(19) DANMARK

(10) DK/EP 3214927 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: ***A 01 K 1/015 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2020-06-15**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2020-03-11**

(86) Europæisk ansøgning nr.: **15804881.9**

(86) Europæisk indleveringsdag: **2015-11-05**

(87) Den europæiske ansøgnings publiceringsdag: **2017-09-13**

(86) International ansøgning nr.: **FR2015052992**

(87) Internationalt publikationsnr.: **WO2016071640**

(30) Prioritet: **2014-11-07 FR 1460792**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **Bioret Agri-Logette Confort, Impasse de la Côte , ZI de la Sangle, 44390 Nort sur Erdre, Frankrig**

(72) Opfinder: **BIORET, Jean-Vincent, La Chutte, 44390 Petit Mars, Frankrig**

(74) Fuldmægtig i Danmark: **Chas. Hude A/S, H.C. Andersens Boulevard 33, 1780 København V, Danmark**

(54) Benævnelse: **SYSTEM TIL OPSAMLING AF VÆSKER, DER STRØMMER PÅ GULVET AF EN INDESLUTNING TIL OPDRÆT AF DYR**

(56) Fremdragne publikationer:
WO-A1-97/25857
DE-A1-102004 012 716
DE-C1- 19 519 088
FR-A- 1 306 778
GB-A- 1 395 072

DESCRIPTION

TECHNICAL FIELD TO WHICH THE INVENTION RELATES

The present invention relates to a system for collecting liquids flowing on the ground of an enclosure for livestock, for example cattle (dairy cattle and/or beef cattle), in particular for arranging the circulation corridors of such a livestock enclosure.

TECHNICAL FIELD TO WHICH THE INVENTION RELATES

Animal comfort is a determining parameter in the livestock efficiency, which influences in particular the animal health, the way they eat, as well as their fertility and longevity.

This animal comfort is regulated in particular by legal obligations that are defined in the Treaties of Amsterdam (1999) and Lisbon (2009) relating to the Protocol on Protection and Welfare of Animals, as well as the adoption of the second European Animal Welfare Strategy.

In stable, this comfort involves in particular a rapid and efficient disposal of the excreta produced by the animals.

This excreta management must indeed make it possible to reduce the gas emanations and the proliferation of bacteria in the livestock enclosure, and hence to improve the ambient conditions and the sanitary performances.

These excreta are moreover liable to make the ground slippery, with the risks of fall and injuries that ensue therefrom.

Several excreta disposal systems coexist today: the mechanical disposal systems, the "flush" systems, and the duckboard systems.

Within the framework of a "mechanical disposal" solution, the excreta present on the ground are scraped off one to several times per day by a so-called scraping device called a "planer" (operated by a tractor or by automatic means), to be brought to a collecting pit located out of the livestock building.

However, the separation of urines and faeces is not optimum in such a disposal system, which hence constitutes an important source of ammonia. Moreover, the installation of such a disposal system involves significant structural works, which are difficult to envisage in an existing livestock enclosure.

With a "flush", a flushing liquid evacuates vigorously the excreta to a gutter then to an external pit.

Now, here again, the separation of urines and faeces is not optimum in such a disposal system, still constituting an important source of ammonia.

Moreover, the implementation of such a system leads to a significant humidification of the livestock enclosure grounds, which is liable to generate problems of grip and hygiene.

More generally, an excessively wet flooring is liable to cause sanitary problems at the animal feet, in particular lameness, which constitutes a major livestock health problem

In particular, among the infections at the origin of lameness, digital dermatitis, also called "Mortellaro disease", is the most problematic.

There hence exists a need for technical solutions making it possible to reduce humidity on the livestock enclosure ground bearing surfaces by an efficient evacuation of the liquids, so as to improve the grip conditions and the sanitary conditions of the animals.

Document DE 195 19 088 and WO 97/25857 both describe a system for collecting liquids flowing on the ground of a livestock enclosure.

In these documents, the ground comprises grooves intended to receive the liquids.

The flooring is herein consisted of the bitumen or concrete screed of the enclosure.

Chains equipped with pads are placed into these grooves and are intended to travel along these latter.

But such a solution requires significant civil engineering works. Its implementation is then relatively complex and expensive.

There hence still exists a need for technical solutions making it possible to reduce humidity on the livestock enclosure ground bearing surfaces by an efficient evacuation of the liquids, advantageously without requiring significant structural works, so as to improve the grip conditions and the sanitary conditions of the animals.

There still exists an interest for simple solutions that permit a certain separation of urines and faeces, so as to limit the production of ammonia in the livestock enclosures.

OBJECT OF THE INVENTION

In this context, the applicant has developed a new system for collecting the

liquids flowing on the ground of a livestock enclosure, aiming at improving the hygiene conditions in a livestock enclosure, in particular thanks to an optimum management of the liquids according to claim 1.

This system for collecting the liquids flowing on the ground of an enclosure for livestock, for example cattle, comprises:

(i) a flooring, comprising:

- bearing portions on which the animals are intended to rest, and
- at least two grooves distributed over said flooring, separating said bearing portions from each other and intended to receive the liquids flowing on said flooring,

(ii) means for collecting the liquids circulating within said grooves, and

(iii) means for pushing the liquids within the grooves of said flooring, so as to generate a circulation of said liquids towards said collection means.

Said flooring is made of at least one material adapted to undergo an elastic deformation; and said flooring is adapted to be placed on a support surface.

Such a system allows an automatic and continuous evacuation of the liquids from said bearing portions, up to the grooves.

The bearing surfaces of the flooring hence remain always relatively little wet, hence participating in improving the qualitative features of the ground as regards grip and hygiene.

This structure also permits a rapid and relatively efficient separation of urines with respect to faeces, to limit the production of ammonia in a livestock enclosure.

Such a system according to the invention is moreover adapted to be installed in simple way in a new livestock enclosure or an existing one (improvement or renovation), without requiring the implementation of significant structural works.

This solution has in particular for interest that it makes it possible to install a collection system in an existing livestock enclosure, as a renovation, without requiring civil engineering works. Its implementation is indeed relatively simple and rapid, in particular due to the fact that the grooves are directly formed by the added flooring.

The less wet environment also allows the bovine hoof to be harder, which participates to the foot health of these animals and contributes to reduce the risks of animal slides.

In this less wet and less ammonia-productive environment, the bacterial level and the proliferation peaks are kept low, which significantly simplify the fight against foot diseases.

The flooring is advantageously consisted of at least one part that is made of at least one material capable of undergoing an elastic deformation, and that is adapted to be placed on a support surface.

According to the invention, the flooring is consisted of (i) a set of elongated members that are fastened to a support surface, juxtaposed to each other while preserving a space defining the grooves, or (ii) a carpet including a base, a lower face of which is intended to rest on a support surface, and an upper face of which is provided with protruding structures arranged remote from each other, which delimit between each other the grooves and the free face of which forms the bearing portion.

According to an advantageous feature, the means for pushing the liquids comprise:

- leading members that are each placed in and along one of said grooves, said leading members each including a pushing surface that is adapted to push the liquids present within said associated groove, and

- means for operating said leading members within their respective grooves, so that said at least one pushing surface generates said circulation of liquid within its groove.

According to a first embodiment, the leading members, mobile in translation within the grooves, are distributed over the length of an elongated body.

In this case, preferably:

- the elongated body consists of a rope and the leading members each consist of a knot formed on said rope, or

- the elongated body consists of a chain consisted of several links assembled to each other and in that the pushing members are formed by the links of said chain or by protruding parts placed on the links of said chain.

Still in this case, advantageously, the operating means consist of:

- means for operating the leading members in a single progression direction, or

- means for operating the leading members according to an oscillating movement, wherein the leading members include an upstream surface adapted to limit the thrust on the liquids.

According to a second embodiment:

- at least one of the leading members consists of a screw-shaped member forming a helical pushing surface, and

- the operating means consist of means for rotating said at least one screw-

shaped leading member.

According to other advantageous features:

- the liquid collection system also includes means for supplying the grooves with a process liquid;

- the grooves are rectilinear and extend parallel relative to each other, delimiting between each other a plurality of bearing portions each having the shape of a rectilinear strip; in this case, preferably, the grooves each have a width comprised between 15 and 50 mm, and a depth comprised between 15 and 50 mm, and the bearing portions have a width comprised between 50 and 500 mm;

- the grooves have an arc-shaped or polygonal cross-section, with a bottom face extended perpendicularly, or at least approximatively perpendicularly, by two lateral faces, advantageously via chamfers;

- the bearing portions of the flooring are provided with an anti-skid protrusion, and/or an abrasive material, in order to allow and/or favour the wear and health of the animal feet;

- the collection means include troughs opening into the grooves, for the evacuation of the liquids;

- the pushing means extend in the thickness and the volume of said grooves, without protruding with respect to said adjacent bearing portions.

The present invention also relates to a livestock enclosure equipped with a collection system according to the invention.

Preferably, the livestock enclosure comprises a circulation corridor having a longitudinal axis and that is covered with the flooring; and the grooves of the flooring are arranged parallel, or at least approximately parallel, to said longitudinal axis.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be further illustrated, without being limited in any way, by the following description of different particular embodiments, in connection with the appended figures, in which:

- Figure 1 is a schematic view, along a vertical cross-sectional plane, of a portion of a liquid collection system whose flooring consists of a carpet made of a material adapted to undergo an elastic deformation in which are formed sealed longitudinal chambers;

- Figure 2 illustrates the flooring according to Figure 1, whose sealed

longitudinal chambers contain a fluid intended to participate to the elastic deformation of its bearing surface;

- Figure 3 is a top view of the flooring according to Figures 1 and 2, associated with liquid pushing means that are of the chain type, provided with added elements, to form the liquid leading members;

- Figure 4 is a schematic view, along a vertical cross-sectional plane, of another embodiment of the flooring that consists of a set of single-material longitudinal members fastened to a receiving surface;

- Figure 5 illustrates a variant embodiment of the flooring according to Figure 4, within the longitudinal members are bi-material;

- Figure 6 is also a partial and schematic top view of the flooring according to Figures 1 to 5, now equipped with liquid pushing means that are in the form of ropes;

- Figure 7 is also a partial and schematic top view of the flooring according to Figures 1 to 5, here equipped with liquid pushing means that comprise leading members operable according to an oscillating movement;

- Figure 8 is still a partial and schematic top view of the flooring according to Figures 1 to 5, here equipped with liquid pushing means that consist of rotary screws.

The collection systems according to the invention, shown in Figures 1 to 8, are specifically adapted to equip a livestock enclosure.

As explained hereinafter, such collection systems have for interest to collect the liquids flowing on the ground and to evacuate them, so as to provide a relatively dry bearing surface (or at least without excessive humidity), and hence healthier and more securing, for the feet of the animals.

By "animals", it is meant cattle (in particular, dairy cattle or beef cattle), pigs, or any other livestock animal (sheep, poultry, rabbits, horses, etc.).

Such a livestock enclosure (not shown) consists of a building delimited by a frame, adapted for the desired livestock (for example, a stable in case of cattle).

The collection system according to the invention comprises a flooring 1 that covers at least one portion of the ground of this livestock enclosure.

In particular, the flooring 1 is advantageously implanted at the circulation corridors that are taken by the animals travelling between the different functional spaces of the livestock enclosure (for example, stalls, milking parlours, etc.).

This flooring 1 is adapted to collect the liquids flowing on the ground.

Herein, and as explained hereinafter, this flooring 1 comprises one or several

parts that are made of at least one material adapted to undergo an elastic deformation, and that are adapted to be placed on a support surface S.

For that purpose, and as illustrated in Figures 1 to 8, the corresponding flooring 1 comprises a bearing surface 2, on which the animals are intended to rest, which is divided into a plurality of bearing portions 21, separated from each other by grooves 3.

The grooves 3 hence constitute structures such as troughs or gutters, opening upward, through the bearing surface 2.

These grooves 3 are adapted to collect (by gravity) and contain the liquids flowing on the flooring 1, so that these liquids stagnate the less possible on the bearing portions 21.

By "liquids", it is meant in particular the liquid excreta produced by the livestock animals, in particular the urine thereof.

For that purpose, as described hereinafter in relation with Figure 1, each groove 3 is delimited by two lateral faces 31 connected by a bottom face 32.

Each groove 3 is moreover ended by two open ends 35 (only one is visible in Figure 3), allowing a flowing and evacuation of the liquid.

The two lateral faces 31 herein extend parallel, or at least approximately parallel, to each other.

In Figures 1 to 5, the bottom face 32 consists of a planar bottom face, extending between the two lateral faces 31.

The upper edges of the two lateral faces 31 of the groove 3 delimit a longitudinal upper opening, extending opposite the bottom face 32. This longitudinal upper opening herein extends over the whole length of the groove 3.

Each lateral edge of the bottom face 32 is herein connected to a lower edge of a lateral face 31 through a chamfer 33 (or cut-off corner) so as to limit the angles liable to retain the fouling.

These chambers 33 extend along an angle comprised between 40° and 50° (for example, of the order of 45°), with respect to the bottom face 32.

As an alternative, the bottom face 32 of the grooves 3 may have a concave curved aspect, for example an arc-shaped cross-section.

Moreover, these grooves 3 have advantageously a particular size to allow an efficient collection of the liquids, while avoiding hampering the travel of the animals.

For that purpose, as illustrated in Figure 1, each groove 3 can be defined by

two dimensions:

- a width A, corresponding to the distance separating its two opposite lateral faces 31, and

- a depth P, corresponding to the maximum distance separating, on the one hand, its bottom face 31, and on the other hand, the adjacent bearing portions 21.

Herein, the grooves 3 each advantageously have:

- a width A of at least 50 mm, preferably comprised between 15 and 50 mm, and

- a depth P of at least 15 mm, advantageously comprised between 15 and 50 mm.

The grooves 3 are advantageously regularly spaced apart with respect to each other on the flooring 1. In other words, these grooves 3 are advantageously regularly distributed over the flooring 1.

As for them, the bearing portions 21 of the bearing surface 2 extend between two grooves 3, and advantageously in a same plane or at least approximately in a same plane.

These bearing portions 21 have preferably a horizontal planar surface (Figure 1) or a convex curved surface (Figure 2).

These bearing surfaces 21 have preferably a width L comprised between 50 and 500 mm, and still preferably comprised between 10 and 300 mm.

For an optimum grip, these bearing portions 21 are advantageously provided with anti-skid protrusions 211.

The anti-skid protrusion 211 consists for example of a single-piece protrusion chosen among the protrusions used in the floorings conventionally implemented in the livestock buildings, for example diamond-shaped protruding elements provided with bosses.

Some of the bearing portions 21 also advantageously comprise a layer of abrasive material 212, in order to allow and/or favour the animal hoof wear and foot health.

Herein, the bearing surface 2 comprises, alternately, a bearing surface 21 provided with a layer of abrasive material 212 and a bearing portion 21 devoid of this layer of abrasive material 212.

To obtain this layer of abrasive material 212, the abrasive material is advantageously mixed with the constituent material of the bearing portions 21.

The abrasive material consists for example of particles of quartz, metal or any other material having an abrasive power on the cow hoof.

This abrasive material is added before, during or after the manufacturing of the bearing surface 2 of the flooring 1.

Preferably, as illustrated in Figure 3, the grooves 3 are rectilinear and extend parallel to each other.

Each groove 3 hence has a longitudinal axis 3', extending parallel to its lateral faces 31; the longitudinal axes 3' of the different grooves 3 extend parallel to each other.

Preferably, the grooves 3 are distributed over the width of the flooring 1; and these grooves 3 extend over the whole length of the flooring 1.

The grooves 3 hence delimit between each other a plurality of bearing portions 21 that each have the shape of a rectilinear strip.

Each bearing portion 21 hence has a longitudinal axis 21', extending parallel to the longitudinal axis 3' of the grooves 3 and to the longitudinal axis 21' of the other bearing portions 21.

Such a flooring structure 1 according to the invention can take different embodiments.

According to a first embodiment illustrated in Figures 1 and 2, the flooring 1 consists of a carpet made of an elastomeric material, intended to be placed on a receiving surface S of the livestock enclosure.

The bearing surface 2 of this flooring 1 is hence intended to undergo an elastic deformation, allowing a comfortable displacement of the animals.

The receiving surface S of this livestock enclosure advantageously consists of a concrete screed, potentially reinforced with a metal mesh, or a bitumen screed (or slab).

This flooring 1 consists of an elongated strip comprising a base 15, of which:

- a lower face 151 is intended to rest on the receiving surface S,
- an upper surface 152 is provided with protruding structures 16 arranged remote from each other, and
- the peripheral contour is delimited by two lateral edges 153 and by two end edges 154 (only one of these end edges 154 is visible in Figure 3).

The protruding structures 16 each have an elongated shape, of the stringer or runner type, are regularly disturbed over the width of the base 15 and extend parallel

to the lateral edges 153 thereof (Figures 1 and 2).

These protruding structures 16 each comprise:

- a lower face 161 that is fasten with the upper face 152 of the base 15,
- a free upper face 162 forming one of the bearing portions 21, and
- two lateral faces 163 forming the lateral faces 31 of the grooves 3.

Each protruding structure 16 has advantageously - a height P comprised between 15 and 50 mm and - a width L comprised between 50 and 500 mm.

Two juxtaposed protruding structures 16 delimit, between them, one of the grooves 3 of the flooring 1.

These grooves 3 are here again regularly distributed over the width of the base 15 and extend parallel to its lateral edges 153 (Figures 1 and 2).

These grooves 3 advantageously extend over the whole length of the flooring 1 (between the end edges 154 of its base 15).

The exposed portions of the upper face 152 of the base 15, between two protruding structures 16, form the bottom faces 31 of the grooves 3.

The bearing face 21 are advantageously adapted to undergo a press-in deformation, of at least 1 mm, and preferably comprised between 1 and 5 mm, when the foot of the animal or a person bears thereon.

By "press-in", it is meant in particular a reduction of the thickness between the bearing portion 21 and the lower face 151 of the base 15, by moving of the respective surfaces closer to each other.

For that purpose, the flooring 1 is advantageously made of at least one material adapted to undergo an elastic deformation, chosen among:

- the elastomeric materials, i.e. for example the natural rubber, the "synthetic natural" rubber (or synthetic poly-isoprene), the polybutadiene or the styrene-budatiene, or
- the plastic or thermoplastic elastomeric (TPE) materials, i.e. for example PVB (polyvinyl butyral), ABS (acrylonitrile butadiene styrene) / SBR (styrene-butadiene), PP (polypropylene) / EPDM (ethylene-propylene-diene monomer), TPU (TPE polyurethane).

This flooring 1 may be:

- single-material, or
- multi-material, for example a first material forming the base 15 and a second material forming the protruding structures 16.

This flooring 1 may be made single-piece or be obtained by several pieces assembled in a removable or non-removable manner.

Optionally, to further optimize this elastic deformation phenomenon, each protruding structure 16 integrates a sealed longitudinal chamber 165 intended to contain a fluid (Figure 2).

This sealed longitudinal chamber 165 extends over the whole length, or at least approximately over the whole length, of the associated protruding structure 16.

This sealed longitudinal chamber 165 is advantageously centred on the longitudinal axis 21' of the associated protruding structure 16; it moreover extends over at least half the width of the corresponding protruding structure 16, or even the third-quarter thereof.

The fluid consists in a gas (for example, air), a liquid (for example, water), a gel, or a mixture thereof.

Each sealed chamber 165 advantageously comprises an access trough (not shown), in particular for the filling or draining thereof.

Once the sealed longitudinal chambers 165 filled with the fluid, the bearing portions 21 advantageously have a slightly convex bulge shape, favouring the flowing of the liquids towards the grooves 3 located on either side.

As for it, the base 15 has for example - a thickness comprised between 2 and 10 mm, - a width that is advantageously comprised between 300 and 3000 mm, and - a length of at least 3 m long.

In the direction of its thickness, the base 15 herein comprises two layers, an upper one 155 and a lower one 156, between which a reinforcement intermediate layer 157 is placed.

The reinforcement intermediate layer 157 is chosen among the fibres made of textile, metal, or any other product providing stability and/or resistance to elongation.

This reinforcement intermediate layer 157 consists for example of a textile insert serving as a reinforcement, advantageously made of a material chosen among nylon, cotton, polyester, polyamide or any other reinforcement textile.

This flooring 1 can also be adapted to direct the spurious voltage and current coming from the ground or the underground towards ground connections T located outside the livestock enclosure.

For that purpose, the flooring 1 advantageously comprises an electric conductor network 6 intended to be electrically connected between, on the one hand, the sealed

longitudinal chambers 165 formed in the protruding structures 16 and, on the other hand, said ground connections T.

Such a flooring 1, before being installed, is advantageously stored as plates, or also preferably as rolls.

This latter roll embodiment has for interest to allow a simple and rapid installation of the flooring in the livestock enclosure by unwinding; it also allows ensuring an optimum continuity of the grooves 3 for the efficient recovery of the liquids at the ends of these grooves 3.

These plates or rolls advantageously have a straight or rectilinear peripheral edge, or an assembly structure (of the puzzle type) facilitating the fastening thereof by fitting with a complementary assembly structure.

The base 15 has a width that is advantageously comprised between 300 and 3000 mm, and more generally a width equal to the equipped circulation corridor.

Such a flooring 1 can be manufactured by assembly of a set of superimposed parts, to form a set of the single-piece type, for example:

- by vulcanization,
- by bonding,
- by welding.

In particular, in case of vulcanization, to obtain each of the sealed longitudinal chambers 165, an intermediate part, for example a fireproof plastic sheet, is introduced between two of the parts to be vulcanized so as to prevent their local fastening.

According to as second embodiment illustrated in Figures 4 and 5, the flooring 1 is consisted of a set of longitudinal members 17 (or runner), which are directly fasten (without a base 15) to the receiving surface S.

Each longitudinal member 17 is advantageously made of at least one material adapted to undergo an elastic deformation chosen among:

- the elastomeric materials, i.e. for example the natural rubber, the "synthetic natural" rubber (or synthetic poly-isoprene), the polybutadiene or the styrene-budatiene, or
- the plastic or thermoplastic elastomeric (TPE) materials, i.e. for example PVB (polyvinyl butyral), ABS (acrylonitrile butadiene styrene) / SBR (styrene-butadiene), PP (polypropylene) / EPDM (ethylene-propylene-diene monomer), TPU (TPE polyurethane).

These longitudinal members 17 are arranged in a juxtaposed configuration,

while keeping between each other spaces that are intended to define the desired grooves 3.

The receiving surface S here again consists of concrete or bitumen.

Each longitudinal member 17 comprises a set of faces:

- a lower face 171, intended to rest on the receiving surface S,

- an upper face 172, intended to form a bearing portion 21 of the bearing surface 2, and

- two lateral faces 173, each intended to form one of the lateral faces 31 of a groove 3.

The bottom face 32 of the grooves 3 is for its part formed by an exposed portion of the receiving structure S, located between two juxtaposed longitudinal members 17.

The fastening of each longitudinal member 17 to the receiving surface S is obtained for example through a mechanical fixation (pointing, riveting, etc.) or a chemical fixation (in particular, bonding).

According to a first variant embodiment illustrated in Figure 4, each longitudinal member 17 is made single-piece, for example of an elastomeric material or a plastic material similar to that described hereinabove in relation with Figures 1 and 2.

According to a second variant embodiment illustrated in Figure 5, each longitudinal member 17 consists of at least two superimposed layers:

- a lower layer 177 forming the lower face 171 of the longitudinal member 17, and

- an upper layer 176 forming the upper face 172 of the longitudinal member 17.

These two superimposed layers 176, 177 are advantageously fastened by vulcanization, bonding or welding.

The interest of this second embodiment is the facility of installation and the possibility to use used products of different thicknesses.

In a variant embodiment of the flooring 1 according to Figure 3 to 5, it is also possible to cover the longitudinal members 17 (Figures 3 and 4) with a film made of an elastomeric material, reinforced with fibres, intended to form the upper surface of the flooring 1.

The film portions that conform the grooves 3 are advantageously maintained by means of profiles of concave curved cross-section (for example, an arc-shaped cross-section), which are mechanically fixed into bottom face 32.

The film portions, between the grooves 3, themselves form the bearing portions

21.

This film then conforms the underlying surface so as to constitute the bearing portions 21 and the grooves 3 of the flooring 1.

In practice, and generally for the different embodiments, the flooring 1 is intended to constitute the ground of a livestock enclosure.

Herein, the livestock enclosure comprises a set of spaces, surrounding notably the stalls, at which the animals are intended to circulate and to stand, also called circulation corridors.

A circulation corridor C, very schematically illustrated in Figure 3, advantageously comprises a longitudinal axis C'.

And the flooring 1 is preferably installed so that the longitudinal axis 3' of its grooves 3 is arranged parallel, or at least approximately parallel, with respect to the longitudinal axis C' of the corridor C.

This direction is notably useful to favour the evacuation of the liquids contained in the grooves 3 to collection means 7 with which the livestock enclosure is equipped and installed at the end of the corridors C (Figure 3).

The collection means 7 comprise in particular a pit 71 (or a recovery channel), installed at one at least of the two open ends 35 of the grooves 3 of the flooring 1 (only one of them is visible in Figure 3).

These collection means 7 can also comprise troughs 72 for evacuation of the liquids (for the sake of simplification, only a few troughs 72 are shown in Figures 1 and 2).

The toughs 72 open, on an upstream side 721, into the grooves 3 and, on a downstream side 722, opposite the orifices of a duckboard (shown in a very schematically manner).

In the case of a flooring 1 of the carpet type (Figures 1 to 3), the troughs 72 are advantageously formed in the thickness of its base 15.

A slope is advantageously applied to the flooring 1 (and in particular to its grooves 3), to favour the flowing of the collected fluids towards the collection means 7, i.e. the pit 71 (or recovery channel) or the troughs 72.

However, in order to generate an optimum circulation of the liquids towards these collection means 7, the collection system according to the invention also comprises means 8 for pushing the liquids along the grooves 3 of the flooring 1.

Herein, the pushing means 8 comprise for that purpose driving members 81

that are placed into the grooves 3 and that are coupled with operating means 82 to apply thereto a movement intended to cause the displacement of the liquids in a suitable direction within these grooves 3.

According to a first embodiment family, as schematically shown in Figures 3, 6 and 7, the pushing means 8 can comprise:

- driving member 81 that are each distributed over the length of at least one elongated body 83 placed in and along the grooves 3, and

- means 82 for the translational operation of said driving members 81 within their respective grooves 3, so that each of said driving members 81 generates a circulation of liquid within the associated groove 3.

The elongated body 83 extends parallel to the longitudinal axis 3' of the associated groove 3.

Each driving member 81 hence constitutes a king of planer or scraper, adapted to push/repel the liquids present within the associated groove 3.

Each driving member 81 has for that purpose a peripheral edge 811 that conforms, at least approximately, the bottom face 32 and a lower portion of the lateral faces 31 of the associated groove 3.

This peripheral edge 811, for example circular, has:

- a width corresponding, to within the clearance, to the width A of the associated groove 3, or slightly lower than the latter (for example, comprised between 90 % and 100 % with respect to the width A of the groove 3), and

- a height lower than the height P of the associated groove 3.

The driving member 81 hence extends in the thickness and the volume of its groove 3, without protruding with respect to the upper opening of the latter nor with respect to the adjacent bearing portions 21 (Figures 1 and 2).

Each driving member 81 moreover comprises, on a downstream side, a pushing surface 812 that is adapted to exert said desired thrust on the liquid in presence.

These driving members 81 are for example spaced apart by a distance comprised between 50 and 1000 mm, advantageously adjustable according to the number of animals in presence and the type of excreta.

These driving members 81 can take different embodiments, in particular as a function of the type of translational operation that is applied thereto.

For example, the driving members 81 may be operated:

- along a direction parallel to the longitudinal axis 3' of their respective grooves

3 and

- in a single translation direction (from upstream to downstream) within each groove 3.

In this case, according to a first embodiment shown in Figure 3, the elongated body 83 consists of a chain composed of several links 831 assembled to each other.

Some of these links 831 comprise the driving members 81 that consist of added protruding parts (for example, parts adapted to limit the friction and to resist to abrasion, in particular polyurethane or high-density polyethylene).

These driving members 81 consist for example of disks that are directed perpendicular to the longitudinal axis 3' of the associated groove 3.

As an alternative, not shown, the driving members are directly formed by the links 831 of said chain 83.

Certain at least of the links 831 then comprise for that purpose protruding portions that are arranged so as to form a pushing surface 812.

According to a second embodiment schematically shown in Figure 6 (for the sake of simplification, only one groove 3 is shown), the elongated body 83 consists of a rope.

The driving members 81 then advantageously consist of nodes that are distributed over the length of said rope 83 and each form one of the pushing surfaces 812.

To ensure the single-direction translational operation in each groove 3, the pushing means 8 herein comprise a single, continuous elongated body 83 (for example, the chain or the rope), extending within each of the grooves 3.

This elongated body 83 hence comprises active strands 832 that each extend within one of the grooves 3 and that are connected by junction strands 833 extending between two of the successive active strands 832 (Figure 3).

The elongated body 83 also comprises a return strand (not shown), for the closing and the continuity of said elongated body 83.

In this case, the operating means 82 consist of operating means 821 advantageously comprising a set of pulleys (not shown) each cooperating with one of the junction strands 833 to guide the elongated body 83 between two grooves 3 and within these grooves 3.

The pulleys are in particular arranged herein so that the elongated body 83 forms a roundtrip assembly (or a generally S shape) in the successive grooves 3.

One at least of these pulleys is motorized to ensure the travel of the elongated body 83.

The speed of travel is for example comprised between 1 and 10 m/min, in particular according to the animal concentration per m^2 and the type of excreta.

Two successive active strands 832 hence travel in reverse directions with respect to each other.

In other words, an active strand 832 of a groove 3 travels from a first end to a second end of the flooring 1, and conversely for the juxtaposed active strands 832 (as illustrated by the arrows in Figure 3).

The associated driving members 81 are hence intended to successively travel along the length of each of the grooves 3 of the flooring 1, from an upstream groove 3 (on the left in Figure 3) to a downstream groove 3 (on the right in Figure 3), before coming back to the above-mentioned upstream groove.

The liquids are hence alternately evacuated at one of the two open ends 35 of the grooves 3, opposite to which are arranged a pit or a recovery channel 71.

In each groove 3, the liquid is circulated in a direction identical to the direction of travel of the driving members 81.

As an alternative, not shown, the pushing means 8 can also be composed of several elongated bodies 83 that are each provided with driving members 81 arranged in series over their respective lengths.

Each elongated body 83 then cooperates with a group of grooves 3 and with operating means 821 to ensure the displacement thereof in the corresponding grooves 3.

According to another variant (Figure 7), the driving members 81 can be operated according to:

- a direction parallel to the longitudinal axis 3' of their respective grooves 3, and
- an oscillating upstream-downstream movement (upstream to downstream and downstream to upstream) within their respective grooves 3.

For the sake of simplification, only the driving members 81 of one groove 3 are represented.

In this case, the driving members 81, distributed over a rigid elongated body 83, each comprise two opposite surfaces:

- a downstream surface 812 constituting the pushing surface adapted to cause the travel of the liquid to be evacuate from the upstream to the downstream, and

- an upstream surface 813 that generates a reduced (or even null) pushing phenomenon on the liquids during the return, downward to upward movement.

For that purpose, the downstream surface 812 extends for example in a plane perpendicular to the longitudinal axis 3' of the associated grooves 3.

And the upstream surface 813 has for example a profiled shaped from the downstream to the upstream, for example dihedral or conical.

To ensure such an oscillating operation, the operating means 822 advantageously consist of a connecting rod/piston system.

The speed of travel is for example comprised between 1 and 10 m/min, adapted in particular as a function of the animal concentration per m^2 and the type of excreta.

According to another embodiment family, the driving members 81 can also be rotated within their respective grooves 3 (Figure 8).

In this case, these driving members 81 each advantageously consist of a screw provided with a pushing surface 812 that is of helical shape and that extends over all or part of its length.

This screw 81 advantageously extends over the whole length of a groove 3.

As an alternative, each groove 3 can comprise two screws 81, each extending - over a half of its length and - from one of the two ends 35 of this groove 3.

Here again, this driving member 81 of the screw type is inscribed in a peripheral cylindrical volume 811 that conforms, at least approximately, the bottom face 32 and a lower portion of the lateral faces 31 of the associated groove 3.

This peripheral volume 811 has a circular cross-section, whose diameter corresponds, to within the clearance, to the width A of the associated groove 3, or slightly lower than the latter (for example, comprised between 90 % and 100 % with respect to the width A of the groove 3).

The driving member 81 hence extends in the thickness and the volume of its groove 3, without protruding at the upper opening of the latter nor at the adjacent bearing portions 21 (Figures 1 and 2).

The operating means 823 then consist of means for rotating each of these driving members 81 about an axis 82' extending parallel to the longitudinal axis 3' of the associated groove 3.

These operating means 83 consist for example in a gear motor and/or a motor driving a chain/belt reversing system.

The rotation speed is for example comprised between 10 and 40 rotations per

minute, according to the animal concentration per m^2 and the type of excreta.

Generally, for an efficient hygiene and an optimum disposal of the liquids, the collection system also advantageously comprises means 9 for supplying the grooves 3 with a process liquid (Figure 2).

These supply means 9 advantageously consist of means allowing a flowing of the process liquid directly into the grooves 3, for example a drip type device.

These supply means 9 are then advantageously implanted on an upstream side of the grooves 3 (near one at least of its open ends 35), taking into account the direction of travel of the liquids.

The process liquid contains for example bacteria of interest and/or a disinfectant.

These supply means 9 can also comprise ramps provided with nozzles (not shown) for the application of process liquid directly on the pushing means 8, in particular on the junction strands 833 extending at the pit 71.

In practice, the supply means 9 can comprise several ramps, i.e.:

- a ramp of nozzles for spraying disinfectant,
- a ramp of nozzles for spraying detergent, and
- a ramp of nozzles for spraying a rinsing liquid.

The junction strand 833 can also cooperate with brushes, to ensure their mechanical cleaning.

In operation, the flooring 1 is liable to receive different organic materials, in particular excreta (urine, faeces).

The flooring 1 hence allows a flowing of the liquids in the grooves 3, hence avoiding the accumulation of these liquids on the bearing portions 21 that hence remain relatively dry.

The solid matters, in particular the faeces, remain mainly on the bearing portions 21, so as to avoid their mixture and to limit the production of ammonia in a livestock enclosure.

During a cleaning of this flooring 1, the cleaning liquid will also flow in these grooves 3, avoiding that the bearing portions 21 remain excessively wet.

This phenomenon hence allows the animals to travel on a relatively healthy bearing surface 2, with a reduced risk of fall and without humidification of their feet.

All the liquids flowing in the grooves 3 are then efficiently evacuated towards the collection means 7 (in particular the pit 71 or the recovery channel) by

implementation of the pushing means 8 described hereinabove in relation with Figures 1 to 8.

As mentioned, the driving members 81 are moved (in a single direction, in oscillation or in rotation according to the case), so as to generate the travel of the liquids toward dedicated collection means 7.

The pushing means 8 hence allow a circulation and an active evacuation of the liquids contained in the grooves 3, to avoid their stagnation and to limit the development of ammonia and micro-organisms in the livestock enclosure.

For an optimum cleaning of these grooves 3, the process liquid can be poured by means of the above-mentioned supply means 9.

Generally, the means for pushing the liquids 8 described hereinabove can be tailored within any one of the floorings 1 constituting the collection system according to the invention.

Still generally, the flooring 1 according to the invention hence allows a rapid and continuous evacuation of the liquids with respect to the bearing surface 2 and with respect to the livestock enclosure, which allows the latter to be efficiently maintained in dry state (or at least without excess of humidity), hence limiting the problems of hygiene met with the usual floorings.

The flooring 1 according to the invention hence allows a certain separation of the liquids that flow into the grooves 3, with respect to the faeces that remain mainly on the bearing portions 21, so as to avoid their mixing and to limit the production of ammonia within the livestock enclosure.

Patentkrav

1. System til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr, for eksempel kvæg, hvilket opsamlingssystem omfatter:

(i) en gulvbelægning (1) der omfatter:

- understøttende dele (21) som dyrene er beregnet til at støtte på, og
- mindst to riller (3) der er fordelt over gulvbelægningen (1), som adskiller de understøttende dele (21) fra hinanden, og som er beregnet til at modtage væskerne, der strømmer på gulvbelægningen (1),

(ii) midler (7) til opsamling af væsker der strømmer inden i rillerne (3), og

(iii) midler (8) til at skubbe væskerne inden i rillerne (3) af gulvbelægningen (1) for at frembringe en strøm af væskerne mod opsamlingsmidlerne (7),

kendetegnet ved, at gulvbelægningen (1) er fremstillet af mindst et materiale som er tilpasset til at undergå en elastisk deformation,

og at gulvbelægningen (1) er tilpasset til at blive anbragt på en støtteflade (S), hvilken gulvbelægning (1) består af:

- et sæt sideelementer (17) der er fastgjort til en støtteflade (S), som er anbragt sammen med hinanden, mens der opretholdes et mellemrum, som definerer rillerne (3), eller
- et tæppe der omfatter en basis (15), hvis nedre flade (151) er beregnet til at støtte på en støtteflade (S), og en øvre flade (152) der er forsynet med fremspringende strukturer (16), som er anbragt fjernt fra hinanden, og som mellem hinanden afgrænser rillerne (3) og hvis frie flade (162) danner den understøttende del (21).

2. Systemet til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge krav 1, **kendetegnet ved, at** midlerne (8) til at skubbe væskerne indbefatter:

- driftselementer (81), som hver er anbragt i en af rillerne (3), hvilke driftselementer (81) hver inkluderer en skubbeflade (812), der er indrettet til at skubbe væskerne, som er til stede i den tilhørende rille (3), og

- midler (82) til at drive driftselementerne (81) inden i deres respektive riller (3), således at den mindst ene skubbeflade (812) genererer væskestrømen inden i sin rille (3).

3. Systemet til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge krav 2, **kendetegnet ved, at** driftselementerne (81) der er translatorisk bevægelige inden i rillerne (3), er fordelt over længden af mindst et langstrakt legeme (83).

4. Systemet til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge krav 3, **kendetegnet ved, at**:

- det langstrakte legeme (83) består af et reb, og driftselementer (81) består hver af en knude, som er dannet på rebet (83), eller
- det langstrakte legeme (83) består af en kæde, der består af flere led (831) som er samlet til hinanden og hvor skubbeelementerne (81) er dannet af ledene (831) af kæderne (83) eller af fremspringende dele (81), der er anbragt på ledene (831) af kæderne (83).

5. System til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge et hvilket som helst af kravene 2 til 4, **kendetegnet ved, at** midlerne (82) til at drive driftselementerne består af:

- midler (821) til drive driftselementerne (81) i en enkelt progressionsretning inden i hver rille (3), eller
- midler (822) til drift af driftselementer (81) ifølge en oscillerende bevægelse, hvor driftselementerne (81) inkluderer en opstrøms overflade (813), der er tilpasset til at begrænse trykket på væskerne.

6. Systemet til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge krav 2, **kendetegnet ved, at**:

- mindst et af driftselementerne (81) består af et skrueformet element, der danner en spiralformet skubbeflade (812), og
- midlerne til at drive driftselementerne (82) består af elementer (823), der roterer det mindst ene skrueformede driftselement (81).

7. System til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge et hvilket som helst af kravene 1 til 6, **kendetegnet ved, at** det også inkluderer elementer (9) til at forsyne rillerne (3) med en behandlingsvæske.

8. System til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge et hvilket som helst af kravene 1 til 7, **kendetegnet ved, at** rillerne (3) er retlinede og strækker sig parallelt i forhold til hinanden og afgrænser mellem hinanden et antal understøttende dele (21), der hver har form af et retlinet bånd.

9. Systemet til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge krav 8, **kendetegnet ved, at** rillerne (3) har hver:

- en bredde på mellem 15 og 50 mm og
- en dybde på mellem 15 og 50 mm og

hvor understøtningsdelene har en bredde på mellem 50 og 500 mm.

10. System til opsamling af væsker der strømmer på gulvet af en indeslutning til opdræt af dyr ifølge et hvilket som helst af kravene 1 til 9, **kendetegnet ved, at** midlerne til at skubbe (8) strækker sig ind i tykkelsen og hovedparten af rillerne (3) uden at stikke ud i forhold til de tilstødende understøttende dele (21).

11. Indeslutning til opdræt af husdyr der er udstyret med et opsamlingssystem (1, 7, 8) ifølge et hvilket som helst af kravene 1 til 10.

12. Indeslutningen til opdræt af husdyr ifølge krav 11, **kendetegnet ved, at** det inkluderer en strømningskanal (C) med en langsgående akse (C') og hvis støtteflade (S) er dækket med en gulvbelægning (1), og hvor rillerne (3) af gulvbelægningen (1) er anbragt parallelt eller mindst tilnærmelsesvis parallelt med den langsgående akse (C').

Fig.1

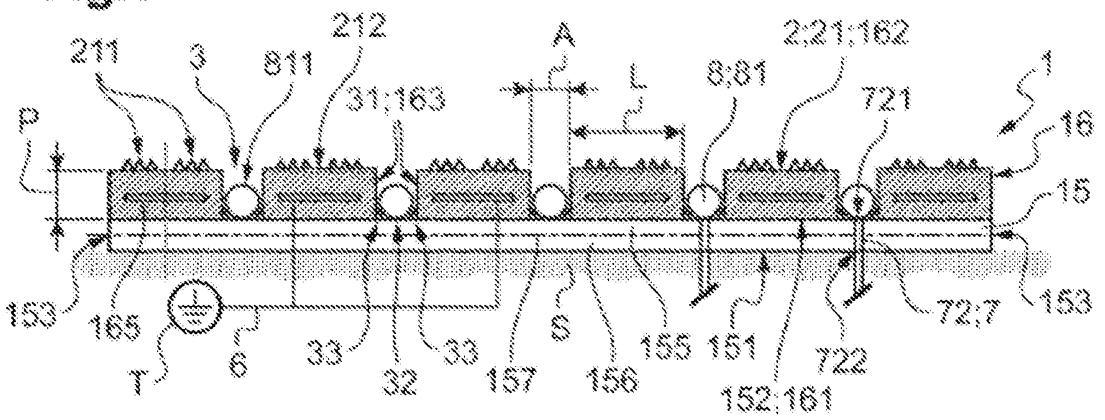
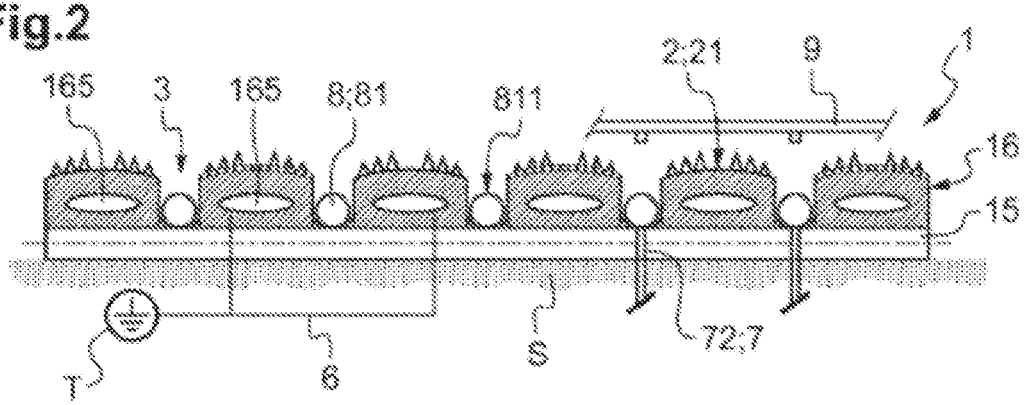


Fig.2



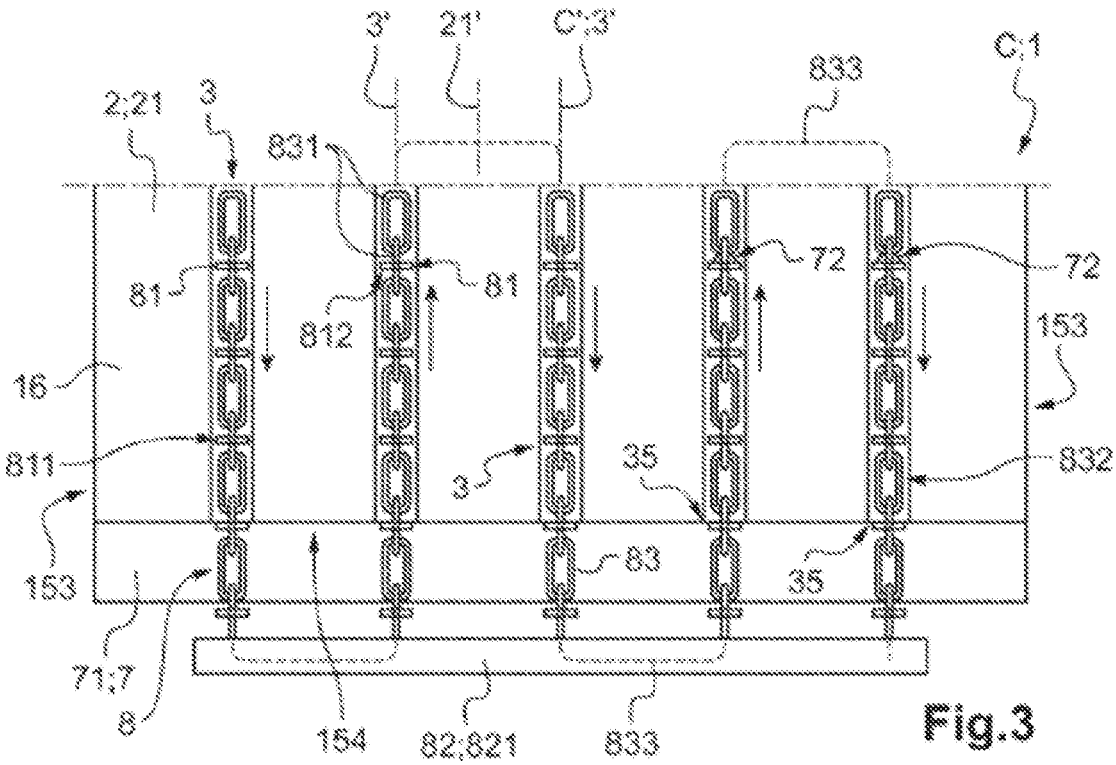


Fig.3

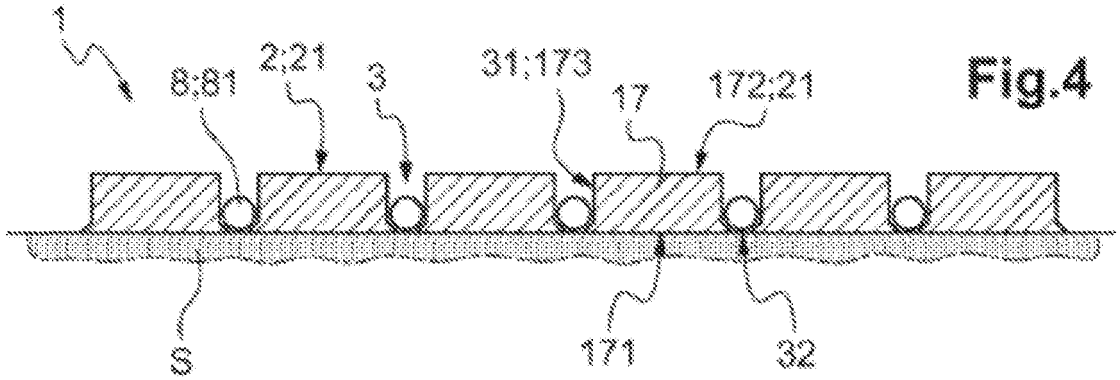

1
8;81
2;21
3
31;173
17
172;21
S
171
32

Fig.4

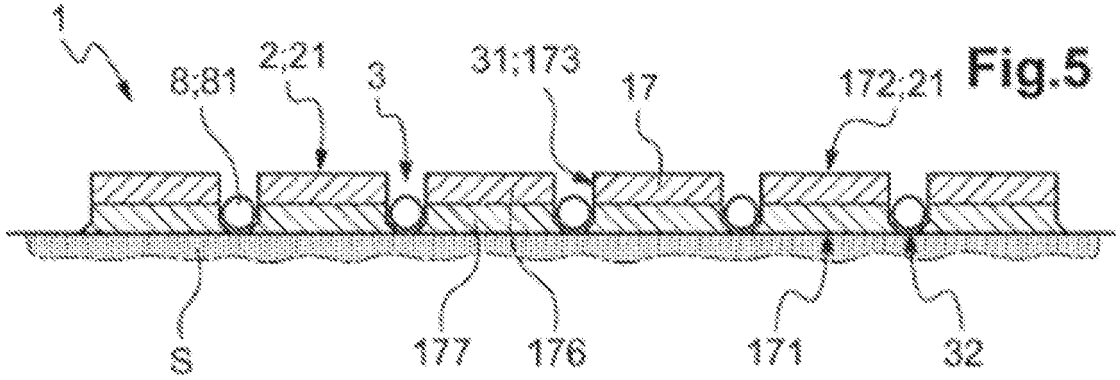

1
8;81
2;21
3
31;173
17
172;21
S
177
176
171
32

Fig.5

Fig.6

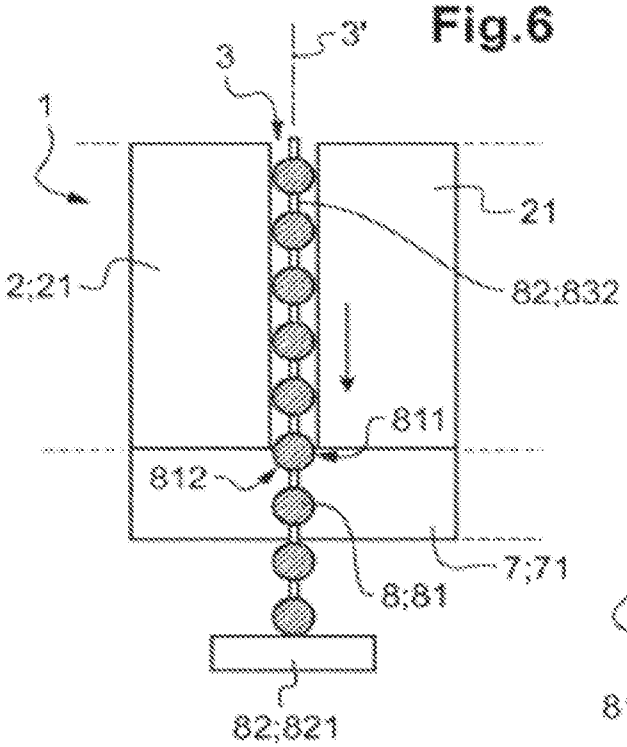
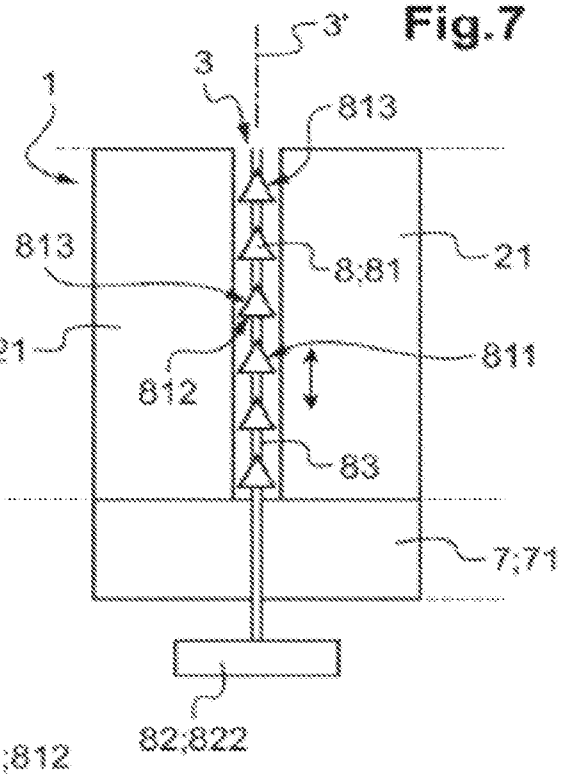


Fig.7



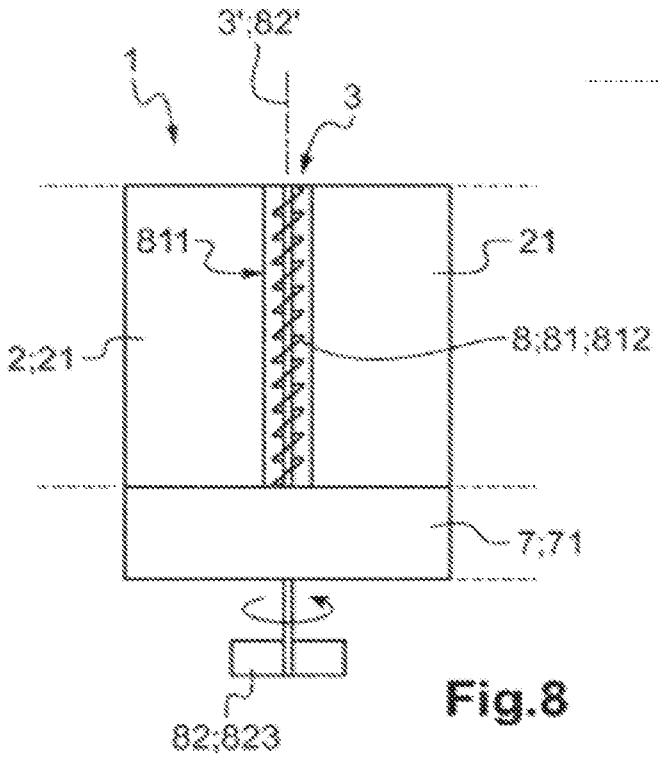


Fig.8