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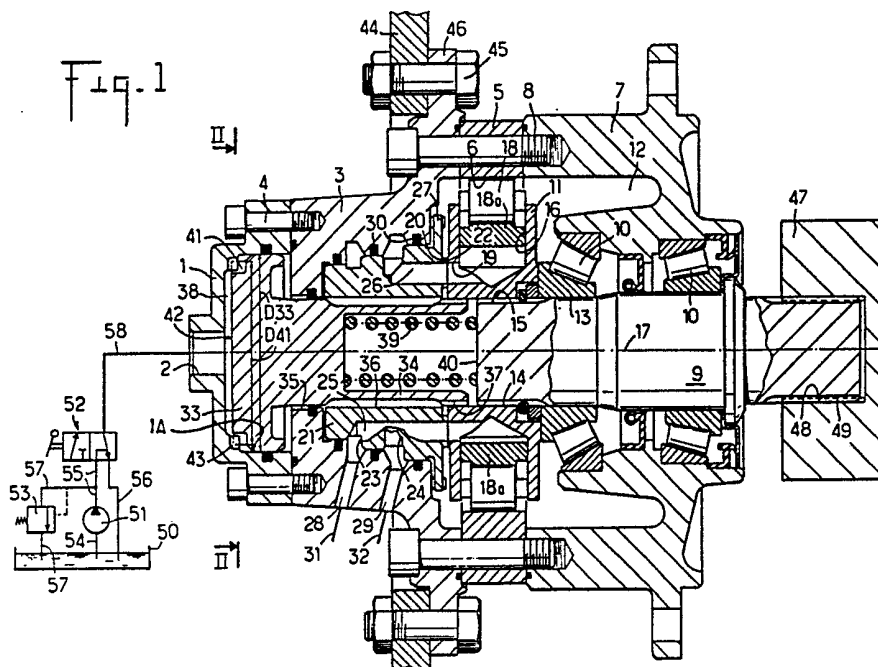
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(54) Hydraulic motor with immobilization device

(57) A hydraulic motor having device for immobilization thereof includes a reaction cam (5), a cylinder-block (11) mounted to rotate with respect to the reaction cam; and an immobilization member (34) splined to the cylinder-block. The immobilization member is capable of being disposed in a first position, in which further splines (41) thereon interengage with splines (43) on the internal face of a cover (1) fast with the reaction cam (5) and a second, disengaged position allowing operation of the motor. Movement of the member to its disengaged position is effected by pressurising a chamber (38) thereby displacing a piston (33) carried by the member (34). A spring (39) causes re-engagement of the splines (41, 43) when pressure is removed from the chamber (38).



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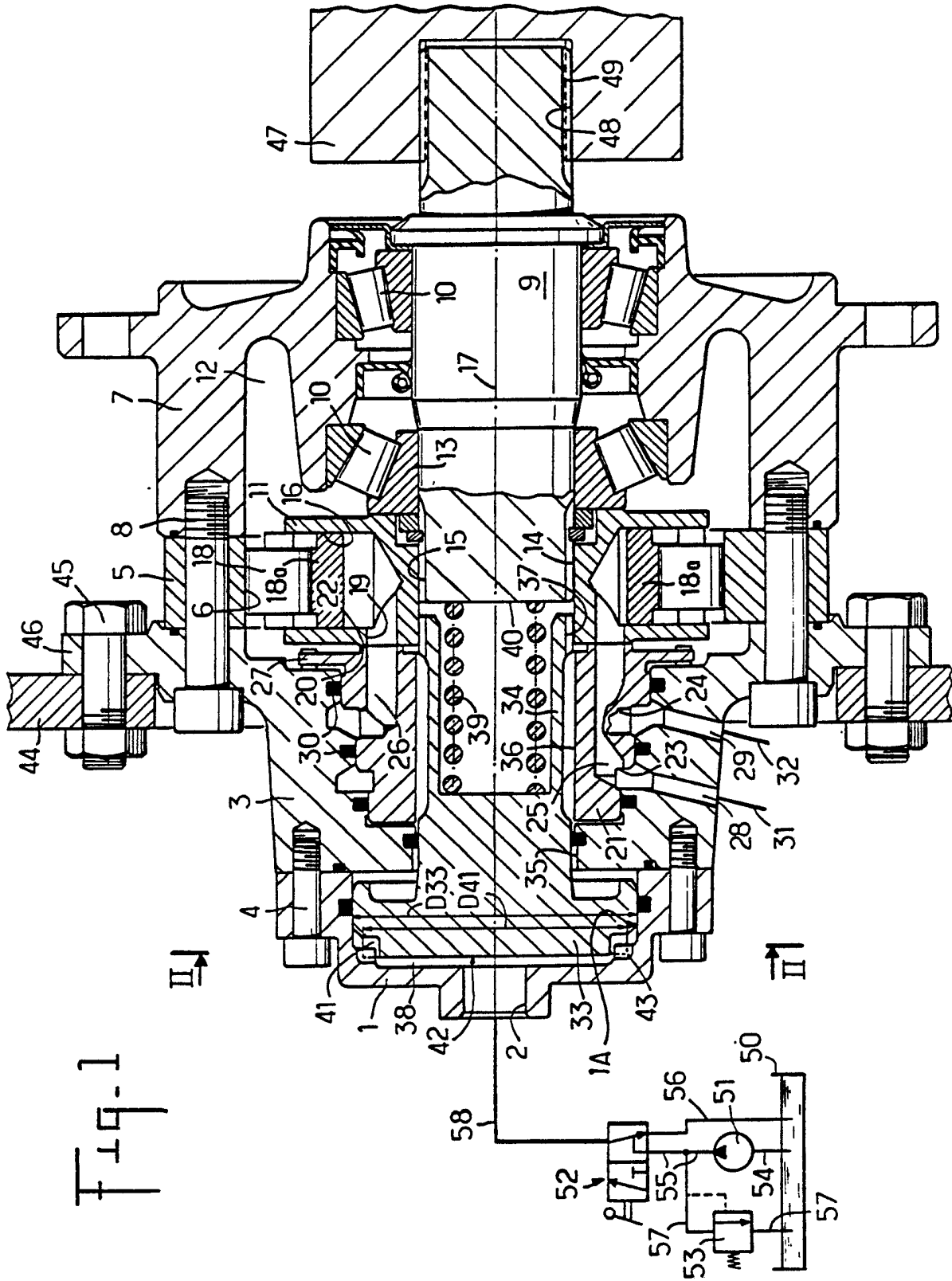


Fig. 2

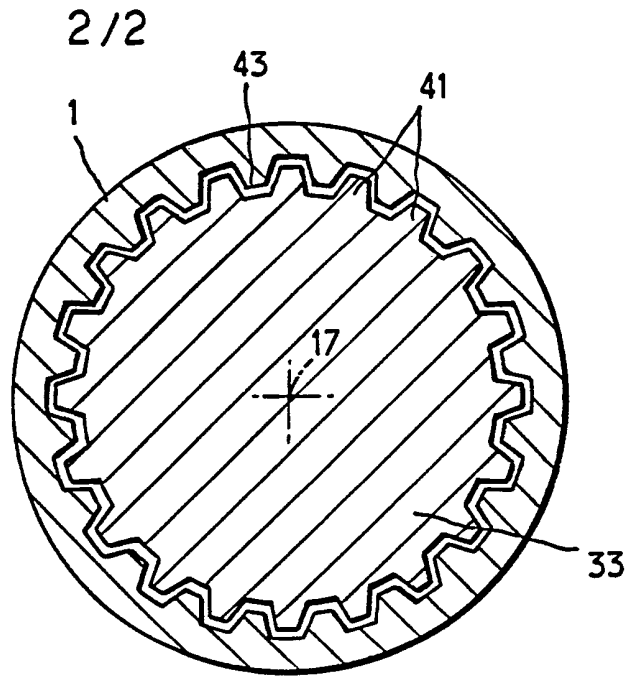


Fig. 4

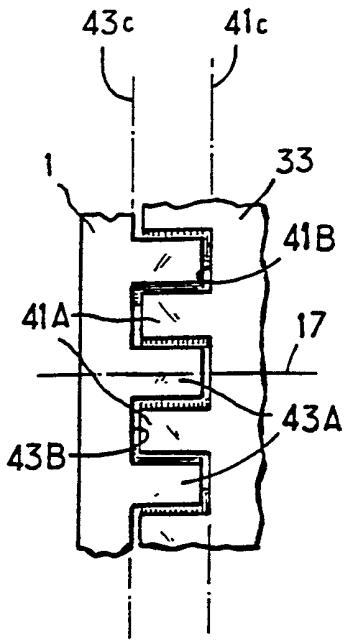
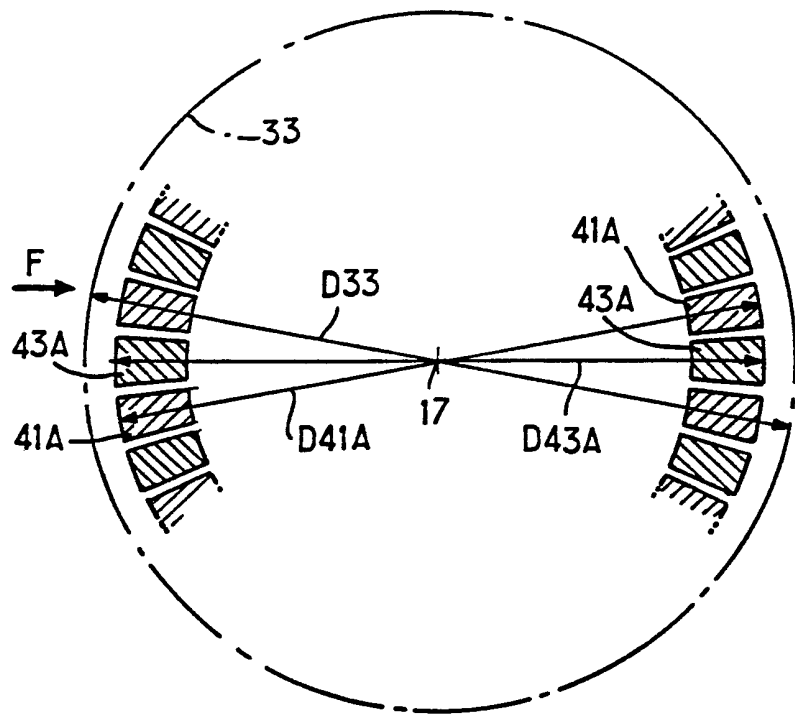


Fig. 3



-1-

DEVICE FOR MUTUAL IMMOBILIZATION OF TWO ELEMENTS
MOUNTED FOR RELATIVE ROTATION

The present invention relates to a device for mutual immobilization of two elements mounted for relative rotation.

Devices are already known for braking the rotation of two elements mounted for relative rotation, such as brakes, which allow the immobilization, with respect to rotation, of said elements.

10 Numerous known brakes are constituted by stacks of brake discs whose axial dimensions are large and whose cost is high.

It is an object of the present invention to overcome these drawbacks by proposing an assembly
15 of a hydraulic motor and a combined device for immobilization, comprising: a reaction cam; a cylinder-block mounted to rotate with respect to the reaction cam; a first immobilization means which is fast with respect to the rotation of the cylinder-block; a
20 second immobilization means which is fast with respect to the rotation of the reaction cam and which is capable of being disposed with respect to said first immobilization means in two distinct positions: a first position, in which said first and second
25 immobilization means are fast with one another with respect to rotation, and a second position, in which these first and second immobilization means do not cooperate for their mutual immobilization; and a device for adjusting the relative position of the
30 first and second immobilization means, coupled together and comprising in particular a pressurized fluid jack comprising a working chamber defined by a cylinder and by a piston mounted to slide therein.

35 According to the invention, the following arrangements are adopted: a) one of the first and second

immobilization means is coupled to an immobilization member which is mounted to move in translation on that of the two elements of the motor - cylinder-block and reaction cam - with which said immobilization means is fast with respect to rotation; b) said immobilization member constitutes, with one of the elements defining the working chamber of said fluid jack - piston and cylinder -, a monobloc assembly; c) one of the first and second immobilization means is constituted by at least one immobilization catch capable of cooperating with at least one receiving housing formed in the other of said first and second immobilization means; d) the first and second immobilization means are contained in the working chamber of the pressurized fluid jack.

The following advantageous arrangements are also preferably adopted:

- the cylinder-block of the motor comprising a central bore provided with splines intended in particular to render a drive shaft fast with said cylinder-block, with respect to rotation, said immobilization member is also provided with splines, which cooperate with the splines of the cylinder block in order to effect assembly of this immobilization member in translation with respect to said cylinder block and fast, with respect to rotation, with this cylinder-block;

- the immobilization member and the piston of the jack constitute a monobloc assembly;

- said first immobilization means and said piston constitute a monobloc assembly;

- said second immobilization means and said cylinder constitute a monobloc assembly;

- the first and second immobilization means are constituted by splines or by frontal toothings;

- the maximum diameter of the splines, or of the frontal toothings, which constitute a monobloc assembly with the piston, has a value close to that of the diameter of said piston;

5 - the maximum diameter of the splines, or of the frontal toothings, forming a monobloc assembly with the piston, is included between 0.88 and 0.96 times the diameter of the piston.

The principal advantage of the device described
10 hereinbefore resides in the simultaneous obtaining of the simplicity of its constitution, its compactness and its efficiency. Saving of space which is particularly sought is especially obtained by means of a simple device.

The invention will be more readily understood on reading the following description with reference to the accompanying drawings, in which:

Figure 1 shows a hydraulic motor provided with
20 an immobilization device according to the invention.

Figure 2 is a section along II-II of Figure 1.

Figure 3 is a transverse section, similar to that of Figure 2, of a variant embodiment of the
25 immobilization means, according to the invention; and

Figure 4 is a view in the direction of arrow F of Figure 3.

30 Referring now to the drawings, Figure 1 shows the assembly of a hydraulic motor and of an immobilization device adapted thereto, this assembly comprising:

- the casing of the motor constituted by an end cover 1, provided with a joining element 2,
35 by a first intermediate part 3 on which said cover

is screwed (4), by a second intermediate part 5, in which is machined a multi-lobe cam 6, and by an end part 7, the first (3) and second (5) intermediate parts and the end part 7 being assembled by
5 screws 8, and the casing defining an enclosure 12;

- a driven shaft 9 which is mounted to rotate with respect to the casing by means of two conical bearings 10;

- a cylinder-block 11 which is contained inside
10 the enclosure 12, is in axial abutment on the ring 13 of one of the conical bearings 10, and which comprises central splines 14 cooperating with internal splines 15 that the driven shaft 9 comprises, to be fast in rotation with said driven shaft;

15 - cylinders 16 disposed radially with respect to the axis of rotation 17 of the driven shaft 9 with respect to the casing, in the cylinder-block 11, each containing a piston 18a provided with a roller bearing 18 via which each piston 18a is capable
20 of being in abutment on the cam 6, each cylinder communicating by a conduit 19 with a flat face 20, perpendicular to the axis of rotation 17, that the cylinder-block 11 comprises;

- a fluid distributor valve 21 which comprises
25 a flat face 22, perpendicular to the axis of rotation 17, in abutment on the flat face 20 of the cylinder-block 11, as well as two distinct grooves 23, 24, isolated from each other by seals 30, that conduits 25 and 26 respectively connect to the flat face
30 22, so as to be able to communicate with the conduits 19 of the cylinder-block, successively, notches and catches 27 immobilizing, with respect to rotation, the fluid distributor valve 21 and the first intermediate part 3 of the casing;

35 - two conduits 28 and 29, made in this first

intermediate part 3 and respectively connecting the grooves 23, 24 to external conduits 31, 32 for supply of pressurized fluid and exhaust of fluid;

- a cylinder 1A, made in the cover 1;
- 5 - a piston 33, of which an internal extension 34, passing through bores 35 in the first intermediate part 3 of the casing, and 36 in the fluid distributor valve 21, and provided with splines 37, is rendered fast in rotation with the cylinder-block 11 by the
- 10 cooperation of said splines 37 of said extension 34 of the piston 33 and the splines 14 of the cylinder-block 11, said piston 33 being mounted to slide inside the cylinder 1A;
- a fluid chamber 38 defined by the piston
- 15 33 and by the cylinder 1A, and communicating with the joining element 2 of the cover;
- a spring 39, interposed between the internal end 40 of the driven shaft 9 and the piston 33 and its extension 34;
- 20 - splines 41 which open out in the face 42 of the piston defining the chamber 38, being fast with said piston, and which also open out on the periphery of the piston 33, having a maximum diameter D 41;
- 25 - splines 43, which are formed in the internal face of the cover 1, being fast with said cover, and which, as shown in Figures 1 and 2, cooperate with the splines 41 of the piston 33, in order to render fast in rotation the piston 33 and the cover
- 30 1 and, by their intermediary, to immobilize, with respect to rotation, the cylinder-block 11 and the casing (1-3-5-7).

It must be observed that the maximum diameter D 41 of the splines 41 has a value very close to

35 that of the diameter D 33 of piston 33. In fact,

D 41 has a value included between 0.88 and 0.96 times D 33 in the preferred embodiments. Furthermore, a body 44, such as the frame of a machine, may be rendered fast with the casing by means of bolts 5 45 and a flange 46 that the first intermediate part 3 comprises, a second body 47, such as the drive shaft of a device having to be driven in rotation, is coupled in rotation with the driven shaft 9 by means of splines 48, 49 that said second body 47 10 and the external part of the driven shaft 9 respectively comprise.

The effect of spring 39 is to effect mutual penetration of splines 41 and 43 of piston 33 and cover 1, in the absence of pressurized fluid in 15 chamber 38.

A circuit for adjusting the position of the piston 33 is provided, constituted by:

- a fluid reservoir 50;
- a hydraulic pump 51;
- 20 - a two-way fluid distributor valve 52;
- a calibrated discharge valve 53;

and the following conduits:

- suction conduit 54 connecting pump 51 to reservoir 50;
- 25 - delivery conduit 55 of pump 51 connecting the latter to the fluid distributor valve 52;
- conduit 56 connecting the fluid distributor valve 52 to the fluid reservoir 50;
- conduit 57, which connects delivery conduit 30 55 to the fluid reservoir 50 and on which is disposed the discharge valve 53 for protection against excess pressures; and
- conduit 58, which connects the fluid distributor valve 52 to the joining element 2 of the cover 35 1.

The two positions of the fluid distributor valve 52 correspond as follows:

- the first position, to the communication of conduits 58, 56 and 55, to the immobilization of splines 41 by splines 43 and to a first end position of piston 33; and

- the second position, to the communication of conduits 55 and 58, to the obturation of conduit 56 and to a second end position of piston 33, splines 41 and 43 being disconnected with respect to one another.

As a variant to splines 41-43, the device may be provided with frontal toothings (Figures 3 and 4) of which the teeth 41A, 43A have their respective roots 41B, 43B contained in transverse planes 41C, 43C perpendicular to the axis of rotation 17, respectively. Naturally, the effect of connection of toothings 41A, 43A, when they are imbricated, is identical to that of splines 41, 43. In order to take optimum advantage of the place available, it is also often preferred to choose the maximum diameters D_{41A} and D_{43A} of said toothings to be as large as possible, for example between 0.88 and 0.96 times that, D_{33} , of piston 33.

Operation of the hydraulic motor is conventional and it is unnecessary to describe it here.

On the other hand, the operation of the immobilization device will be set forth hereinafter.

When the fluid distributor valve 52 is placed in its first position, either splines 41 and 43 are imbricated and spring 39 maintains them imbricated, or these splines are not yet imbricated, and a slight rotation corresponding at the most to the angle separating two splines will place splines 41 in position to be imbricated in splines 43, spring

39 in that case effecting such imbrication. When, from the position of mutual imbrication of splines 41 and 43, the fluid distributor valve 52 is placed in its second position, the pressurized fluid contained in chamber 38 and acting on piston 33, pushes this piston and ends imbrication of splines 41 and 43, with the result that the cylinder-block 11 and the driven shaft 9 may again rotate with respect to casing (1-3-5-7).

10 The advantage of the invention described hereinbefore resides in the simplicity of the device, in its compactness, particularly axial, in its low cost price.

It should be noted that the fact of having chosen to arrange the splines 41 of piston 33 on the periphery of the latter, allows, with a high value of D 41, a take-up of high torques, without difficulty. This is also valid for toothings 41A, 43A.

20 The invention is not limited to the embodiment described, but covers, on the contrary, all variants that may be made thereto without departing from its scope nor its spirit.

CLAIMS

1. An assembly of a hydraulic motor and a combined device for immobilization, comprising:
- a reaction cam;
 - a cylinder-block mounted to rotate with respect
- 5 to the reaction cam;
- a first immobilization means which is fast with respect to the rotation of the cylinder-block;
 - a second immobilization means which is fast with respect to the rotation of the reaction cam
- 10 and which is capable of being disposed with respect to said first immobilization means in two distinct positions: a first position, in which said first and second immobilization means are fast with one
- 15 another with respect to rotation, and a second position, in which these first and second immobilization means do not cooperate for their mutual immobilization; and
- a device for adjusting the relative position of the first and second immobilization means, coupled
- 20 together and comprising in particular a pressurized fluid jack comprising a working chamber defined by a cylinder and by a piston mounted to slide therein,
- wherein
- a) one of the first and second immobilization
- 25 means is coupled to an immobilization member which is mounted to move in translation on that of the two elements of the motor - cylinder-block and reaction cam - with which said immobilization means is fast with respect to rotation;
- b) said immobilization member constitutes,
- 30 with one of the elements defining the working chamber

of said fluid jack - piston and cylinder -, a monobloc assembly;

c) one of the first and second immobilization means is constituted by at least one immobilization catch capable of cooperating with at least one receiving housing formed in the other of said first and second immobilization means;

d) the first and second immobilization means are contained in the working chamber of the pressurized fluid jack.

2. The assembly of Claim 1, wherein the cylinder-block of the motor comprising a central bore provided with splines intended in particular to render a drive shaft fast with said cylinder-block, with respect to rotation, said immobilization member is also provided with splines, which cooperate with the splines of the cylinder-block in order to effect assembly of this immobilization member in translation with respect to said cylinder-block and fast, with respect to rotation, with this cylinder-block.

3. The assembly of either one of Claims 1 and 2, wherein the immobilization member and the piston of the jack constitute a monobloc assembly.

4. The immobilization assembly of any one of Claims 1 to 3, wherein said first immobilization means and said piston constitute a monobloc assembly.

5. The immobilization assembly of any one of Claims 1 to 4, wherein said second immobilization means and said cylinder constitute a monobloc assembly.

6. The immobilization assembly of any one of Claims

1 to 5, wherein the first and second immobilization means are constituted by splines.

7. The immobilization assembly of Claim 6, wherein the maximum diameter of the splines which constitute a monobloc assembly with the piston, has a value close to that of the diameter of said piston.

8. The immobilization assembly of Claim 7, wherein the maximum diameter of the splines forming a monobloc assembly with the piston, is included between 0.88 and 0.96 times the diameter of the piston.

9. The immobilization assembly of any one of Claims 1 to 5, wherein the first and second immobilization means are constituted by frontal toothings.

10. The immobilization assembly of Claim 9, wherein the maximum diameter of the frontal toothings, which constitute a monobloc assembly with the piston, has a value close to that of the diameter of said piston.

11. The immobilization assembly of Claim 10, wherein the maximum diameter of the frontal toothings forming a monobloc assembly with the piston, is included between 0.88 and 0.96 times the diameter of the piston.

12. An immobilization assembly substantially as herein described with reference to the accompanying drawings.