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(71) Applicant *(for all designated States except US)*: **DE'LONGHI S.p.A.** [IT/IT]; Via L. Seitz, 47, I-31100 Treviso (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **DE' LONGHI, Giuseppe** [IT/IT]; Vicolo Rovero, 1, I-31100 Treviso (IT).

(74) Agent: **RAPISARDI, Mariacristina**; Ufficio Brevetti Rapisardi S.r.l., Via Serbelloni, 12, I-20122 Milano (IT).

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[Continued on next page]

(54) **Title:** COFFEE MACHINE INFUSION GROUP

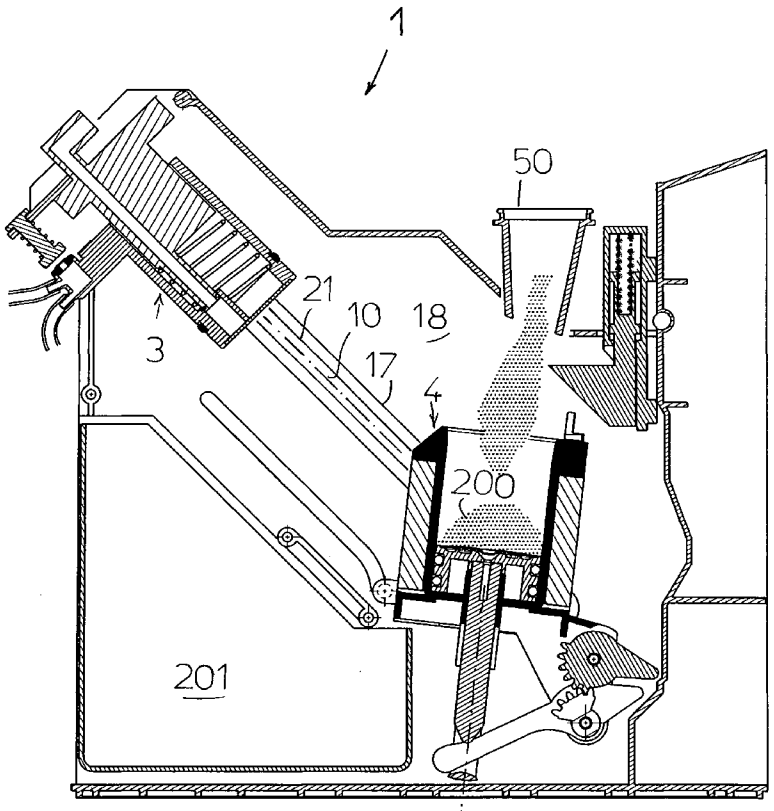

FIG 1

(57) **Abstract:** The coffee machine infusion group comprises a closure piston (3) and an infusion cylinder (4) subjectable to a reversible movement between a position of engagement with the closure piston (3) for the creation of an infusion chamber (5) and a position of disengagement from the closure piston (3) for the loading of a coffee powder load (200), the infusion group having an expulsion system of the spent coffee powder load (200) from the infusion cylinder (4), the expulsion system comprising an expulsion piston (29) displaceably housed in the infusion cylinder (4), the expulsion system further comprising a speed multiplier mechanism operatively connecting the infusion cylinder (4) and the expulsion piston (29) for their relative displacement between a receiving position of the coffee powder load into the infusion cylinder (4) and an expelling position of the coffee powder load (200) from the infusion cylinder (4).

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COFFEE MACHINE INFUSION GROUP

DESCRIPTION

The present invention relates to an infusion group for a machine for producing a coffee drink.

The traditional automatic or semi-automatic coffee machines comprise an infusion group having an infusion cylinder reversibly movable from a disengagement position to an engagement position with a closure piston for the creation of an infusion chamber into which the infusion water is conveyed which has been heated by a boiler, and conveyed through a suitable inner channelling to the closure piston.

The infusion cylinder instead has at its interior an expulsion piston which is moved in a coordinated manner with a scraper for the discharge of the load of spent coffee powder.

A functioning cycle in general comprises a step of loading the coffee powder load inside the infusion cylinder, a step of outgoing movement of the infusion cylinder towards the engagement position with the closure piston for the creation of the infusion chamber and the achievement of the

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infusion, and a step of return movement of the infusion cylinder which is disengaged from the closure piston for expelling the load of spent coffee powder and loading the new coffee powder load.

Such coffee machines can lament an excessive bulk due to the particular placement and structure of the infusion group and mechanisms with which it is equipped.

The increasingly heard market need to have the infusion cylinder dismountable, to be removed mainly for its cleaning and/or maintenance, has in general led to an increased structural complication of the infusion group.

The technical task which the present invention proposes is therefore that of making an infusion group for a machine for producing a coffee drink which permits eliminating the lamented technical drawbacks of the prior art.

In the scope of this technical task, one object of the invention is that of making a highly efficient and reliable infusion group for a coffee machine, easily accessible, compact, constructively and structurally simple.

The technical task, as well as these and other objects according to the present invention are achieved by making a infusion group for coffee machine in accordance with claim 1.

Other characteristics of the present invention are moreover defined in the dependent claims.

Further characteristics and advantages of the invention will be clearer from the description of one or more preferred but not exclusive embodiments of the infusion group for coffee machine according to the finding, illustrated as indicative and non-limiting in the attached drawings, in which:

Figures 1-9 show a side elevation view of a section in a central vertical plane of a coffee machine having in infusion group according to a preferred embodiment of the present invention, wherein the infusion cylinder is shown in the operative positions which progressively follow each other in an entire functioning cycle.

Figures 10-18 show a side elevation of a section in a central vertical plane of a coffee machine having an infusion group according to a second embodiment of the present invention, wherein the infusion cylinder is shown in the operative positions which

progressively follow each other in an entire functioning cycle.

Equivalent parts in the figures are indicated by equivalent reference numbers.

With reference to the mentioned figures, a coffee machine is shown indicated in its entirety with the reference number 1.

The coffee machine 1 has an infusion group comprising a closure piston 3 and an infusion cylinder 4 subjectable to a reversible movement relative to the closure piston 3 between a position of engagement for the creation of an infusion chamber 5 and a position of disengagement for the loading of a coffee powder load 200.

The infusion group has also an expulsion system of the spent coffee powder load from the infusion cylinder 4.

The expulsion system comprises an expulsion piston 29 displaceably housed in the infusion cylinder 4, and further comprises a speed multiplier mechanism operatively connecting the infusion cylinder 4 and the expulsion piston 29 for their relative displacement between a receiving position of the

fresh coffee powder load into the infusion cylinder 4 and an expelling position of the spent coffee powder load from the infusion cylinder 4.

The speed multiplier mechanism is permanently fixed to the infusion cylinder 4 or (as shown) to a carrier 9 of the infusion cylinder 4 whereon the infusion cylinder 4 is preferably detachably mounted.

The expulsion system has cam actuating means for actuation of the speed multiplier mechanism.

The cam actuating means can actuate the speed multiplier mechanism during a translation component of the movement of the infusion cylinder 4 or during a rotation component of the movement of said infusion cylinder 4.

The infusion group has a main body formed by a shell 6 which defines a space for the reversible movement of the infusion cylinder 4, and supports a boiler (not shown) adapted to supply infusion water to the closure piston 3.

The carrier 9 has a rotation axis orthogonal to and movable along a translation axis 10 of the carrier 9 in turn parallel to the axis 13 of the closure

piston 3. The axis 13 of the closure piston 3 is tilted with respect to the horizontal.

Suitable means are provided for the rotation of the carrier 9, between a first angular position in which the axis 12 of the infusion cylinder 4 is oriented transversely to the translation axis 10 to carry out the loading of said coffee powder load, and a second angular position in which the axis 12 of the infusion cylinder is oriented parallel to the translation axis 10. The rotation means of the carrier 9 comprise a cam 23 for the rotation of the carrier 9, in which a projection 25 is engaged which projects from the carrier 9 or from the infusion cylinder 4.

The expulsion system further comprises a scraper 27 pivoted at the side of the access mouth of the infusion cylinder 4 and movable in rotation in a coordinated manner with an expulsion piston 29.

The speed multiplier mechanism comprises a push rod 30 having a first end 31 operatively connected to the rod 33 of the expulsion piston 29 and a second end 34 pivoted in 35 to push rod 30 and having an arc of teeth 38 meshed with an arch of teeth 39 of a second transmission element 40 pivoted in 41 to a

support 205 integrally fixed to the carrier 9 or to the infusion cylinder 4.

The speed multiplier mechanism further comprises a pick-up cam 42 of the retraction movement of the expulsion piston 29, shaped on the second end 34 of the push rod 30, and a pick-up cam 43 of the extraction movement of the expulsion piston 29, shaped on the second transmission element 40.

The hinging axes 35 and 41 are parallel to each other and preferably orthogonal to the axis 12 of the infusion cylinder 4.

The pick-up cams are preferably of flat form and are positioned and moved on respective parallel planes, spaced so to not mutually interfere.

The cam actuating means operate pick-up cam 42 and pick-up cam 43.

As to pick-up cam 42, the cam actuating means comprise an interception element 44 made by a suitable shaping of a internal side wall 45 of the shell 6.

As to pick-up cam 43, the cam actuating means comprise a ratchet 46 constrained to the side wall 45 of the shell 6.

The ratchet 46 can oscillate along a short translation path against and driven by a spring 47 and has a slide surface 48 and an interception surface 49 tilted with respect to each other.

Furthermore also the scraper 27 can have its own cam actuating means of type analogous to that described for the speed multiplier mechanism, for instance a ratchet adapted to interfere with a suitable cam which projects from the scraper 27 to drive in rotation the latter so to sweep the access mouth of the infusion cylinder 4 at which the expulsion piston 29 has brought the load of spent coffee powder. The scraper 27 more in particular has a hinging pin parallel to the axis 12 of the infusion cylinder 4 and is moved against and driven by a return spring (not shown) towards the rest position at the side of the access mouth to the infusion cylinder 4.

The functioning of the coffee machine 1 is briefly as follows.

The infusion cylinder 4 is found at travel start below the loader of the coffee powder and preferably with axis slightly tilted back with respected to the vertical.

The expulsion piston 29 is in retracted position.

At the end of the loading of the coffee powder in the infusion cylinder 4 the latter is moved.

During the initial part of ascent, the projection 25 follows a curvilinear section of the rotation cam 23 which causes the rotation of the infusion cylinder 4 until the axis 12 of the infusion cylinder 4 is aligned with the axis 13 of the closure piston 3.

Such rotation of the infusion cylinder 4 also generates a certain levelling of the coffee powder just poured into the infusion cylinder 4.

From this moment, the upward driving proceeds with the same angular orientation of the infusion cylinder 4, since the remaining section of the rotation cam 23 is rectilinear and parallel to the translation axis 10 of the infusion cylinder 4.

During the ascent of the infusion cylinder 4, the pick-up cam 43 of the expulsion piston 29 extraction movement encounters the slide surface 48 of the ratchet 46, which moves back and is passed over by the cam 43 which is thus not driven in movement.

The same thing occurs for the pick-up cam of the rotation movement of the scraper 27, which is not driven in movement.

The infusion cylinder 4 comes to be engaged with the closure piston 3 and the infusion occurs.

At the end of the infusion, the descent movement begins of the infusion cylinder 4.

During descent, the infusion cylinder 4 is disengaged from the closure piston 3 and the speed multiplier mechanism is activated.

The speed multiplier mechanism operates in the following manner.

The pick-up cam 43 of the expulsion piston 29 extraction movement this time encounters the interception surface 49 of the ratchet 46, which cannot move backward and is passed over by the cam 43 which however is driven in movement. The movement of the cam 43 is transmitted to the push rod 30 and from this to the expulsion piston 29 through the gear between the first and second transmission 37 and 40. The expulsion piston 29 is moved towards the access mouth of the infusion cylinder 4.

Analogously, the pick-up cam 121 of the scraper 27 rotation movement this time encounters the interception surface of the related ratchet, which cannot move backward and is passed over by the cam, which is however driven in movement. The coordinated movement of the expulsion piston 29 and scraper 27 determines the expulsion of the spent coffee powder load 200 which is connected in a suitable collector 201.

The scraper 27 automatically returns in the initial rest position due to the return spring while the retraction of the expulsion piston 29 is controlled during the final descent section of the infusion cylinder 4 when the pick-up cam 42 of the retraction movement of the expulsion piston 29 encounters the interception element 44 which causes a rotation of the gear between the first and second transmission element 37 and 40, equal in amplitude but in opposite sense with respect to that which previously occurred during the extraction of the expulsion piston 29.

After the expulsion of the spent coffee powder load, during a further terminal descent section of the infusion cylinder 4, the projection 25 once

again follows the curvilinear section of the rotation cam 23, which causes the counter-rotation of the infusion cylinder 4 until its axis 12 is aligned with the overlying loader.

With reference to figures 10-18, in a second embodiment of the invention the infusion cylinder 4 is fixedly aligned with the axis 13 of the closure piston 3. It thus exhibits only a linear translational movement. In this second embodiment, the push rod 30 is connected to the rod 33 of the expulsion piston 29 by an arc of teeth 50 meshing with a rack of teeth 51 along the rod 33. Apart from this difference in the speed multiplier mechanism and the lack of roto-translational movement of the infusion cylinder 4, the structure and operation of the speed multiplier mechanism operatively connecting the infusion cylinder 4 and the expulsion piston 29 for their relative displacement are as described above.

The coffee machine thus conceived is susceptible of many modifications and variations, all of which fall within the scope of the inventive concept; moreover all details can be replaced by technically equivalent elements.

The infusion group according to the present invention can be installed in any type of coffee machine, and in particular both for coffee machines providing a mere translation, and for coffee machines providing a roto-translation of the infusion cylinder.

In practice, the materials used, as well as dimensions, can be of any type according to the particular requirements and the state of the art.

CLAIMS

1. Coffee machine infusion group comprising a closure piston and an infusion cylinder subjectable to a reversible movement between a position of engagement with said closure piston for the creation of an infusion chamber and a position of disengagement from said closure piston for the loading of a coffee powder load, said infusion group having an expulsion system of the spent coffee powder load from said infusion cylinder, said expulsion system comprising an expulsion piston displaceably housed in said infusion cylinder, characterised in that said expulsion system further comprises a speed multiplier mechanism operatively connecting said infusion cylinder and said expulsion piston for their relative displacement between a receiving position of said coffee powder load into said infusion cylinder and an expelling position of said coffee powder load from said infusion cylinder.
2. Coffee machine infusion group according to claim 1, characterised in that said speed

multiplier mechanism is permanently fixed to said infusion cylinder or to a carrier of said infusion cylinder whereon said infusion cylinder is detachably mounted.

3. Coffee machine infusion group according to one or more preceding claims, characterised in that said expulsion system has cam actuating means for actuation of said speed multiplier mechanism.

4. Coffee machine infusion group according to one or more preceding claims, characterised in that said cam actuating means actuate said speed multiplier mechanism during a translation component of the movement of said infusion cylinder.

5. Coffee machine infusion group according to one or more preceding claims, characterised in that said cam actuating means actuate said speed multiplier mechanism during a rotation component of the movement of said infusion cylinder.

6. Coffee machine infusion group according to one or more preceding claims, characterised in that said speed multiplier mechanism comprises

a push rod having a first end operatively connected to the rod of said expulsion piston and a second end pivoted to a support integrally fixed to said infusion cylinder or to said carrier, a first transmission element integral with said push rod and having an arc of teeth meshing with an arc of teeth of a second transmission element pivoted to said support.

7. Coffee machine infusion group according to one or more preceding claims, characterised in that said speed multiplier mechanism further comprises a pick-up cam of the retraction movement of the expulsion piston, obtained from the second end of said push rod, and a pick-up cam of the extraction movement of said expulsion piston, obtained from said second transmission element.

8. Coffee machine infusion group according to one or more preceding claims, characterised in that said first end of said push rod is housed in a hole of said rod of said expulsion piston.

9. Coffee machine infusion group according to one or more preceding claims, characterised in that said first end of said push rod comprises an arc of teeth meshing with a rack of teeth along said rod of said expulsion piston.

10. Coffee machine infusion group according to one or more preceding claims, characterised in that said cam actuating means for actuating said pick-up cam of the retraction movement of the expulsion piston comprise an interception element made by a suitable shaping of a internal side wall of a shell of said infusion group which defines a space for the reversible movement of said infusion cylinder.

11. Coffee machine infusion group according to one or more preceding claims, characterised in that said cam actuating means for actuating said pick-up cam of the extraction movement of the expulsion piston comprise a ratchet constrained to said side wall of said shell.

12. Coffee machine infusion group according to one or more preceding claims, characterised in that said ratchet can oscillate along a short translation path against and driven by a

spring and has a slide surface and an interception surface, tilted with respect to each other, for said pick-up cam of the extraction movement of the expulsion piston.

13. Coffee machine characterised in that of having an infusion group according to one or more preceding claims.

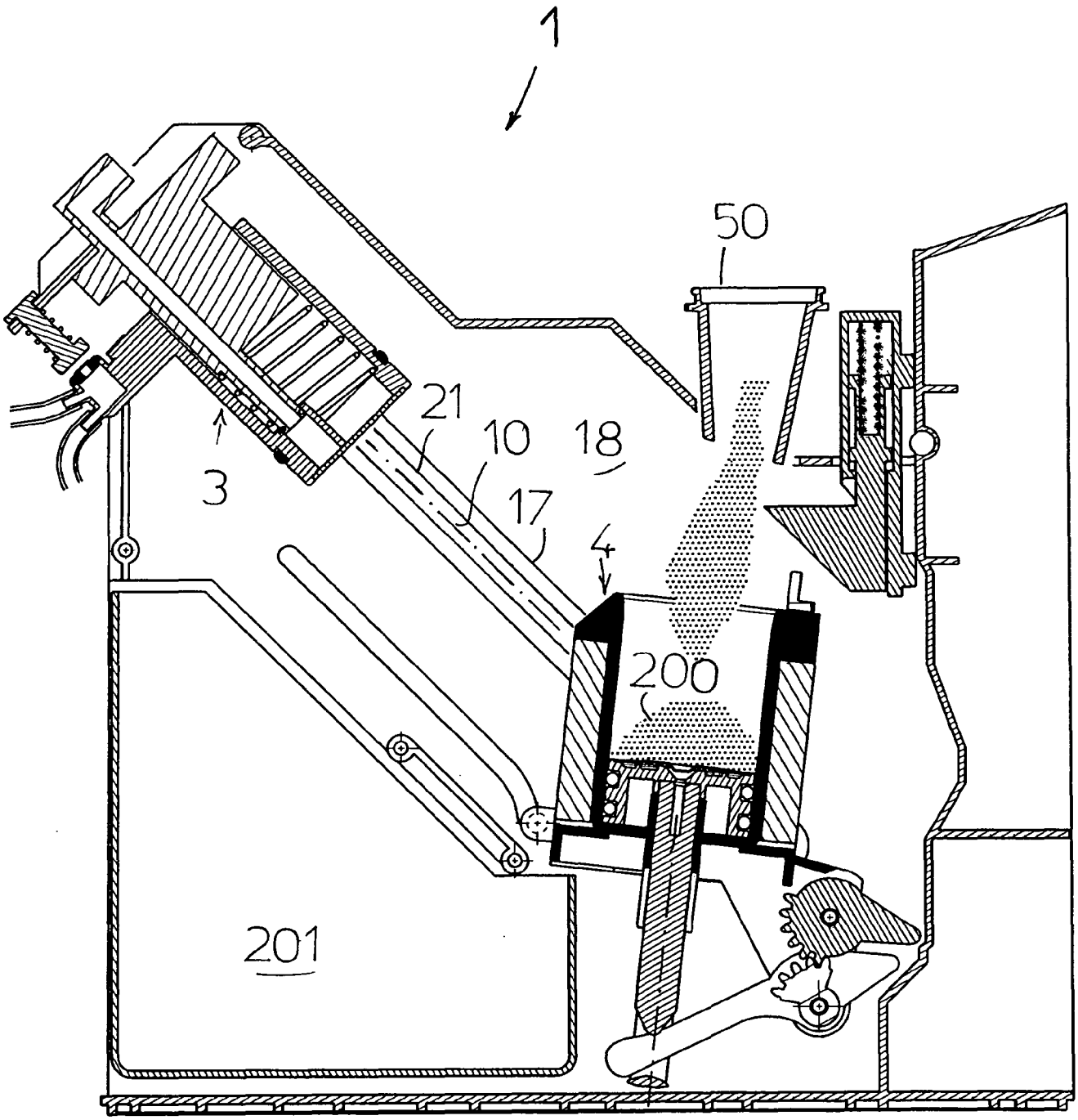

FIG 1

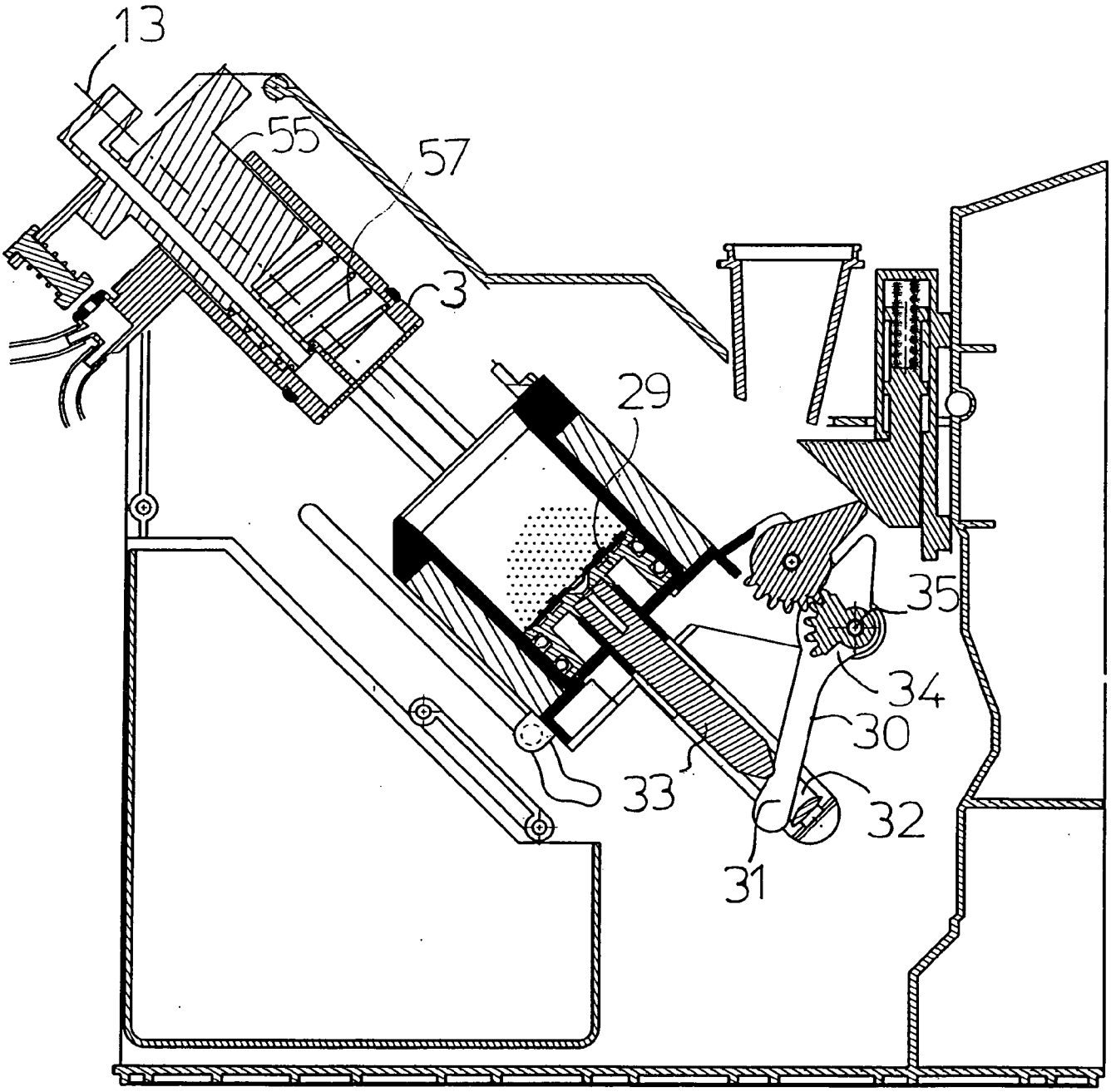

FIG2

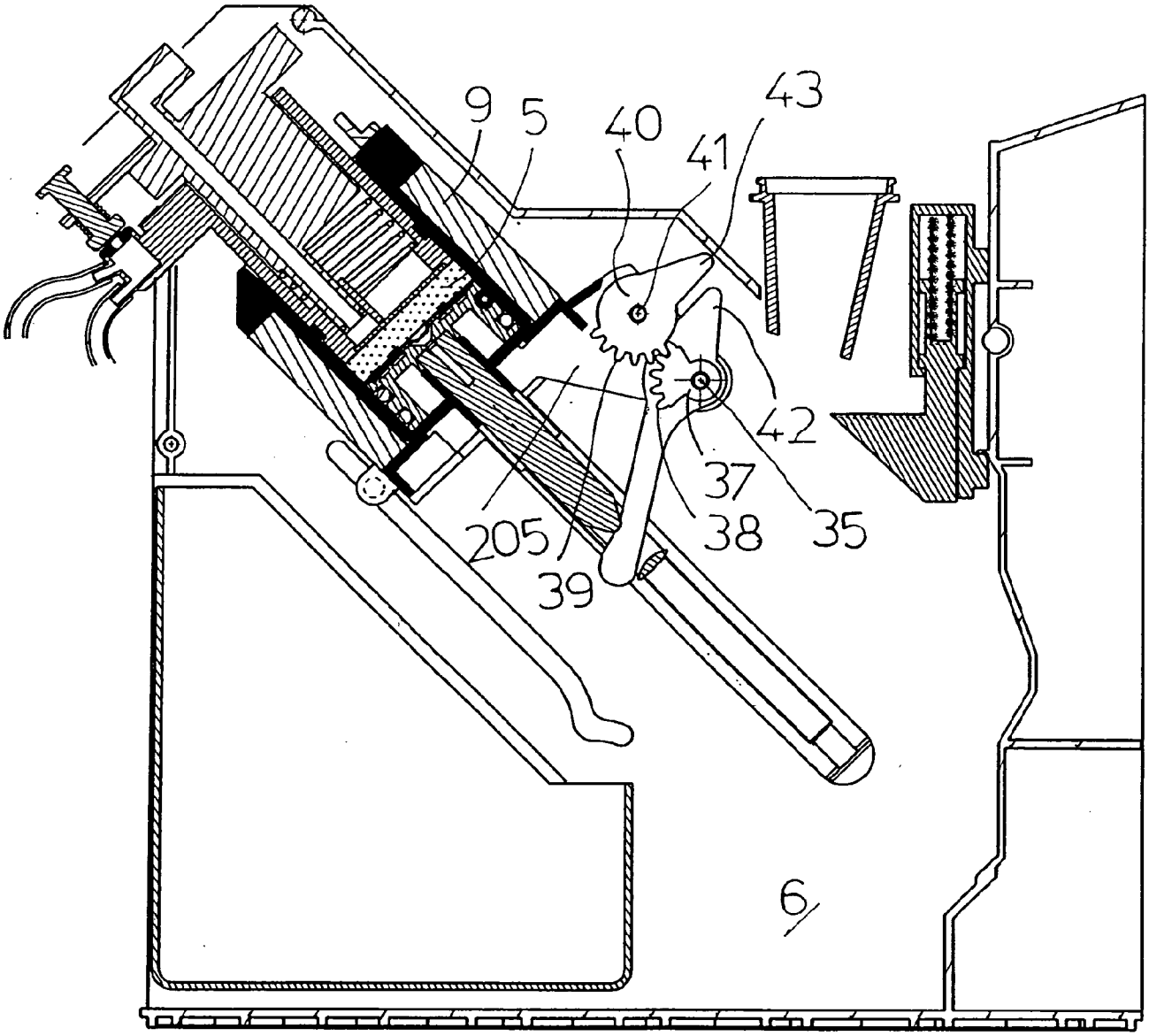

FIG 3

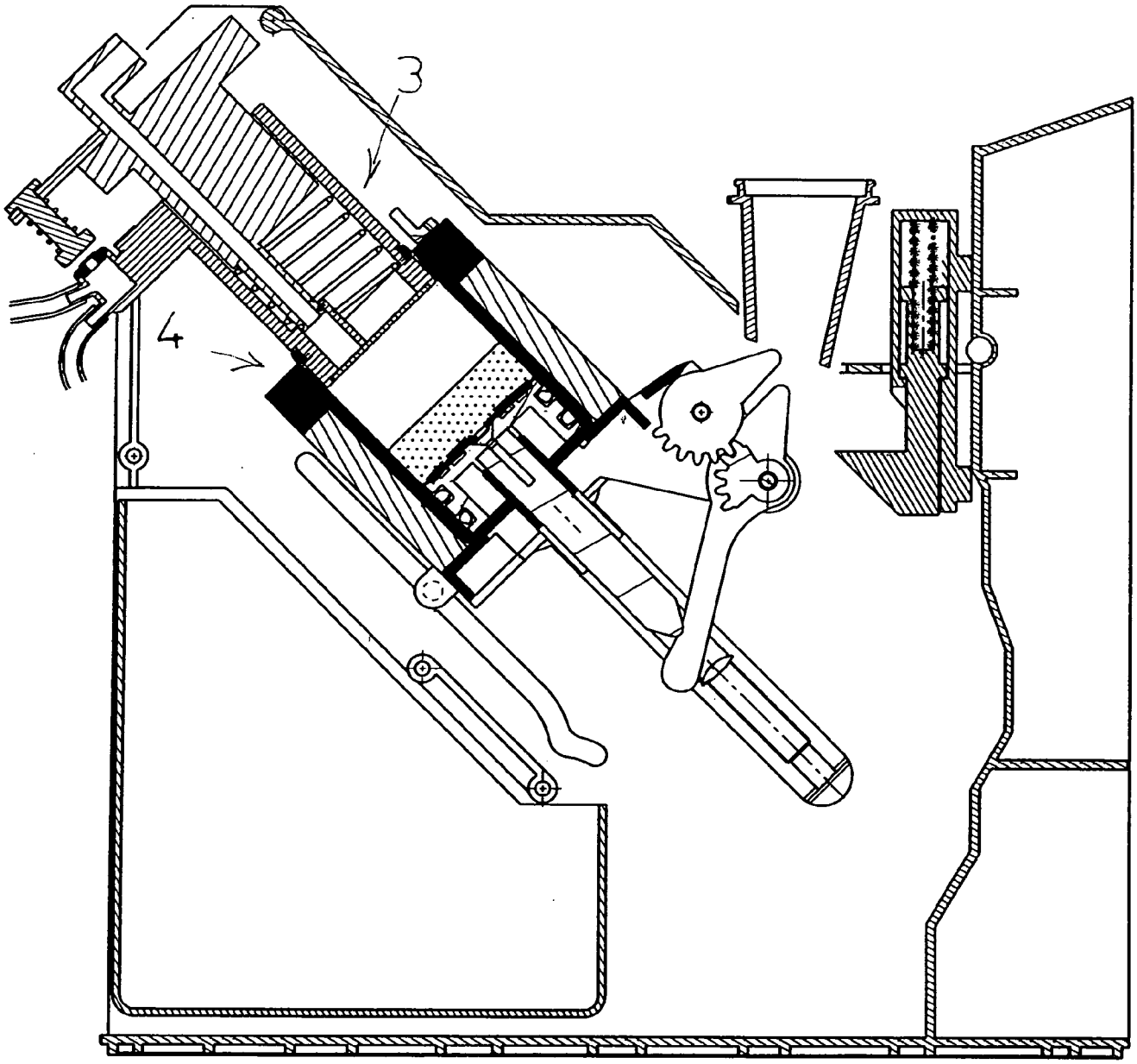

FIG4

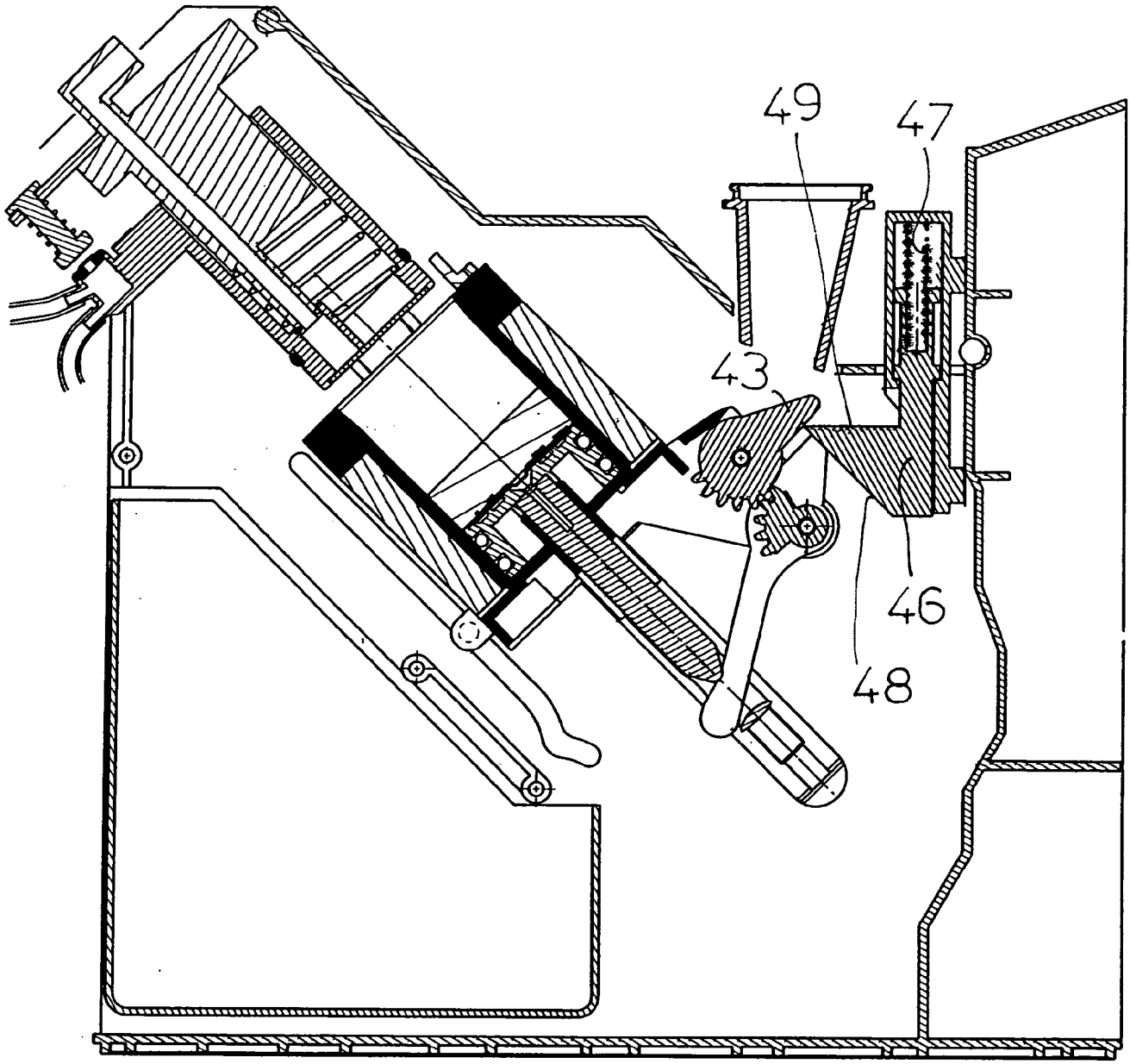

FIG5

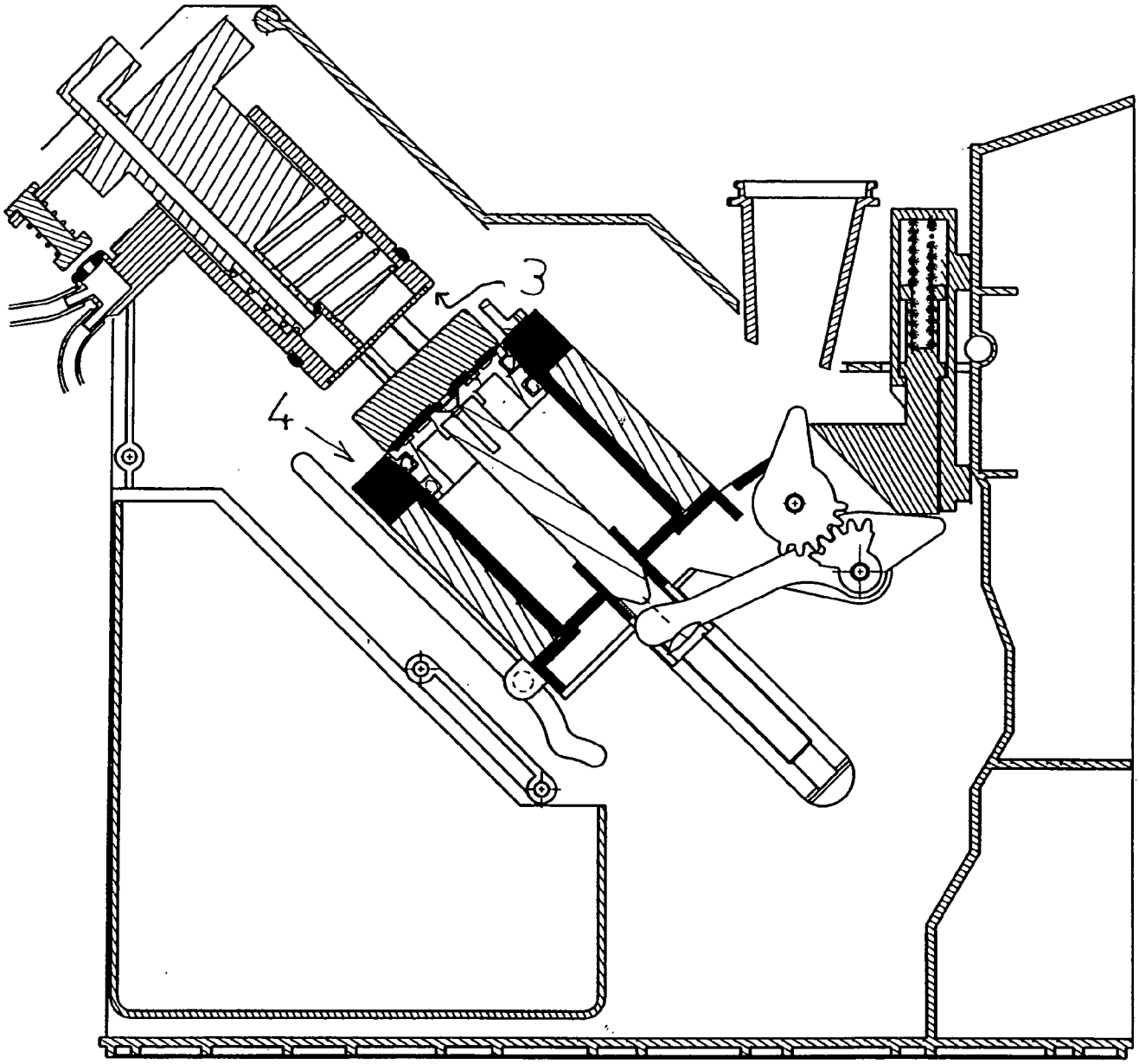

FIG6

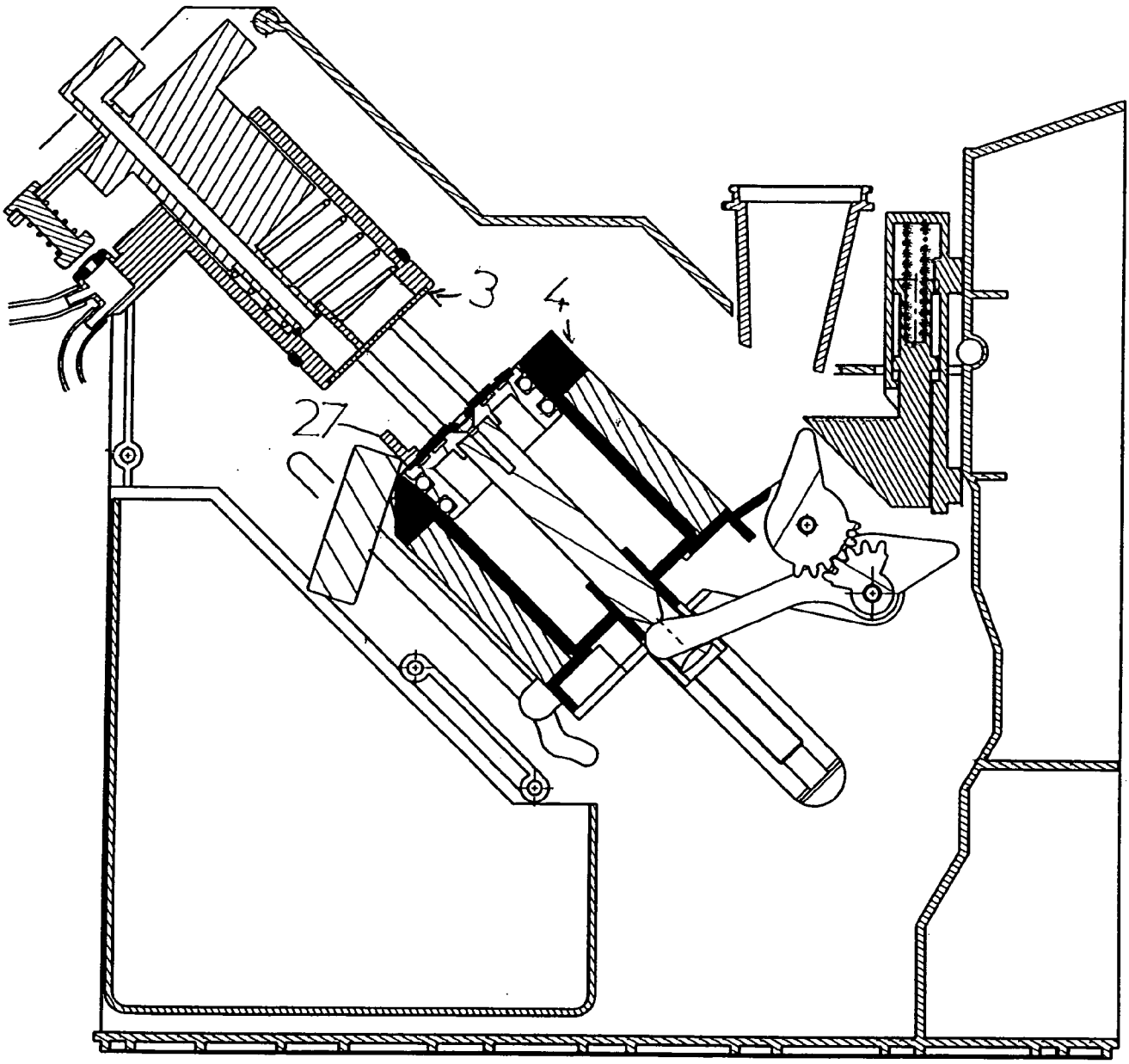

FIG7

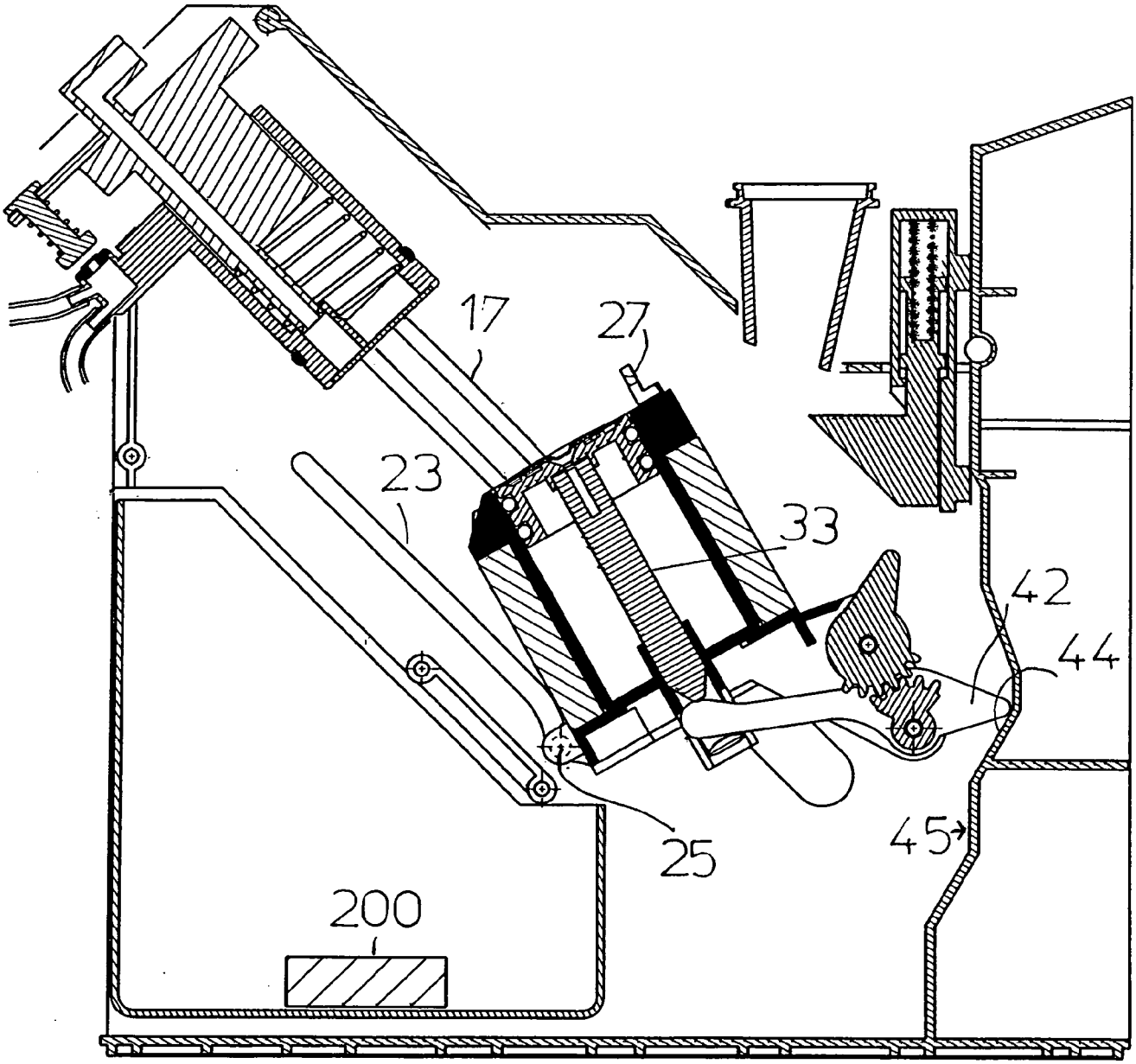

FIG 8

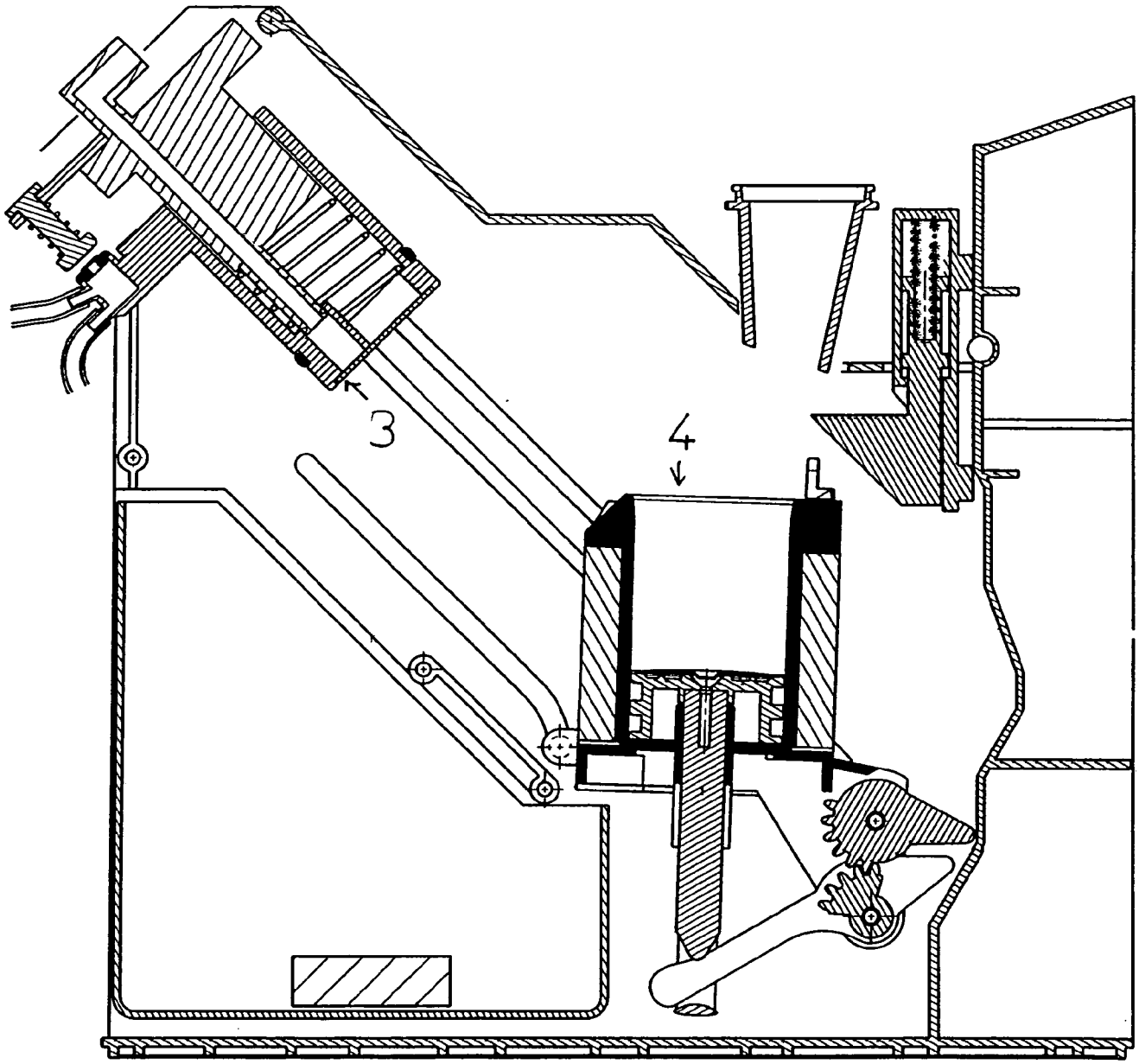

FIG 9

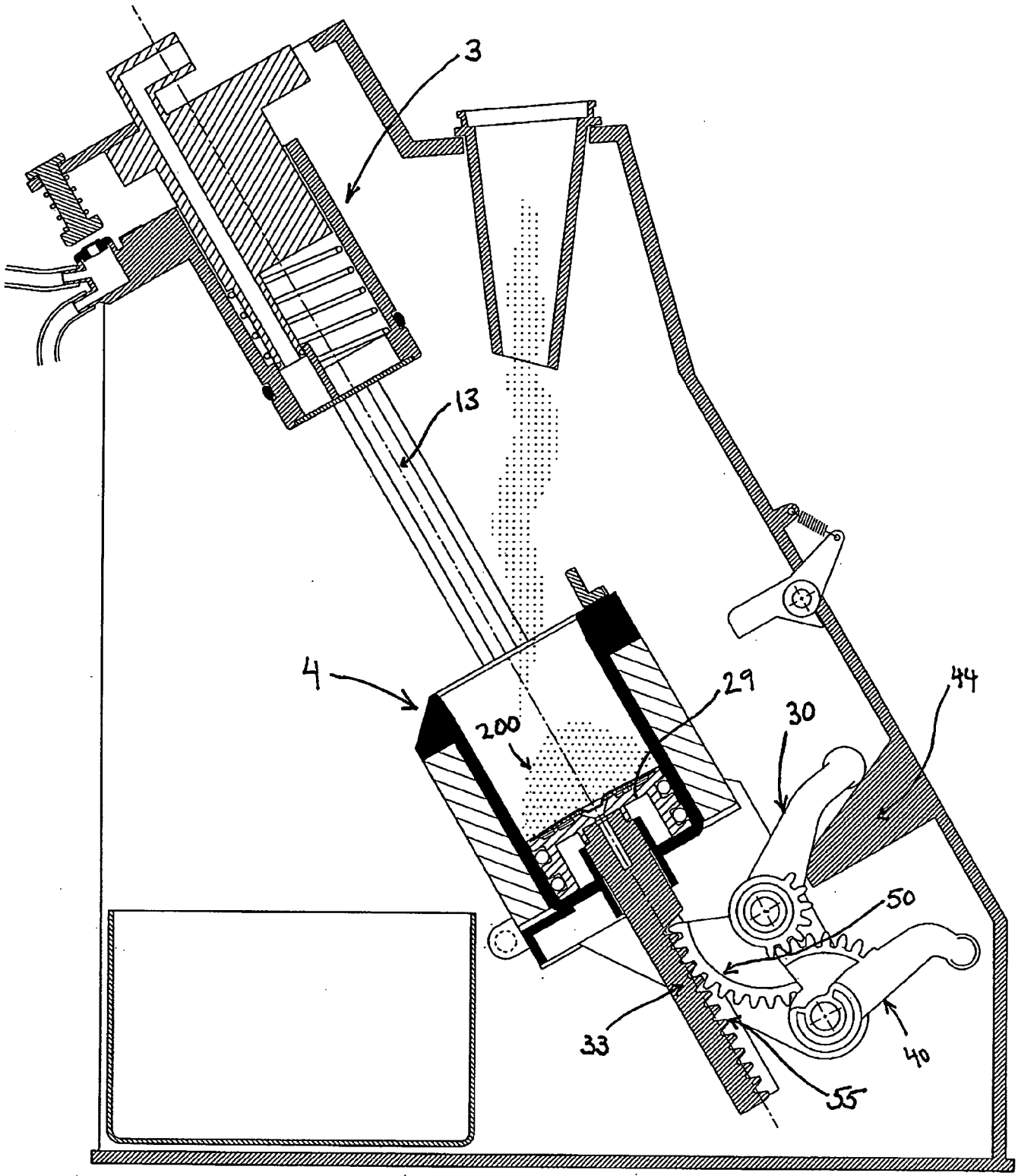

FIG 10

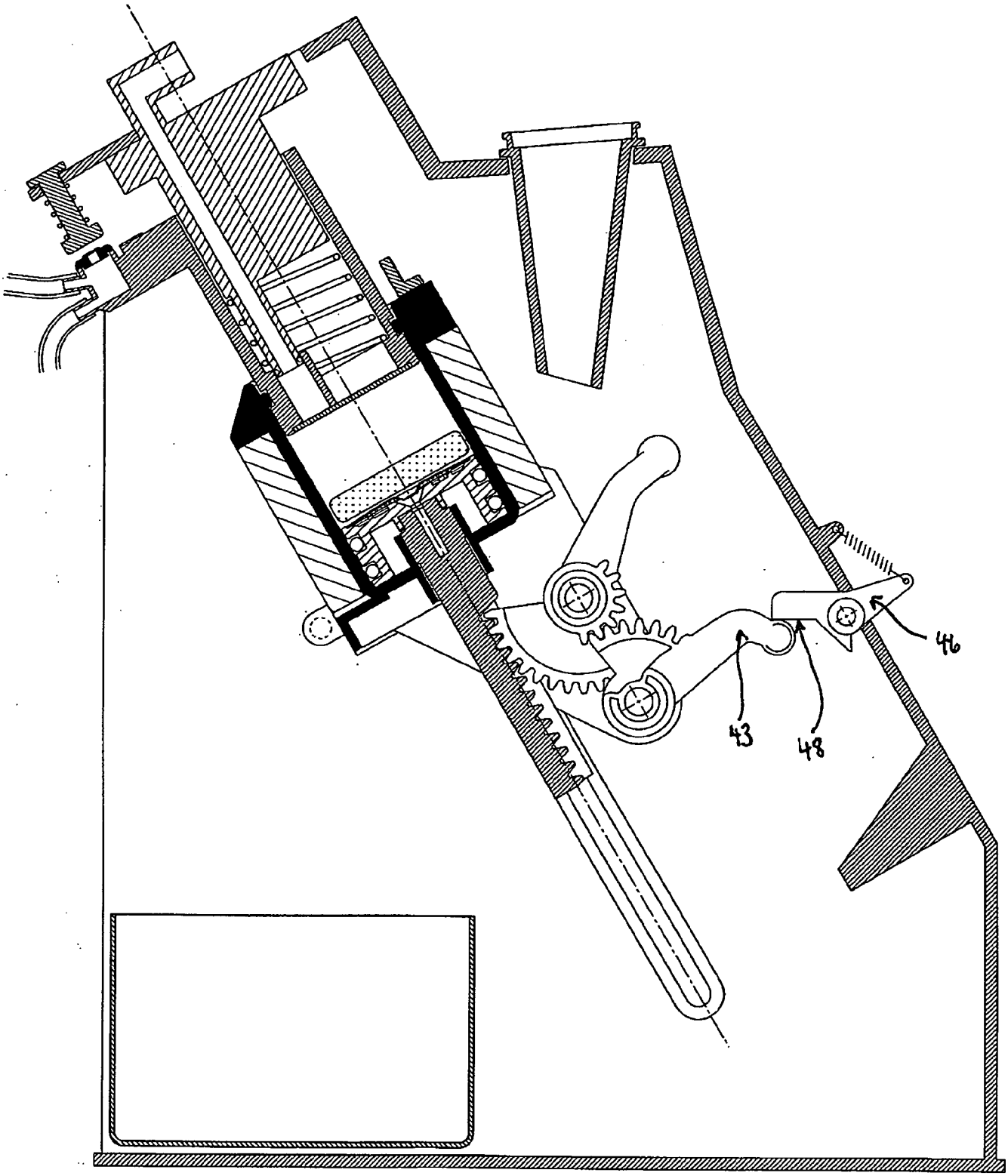

FIG 11

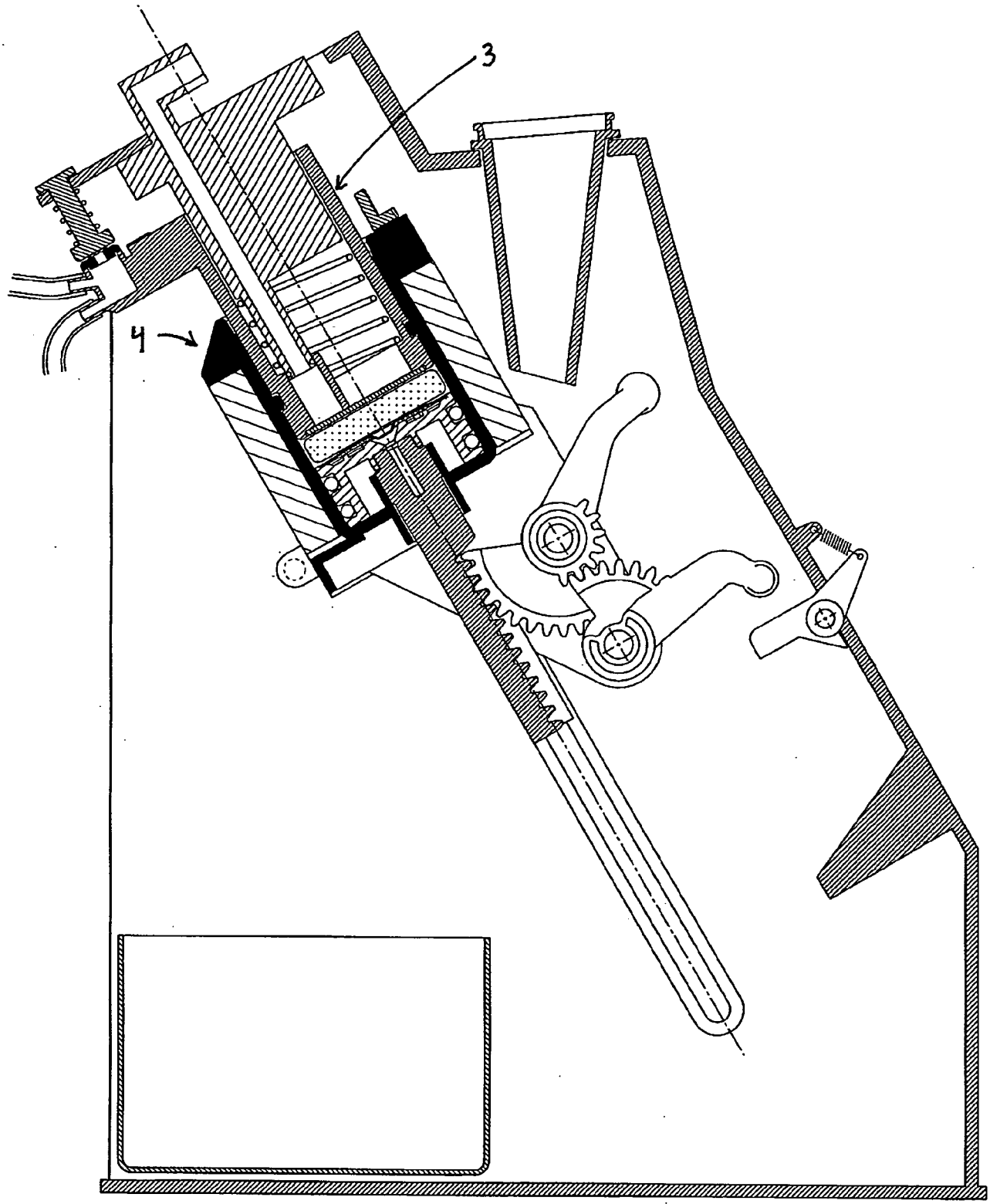

FIG 12

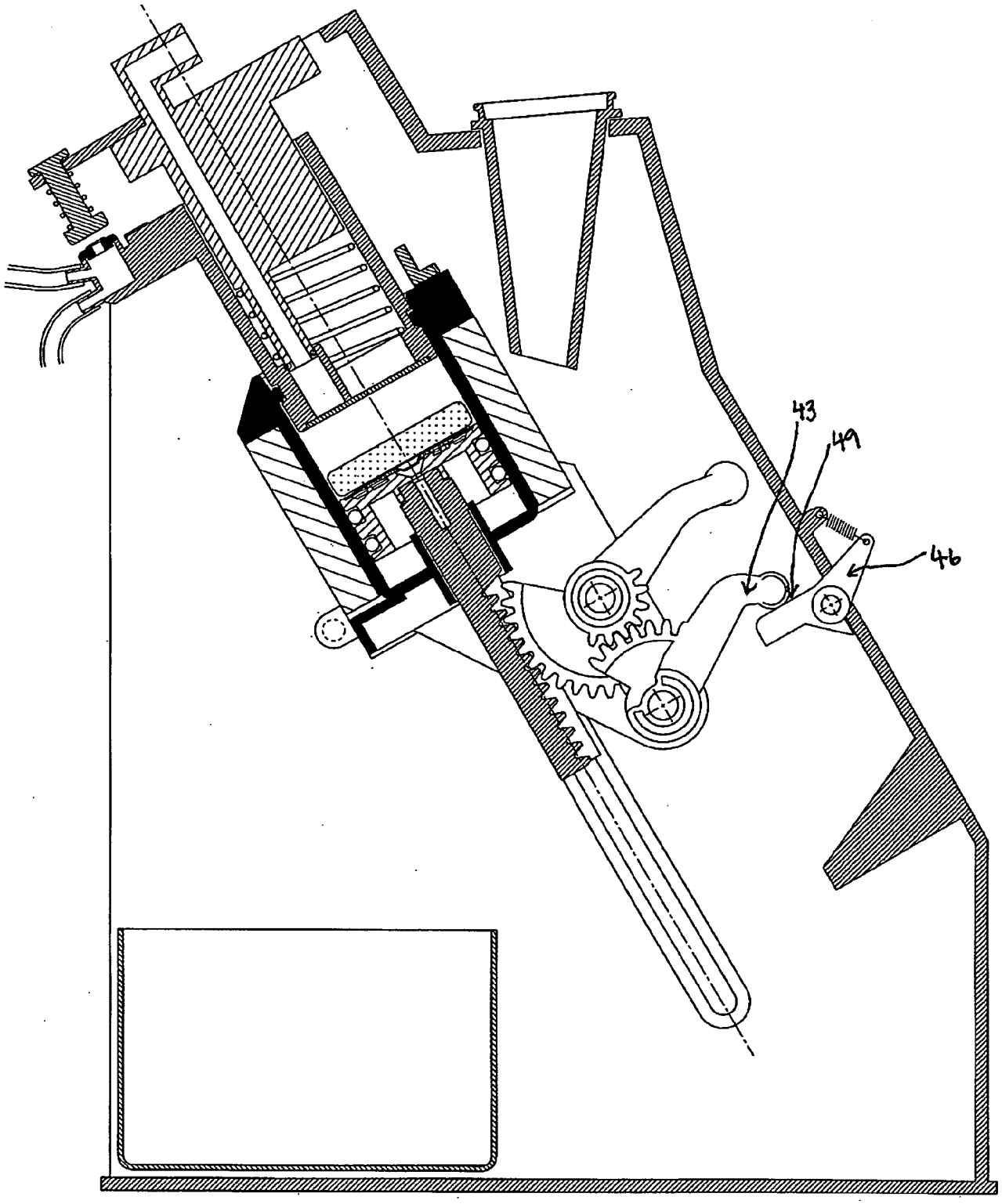

FIG 13

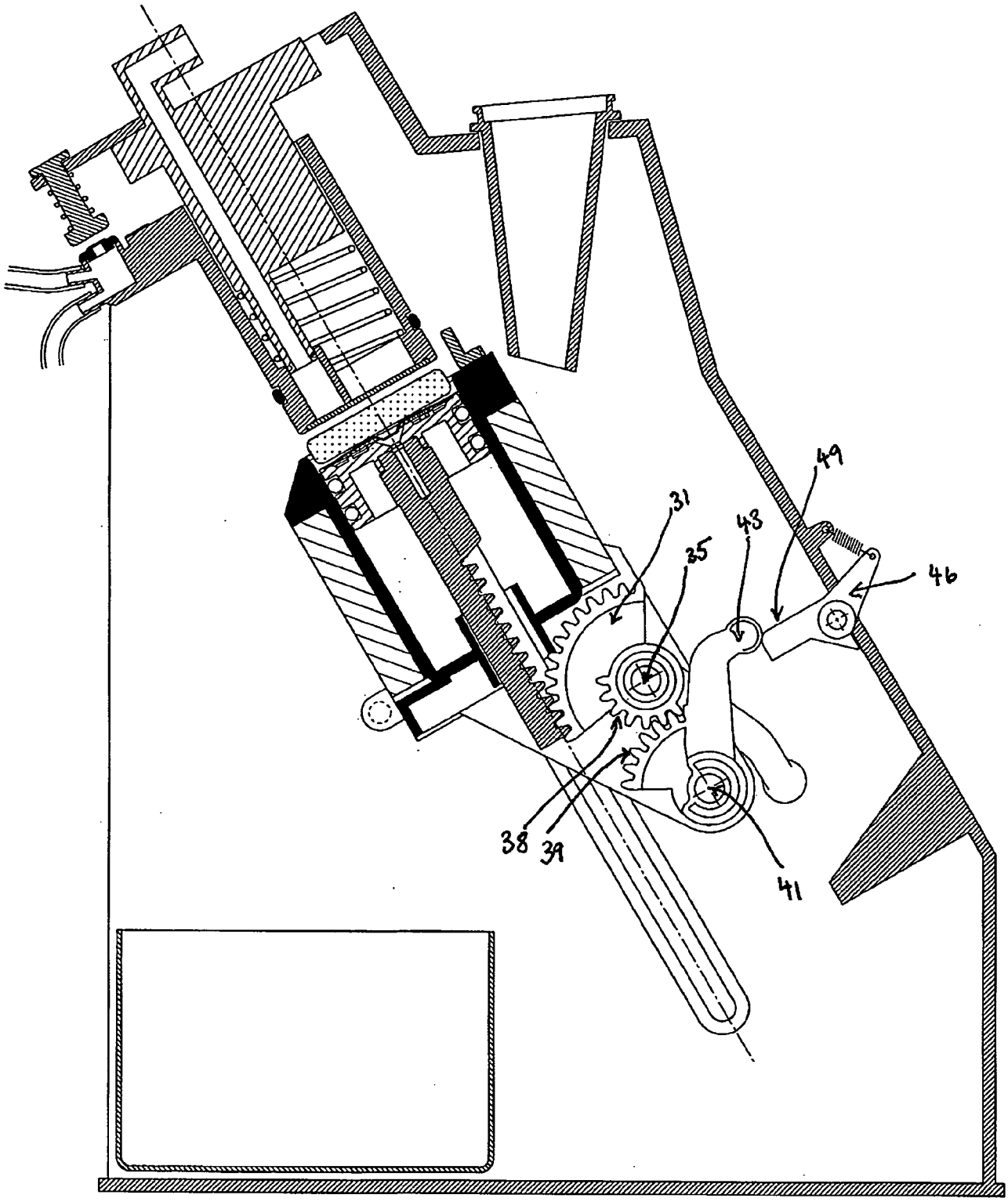

FIG 14

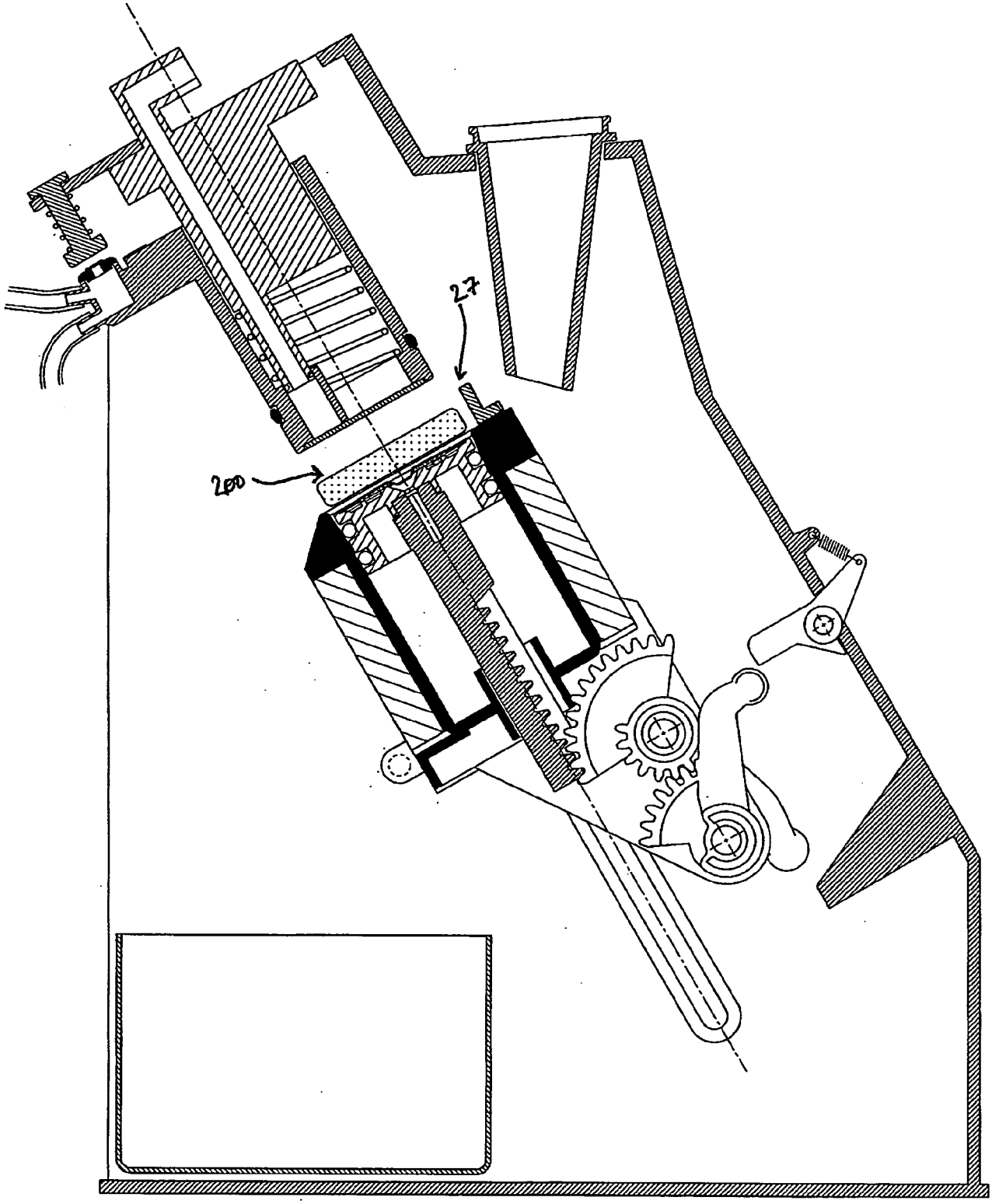

FIG 15

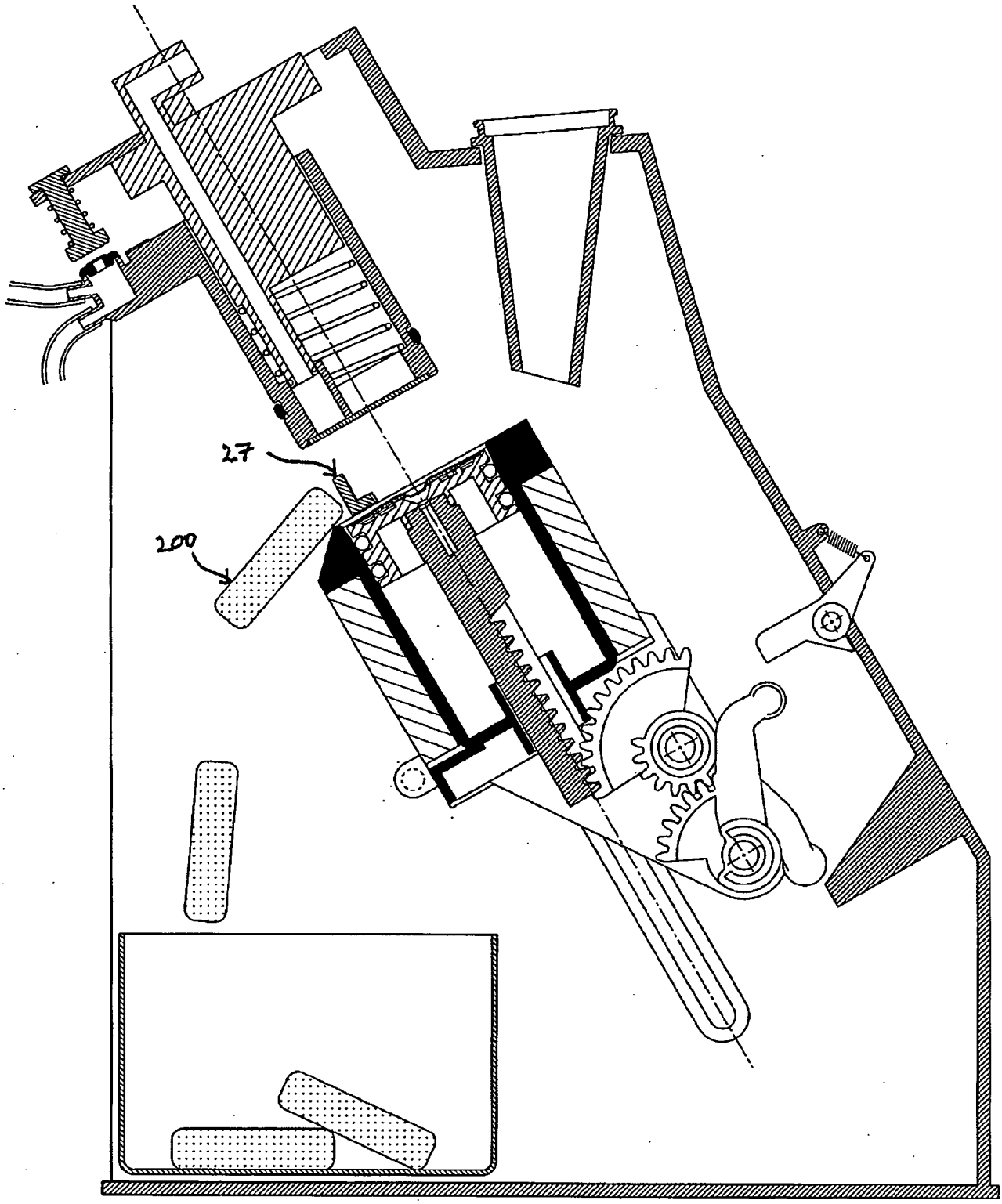

FIG 16

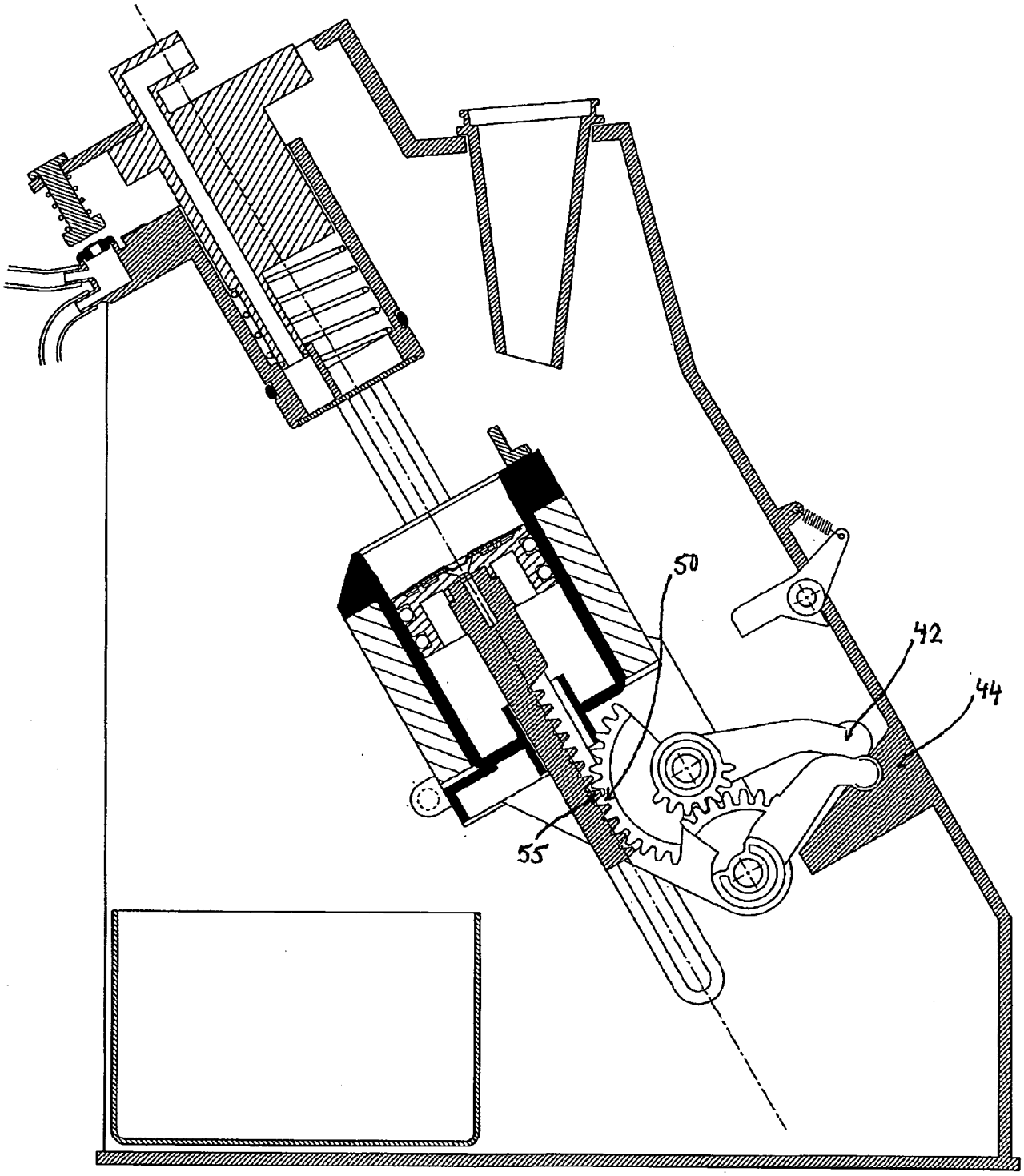

FIG 17

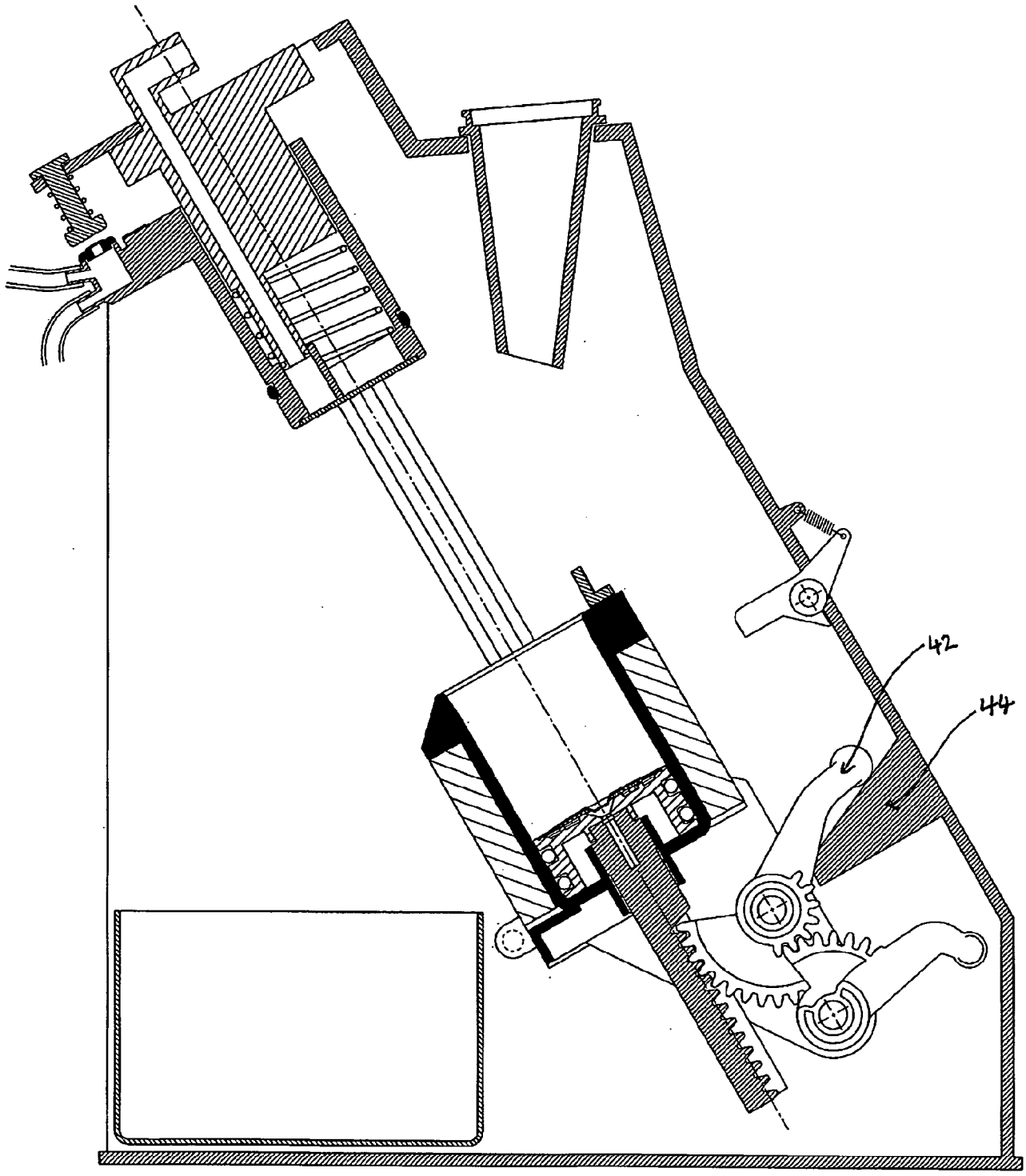

FIG 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/005794

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J31/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 559 620 A (JURA ELEKTROAPPARATE AG [CH]) 8 September 1993 (1993-09-08) column 9, line 24 - column 10, line 52; figures 1-15	1-5,13
A		6-12
X	EP 1 360 919 A (JOFEMAR SA [ES]) 12 November 2003 (2003-11-12) paragraph [0025] - paragraph [0048]; figures 1-9	1-4
X	EP 0 486 433 A (JURA ELEKTROAPPARATE AG [CH]) 20 May 1992 (1992-05-20) page 2, line 26 - page 5, line 23; figures 1-20	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 October 2008	06/11/2008

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/005794

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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