

The invention relates to the artificial insemination of animals and more exactly to a strip of interconnected dose bags and a machine for processing these dose bags.

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The artificial insemination of pigs requires a quantity of semen in the order of 125 cm³. The semen is transferred into the vagina of the sow by means of an insemination probe adapted to the outlet of a receptacle containing this dose of semen.

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These receptacles are currently available in several different forms.

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For example, the doses may be contained in an extrusion blown small bottle made of a flexible or semi-rigid, inflatable thermoplastic material and closed by a screw-on moulded stopper adapted to receive a connection nozzle. Such a small bottle weighs about fifteen to twenty grams.

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After manual distribution, these bottles may be processed manually by gravity feed through a valve located at the base of a storage container of semen, or semi-automatically by means of a peristaltic pump supplying the predetermined amount of semen. The bottle is closed manually by simply screwing on the stopper.

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Flexible receptacles in the general shape of a truncated cone, similarly made of thermoplastic material and extrusion blown, are also known. These receptacles have an integral nozzle, the initially open base being sealed by welding after being filled, and weigh less than 10 g.

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Before processing, these truncated-cone-shaped receptacles are fitted to mid-height one inside the other, which reduces

the overall space required and facilitates distribution. This distribution is semi-automatic, i.e. because the tubes are stacked together in quantities and are manually placed vertically in dispensers with the base open to the top, the receptacle at the top is filled by means of a peristaltic pump, and then the upper wall is clamped and welded, the sealing being carried out automatically. Because the tube is open and filling is carried out by vertical flow exposed to the air, the diluted semen is exposed to contaminants.

There are also receptacles in the form of individual flexible bags comprising a welded flexible tube connection.

This technique has an appreciable effect on the cost price and does not permit automation. In fact, in the case of the known flexible bags and their welded flexible connecting tubes, distribution can rarely be other than manual. Filling, if carried out by gravity feed, is itself manual and very slow in this case. If filling is carried out by means of a peristaltic pump, it is semi-automatic, but by whatever method, sealing the bag in the form of a flexible tube by welding or sealing this bag by means of a stopper is also manual.

The disadvantage of using peristaltic pumps is that they crush a considerable proportion of the spermatozoa.

In all these cases, flexible screw-top bottles or semi-rigid inflatable bottles, flexible truncated-cone-shaped receptacles or bags, the nozzle, connection or feed channel, though normally sealed, are open by perforating the stoppered end before being attached to the insemination probe. The seal and positioning are achieved by tightly fitting the tube or connection from the bag internally or

externally on the free end of the insemination probe.

5 In the case of the small bottles and flexible truncated-cone-shaped receptacles, the diluted semen is gradually squeezed out using manual pressure. In order to completely empty them, two operations entailing recovery of air are necessary.

10 In the case of the bags, emptying occurs naturally by combined action of atmospheric pressure, of the genital tract of the sow and of the sachet, which is initially flat without reserved volume and without requiring a volume of liquid to be replaced by the same volume of air.

15 The insemination probes used for adaptation to these receptacles are extremely varied.

20 The majority of these tubular probes are generally cylindrical with a circular cross-section, and have an outside diameter of 5 to 14 mm and an inside diameter of 3 to 6 mm. One of the ends of the probe is adapted to fit the genital tract of the sow, the other end, as has been seen, is made adjustable for attachment to the nozzle or
25 connection of the receptacle containing the semen. The length of these probes is in the order of fifty centimetres. The end to be introduced into the vagina of the sow and referred to as the "functional end" is generally made in the form of a moulding made of rubber or elastomer with a left-
30 hand thread, or a moulded flexible foam pad.

Hence, there are some very elaborate probes, which are very costly and designed for multiple use for economic reasons, thus requiring very careful washing, which does not,
35 however, fully eliminate the risk of contamination. There

are also simple disposable probes, the manufacture of which is automated using a minimum of low-cost material, and their cost is obviously appreciably lower than the cost of cleaning. In these two cases, the internal passage of the probe is open at both ends, and this poses problems with respect to the necessity to keep them sterile.

The document EP-A 0 096 191 describes a strip of interconnected dose bags of flexible thermoplastic material arranged consecutively in the longitudinal direction of the strip, said strip being formed from a flattened casing, the side walls of which are made of a composite film formed from superimposed sheets fastened to one another by means of a weld defining a feed channel. In addition, EP-A 0 096 191 describes a machine for processing dose bags of flexible thermoplastic material intended for animal artificial insemination comprising a filling device for the bags and a welding device for sealing the bags after they have been filled.

The aim of the invention is to remedy the problems of previous methods, and more particularly to provide a disposable dose bag, which has a minimum volume when empty, is economical because it is manufactured using a small amount of low-cost plastic material by a simple method which may be automated, is of simple design and has no welded tube connection, and which may be joined to other identical bags in a strip arrangement, thus permitting complete automation from the distribution of the plastic sheets to manufacture of the bag and the filling operation.

Another aim of the invention is to allow the bag to be filled in volume rapidly and automatically shielded from the air and contamination, to allow the bag to be joined to the

probe before insemination, their positioning and tightness being assured in a feasible manner, to allow the channel in the probe to be sealed at both ends, thus restricting the introduction of foreign cells into the uterus, and to allow the bag to be emptied naturally and completely shielded from the air and contamination.

On this basis, the invention relates to a strip of interconnected dose bags of flexible thermoplastic which are intended for animal artificial insemination and which are arranged consecutively in the longitudinal direction of the strip, said strip being formed solely from two sheets of flexible thermoplastic fastened to one another by means of welds, each defining a bag along an almost closed contour, one of the short sides of which contains an opening and from this opening in the short side the weld defines a feed channel extended by a centring cone, the two sheets of flexible thermoplastic being pierced on the outside of each contour formed by the weld by holes for drive means, and the bags are partially separated by a single perforation extending along part of the width of the strip to allow deformation movements of the bags, particularly during filling, without there being any appreciable change in the centre to centre distances between holes longitudinally in relation to the strip.

The invention also relates to a machine for processing dose bags of flexible thermoplastic material intended for animal artificial insemination, comprising a filling device for the bags and a welding device for sealing the bags after they are filled, characterised in that it is provided with a drum holding a rolled strip of empty bags, a supply roller to receive this strip, which is located on the supply roller by means of drive pins, and a take-up roller to receive the

filled bags which is also equipped with drive pins as well as perforating means to separate the filled bags, and in that the filling device and the welding device are disposed between the supply roller and the delivery roller, the filling device comprising two guide elements defining a passage between them, in which the strip is positioned and transported when guided by the rollers and which has two widths corresponding respectively to the thickness of the bag when full and the thickness of the strip forming the bag with sufficient clearance to allow for displacement of the strip, the two guide elements each defining a cavity adapted to receive a filling tube for the bag.

Other features and advantages of the invention may be seen from the following description given to provide a non-restrictive example on the basis of the attached drawings:

Figures 1A, B,

C, D are front views showing the successive shapes of a dose bag according to the invention from its manufacture to its use;

Figure 2 is a schematic representation of a front view of the stages of processing of a dose bag by means of a manufacturing installation according to the invention;

Figure 3 is a view corresponding to Figure 2, showing a top view onto the bags;

Figure 4 is a more detailed front view, showing a stage of production of a dose bag according to the invention;

Figure 5A is a sectional view along line V-V in Figure 4;

Figure 5B is a similar sectional view showing a later stage
of production.

Since the dose bags 1 according to the invention are to pass through the processing machine in the form of a strip with consecutive bags formed along the length of this strip, which is initially stored on a roll, these dose bags are made from two sheets of light flexible thermoplastic material placed one on top of the other and joined by welds. Their contour defining the shape of the bag will be described in more detail below. The flexible and thin sheets of thermoplastic material are single layers or composites adapted to thermal seal welding, may preferably be sterilised by gamma rays, are devoid of extraneous toxic constituents, impermeable to light and ultraviolet radiation, and may be printed on. The weight of each bag is approximately 2.5 g.

Whereas the bags are rectangular in form when empty, the weld 2 extends in such a way as to define a contour of a bag of a similarly general rectangular form, but with one of the short sides containing an opening, and from this opening the weld defines a feed channel 3 which is extended by a centring cone 4 widening outwards. The angles of the rectangle are rounded.

Holes 5 arranged at equal distance from one another are arranged in succession close to the two longitudinal edges of the strips on the outside of the closed contour formed by the weld. Their purpose will be outlined below.

A perforation 6, which extends only along part of the width

of the strip and defines the width of the rectangular bag, formed before filling, allows this width and the thickness of the bag to be modified in parts during the filling process without there being any appreciable change in the centre to centre distances between holes 5 longitudinally in relation to the strip.

The machine for processing these interconnected bags in strip form firstly distributes and unwinds two sheets in parallel which have been perforated to the desired width for the strip and for processing in rolls, forms the welds by means of heating jaws to form the contour of the bags by joining the two sheets, and cuts the holes 5 and perforations at equal distance for partial separation of the bags.

The processing machine, which is generally separate, is intended to equip laboratories for the preparation of diluted pig semen.

The machine is fed by a drum (not shown), on which a roll of a strip of identical empty bags with a length corresponding to the processing cycle, and comprises a supply roller 7 for the empty strip of bags and a take-up roller 8 for the full bags, having parallel longitudinal axes oriented in an appropriate direction to allow the bags to be transferred into a position from the supply roller 7 to the take-up roller 8 to enable them to be easily filled. The angle of inclination of the strip in the machine, which is determined by the inclination of the rollers, is preferably approximately 30° relative to the horizontal. A drive mechanism (not shown) causes the two rollers to simultaneously rotate 90° in each cycle. For this purpose, the rollers have four faces arranged at 90° , each provided

with drive pins 10 to penetrate the holes 5 in the strip of bags to secure their position. Whereas the faces of the supply roller are plane, those of the take-up roller are concave to accommodate the bags when inflated by their contents.

The labelling machine provided at the level of the faces of the supply roller 7 attaches a marker for automatic identification of the bags to a position 11.

A perforating device, indicated by perforating means 12 such as punching tools provided on the periphery of the supply roller 8, automatically separates the bags by extending the perforation 6 on either side.

A filling device and a welding device are arranged consecutively between the two rollers 7, 8.

The filling device comprises two hollow shells 13 facing one another, which may be moved back and forth in relation to one another. The open position (Figures 4 and 5A) provides a free space which is slightly larger than the area required for a full bag. The closed position (Figure 5B) creates a rectangular enclosure by pressing the two shells 13 against one another and clamping the strip at the point of supply.

A passage is retained in the shells 13 for a filling tube 14. Partial tightness is sufficient.

A guide means comprising two symmetrical guide elements 15 arranged to face one another forms a passage with two widths, i.e. a central passage with a width corresponding to the thickness of the filled bag and two side passages with a width corresponding to the thickness of the strip with the

necessary clearance to allow the two continuous side sections of this strip to pass through. The two guide elements 15 touch and are held in place by screw connection at the two ends of the passage. The height of the passages corresponds to the width of the strip with the necessary clearance to allow it to pass.

Within the passage provided in the two shells 13 for the filling tube 14, a cylindrical cavity 16 extending towards the outside via an outwardly widening connection cone 17 is formed in the guide means with the two elements 15. The diameter of the cavity 16 and the shape of the connection cone 17 correspond to the feed channel 3 which is extended by the centring cone 14 of the bag. The connection cone 17 is itself extended by a cylindrical cavity.

A nozzle made of flexible material 18 in the shape of a truncated cone is provided on the outside of the filling tube 14. The whole arrangement is in a retracted position (Figures 4 and 5A) during the distribution operations of the bags, and in a projected position (Figure 5B) pressed against the connection cone 17 during the filling operation.

The conical nozzle 18 may be moved in the large diameter of the cylindrical cavity formed in the guide means.

When in retracted position (Figures 4 and 5A), this conical nozzle 18 remains engaged between the two sheets forming the strip. When in projected position (Figure 5B), it engages into the centring cone 4 of the bag and forms a tight connection by pressing and deforming the film against the connection cone 17 of the guide means.

The filling tube 14 is connected to a semen storage

container by a flexible pipe, which may be sealed by a clamping valve (neither of which are shown).

5 The bag is positioned by four pins 19 integral to one of the shells 13 as they close.

10 The central passage of the guide means with two elements 15 has two calibration plates 20 to gauge the thickness of the bag when filled. These calibration plates are mounted on four sliding posts 21, each of which being supported by a guide element 15 and associated with restoring spring means to allow the calibration plates 20 to be retracted when the shells are open and vice versa. The space between the
15 calibration plates is adjustable.

20 These plates have a triple role: they allow the volume of liquid to be regulated by controlling the thickness of the bag, they allow the free volume of the bags to be increased when the shells open in order to prevent forcing, and they allow a contact pulse to be supplied to determine the end of the filling operation.

25 The angle of inclination of 30° relative to the horizontal allows the volume of the bag 1, the feed channel 3, the filling tube 14 and the volume of liquid to be processed to be arranged on consecutive levels one above the other.

The filling process is as follows:

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Opening of the shells 13 is associated with:

- the cavity formed by these shells being exposed to the open air,
- closure of the communicating valve with the volume of
35 liquid located at the upper level,

- retraction of the filling tube 14 which still remains engaged between the two sheets forming the bags,
- passage of the strip delivering the filled bag at the following welding point and introducing a new empty bag.

Closure of the shells 13 is associated with:

- positioning of the new empty bag by means of pins 9,
- projecting and pressing the filling tube 4 on the centring cone 4 of the bag against the connection cone 17 of the guide elements,
- opening the communicating valve with the volume of liquid located at the upper level,
- placing the cavity formed by the shells 13 under partial vacuum.

Filling is thus achieved rapidly under the double action of gravity applied to the liquid and of underpressure applied to the bag.

The welding device comprises two heating jaws 22 to form the seal on the bag by pressing these two heating jaws against one another at the level of the centring cone 4. The jaws 22 are shaped in the form of an inverted V intersecting the centring cone 4 to permit the bag to be opened at a later stage by the perforation, and the probe to be positioned through this perforation.

Therefore, by a section of the weld in the form of an inverted V, the welding device closes the contour of the initial weld bordering the bag defined between the two flexible sheets at the free widened end of the centring cone.

Therefore, the overall cycle of operation of the processing

machine may be divided into two main phases:

- rotation of the rollers 7, 8 by 90° and advance of the strip by one bag from left to right,
- simultaneous operations of filling and welding.

These two main phases of operation continuously follow one another, being separated by two intermediate phases consisting of opening the filling shells 13 at the same time as the welding jaws 22 are opened, and closing the filling shells at the same time as the welding jaws are closed.

It may be noted that the centre to centre distance of the holes 5 provided for the drive pins 10, 19 is decreased transversely in relation to the strip when the bag is filled, and this is compensated by a corresponding decrease in the centre to centre distance of these pins 19 at the time of filling. Hence, the distribution movements transferred by the drive pins 19 are applied to the strip equally onto the two continuous side sections of the strip devoid of perforation or deformation.

The bag thus filled in the laboratory with diluted semen, in this case pig semen, is distributed and despatched to the breeding centres.

It is opened at the time of insemination via a perforation 23 made, for example, using scissors, said perforation being in the shape of a V with its branches intersecting (approximately at right angles) the branches of the inverted V of the weld closing the centring cone 4 of the bag. This perforation 23 should be just sufficient to allow an insemination probe to pass through.

The invention is, of course, not restricted to the examples

described and represented above, and other forms and embodiments may be used while remaining within its framework.



CLAIMS:

1. Strip of interconnected dose bags of flexible
thermoplastic which are intended for animal artificial
insemination and which are arranged consecutively in the
longitudinal direction of the strip, said strip being formed
solely from two sheets of flexible thermoplastic fastened to
one another by means of welds (2), each defining a bag along
an almost closed contour, one of the short sides of which
contains an opening and from this opening in the short side
the weld defines a feed channel (3) extended by a centring
cone (4), the two sheets of flexible thermoplastic being
pierced on the outside of each contour formed by the weld
(2) by holes (5) for drive means (10, 19), and the bags are
partially separated by a single perforation (6) extending
along part of the width of the strip to allow deformation
movements of the bags, particularly during filling, without
there being any appreciable change in the centre to centre
distances between holes (5) longitudinally in relation to
the strip.

2 - Machine for processing dose bags of flexible
thermoplastic material intended for animal artificial
insemination, comprising a filling device (13..21) for the
bags and a welding device (22) for sealing the bags after
they are filled, characterised in that it is provided with a
drum holding a rolled strip of empty bags, a supply roller
(7) to receive this strip, which is located on the supply
roller by means of drive pins (10), and a take-up roller (8)
to receive the filled bags which is also equipped with drive
pins (10) as well as perforating means (12) to separate the
filled bags, and in that the filling device (13..21) and the
welding device (22) are disposed between the supply roller
(7) and the delivery roller (8), the filling device



comprising two guide elements (15) defining a passage
between them, in which the strip is positioned and
transported when guided by the rollers (7, 8) and which has
two widths corresponding respectively to the thickness of
the bag when full and the thickness of the strip forming the
bag with sufficient clearance to allow for displacement of
the strip, the two guide elements each defining a cavity
adapted to receive a filling tube (14) for the bag (1).

3. Machine according to Claim 2, characterised in that
the filling device comprises two hollow shells (13) facing
one another, which may be moved back and forth in relation
to one another, the two guide elements (15) also defining a
stepped cavity provided with a connection cone (17) to
receive a filling tube (14) for the bag (1).

4. Machine according to Claim 2, characterised in that
the filling device comprises two shells (13), inside which
the two respective guide elements (15) are housed to define
a passage with two widths, the wider section of this passage
containing two calibration plates (20) to gauge the
thickness of the filled bag, these plates being mounted on
sliding posts (21), of which each is supported by a guide
element and associated with restoring spring means of the
calibration plates.