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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Auxiliary device for artificial insemination in animal breeding**

(57) The device is used in association with a syringe (100) provided with a spout (102) having an open output end (102a) through which a paillette of seminal liquid (110) is insertable. A disposable protective cannula (114) is applicable to the spout (102). A case (12) incorporates a paillette-holding seat (24) aligned to a first hole (44) in the case, into which said spout (102) is insertable for drawing a paillette (110) from the paillette-holding seat through its open output end (102a). A cannula-holding seat (56) is aligned to a second hole (58) in the case into which said spout (102) is insertable for receiving a cannula (114) lying on said cannula-holding seat (56).

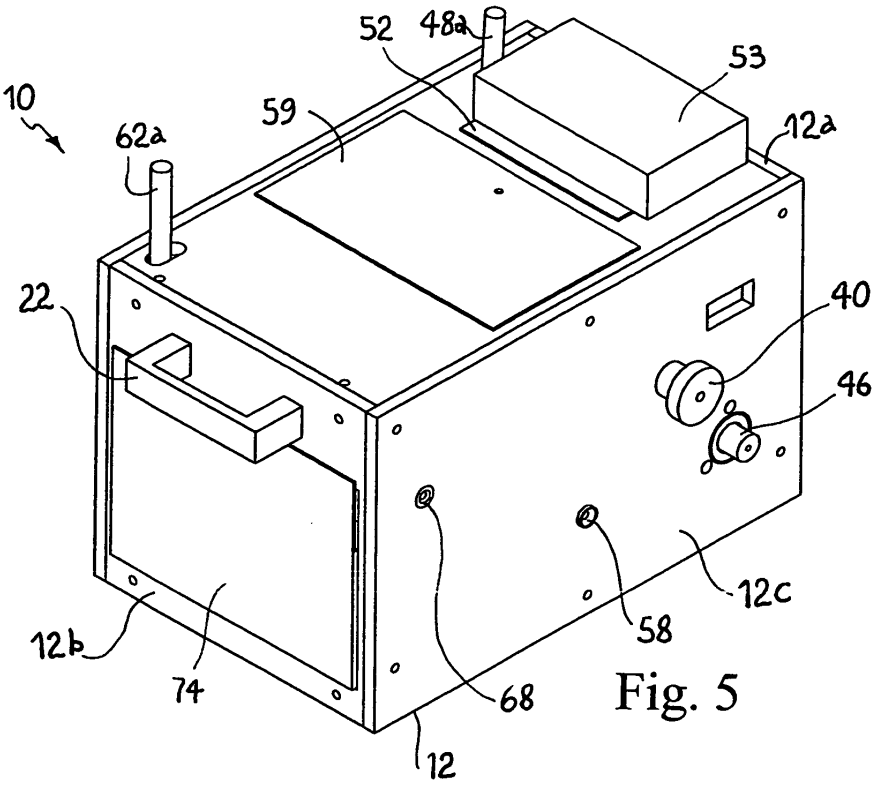

Fig. 5

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Description

[0001] The present invention relates to an auxiliary device for use in operations of artificial insemination in animal breeding, with particular reference to relatively small-sized animals, more particularly, rabbits.

[0002] The common practice of artificial insemination has been known for several years in the rabbit farms, and includes drawing the semen from a bottle by a syringe and then injecting it into the doe rabbit.

[0003] As well known to the person skilled in the art, the above system is subject to drawbacks. In particular, since the bottle must be open when drawing the semen, the latter is subject to temperature fluctuations, with consequent risk of damage, and it is also exposed to the breeding air, with risk of contamination by polluting agents, dust and ammonia.

[0004] As known, other hygienic complications derive from the circumstance that a disposable, protective thin cane or "cannula" is usually applied to the syringe before drawing the semen from the bottle. However, while drawing the semen, the cannula may accidentally touch the wall or the rim of the bottle, which in certain cases may be unsafe from an hygienic point of view.

[0005] Moreover, the natural light, and ever more the light of the neon lamps which are usually installed in the areas where the insemination operations are carried out, may damage the semen because the bottels are often made of a material which is not completely opaque.

[0006] Furthermore, the above system of drawing the semen from a bottle by a syringe is subject to complications connected to the packaging and transportation by carriers which have the duty of deliverying the semen to the various farms.

[0007] Another known artificial insemination system includes injecting the seminal liquid by means of a dedicated syringe that is loadable with single-dose capsules, which are usually called "paillettes". In details, the operator must take a paillette from a container, cut away one of its ends, e.g., by a knife or scissors, then insert the paillette into the syringe, apply a disposable protective cannula on the syringe, inject the seminal liquid into the rabbit, and then remove the protective cannula containing the empty paillette from the syringe and throw it away.

[0008] The repeated manipulation of the paillettes and protective cannulas by the operator, both before and after the injection of the seminal liquid, generates hygienic/sanitary complications and makes the precautions (such as the use of the protective cannula) taken to prevent contamination between animal and animal, as well as between human and animal, partially fruitless.

[0009] Nevertheless, the operator may hurt himself while cutting the paillette, which circumstance further affects the safety conditions and the hygienic conditions in which the operations are carried out.

[0010] Furthermore, it would be desirable to mechanize the process at least partially, in order to make it faster and consequently to increase productivity, mainly in consideration of the high reproductive capability of rabbits.

[0011] Consequently, nowadays the above system with single-dose capsulas is not very widespread, because it is not very practical and it is not supported by a technology which could make it advantageous with respect to the method of drawing the semen by a syringe from a bottle.

[0012] Therefore, it is a main object of the present invention to provide an auxiliary device which considerably improves the hygienic/sanitary conditions in which the operations of artificial insemination in animal breeding are carried out, thereby considerably reducing the risk of contamination with respect to the present situation.

[0013] It is another object of the invention to provide a device which accelerates the operations of artificial insemination in order to increase productivity.

[0014] The above object and other advantages, which will better appear from the following description, are achieved by the auxiliary device having the features recited in claim 1, while the dependent claims state other advantageous, though secondary features of the invention.

[0015] The invention will be now described in more detail, with reference to a few preferred, non-exclusive embodiments, shown by way of non-limiting example in the attached drawings, wherein:

Fig. 1 is a broken-away view in side elevation of a conventional insemination syringe;

Fig. 2 is a view in longitudinal cross-section of a conventional paillette of seminal liquid;

Fig. 3 is a view in longitudinal cross-section of a conventional protective cannula;

Fig. 4 shows the syringe of Fig. 1 assembled with the paillette of Fig. 2 and the protective cannula of Fig. 3;

Fig. 5 is a perspective view of an auxiliary device according to the invention;

Fig. 6 is a broken-away view in side elevation of the auxiliary device of Fig. 5;

Fig. 7 is a view in cross-section of Fig. 6 along line VII-VII;

Fig. 8 is a view in cross-section of Fig. 6 along line VIII-VIII;

Fig. 9 shows a detail of Fig. 6 to an enlarged scale;

Fig. 10 is a front view of the auxiliary device of Fig. 5;

Fig. 11 is a view in cross-section of Fig. 10 along line

XI-XI.

[0016] With initial reference to Figs. 1 to 3, the device according to the invention is usable in the operations of artificial insemination of rabbits, in association with conventional insemination syringes of the type indicated with 100 in Fig. 1. Syringe 100 comprises an elongated rectilinear spout 102 having an open output end 102a. A thin rod 104 is axially movable within the spout and is provided with a ball thickening 106 at its end facing output end 102a of the syringe, as well as with a plunger 108 at its opposite end.

[0017] Syringe 100 is loadable with conventional paillettes of seminal liquid of the type indicated with 110 in Fig. 2. Paillette 110 is shaped as an elongated cylinder, with a sealed output end 110a and an opposite end closed by a plug 112 made of cloth, typically a cotton cloth, which is slidably received within the paillette and acts as a plunger adapted to be engaged by rod 104 of syringe 100.

[0018] A conventional protective cannula of the type indicated with 114 in Fig. 3, which may be fitted to spout 102 of syringe 100, is shaped as an elongated cylinder and is open at both its opposite ends. In particular, the edge 114a of an output end of cannula 114 is bent inwards and is restrainedly engageable by a bush 116, which is received within cannula 114 and has a flange 116a which slidably and sealingly engages the inner wall of cannula 114.

[0019] Fig. 4 shows syringe 100 assembled with a paillette 110 and with a protective cannula 114. This configuration can be obtained by assembling the syringe in a traditional way, as well as in a partially mechanized way by means of the device according to the invention, which will be now described with particular reference to Figs. 5 to 11.

[0020] Auxiliary device 10 according to the invention comprises a case 12 including a paillette-loading/cutting area 14 adjacent to a longitudinal end of case 12, a cannula-applying area 16 at a middle position, as well as a cannula-removing area 18 adjacent to the opposite longitudinal end of case 12 (Fig. 7). A side wall of case 12, which in the prosecution of this description will be referred to as insertion side 12a, has holes into which the syringe is insertable during the various operative steps, as it will be described in more detail below. Handles 20, 22 are attached to respective opposite end walls 12b, 12c of case 12.

[0021] With particular reference to Figs. 7 to 9, a support 23 arranged in paillette-loading/cutting area 14 has a paillette-holding seat 24 defined thereon. Paillette-holding seat 24 is shaped to horizontally support a paillette at right angles to the longitudinal dimension of case 12, and is fed by gravity by a first hopper 26 which is arranged above it and is shaped to horizontally store paillettes of the conventional type shown in Fig. 2. First hopper 26 has an output port 27 (Fig. 9) open to a vertical duit 28, which has a rectangular profile and is sized to guide a paillette with a close fit from hopper 26 to paillette-holding seat 24. As shown in Fig. 8, wherein a general paillette P in first hopper 26 is shown with broken lines, paillette-holding seat 24 is sized and positioned in such a way that the delivery end 110a of a paillette 110 delivered from duit 28, projects to the side facing away from insertion side 12a of case 12, for the purposes that will be clarified below.

[0022] A dispenser is housed in first hopper 26 and comprises a rotary drum 32 which is retained against the bottom of the hopper, immediately upstream of output port 27, by two idle rollers 34, 36, thereby blocking output port 27. A longitudinal groove 38 is formed on the outer skin of drum 32, is sized to receive a paillette and, with the drum in a paillette-deliverying position, is superimposed to output port 27. Drum 32 is manually operable by a knob 40, via a belt drive 42, to draw single paillettes from first hopper 26 to groove 38 and then to to paillette-holding seat 24 via output port 27 and duit 28.

[0023] A first hole 44 aligned to paillette-holding seat 28 is bored on the insertion side 12a of case 12 and has a guiding bush 46 installed therein, which is shaped to accurately guide the insertion of spout 102 of syringe 100 in a direction aligned to paillette-holding seat 24.

[0024] Device 10 also has means for cutting away the sealed output end 110a of a paillette 110 lying on paillette-holding seat. These means consist of a first lever 48 bearing a blade 50 and hinged to case 12 in such a position that the path of blade 50 engages the area occupied by the projecting end of paillette 110 in its seat. Lever 48 may be manually operated by a handle 48a projecting outside case 12.

[0025] First hopper 28 is accessible for replenishment via a first door 52 formed on the top side of case 12. An ice container 53 is mounted on first door 52 for cooling the paillettes stocked in the hopper.

[0026] A second hopper 54 is arranged in cannula-applying area 16 and has a cannula-holding seat 56 (Fig. 7) at its bottom, which is shaped to horizzontally support a protective cannula of the type of Fig. 3 positioned at right angles to the longitudinal dimension of case 12. A second hole 58 (Figs. 5, 6), into which spout 102 of syringe 100 is insertable, is formed on insertion side 12a of case 12 in a position aligned to the cannula-holding seat 56.

[0027] Second hopper 54 is accessible for replenishment via a second door 59 formed on the top side of case 12.

[0028] In cannula-removing area 18 a second lever 62 is hinged to the side wall of case 12 opposite to the side with holes 44, 58. Lever 62 has a grip end 64 adapted to cooperate with a fixed block 66 integral with case 12. A third hole 68 (Figs. 5, 6), into which spout 102 of syringe 100 with cannula is insertable, is bored on the insertion side 12a of case 12 in a position aligned to the area defined between grip end 64 and fixed block 66. Second lever 62 may be manually operated by a handle 62a projecting outside case 12.

[0029] A wall 70 separates the cannula-removing area 14 from the remaining room within case 12, thereby defining a separate chamber 72 within the case for the used cannulas, which is accessible for emptying via a third door 74 formed on the corresponding end wall 12b of case 12.

[0030] In use, first hopper 26 is loaded with paillettes 110 and second hopper 54 with cannulas 114. Thereafter, knob 40 is rotated in order to draw a paillette from first hopper 26 and to drop it onto the paillette-holding seat 24 via paillette-feeding duit 28. Spout 102 of syringe 100 is then inserted via guiding bush 46 to engage paillette-holding seat 24 and consequently receive a paillette through the open output end 102a of spout 102. Now, the delivery end of the paillette is cut away by acting on lever 48.

[0031] Thereafter, spout 102 of syringe 100 is drawn out from bush 46 and is inserted into second hole 58, in such a way as to engage cannula-holding seat 56 and consequently fit the cannula, which is received in the seat, on the spout. While inserting into cannula 114, spout 102 pushes bush 116 against output edge 114a of cannula 114, thereby causing the former to restrainedly engage the latter.

[0032] Now, the syringe is drawn out from second hole 58 and the insemination operation is conventionally carried out. At the end of the insemination operation, the syringe is in a configuration similar to Fig. 4, with output end 110a of paillette 110 which partially and restrainedly engages bush 116 of cannula 110; bush 116, in turn, restrainedly engages output edge 114a of cannula 114.

[0033] Finally, in order to remove the cannula containing the empty paillette, spout 112 of syringe 100 is inserted into third hole 68 until the end of the cannula engages the area between grip end 64 of second lever 62 and fixed block 66. Thereafter, second lever 62 is operated to pinch the end of the cannula and the syringe is pulled out, thereby removing the cannula with paillette from the spout of the syringe. The cannula with paillette will fall into chamber 72, which can be successively emptied by opening door 74.

[0034] A preferred embodiment of the invention has been described herein, but of course many changes may be made by a person skilled in the art within the scope of the claims. In particular, the shape and the size of case 12 may be extensively varied, and the position in the case of paillette-loading/cutting area 14, cannula insertion area 16, and cannula-removing area 18 can be changed or swapped, unlike what described and illustrated. The device could also be arranged in such a way that the operations of loading the paillette, inserting the cannula, and removing the cannula, are carried out in a vertical direction, e.g., by replacing the action of the force of gravity which causes the paillette and the cannulas to be discharged from their respective hoppers, by the action of elastic pushing means and the like.

Claims

1. An auxiliary device for artificial insemination in animal breeding, for use in association with a syringe (100) provided with a spout (102) having an open output end (102a) through which a paillette of seminal liquid (110) is insertable, a disposable protective cannula (114) being applicable to said spout (102), **characterized in that** it comprises a case (12) incorporating:

   - a paillette-holding seat (24) aligned to a first hole (44) in the case, into which said spout (102) is insertable for drawing a paillette (110) from said paillette-holding seat through its open output end (102a), and
   - a cannula-holding seat (56) aligned to a second hole (58) in the case, into which said spout (102) is insertable for receiving a cannula (114) lying on said cannula-holding seat (56).

2. The device of claim 1, **characterized in that** said case (12) also incorporates paillette-cutting means (14) which are operable for cutting an output end of a paillette lying on the paillette-holding seat (24).

3. The device of claim 2, **characterized in that** said paillette-cutting means comprise a first lever (48) bearing a blade (50) whose path engages the area engaged by the delivery end of the paillette received on the paillette-holding seat (24).

4. The device of any of claims 1 to 3, **characterized in that** said paillette-holding seat (24) is fed by a first hopper (26).

5. The device of claim 4, **characterized in that** it comprises a dispenser device (32) arranged between said first hopper (26) and said paillette-holding seat (24) for feeding single peillettes to the seat.

6. The device of claim 5, **characterized in that** said first hopper has an output port (27) sized to allow one paillette to pass, and said dispenser device comprises a rotary drum (32) which is arranged to block said output port (27), has a longitudinal groove (38) sized to receive one paillette and aligned with said output port with the drum rotated in a delivery position, and is rotatable to draw a single paillette from the first hopper to the groove (38), and then to deliver it to paillette-holding seat (24) via said output port, with the drum in said delivery position.

7. The device of any of claims 1 to 6, **characterized in that** said cannula-holding seat (56) is fed by a second hopper (54).

8. The device of any of claims 1 to 7, **characterized**

in that said case (12) also incorporates a cannula-removing station (18).

9. The device of claim 8, **characterized in that** said cannula-removing station (18) comprises pinching means (62, 64, 66), which are aligned to a third hole (68) in the case (12) into which said spout (102) with cannula is insertable, and are operable to restrainedly pinch the end of the cannula.

10. The device of claim 9, **characterized in that** said pinching means comprise a second lever (62) having a grip end (64) adapted to cooperate with a fixed block (66).

11. The device of any of claims 8 to 10, **characterized in that** a chamber for used cannulas (72) is defined within said case (12), which is accessible for emptying via a door (74) on the case (12).

12. The device of any of claims 1 to 11, **characterized in that** said first hole (44) has a guiding bush (46) installed therein, which is shaped to accurately guide the insertion of said spout (102).

13. The device of any of claims 1 to 12, **characterized in that** said case (12) is provided with handles (20, 22).

14. The device of any of claims 1 to 13, **characterized in that** it comprises cooling means (53) for said first hopper (26).

Amended claims in accordance with Rule 137(2) EPC.

1. An auxiliary device for artificial insemination in animal breeding, for use in association with a syringe (100) provided with a spout (102) having an open output end (102a) through which a paillette of seminal liquid (110) is insertable, a disposable protective cannula (114) being applicable to said spout (102), **characterized in that** it comprises a case (12) incorporating:

- a paillette-holding seat (24) aligned to a first hole (44) in the case, into which said spout (102) is insertable for drawing a paillette (110) from said paillette-holding seat through its open output end (102a),
- a cannula-holding seat (56) aligned to a second hole (58) in the case, into which said spout (102) is insertable for receiving a cannula (114) lying on said cannula-holding seat (56), and
- paillette-cutting means (14) which are operable for cutting an output end of a paillette lying on the paillette-holding seat (24).

2. The device of claim 1, **characterized in that** said paillette-cutting means comprise a first lever (48) bearing a blade (50) whose path engages the area engaged by the delivery end of the paillette received on the paillette-holding seat (24).

3. The device of claim 1 or 2, **characterized in that** said paillette-holding seat (24) is fed by a first hopper (26).

4. The device of claim 3, **characterized in that** it comprises a dispenser device (32) arranged between said first hopper (26) and said paillette-holding seat (24) for feeding single peillettes to the seat.

5. The device of claim 4, **characterized in that** said first hopper has an output port (27) sized to allow one paillette to pass, and said dispenser device comprises a rotary drum (32) which is arranged to block said output port (27), has a longitudinal groove (38) sized to receive one paillette and aligned with said output port with the drum rotated in a delivery position, and is rotatable to draw a single paillette from the first hopper to the groove (38), and then to deliver it to paillette-holding seat (24) via said output port, with the drum in said delivery position.

6. The device of any of claims 1 to 5, **characterized in that** said cannula-holding seat (56) is fed by a second hopper (54).

7. The device of any of claims 1 to 6, **characterized in that** said case (12) also incorporates a cannula-removing station (18).

8. The device of claim 7, **characterized in that** said cannula-removing station (18) comprises pinching means (62, 64, 66), which are aligned to a third hole (68) in the case (12) into which said spout (102) with cannula is insertable, and are operable to restrainedly pinch the end of the cannula.

9. The device of claim 8, **characterized in that** said pinching means comprise a second lever (62) having a grip end (64) adapted to cooperate with a fixed block (66).

10. The device of any of claims 7 to 9, **characterized in that** a chamber for used cannulas (72) is defined within said case (12), which is accessible for emptying via a door (74) on the case (12).

11. The device of any of claims 1 to 10, **characterized in that** said first hole (44) has a guiding bush (46) installed therein, which is shaped to accurately guide the insertion of said spout (102).

12. The device of any of claims 1 to 11, **character-**

ized in that said case (12) is provided with handles (20, 22).

13. The device of any of claims 1 to 12, **characterized in that** it comprises cooling means (53) for said first hopper (26).

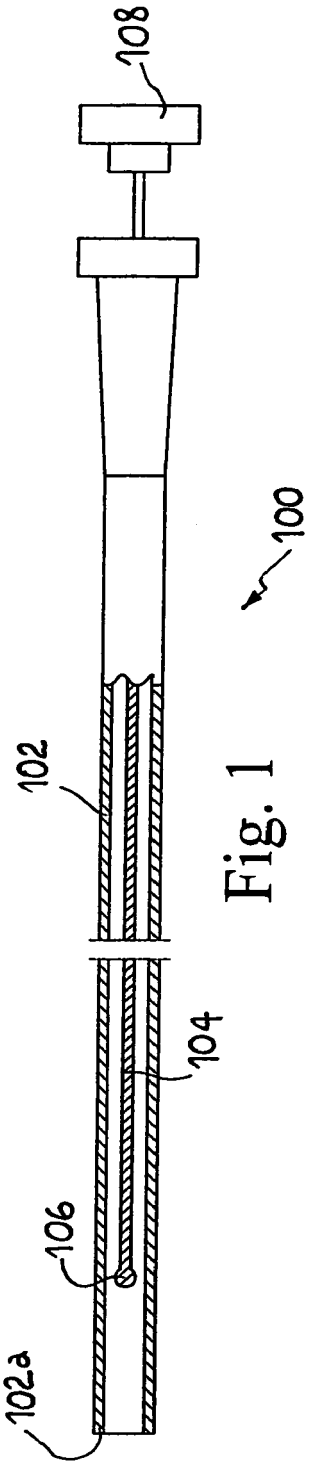


Fig. 1

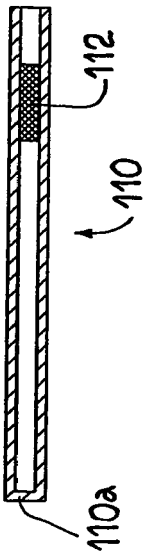


Fig. 2

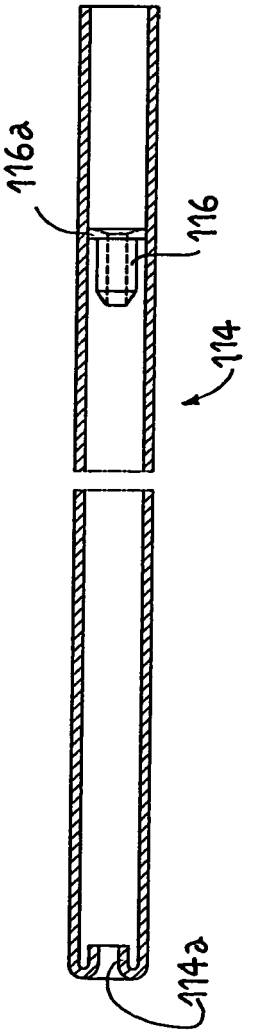


Fig. 3

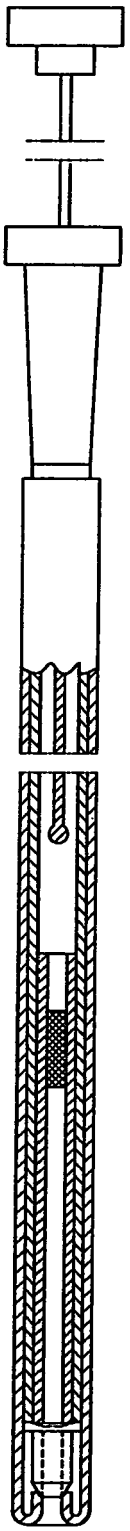


Fig. 4

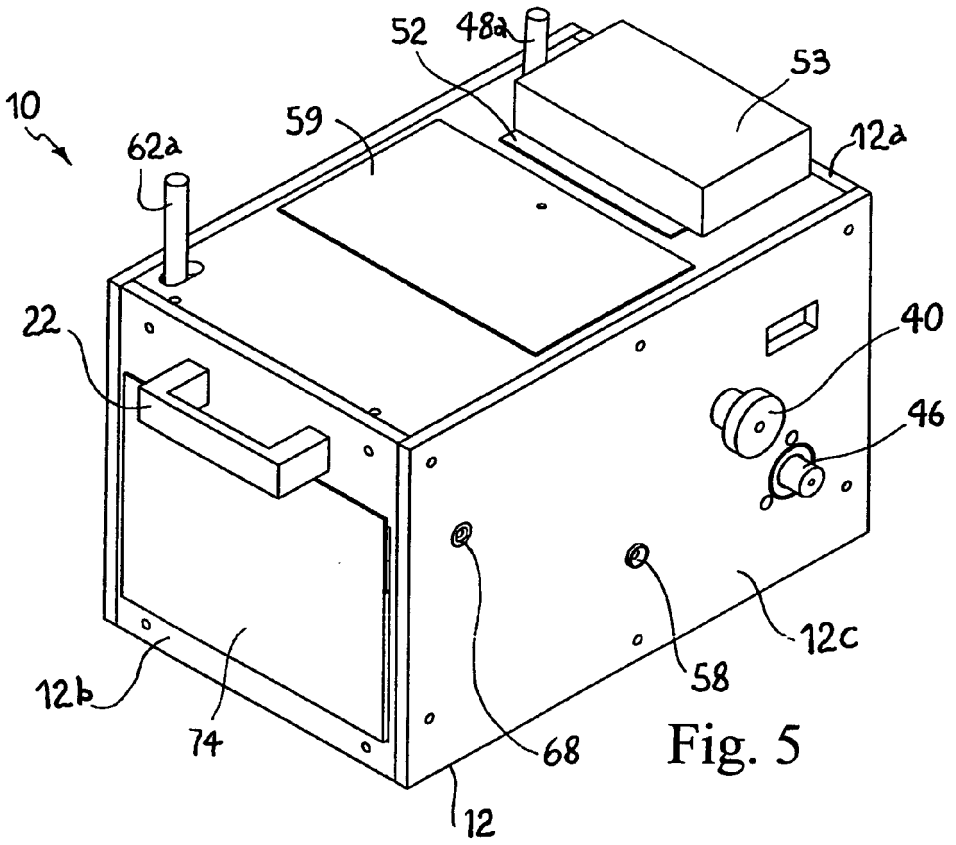
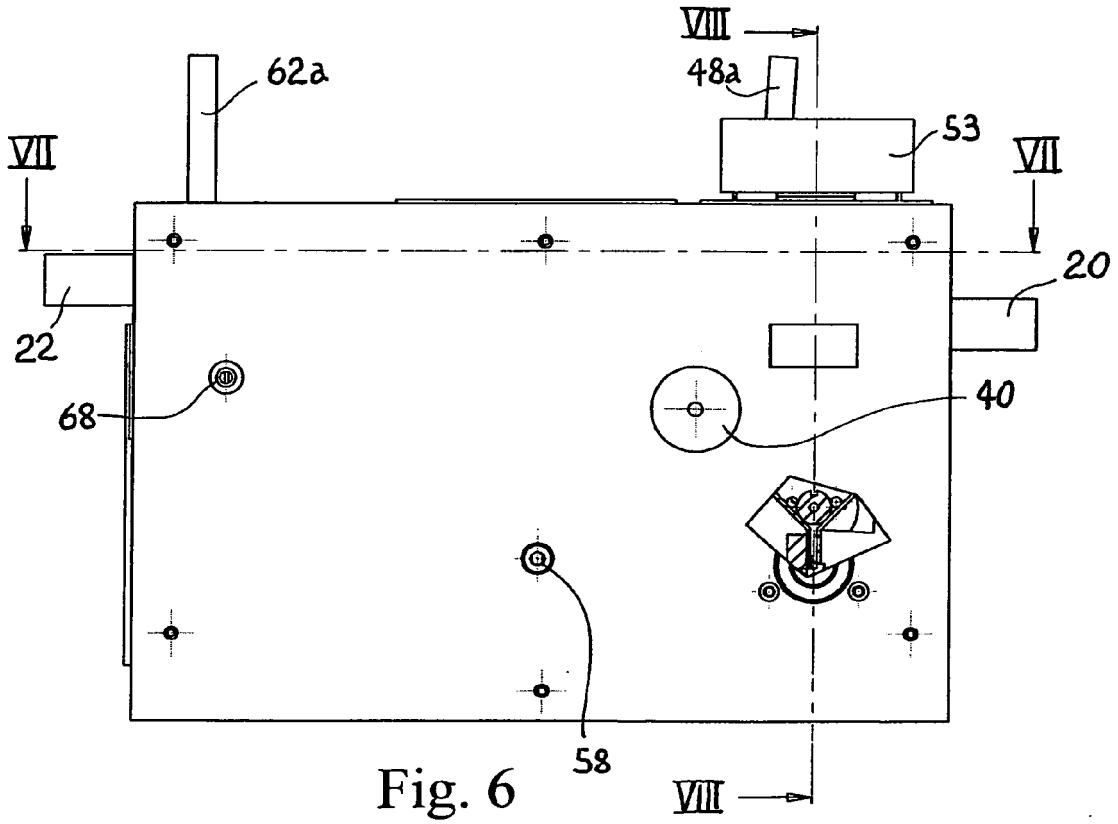

52
48a
53
10
59
62a
12a
22
40
46
12c
58
12b
74
68
12

Fig. 5


VIII
62a
48a
53
VII
VII
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58
VIII

Fig. 6

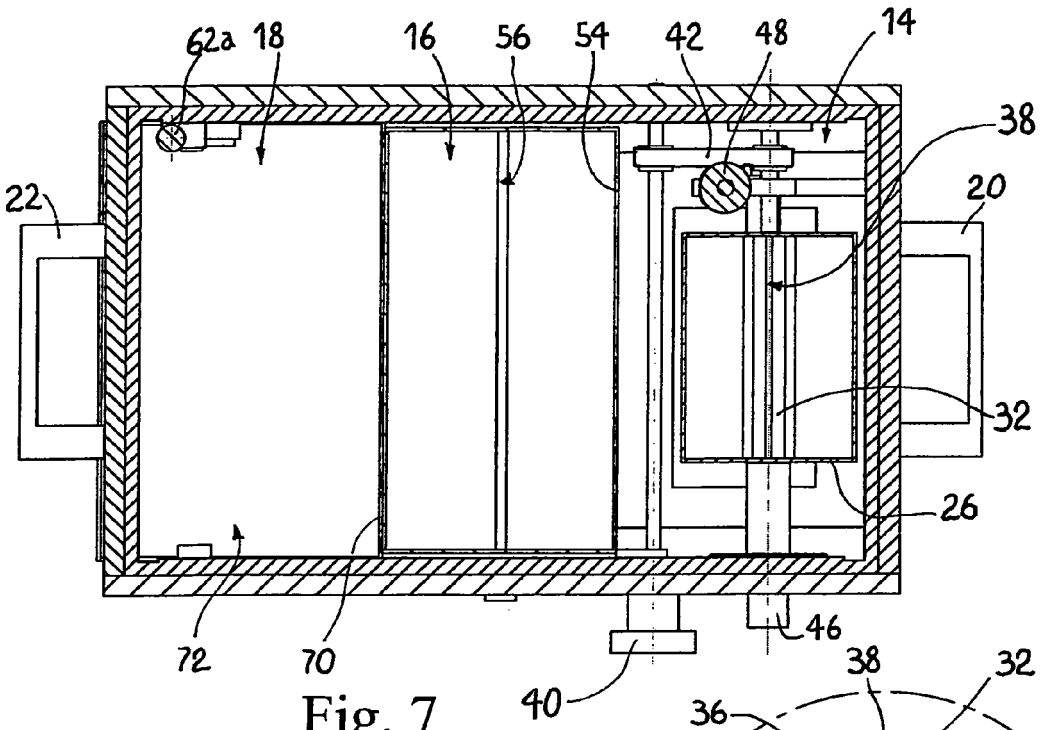

Fig. 7

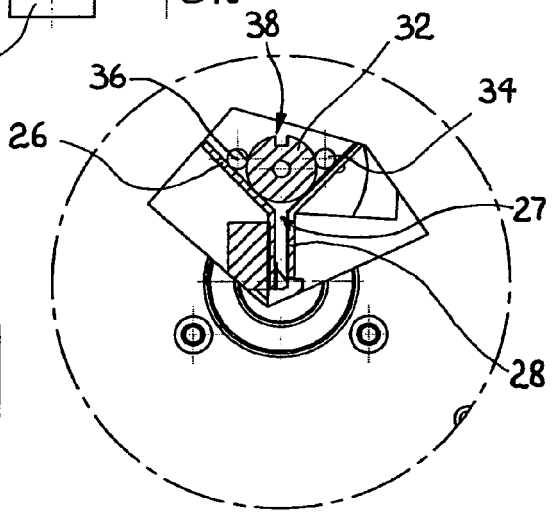

Fig. 9

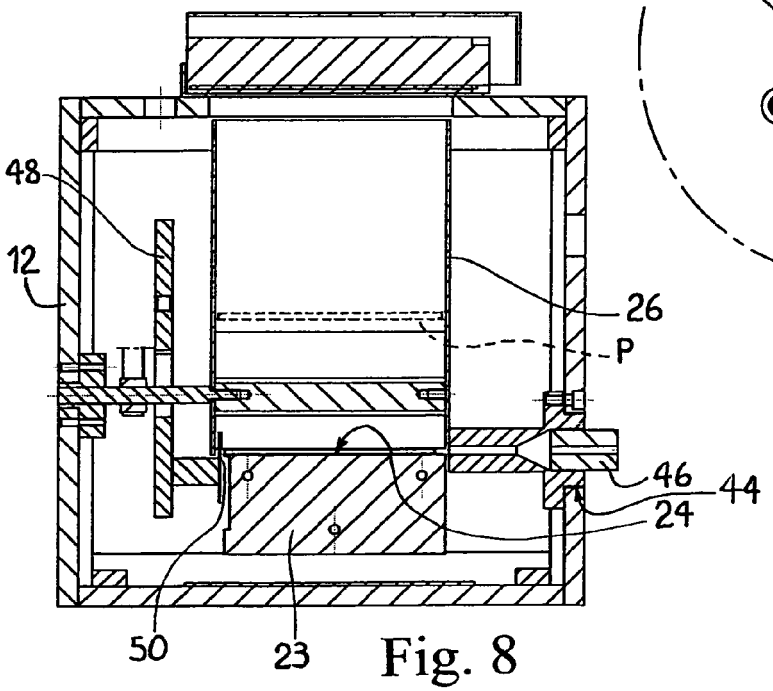

Fig. 8

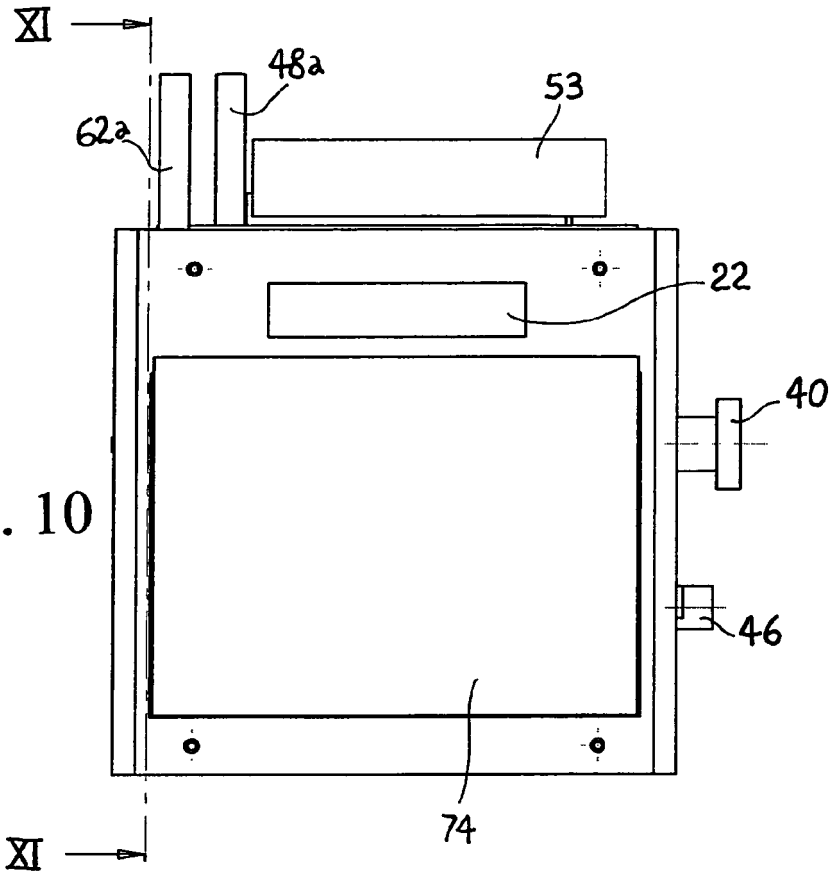

Fig. 10

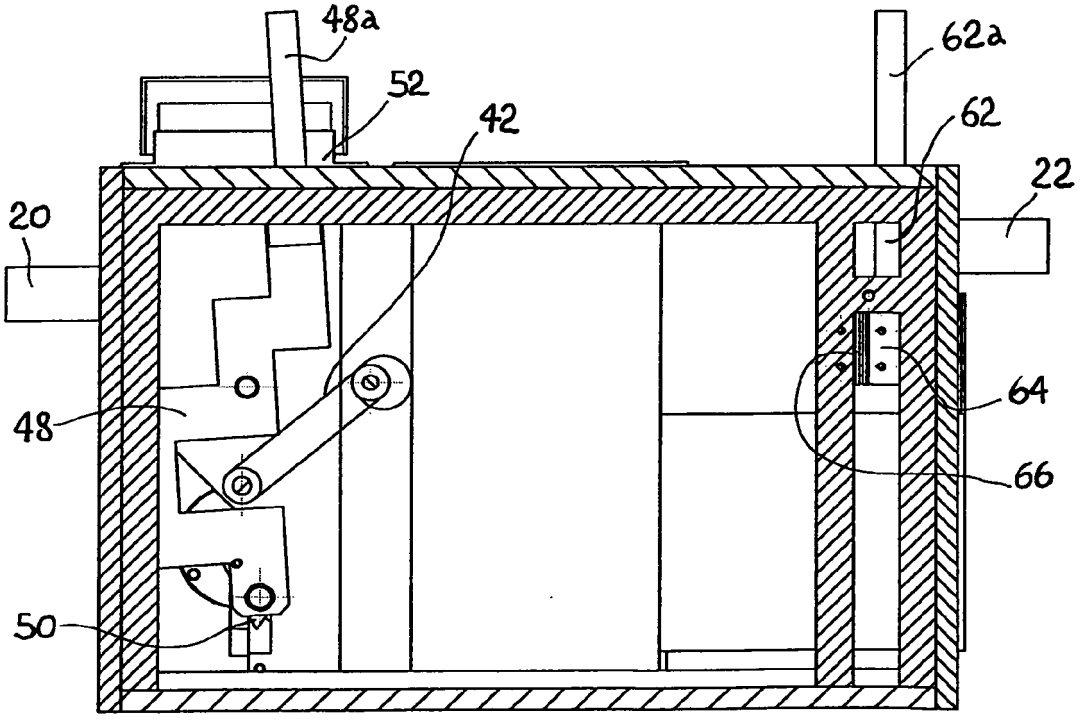

Fig. 11

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5003

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 094 768 A (CASSOU BERTRAND; CASSOU MAURICE) 22 September 1982 (1982-09-22) * page 2, line 112 - page 3, line 2 * * page 3, lines 102-118 * * page 5, lines 107-121 * * page 7, lines 47-93 * * figures 1, 2, 9, 12 *	1,4-7, 12-14	INV. A61D19/02
A	WO 03/096926 A1 (LIVESTOCK IMPROVEMENT CORP LTD [NZ]; PITT COLIN JOHN [NZ]) 27 November 2003 (2003-11-27) * page 10, lines 29-31 * * figure 4 *	1-2,4-5	
A	US 3 593 761 A (LORENZ CURTIS L) 20 July 1971 (1971-07-20) * figure 1 *	1,4-5,13	
A	EP 0 997 114 A1 (IMV TECHNOLOGIES [FR]) 3 May 2000 (2000-05-03) * paragraphs [0029] - [0038] * * figures 3, 4 *	1,4-5	

TECHNICAL FIELDS SEARCHED (IPC)

A61D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 June 2009	Chabus, Hervé

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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05-06-2009

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