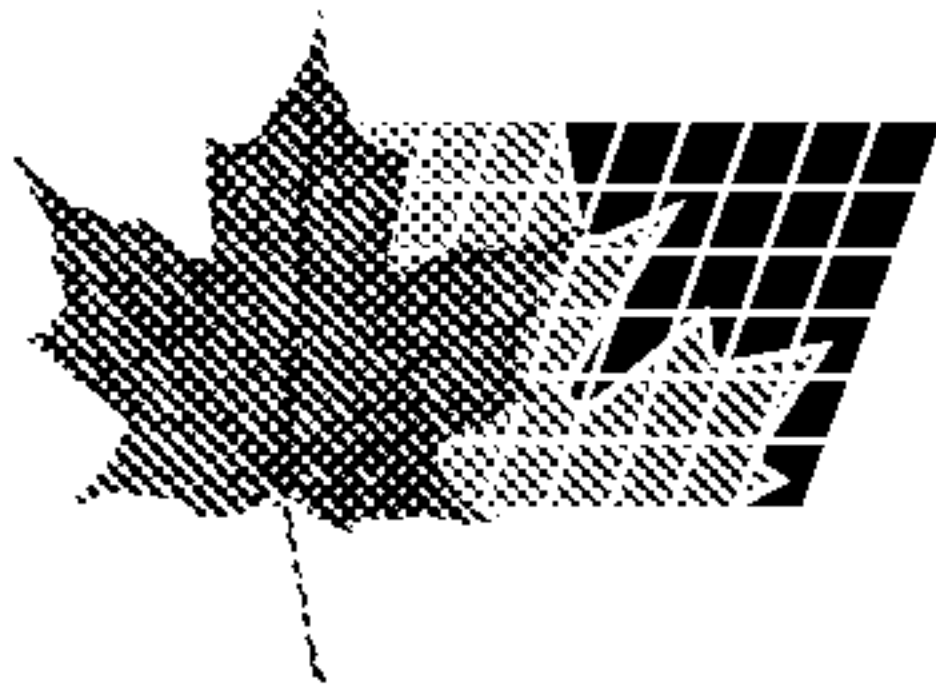




(11) (21) (C) **2,032,391**
(22) 1990/12/17
(43) 1991/08/15
(45) 2000/10/03

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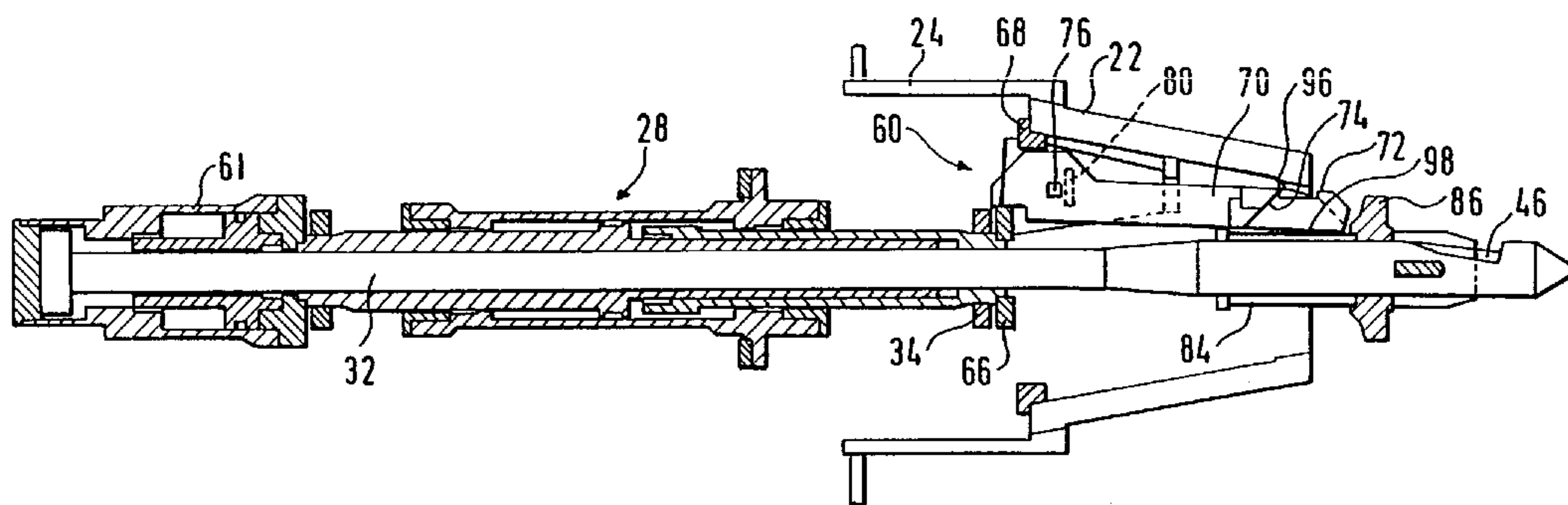
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(51) Int.Cl.⁵ F27D 23/00

(30) 1990/02/14 (87 676) LU

(54) **APPAREIL DE POSE/DEPOSE DES TUYERES OU TYMPES DE
HAUT-FOURNEAU**

(54) **APPARATUS FOR INSTALLING OR REMOVING SHAFT
FURNACE TUYERES OF TYMPs**



(57) The apparatus comprises a hydraulic ram (28) mounted on a movable support designed to be placed in line with the axis of the tuyere or tympe so as to bear on the furnace wall and to act on a gripper (30) composed of two telescopic members respectively displaceable relative to one another in the axial direction of the tuyere or of the tympe in order to ensure the support of the latter, said gripper (30) being axially displaceable through the action of said ram. The hydraulic ram (28) is a double-piston ram comprising a traction piston (38) acting on a pulled member (32) of the gripper (30) and a thrust piston (42) acting on a propelled member (34) of the gripper (30), and is consequently suitable for all forms of tuyeres and tymps.

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ABSTRACT

Apparatus for installing or removing shaft furnace
tuyeres or tymps

The apparatus comprises a hydraulic ram (28) 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 (30) 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 (30) being axially displaceable through the action of said ram. The hydraulic ram (28) is a double-piston ram comprising a traction piston (38) acting on a pulled member (32) of the gripper (30) and a thrust piston (42) acting on a propelled member (34) of the gripper (30), and is consequently suitable for all forms of tuyeres and tymps.

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APPARATUS FOR INSTALLING OR REMOVING SHAFT FURNACE
TUYERES OR TYMPS

5 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 tump 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
10 axial direction of the tuyere or of the tump in order to
ensure the support of the latter, said gripper being
axially displaceable through the action of said ram.

15 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

20 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 first pulled member of the
gripper and a thrust piston acting on a second propelled member of the
gripper.

25 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-
30 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.

35 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.

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

10 For the purpose of manipulating the tympanon, a grab is provided for hooking the tympanon 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.

15 This grab preferably comprises three pairs of convergent legs adapted to be engaged in the tympanon, 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.

20 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.

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

30 In order to facilitate the unlocking both of the tuyere and of the tympanon, 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.

35 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:

5 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;

10 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;

15 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;

20 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;

25 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;

30 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.

35 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

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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 first pulled member 32 consisting of a long cylindrical rod 32 and a second 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 is 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 tym 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 tym) is forced into place the counterreactions

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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.

5 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.

15 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.

20 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 61 . 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 61 , where it is actuated directly by the latter. The aim of this percussion hammer 61 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 61 for the disengagement of the tuyere 20 after replacing the grab 60 by the extension 44.

35 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 tympanon 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 tympanon 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 tympanon 22. In this position the tympanon 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 tympanum 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 70 is sufficient to disengage them axially from the inside face of the tympanum 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 tump 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.

5 The removal of a tump comprises the same
sequences as the installation of a tump, 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
10 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
15 100 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
20 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
25 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 tump 22, the
apparatus is brought into the position shown in Figure
8, the gripper 30 being in the open position, that is to
30 say the claws 70 are retracted. The penetration of the
gripper 30 through the tump 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.
35 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

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

5 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 tympan 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.

20 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 tympan 22 is hooked between the claws 70, on the one hand, and the collar 68 on the other hand.

35 From that moment it is possible to actuate the percussion hammer 61 in order to free the tympan 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 tump 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 tump 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 tump 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
5	1. Gripper closed	A : P B : P C : P
	a. Introduced	A : T B : P C : P
10	b. Withdrawn	A : P B : 1/3 P C : P
15	2. Gripper open	A : P B : T C : T
	a. Introduced	A : P B : T C : T
20	b. Withdrawn	only by dis- placement 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 tump.

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.

Claims

1. An apparatus for selectively installing or removing a tuyere or a tym from a furnace wall, comprising:

a movable support for positioning said apparatus in axial alignment of the tuyere or the tym in front of said furnace wall;

a gripper means comprising a first gripper member and a second gripper member that are telescopically movable relative to one another for gripping and supporting the tym or the tuyere ; and

a hydraulic ram means mounted on said support, said hydraulic ram means including a thrust piston connected to said first gripper member for urging it towards said furnace wall and a traction piston connected to said second gripper member for urging it away from said furnace wall.

2. The apparatus of claim 1, wherein:

said hydraulic ram means includes a cylindrical housing having a front face facing said furnace wall and an opposite rear face;

said traction piston is formed in said housing by a first coaxial sheath member that passes sealingly through said rear face of said housing; and

said second gripper member comprises a cylindrical rod that passes axially through said ram means and is secured to said first coaxial sheath member

3. The apparatus of claim 2, wherein said rod includes a front end with a notch forming a hook for engaging an inner edge of the tuyere .

4. The apparatus of claim 2 or 3, wherein:

said first gripper member comprises a second coaxial sheath surrounding said first coaxial sheath; and

said second coaxial sheath forms said thrust piston in said housing and passes sealingly through said front face of said housing to form a front end

outside said housing.

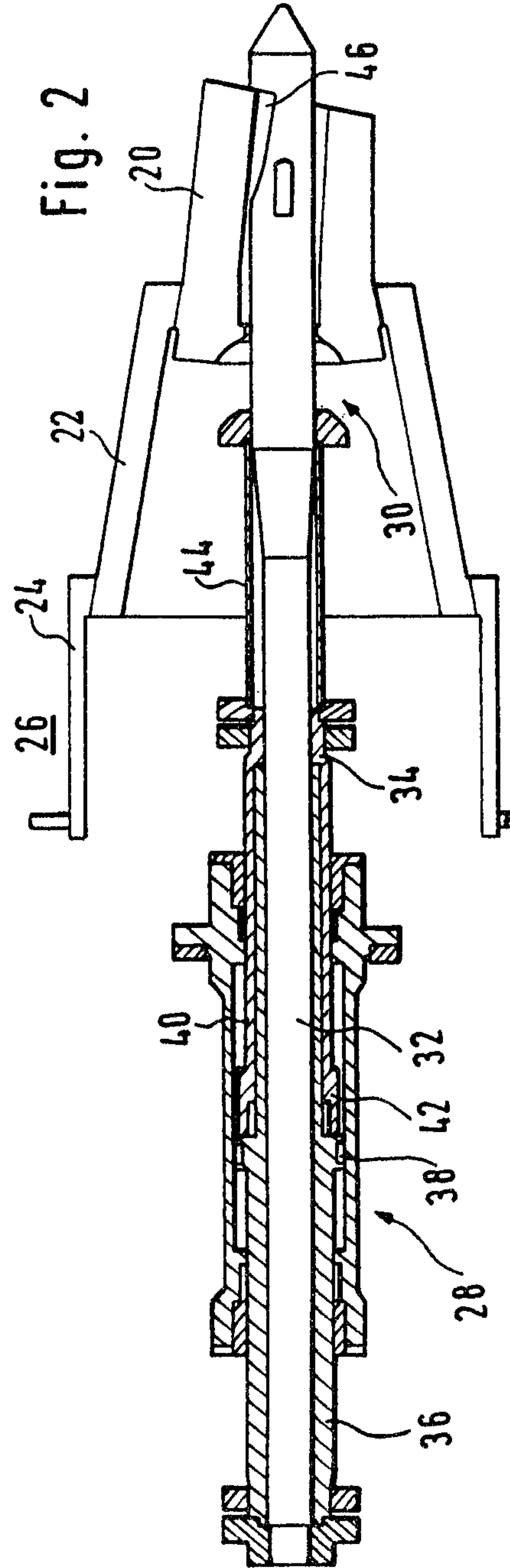
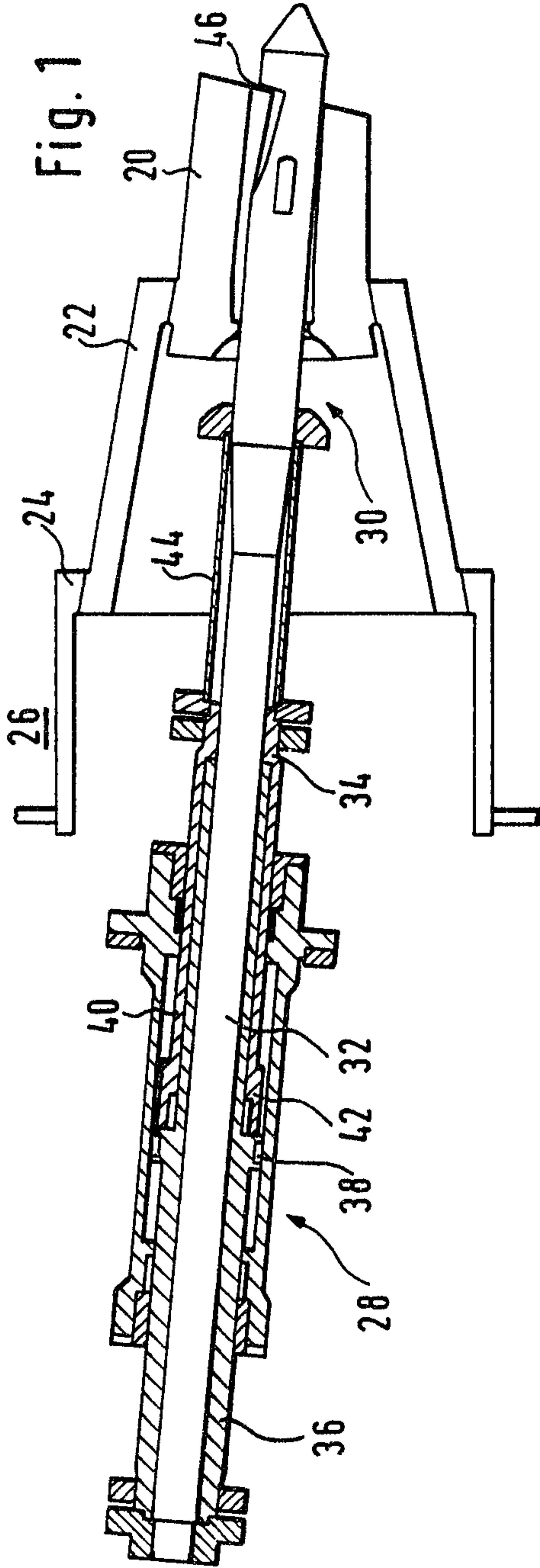
5. The apparatus of claim 4, further comprising a cylindrical extension for bearing against the tuyere, said cylindrical extension being removably attached to said front end of said second coaxial sheath.
6. The apparatus of any one of claims 1 to 5, further comprising means for selectively adjusting inclination of said ram means.
7. The apparatus of claim 1, further comprising grabbing means for hooking the tympan to said gripper means, said grabbing means being secured to said first gripper member and actuated by said second gripper member.
8. The apparatus of claim 7, wherein said grabbing means comprises three pairs of legs extending radially from said second gripper member and three claws each mounted between a respective pair of legs, said pairs of legs being circumferentially spaced apart at intervals of 120° degree around said second gripper member, and each of said claws is operatively associated with said second gripper member so that axial displacement of said second gripper member radially moves said claws.
9. The apparatus of claim 8, wherein:

a sleeve with cam means is secured to said second gripper member, said cam means bearing against inclined ramps on said claws to radially inwardly retract said claws; and

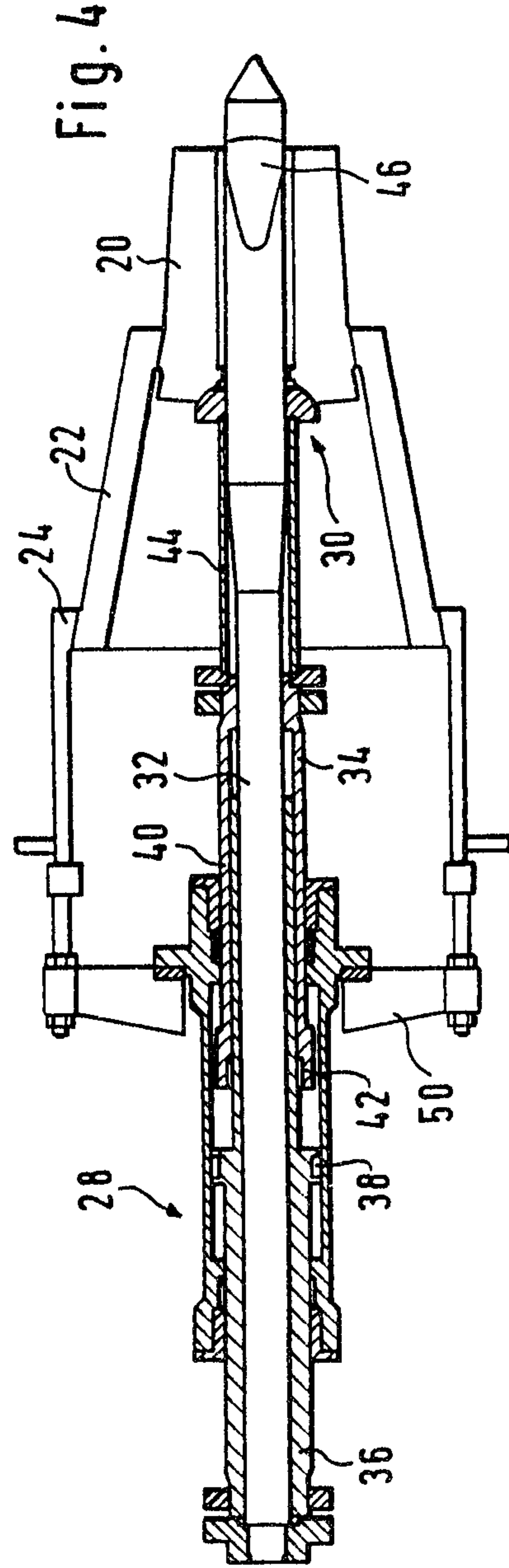
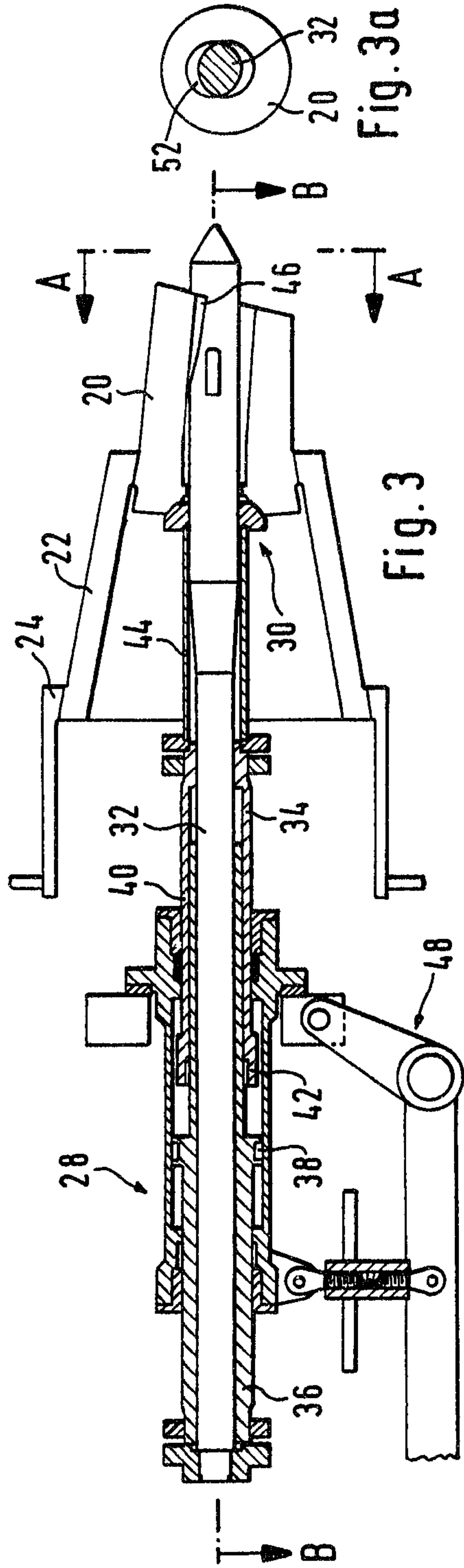
resilient means are provided for urging each of said claws radially outwardly.
10. The apparatus of claim 9, wherein each of said claws is axially movable and stop means are provided on said pairs of legs, for limiting said axial movement of each of said claws.
11. The apparatus of claim 2, further comprising hammer means secured to said first coaxial sheath for applying percussive forces to said second gripper member.
12. The apparatus of claim 4, wherein said thrust piston has a smaller diameter

than said traction piston, so that said traction piston and said thrust piston have a differential action.

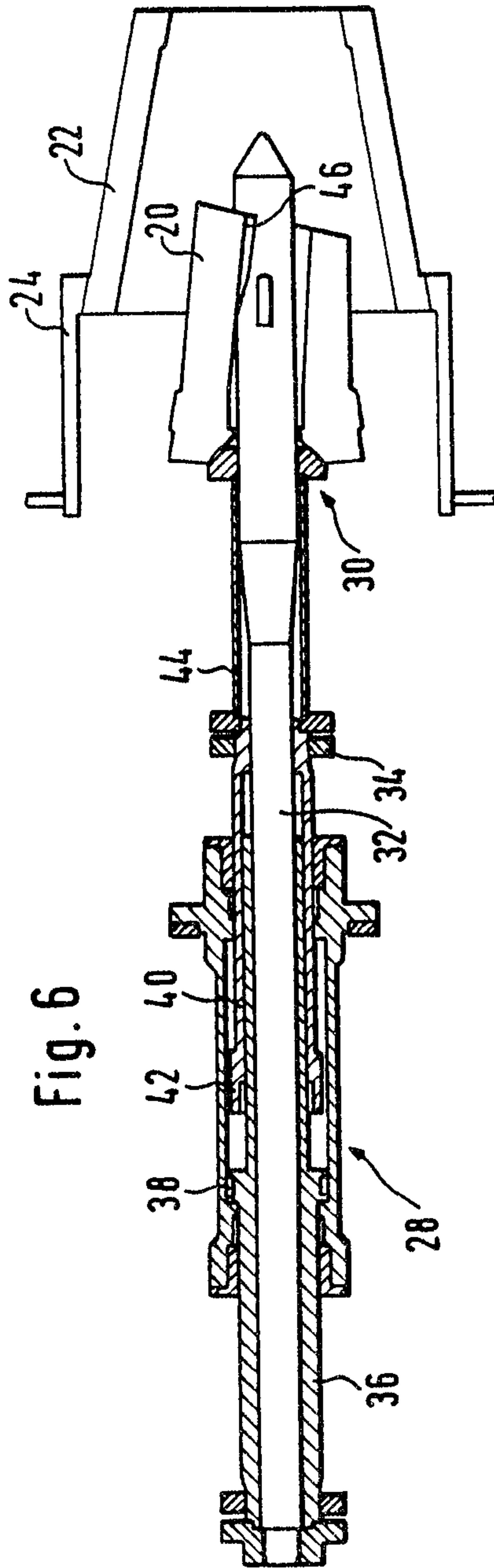
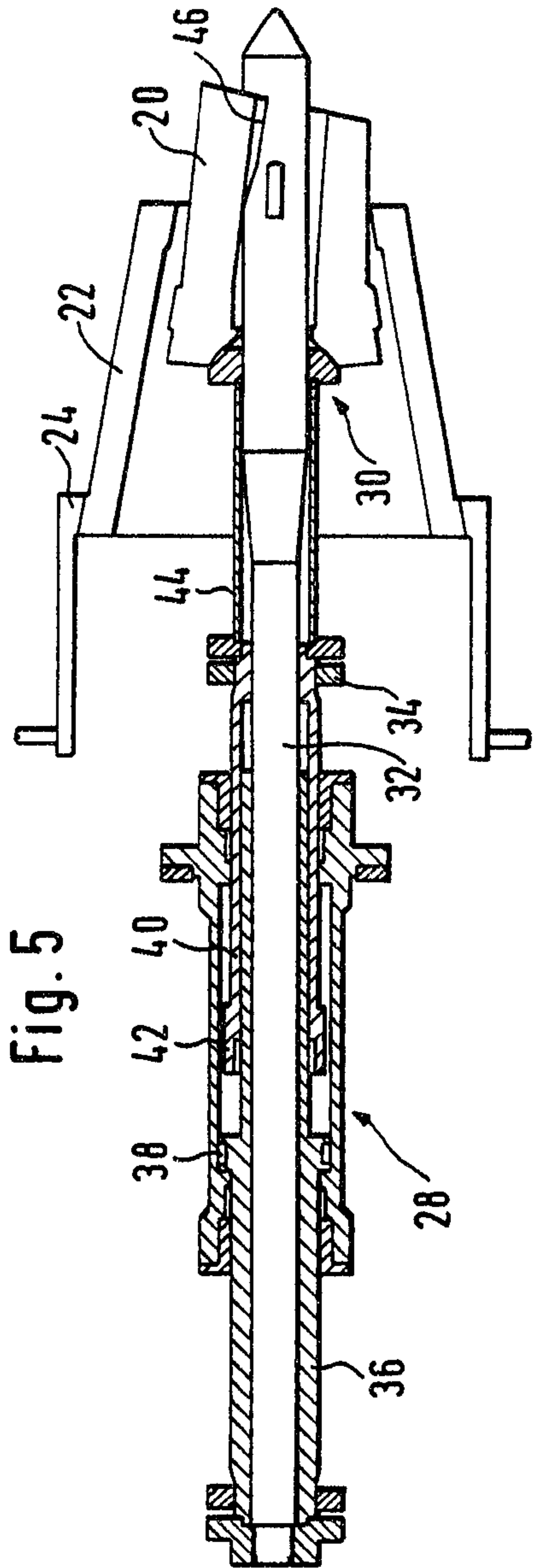
13. The apparatus of claim 4, wherein said thrust piston and said traction piston have a substantially identical active pressure area and are axially facing one another within said housing.
14. The apparatus as claimed in any one of claims 1 to 13, wherein said ram means includes limiting means for limiting said telescopic movement of said first and second gripper member.
15. The apparatus of claim 14, wherein said limiting means comprises stops provided respectively on said first and second coaxial sheaths.
16. The apparatus of claim 14, wherein said limiting means comprises a cylindrical tube secured to one of said pistons and extending beyond the other piston, said tube including stop means for holding back the other piston.



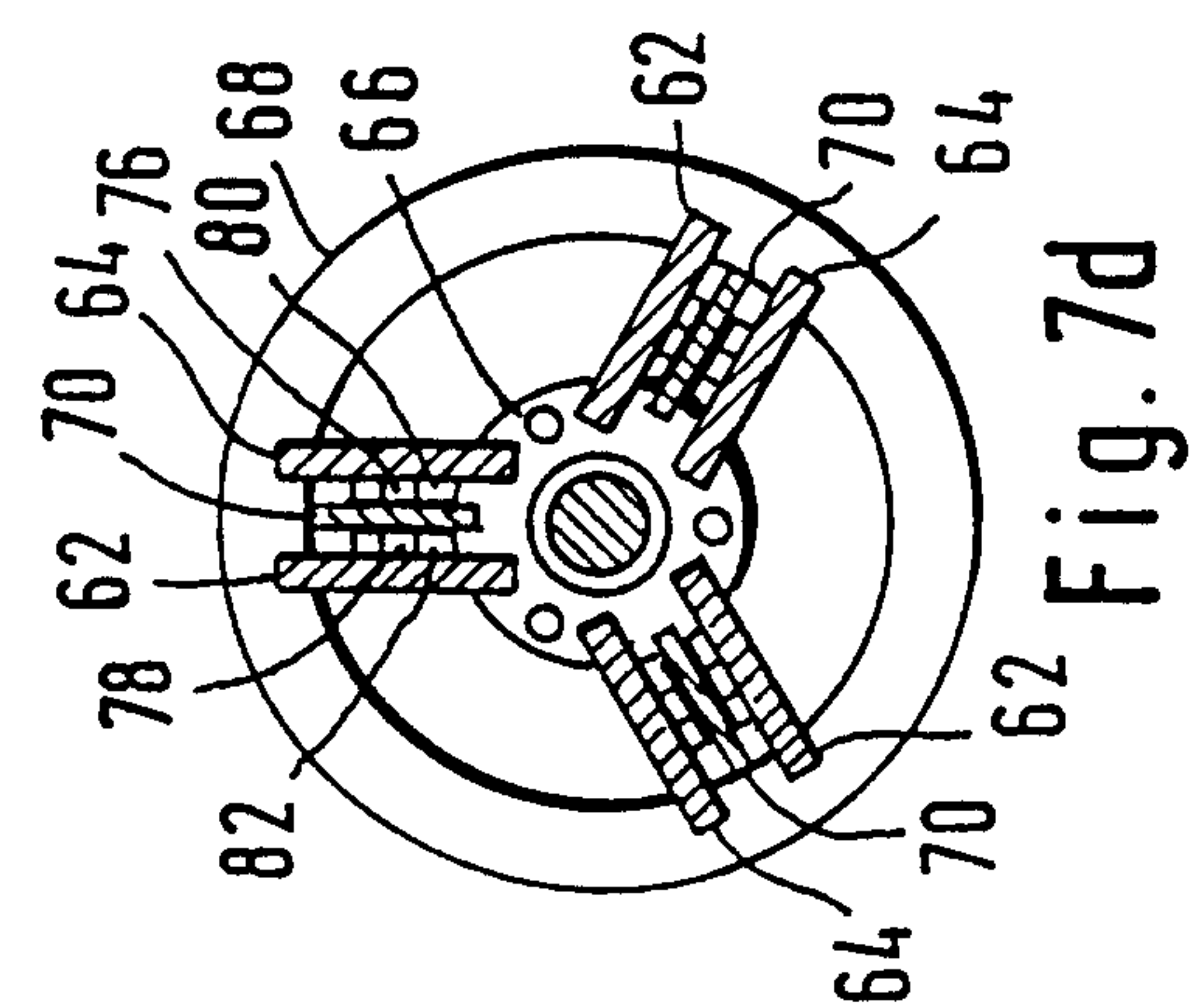
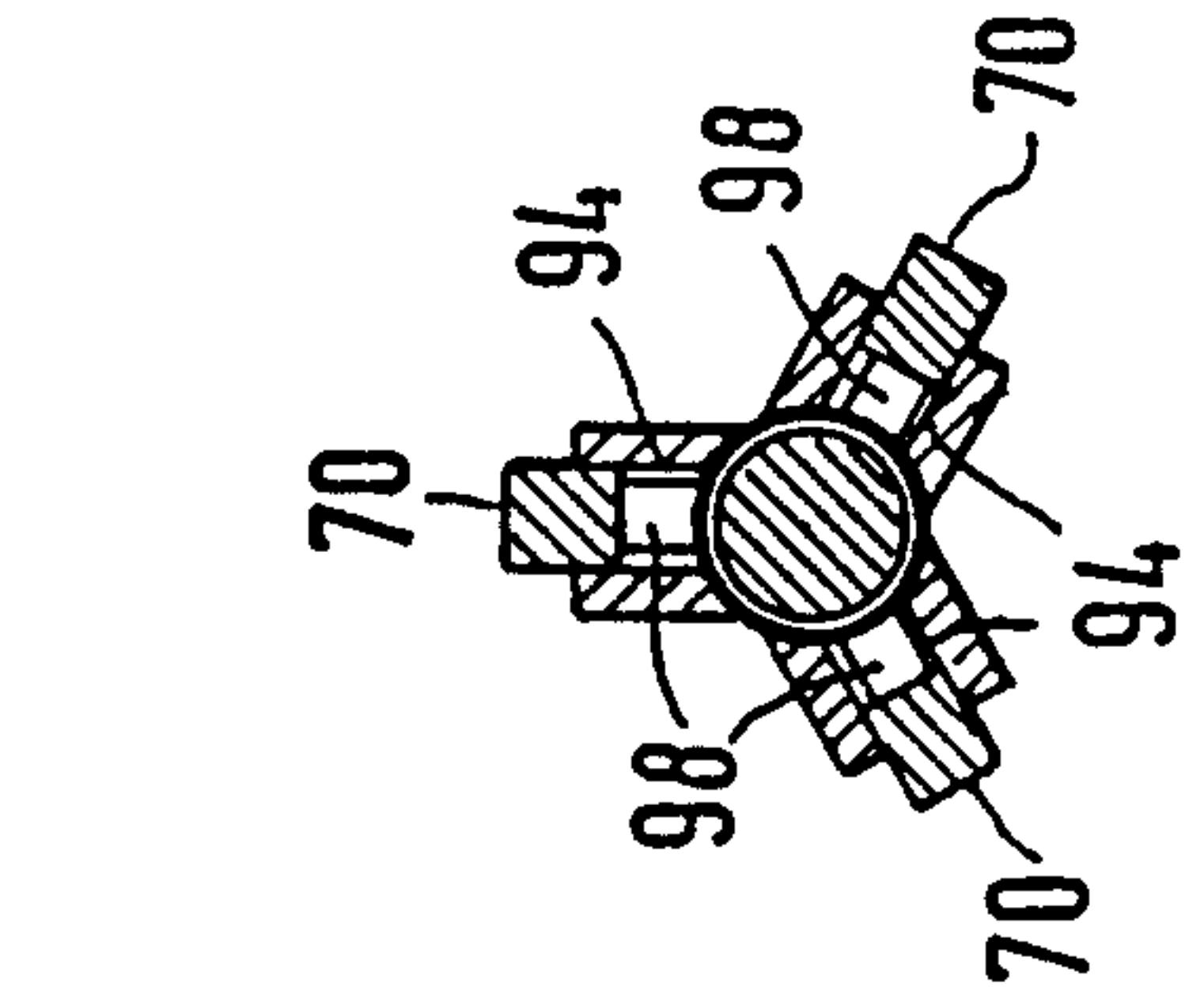
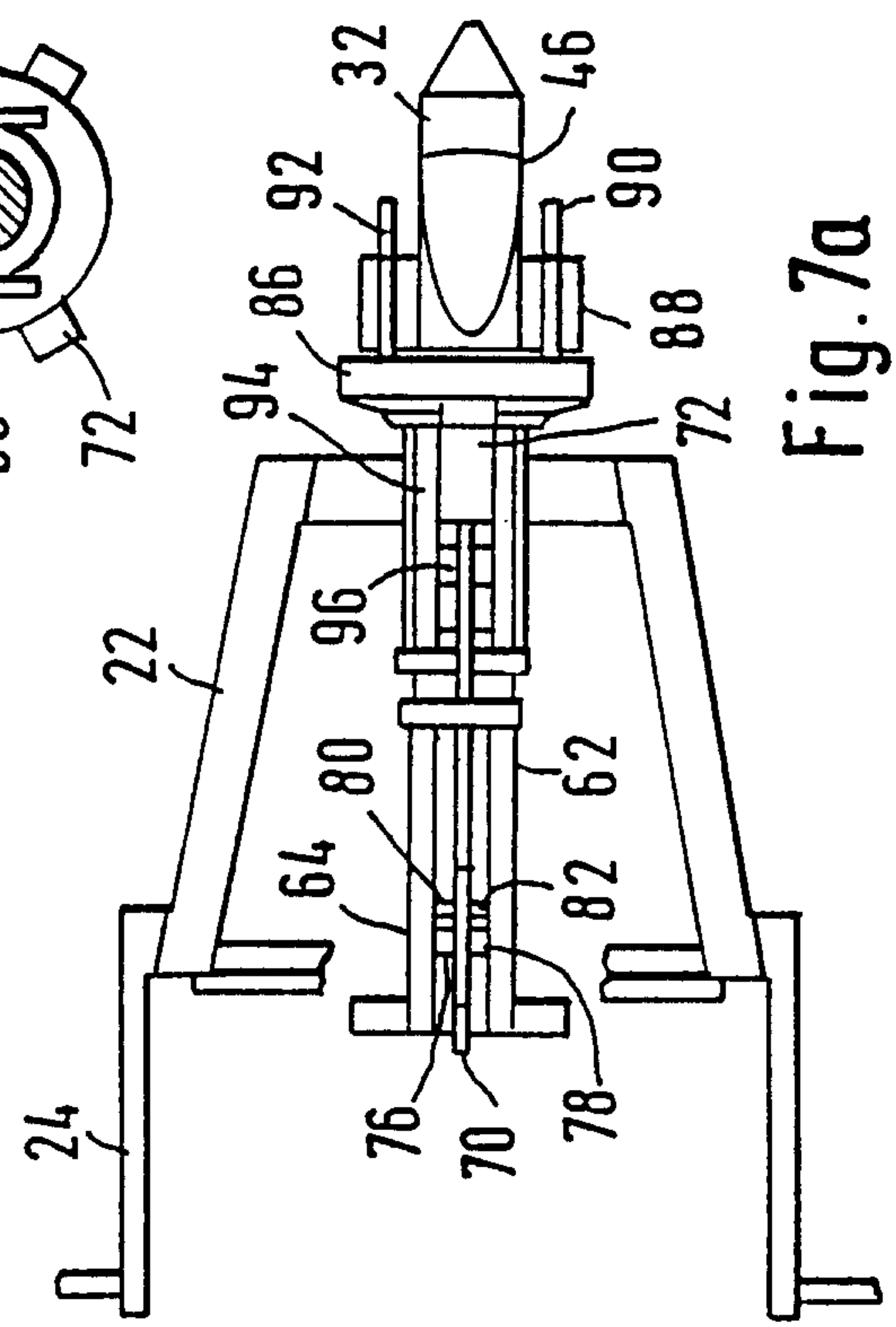
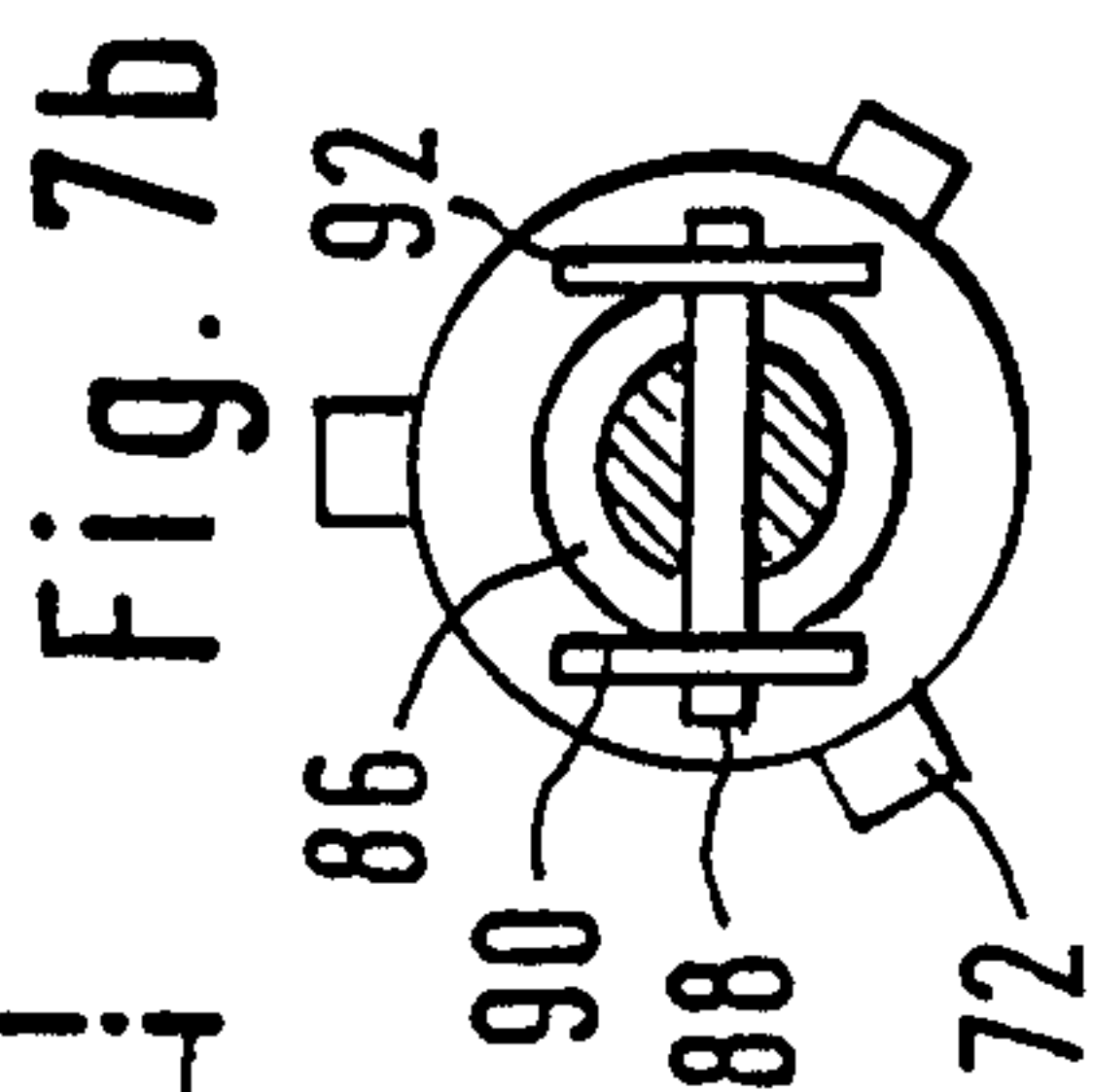
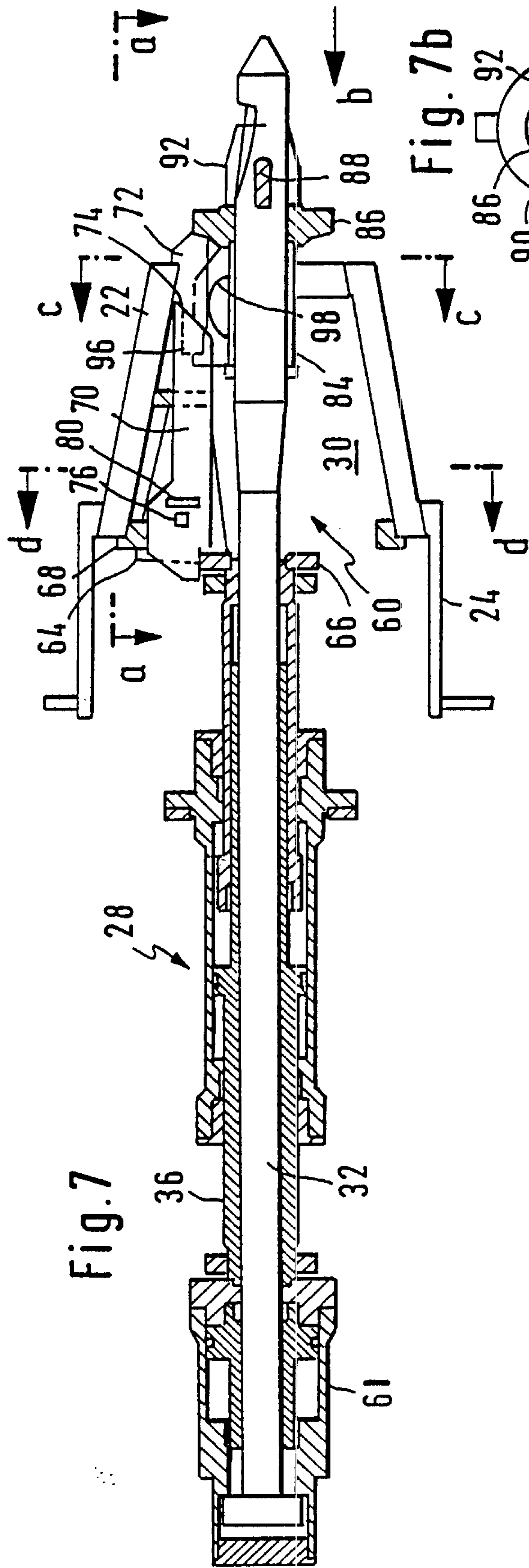
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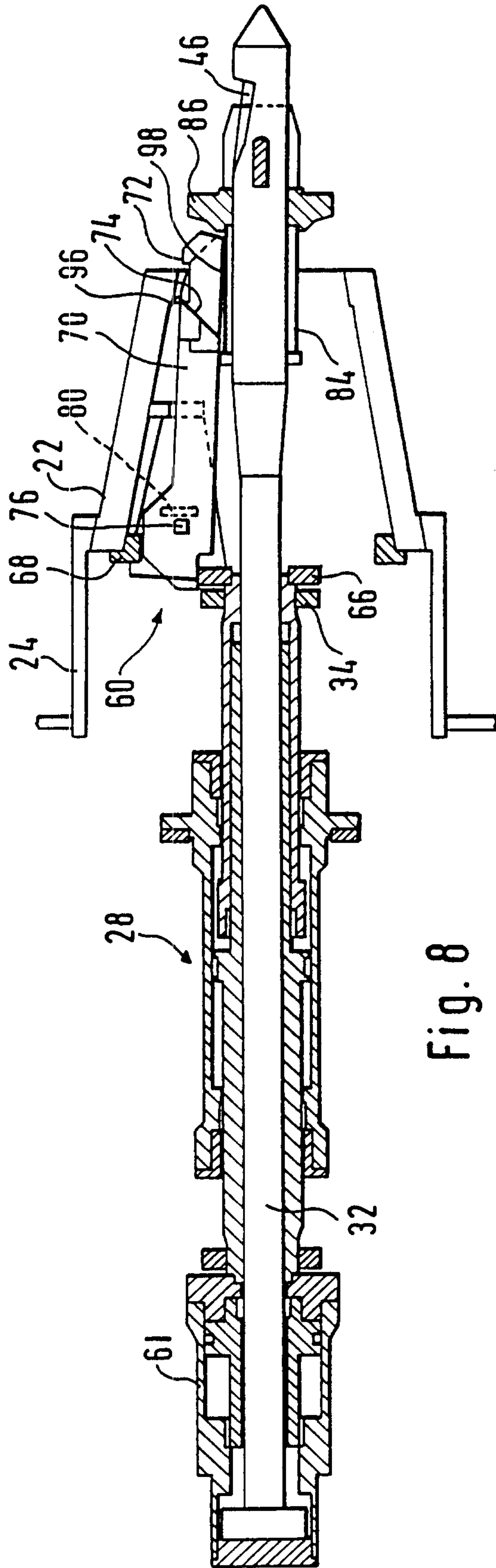


W. H. & S. H.
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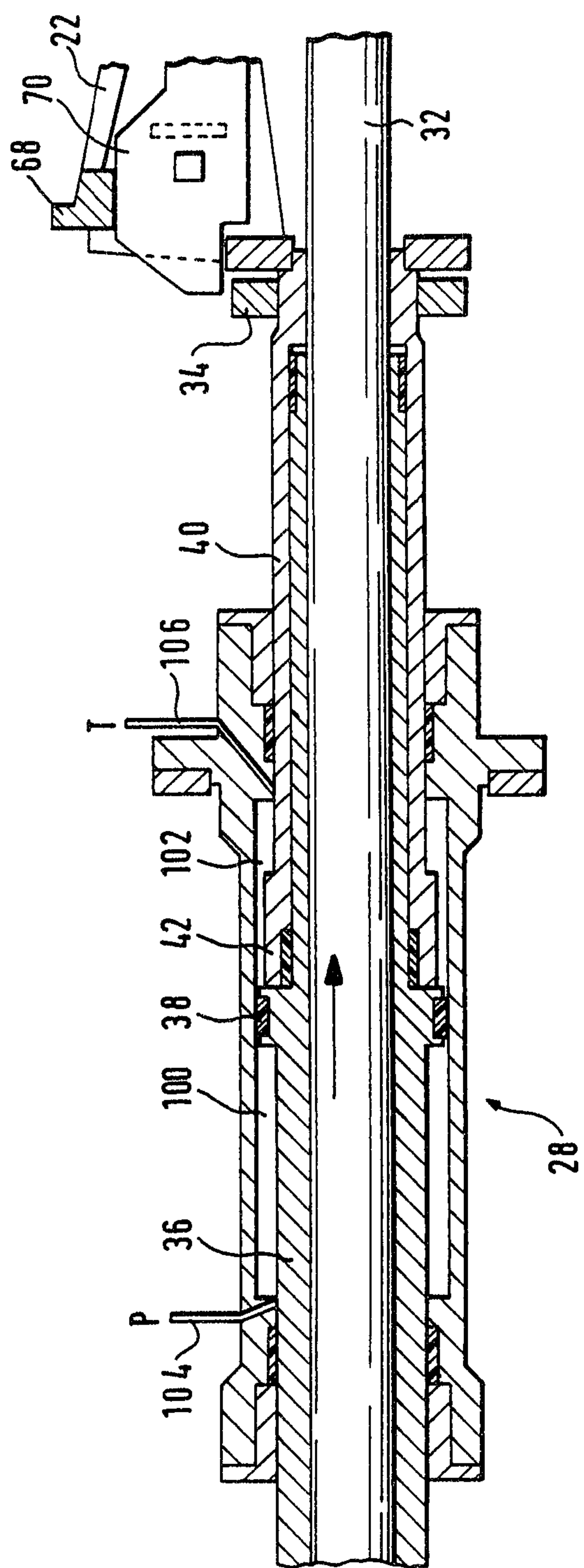


Fig. 9

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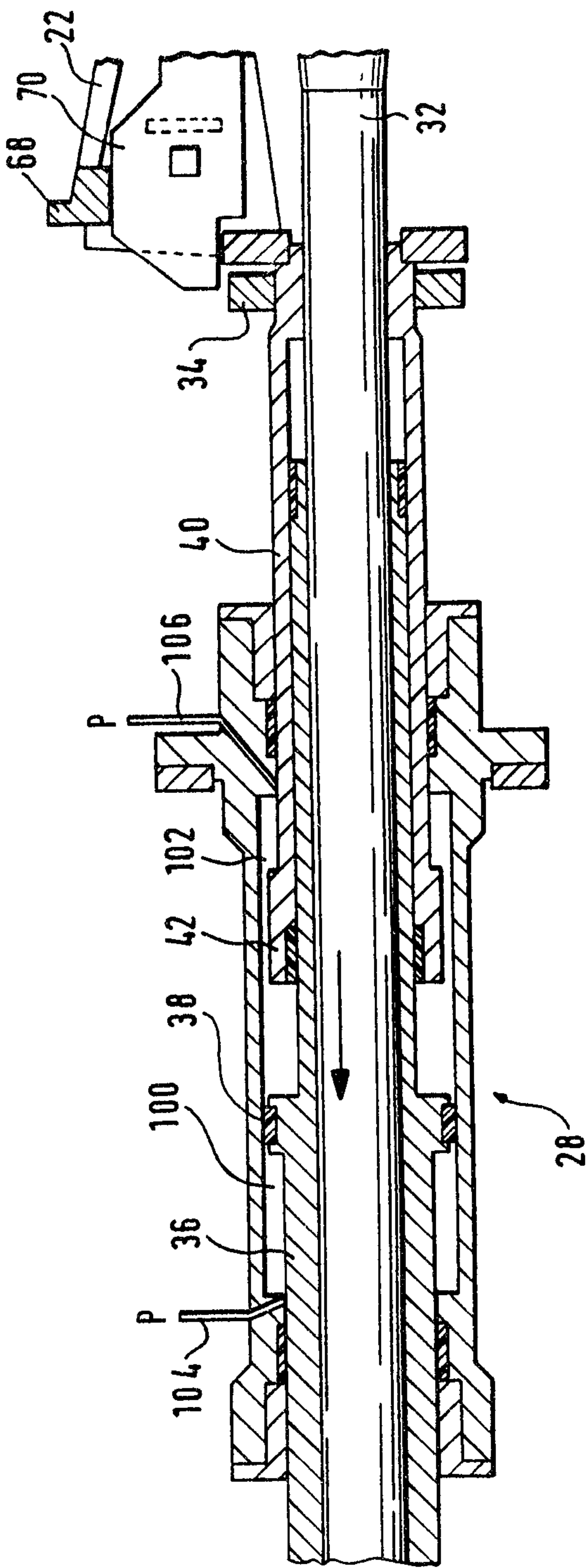


Fig. 10

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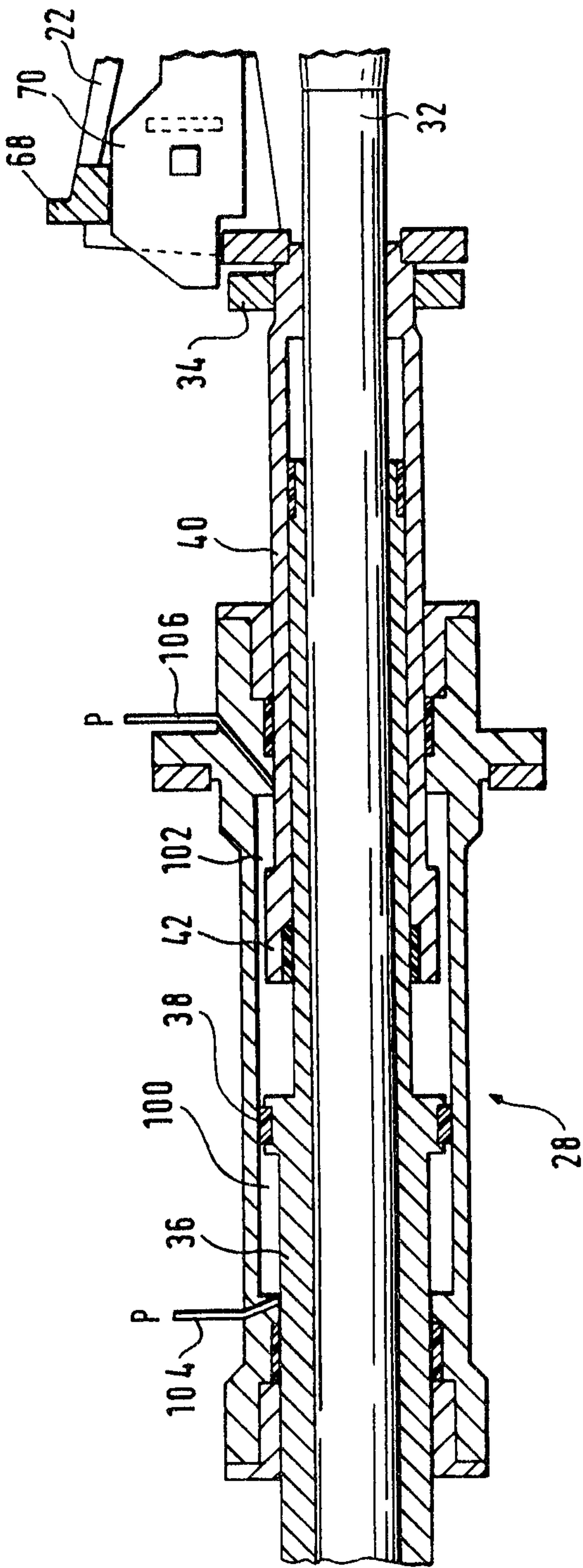


Fig. 11

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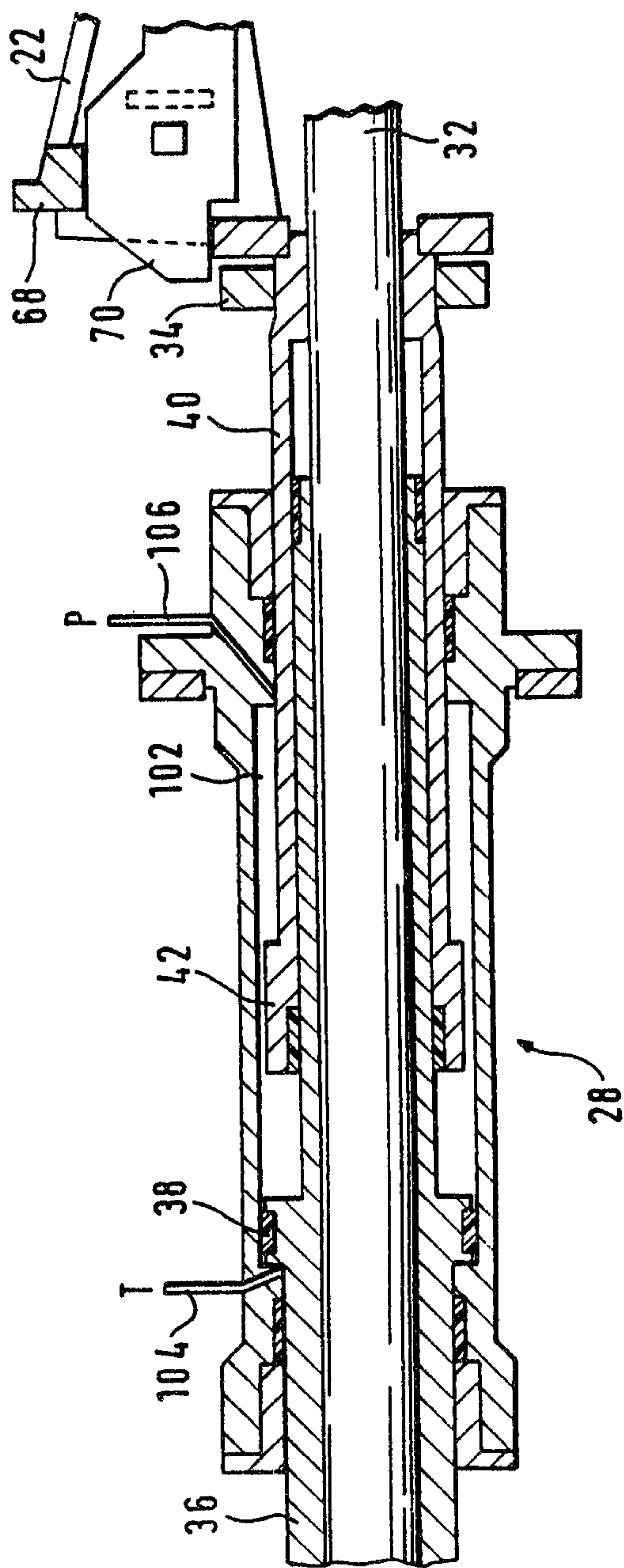


Fig. 12

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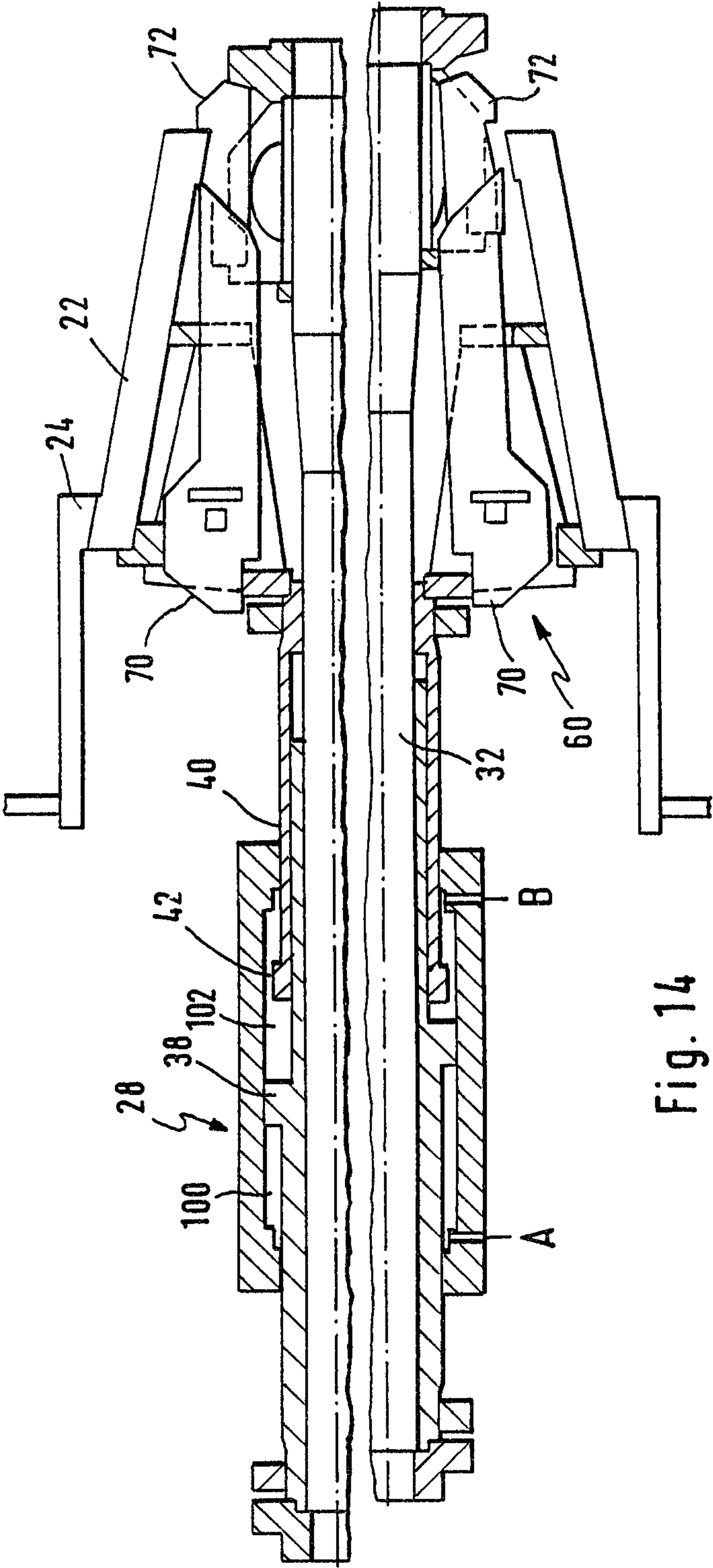


Fig. 14

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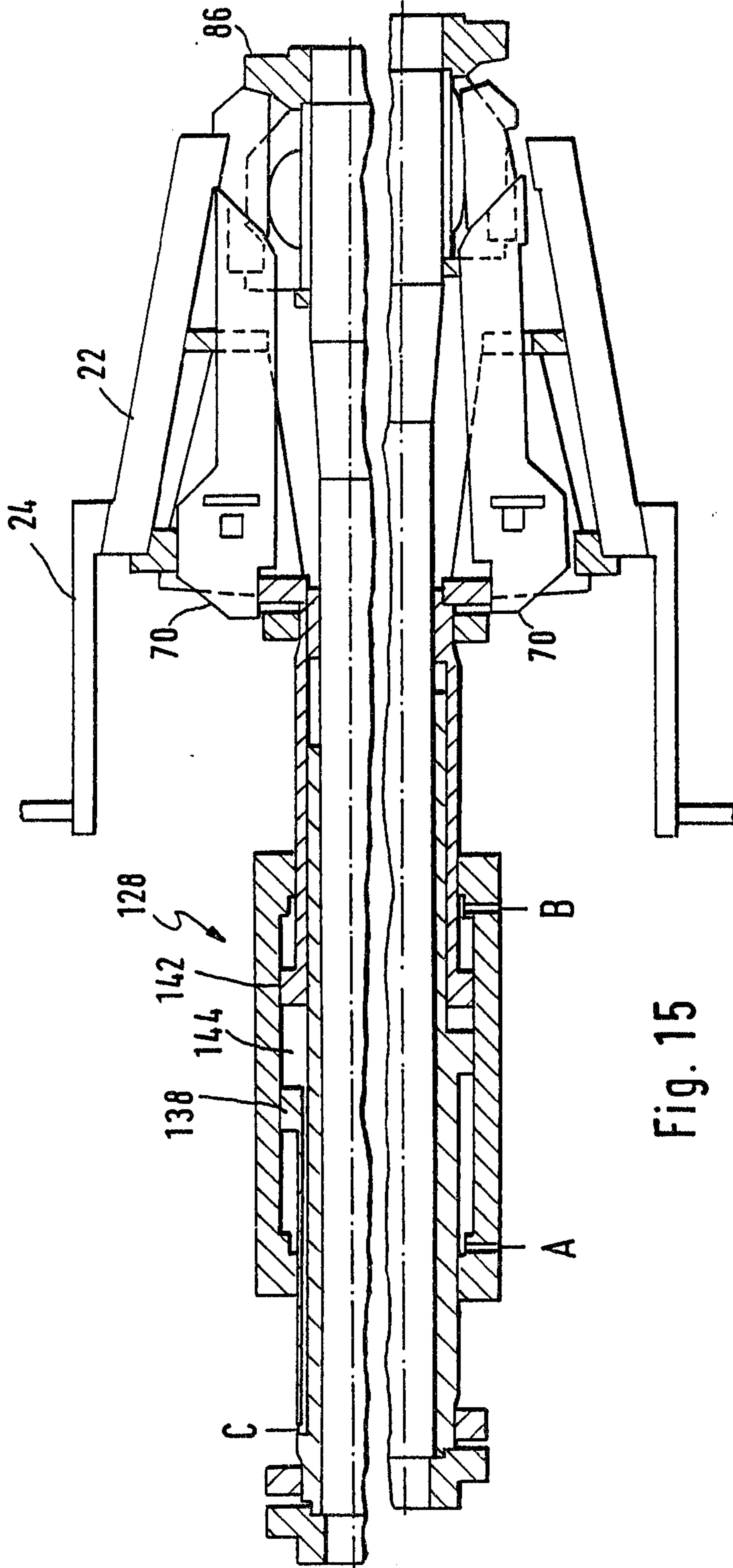
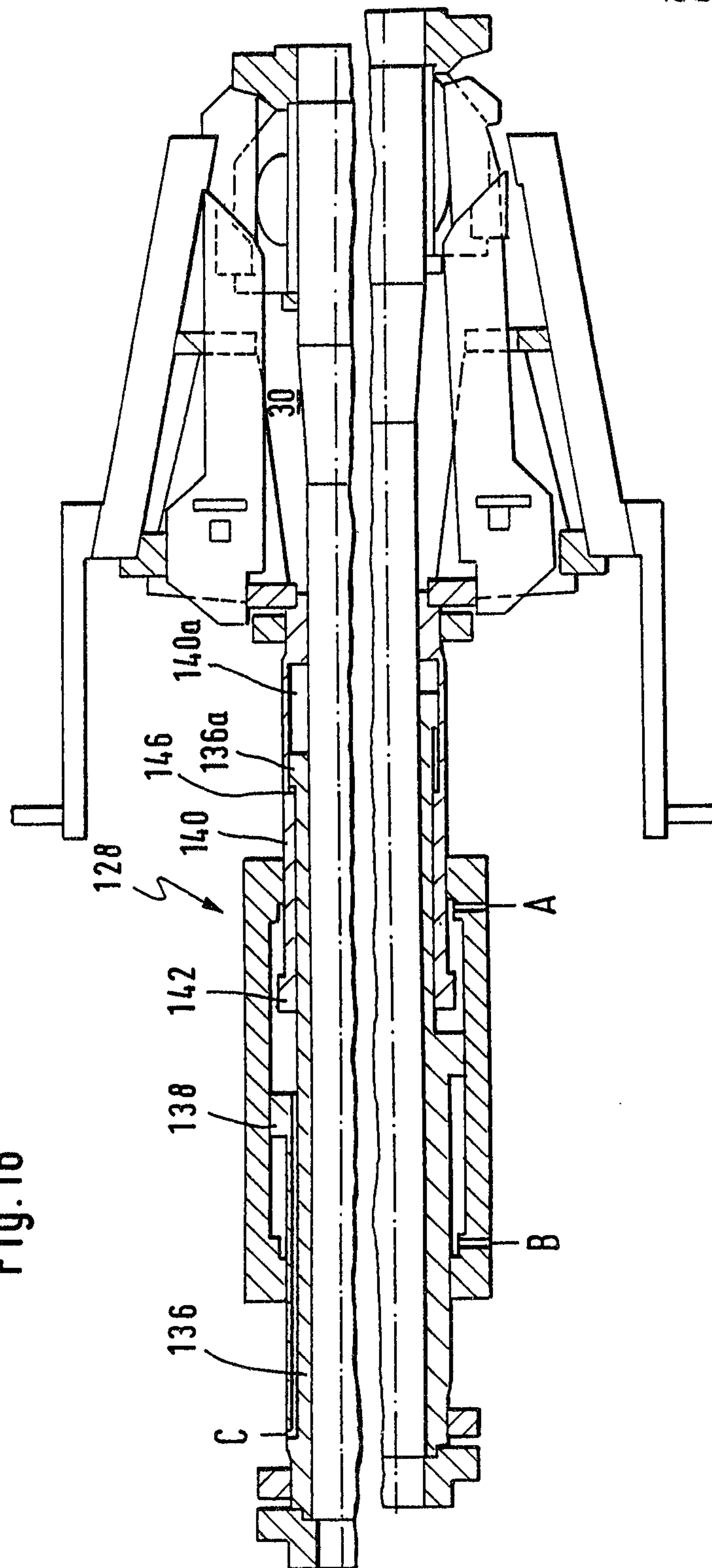


Fig. 15

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Fig. 16



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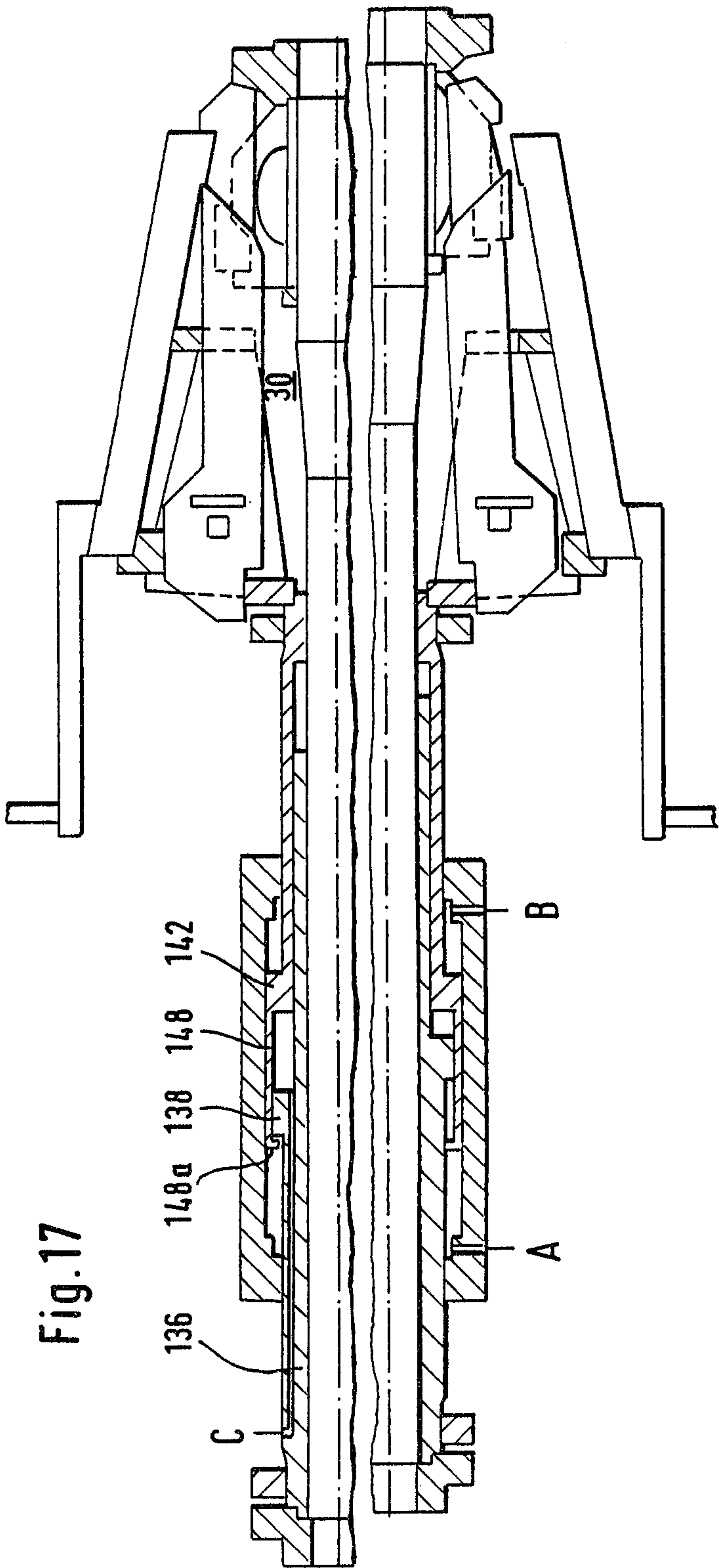


Fig.17

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