

**EUROPEAN PATENT APPLICATION**

Application number: 82201276.1

Int. Cl.<sup>3</sup>: F 15 B 11/20

Date of filing: 14.10.82

Priority: 18.11.81 IT 2515081

Date of publication of application:  
25.05.83 Bulletin 83/21

Designated Contracting States:  
DE FR GB NL

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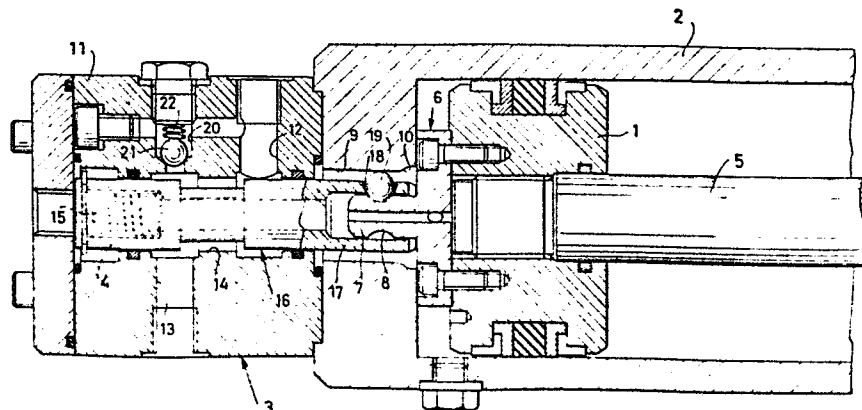
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Device for the sequential operation of controlled members.

A piston 1 sliding in a cylinder 2 operates a first controlled member. A cut-off valve 3 controls a fluid flow destined for the operation of a second controlled member. The piston 1 is provided with a head portion 6 that, in proximity of the end of every advancement stroke of the piston, is automatically connected to a sliding control 16 of the shutter 4 of the cut-off valve 3 to cause the opening of the latter. Still automatically, said head portion 6 leaves said shutter 4 at a prefixed point of the successive return stroke of the piston.

**Fig.1**



"Device for the sequential operation of controlled members".

\* \* \* \* \*

5 The present invention relates to a device for the sequential operation of controlled members.

More particularly, the present invention relates to a device which is able to provide sequentially the closing of the check-valves and the operation of the release device in a pipe fitting of the kind, known per se, realized in two separable parts everyone provided with a check-valve.

10 In the fitting of this kind it is obviously necessary that the two check-valves are brought in closed position before the two fitting parts, controlled by them, are separated by the operation of the release device.

15 It is therefore necessary to assure in any case an appropriate sequential operation of the check-valves and of the release device.

20 In certain cases, this is done by a device in which a piston sliding in a cylinder causes in a first part of advancement run the integral closing of the two check-valves and in a second and last part the opening of a cut-off valve intended for the control of a fluid flow destined for control of the release device.

25 In such a known device the functional connection between the piston and the cut-off valve consists of a simple abutting engagement, which occurs when the piston is in proximity of the end of its advancement stroke, the closing of the cut-off valve at the successive return stroke of the piston in its turn being caused by

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a spring loaded by the opening movement controlled by the piston.

It has been verified that a solution of the kind has the drawback that the spring, for different reasons, is not always able to assure with the due security the closing of the cut-off valve, to which it may therefore happen to remain partially or totally open up to the successive restoration of the piston advancement control and of the fluid flow for the control of the release device.

When this happens, the consequence is that the wanted sequence is no longer respected, that is the operation control of the release device reaches the latter before the piston could realize the check-valve closing, with the drawbacks which can be easily imagined.

The object of the present invention is therefore to realize a sequential operating device of the above mentioned kind, particularly but not only for pipe fittings, which is exempt from the above explained drawback and, more precisely, assures in any case the closing of the cut-off valve in occasion of the piston return movement from the valve opening position.

In view of such an object the device according to the invention, comprising a piston sliding in a cylinder for the corresponding operation of a first controlled member and a cut-off valve intended for the control of a fluid flow destined for the operation of a second controlled member, said cut-off valve being provided with a shutter with sliding control situated in front

of said piston, characterized in that said piston is provided with a head portion releasably connectable to said sliding control of the shutter and there are provided interlocking means for said head portion and said sliding control, which means allow the piston to become integral with the shutter of the cut-off valve in proximity of the end of every advancement stroke of the piston towards said cut-off valve and to leave it at a prefixed point of the successive return stroke of the same piston.

In other words, according to the invention the functional connection between the piston and the shutter of the cut-off valve is now constituted by a releasable connection, which, remaining unreleased in the final part of the piston advancement stroke and in the initial part of its return stroke, allows the piston to control not only the opening but also the closing of the cut-off valve, which the piston subsequently leaves in that position so as to be able to complete its return stroke. It is therefore impossible that the cut-off valve remains inappropriately open and, on the contrary, it is certain that it always closes when due, thus allowing the sure repetition of the wanted sequence.

In the above considered case of a fitting constituted by two separable parts provided with respective check-valves, in particular, it is always assured that the closing of the latter precedes, as it is right, the operation of the release device.

The feature of the present invention will be made

more evident by the following detailed description of an embodiment thereof illustrated by way of non limitative example in the accompanying drawings, in which:

Fig. 1 shows a device according to the invention in axial section with the piston at the advancement stroke end and the cut-off valve in open position;

Fig. 2 shows said device with the piston partially returned and at the moment of the release from the shutter of the cut-off valve;

Fig. 3 shows said device with the cut-off valve in closed position and the piston further returned and completely released from the shutter of the cut-off valve.

The device illustrated in the drawings substantially comprises a piston 1 sliding in an oleodynamic cylinder 2 and a cut-off valve 3 provided with a sliding shutter 4 situated coaxially in front of the piston 1.

To the piston 1 it is attached a stem 5, which in a known way provides for the operation of a first controlled member, for example for the opening (by advancing from right to left) and to the closing (by returning from left to right) of the two check valves of a pipe fitting of the above described kind. To the movements of the piston 1 provides in an usual manner oil fed from time to time on the right or on the left of the piston in the cylinder 2.

To the frontal face of the piston 1, opposite to that from which extends the stem 5, it is fixed a head portion 6, which includes an axial appendix 7 provided with an annular groove 8. As shown in Fig. 1, when the

piston 1 is at the end of the stroke of advancement, said axial appendix is held in a large axial passage 9 of the front wall of the cylinder 2. Said passage 9 includes at its inner end a flaring 10, whose objects  
5 will be clarified later on.

The cut-off valve 3 includes in its turn an outer casing or valve body 11, through which extends a passage formed by two parallel end lengths 12 and 13 and by a perpendicular intermediate length 14. Through said  
10 passage an oil flow fed into the end length 12 can provide for the operation of a second controlled member, for example the release device of a pipe fitting of the above described kind.

Such oil flow is subjected to the control of the shutter 4, which in the position of Fig. 1 opens and  
15 in the position of Figs. 2 and 3 closes the intermediate length 14, respectively setting free and cutting off the above mentioned flow.

A spring 15 stresses towards the closed position the shutter 4, whose movements are however subjected  
20 to the control of the piston 1, as it will be seen better later on, as a result of the releasable connection, which can be realized, when wanted, between a sliding control bar 16 situated as an extension of the shutter  
25 4 and passing through the axial passage of the front wall of the cylinder 2 and the axial appendix 7 of the head portion 6 of the piston 1.

In order to realize such a releasable connection, the control bar 16 is provided with a hollow end portion 17 in which said axial appendix 7 of the piston 1  
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can be slidingly inserted. The above mentioned hollow portion is provided on the other hand with radial holes 18, in which there are slidingly housed the same number of balls 19, which project partially inside and partially outside the hollow portion 17 so as to be able to insert, when wanted, in the annular groove 8 of the axial appendix 7 of the piston 1 and at the same time to be guided, outside, by the wall of the axial passage 9.

10 In the outer casing of the cut-off valve 3 is finally obtained a further passage 20 for the connection of the two end lengths 12 and 13, which passage is controlled in unidirectional way by a non-return valve 21 stressed by a spring 22. Said passage 20 has the function to allow a return oil flow from the second controlled member while the shutter 4 is in closed position.

15 In order to understand the working way of the device illustrated in the drawings, one considers as starting or rest condition that in which the shutter 4 of the cut-off valve 3 is held by the spring 15 in closed position as in Fig. 3 and the piston 1 is separated from the shutter 4 and come back at the end of stroke at the bottom of the cylinder 2. In the exemplificative case that the controlled members are the check valves and the release device of a pipe fitting of the above mentioned kind, the situation is such that the check valves are open and the two parts of the fitting regularly connected.

25 In order to execute sequentially the operation of the two controlled members, in the considered example

the closing of the check valves and the operation of the release device, the device illustrated in the drawings is made working by feeding oil simultaneously in to the cylinder 2 on the right of the piston 1 and in-  
5 to the end length 12 of the inner passage of the cut-off valve 3.

The piston 1 begins then to move towards left, operating with its stem 5 the first controlled member (in the considered example, thus causing the closing of the  
10 check valves), while the closed position of the shutter 4 of the cut-off valve 3 prevents the oil fed in the duct section 2 from reaching the duct section 13 and therefore the second controlled member (in the considered example, the control of the release device),  
15 which therefore remains at rest. The situation is illustrated in Fig. 3.

When the piston arrives in proximity of the end of its advancement stroke, as illustrated in Fig. 2, its axial appendix 7 fits inside the hollow end portion 17  
20 of the control bar 16 of the shutter 4, firstly slightly pushing outwards the balls 19, which are received in the flaring 10 of the axial passage 9, and then leaving them fall by gravity (at least that or those situated in the upper part in the annular groove 8).

25 Immediately after, the piston 1 abuts the near end of the hollow portion 17 (Fig. 1), which consequently is pushed forward by the same piston and obliges the remaining balls 19 to react with the narrow part of the axial passage 9 in order to be forced towards the  
30 inside of the hollow portion 17 and inside the annular



groove 8 of the axial appendix 7; the connection between the piston 1 and the shutter 4 is thus realized.

The last part of the advancement stroke of the piston 1 is now accompanied by the integral displacement of the shutter 4 towards the open position of Fig. 1, which allows the oil fed into the duct section 12 to flow through the intermediate length 14 and then into the duct section 13 to provide finally for the operation of the second controlled member (in the considered example, the release device).

The two controlled members are so operated in the desired sequence, which is destined to be repeated every time in the same way.

This is due again to the releasable connection realized between the piston 1 and the shutter 4, which allows the sure closing of the cut-off valve 3 in occasion of the successive return stroke of the piston 1, with consequent sure restoration of the previously described starting condition.

In fact, when the piston 1 is controlled to move backward from the position of Fig. 1 by oil fed on its left (while its right is connected to discharge), the connection still operating between the appendix 7 and the hollow portion 17 causes the same piston to move again integrally with the shutter 4, that is therefore obliged to bring itself to the closed position.

Once reached this position, as illustrated in Fig. 2, the balls 19 are at the flaring 10 of the axial passage 9, which allow their partial coming out under the push given by the axial appendix 7 being coming back.

So they can disengage from the annular groove 8 of the same appendix and, leaving free the latter, can allow the separation of the piston 1 from the shutter 4.

5 While the latter remains in closed position under the thrust of the spring 15, the piston 1 can in its turn continue its return stroke (Fig. 3) to bring to the starting position the first controlled member (that is to open again the two check-valves in the con- sidered example). The oil previously fed for the ope-  
10 ration of the second controlled member, in its turn, can discharge through the unidirectional control passa-  
ge 20.

Thus restored the starting condition, in every mo-  
ment the sequence described at the beginning can be  
15 repeated.

CLAIMS

1. Device for the sequential operation of controlled members, comprising a piston sliding in a cylinder for the corresponding operation of a first controlled member and a cut-off valve intended for the control of a fluid flow destined for the operation of a second controlled member, said cut-off valve being provided with a shutter with sliding control situated in front of said piston, characterized in that said piston is provided with a head portion releasably connectable to said sliding control of the shutter and there are provided interlocking means for said head portion and said sliding control, which means allow the piston to become integral with the shutter of the cut-off valve in proximity of the end of every advancement stroke of the piston towards said cut-off valve and to leave it at a prefixed point of the successive return stroke of the same piston.

2. Device according to claim 1, characterized in that said head portion of the piston comprises an axial appendix and said sliding control of the shutter comprises a control bar provided with a hollow end portion, in which said axial appendix of the piston can be releasably inserted and locked.

3. Device according to claim 2, characterized in that said interlocking means are constituted by balls housed in radial holes of said hollow end portion and co-operating with an annular groove of said axial appendix, there being provided radial retaining means for retaining said balls in said annular groove and re

lease means for releasing said balls from said retaining means which release means operate from said prefixed point of the return stroke of the piston and are made inoperative by said axial appendix in proximity  
5 of the end of the successive advancement stroke of the same piston.

4. Device according to claim 3, characterized in that said retaining means are constituted by a guide wall surrounding said hollow end portion and said re-  
10 lease means are constituted by an annular flaring of said guide wall.



Fig.1

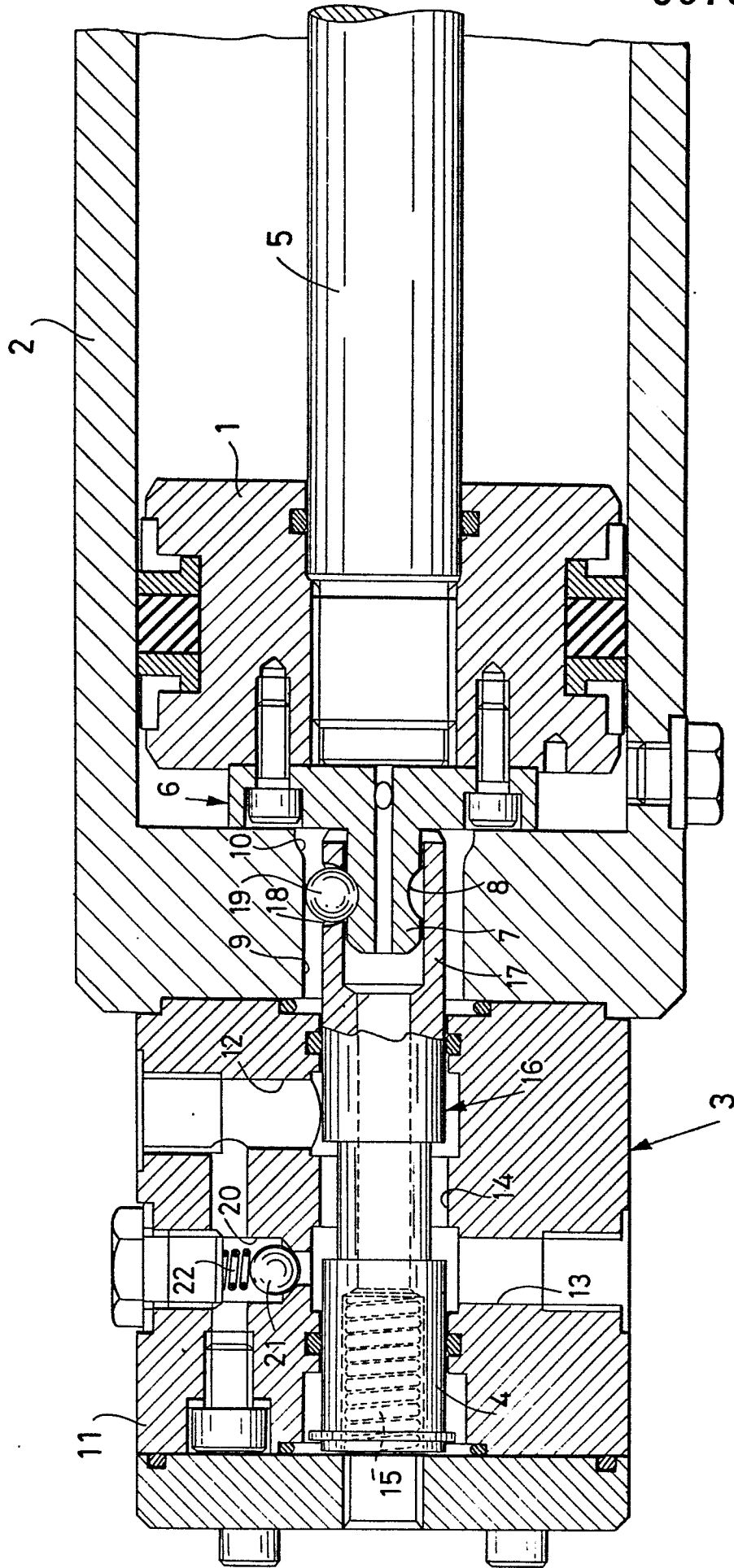
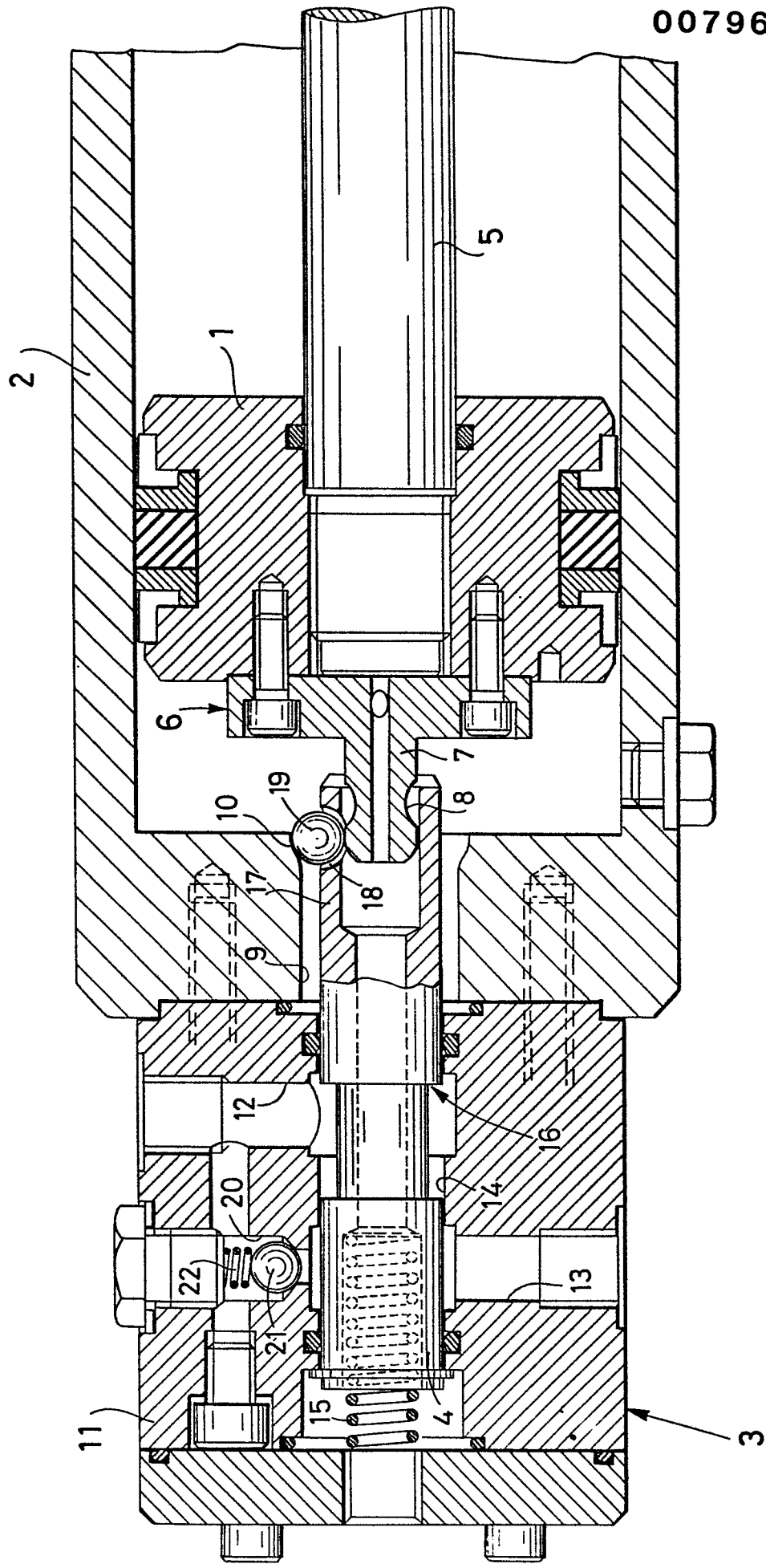


Fig.2



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Fig. 3

