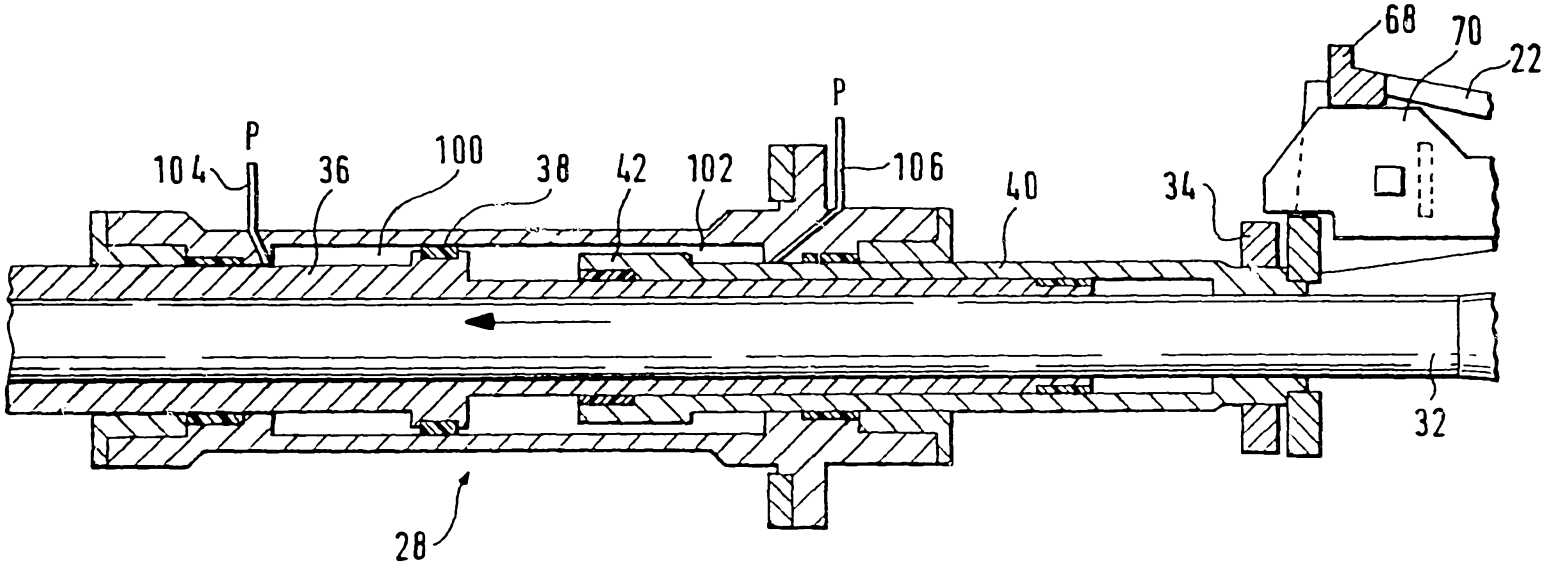


Fig. 10

17 12 90 68136

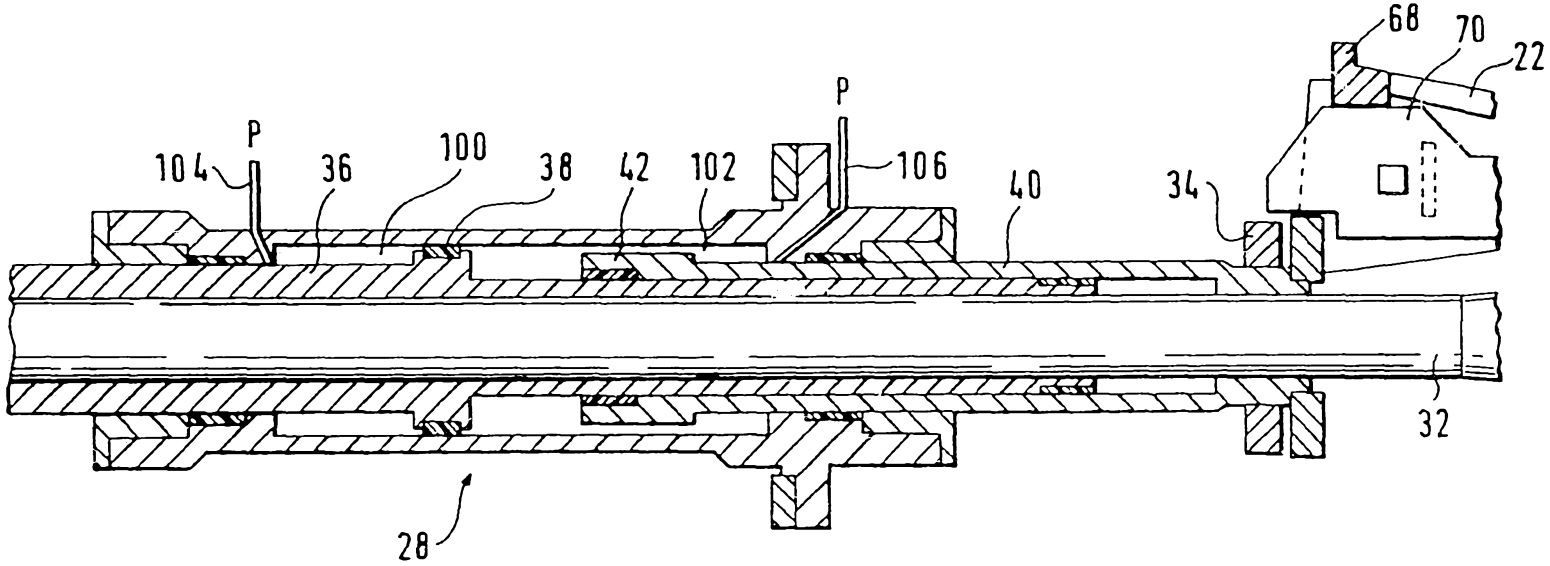


Fig.11

IP 12 90 68136

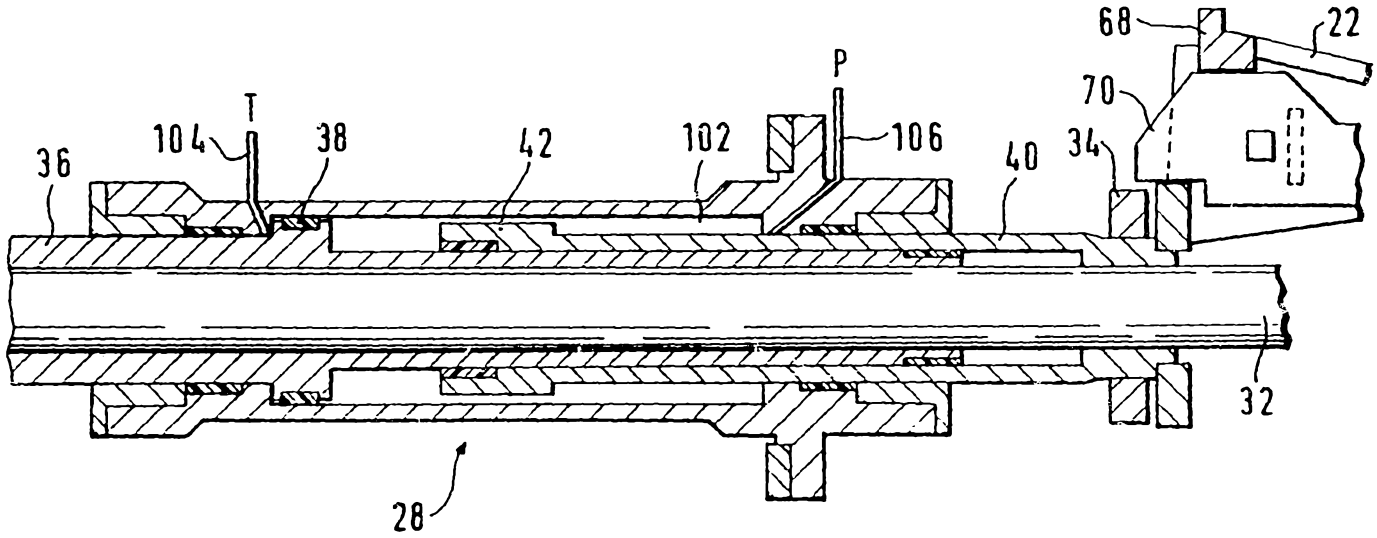


Fig. 12

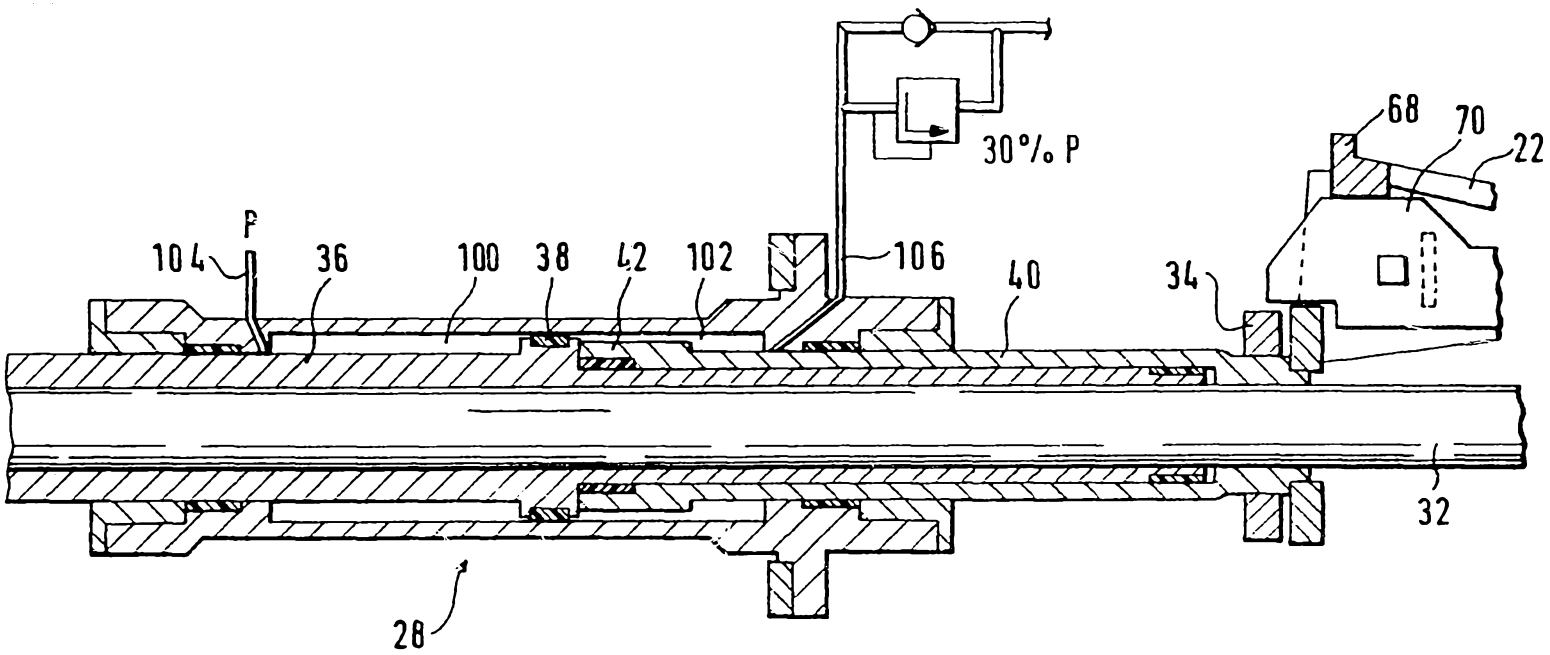


Fig. 13

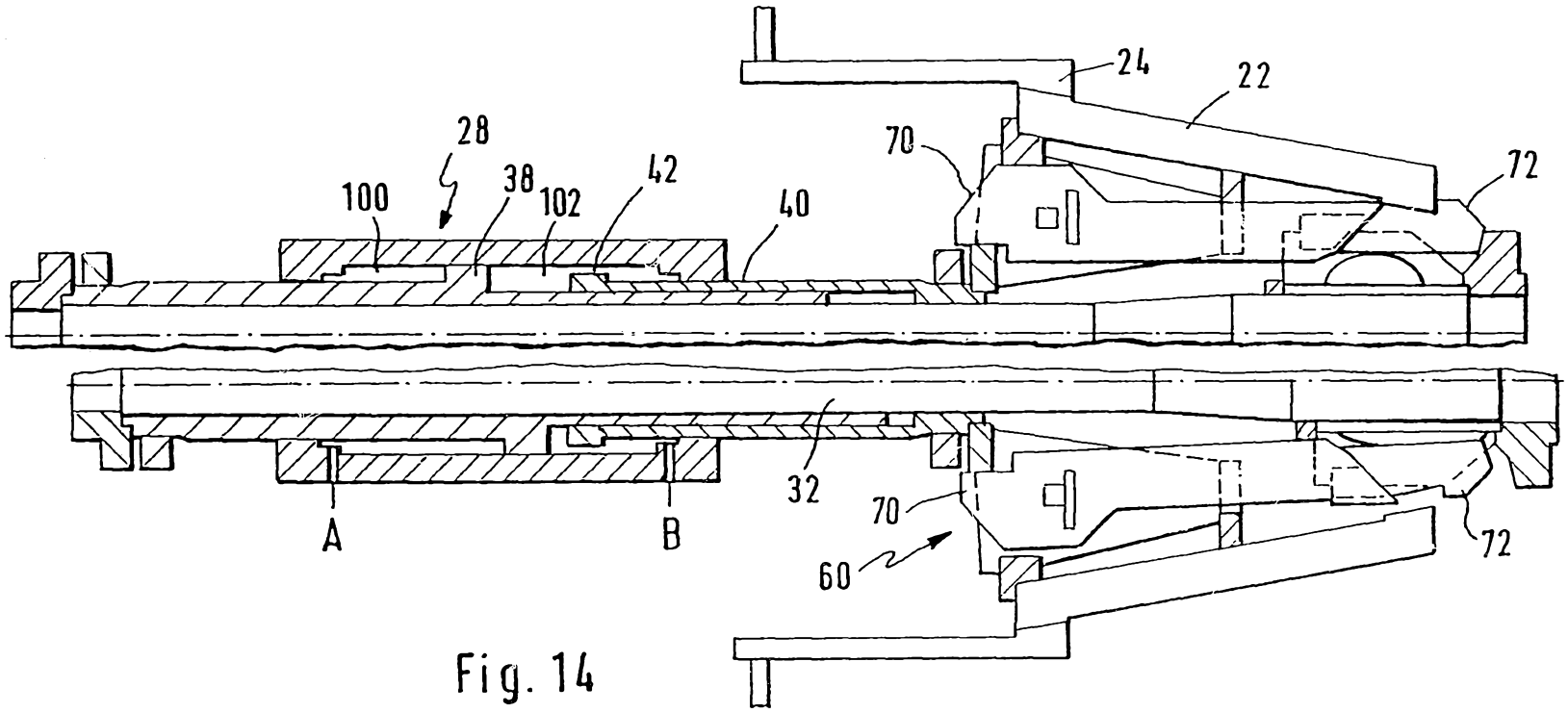


Fig. 14

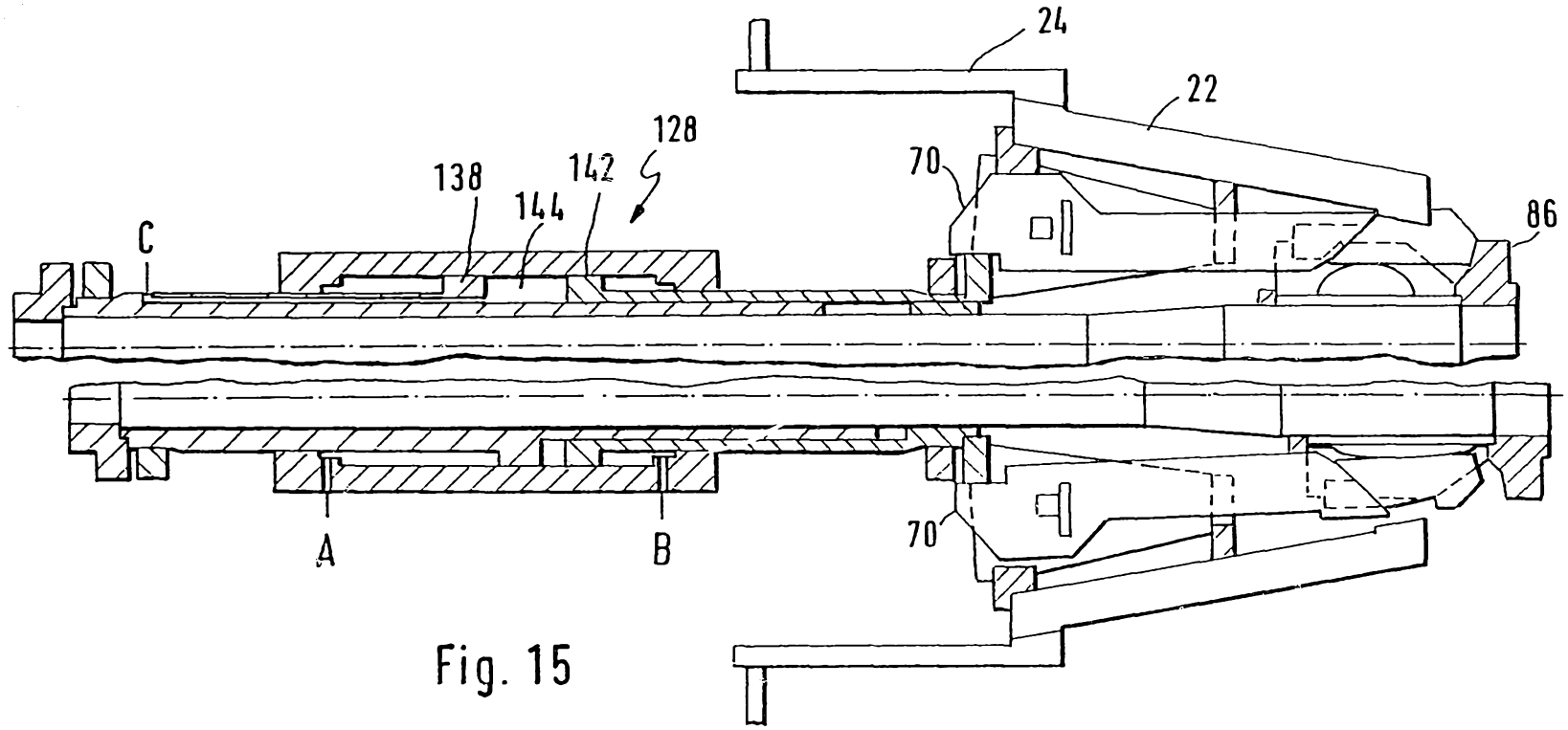


Fig. 15

Fig.16

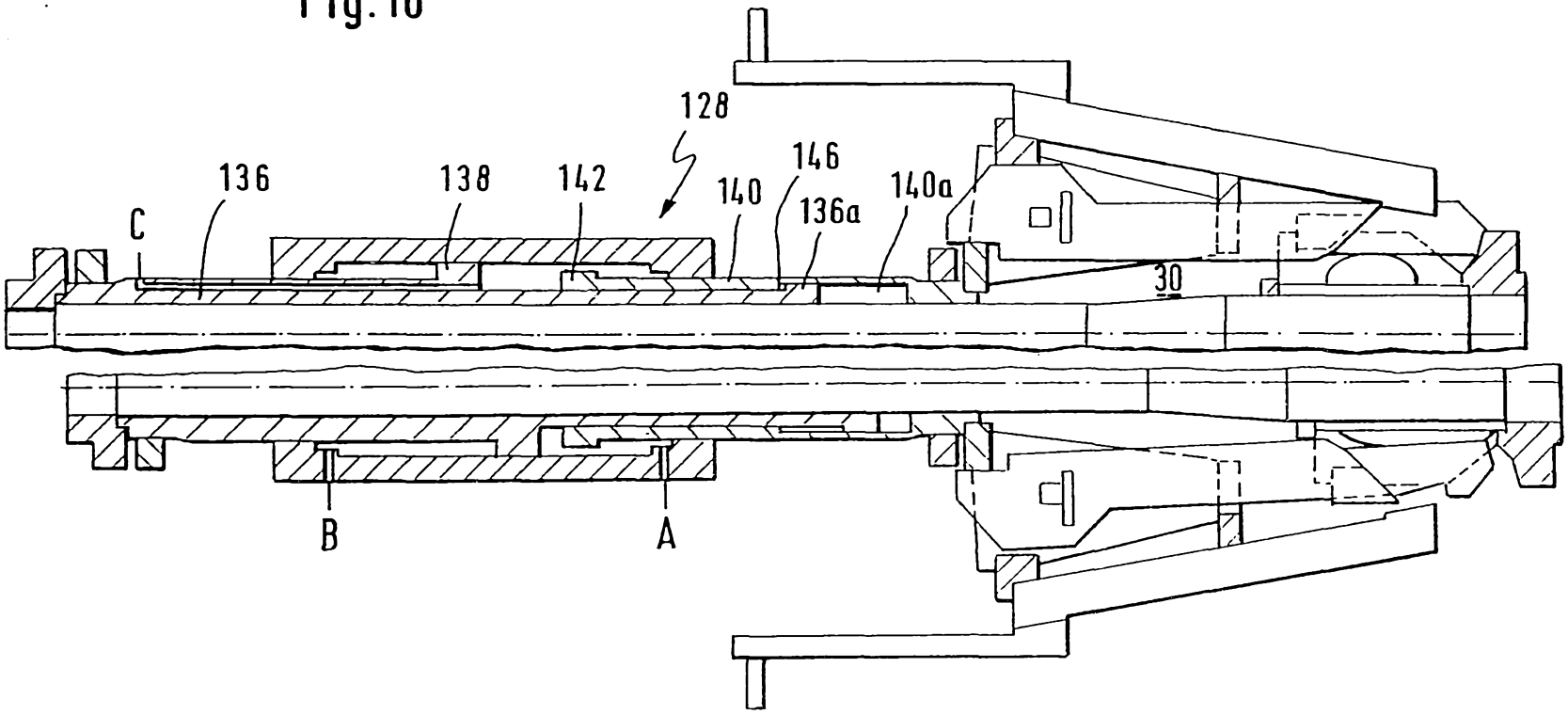


Fig.17

