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## (54) Automatic packaging of live fish.

(57) An apparatus for automatically packaging live fish comprising a container (4) with an inlet (5) for entering fish and with a bottom that can be opened (9) at least partially. Means (1, 2, 4, 8) are provided for forming a pouch from a web of packaging material so that the mouth of the pouch encloses the part of the bottom of the container that can be opened. When the pouch has been formed, the bottom of the container is opened so as to release the live fish into the pouch. The pouch is finally sealed by sealing means (10).

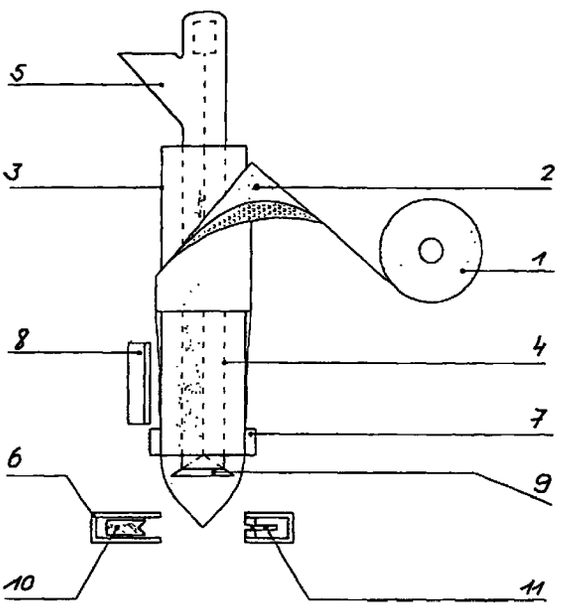


Fig: 1

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## Description

FIELD OF THE INVENTION

**[0001]** The present invention relates to automatic packaging of live creatures such as live fish.

BACKGROUND OF THE INVENTION

**[0002]** Live creatures such as live tropical fish might need to be transported, i.e. from the hatchery to the wholesale dealer and/or from the wholesale dealer to the retail dealer.

**[0003]** It is important that the live fish (or other live creatures) are packaged and transported in optimal conditions so the chance of survival during their transport is optimal.

**[0004]** In the following, whenever live fish is mentioned, this is to be understood so as to apply also to other live creatures that need water and air or oxygen for living.

**[0005]** Commonly live fish are packaged in preformed plastic bags. Such bags are only provided in a limited number of formats. So, one has to select a bag having a size that is best adapted to the number of fish to be packaged and to the amount of fluid and the amount of air or oxygen that is necessary to keep the fish alive in the captured circumstances.

**[0006]** Until now the packaging of live fish was performed manually. The job generally comprises the following step:

- first the number of fish to be packaged is captured in a small can,
- then, guided by his experience, the person who is packaging the fish selects one of a limited number of preformed plastic bags.
- next, water is added so that the amount of water in the bag is adequate for the number of fish in the bag,
- then the bag is pulled vacuum and inflated with oxygen,
- finally the bag is firmly sealed.

Several bags are finally put together in a cardboard box for transport.

**[0007]** The manual packaging of fish is a labour-intensive and a time-consuming job.

**[0008]** Furthermore, the job asks for some experience in packaging live fish. Indeed, in most cases the person who is catching the fish is not the same person as the one who packages and the packaging job is not performed immediately following the catching of the fish. Hence a situation exists where several cans each comprising a different number of fish are lining for packaging. Cans may comprise a great number of fish. It may thus become very hard to count the fish and to determine the corresponding amount of liquid and oxygen that is to be added to the package.

**[0009]** Since a great number of manual actions are performed by several persons, errors are likely to occur, especially in cases of time pressure, inexperienced personnel etc.

**[0010]** There is thus a need to automatize the packaging of live creatures such as live fish.

**[0011]** Several kinds of packaging machines are available on the market for packaging bulk goods such as food products. However, none of these machines is adapted for packaging live fish requiring water and air or oxygen to survive.

OBJECTS OF THE INVENTION

**[0012]** It is an object of the present invention to provide an apparatus for automatically packaging live creatures such as live fish.

**[0013]** It is a further object of the invention to provide a water-tight package suitable for packaging live creatures such as live fish.

**[0014]** Still further objects will become apparent from the description hereafter.

SUMMARY OF THE INVENTION

**[0015]** The above-mentioned objects are obtained by an apparatus for automatically packaging live creatures such as live fish, comprising

- a container (4) with an inlet (5) for entering live creatures to be packaged and with a bottom (9) that can be opened at least partially,
- means ( 1, 2, 3) for forming a pouch from at least one web of packaging material, the mouth of the pouch enclosing the part of the bottom of said container that can be opened,
- means for controlling opening of said part of the bottom that can be opened when the pouch has been formed so as to release the live creatures from container (4) into the pouch,
- means (10) for sealing said pouch after filling.

**[0016]** Specific features of preferred embodiments of the invention are disclosed in the dependent claims.

**[0017]** The packaging material has to be a material that can be formed into a air-tight and water-tight pouch.

**[0018]** The packaging material is preferably low density polyethylene foil.

**[0019]** It is preferably provided in the form of a single web e.g. drawn from a roll supply. Use of a single web is preferred since it allows to produce a pouch with a minimum of sealed seams so that the risk of leakage is reduced to a minimum.

**[0020]** The means for forming the pouch preferably comprise

- guiding means for guiding the web of packaging

material so as to form a tube with an overlapping side,

- sealing means for sealing said overlapping side,
- means for drawing an amount of packaging material down the guiding cylinder, said amount being at least equal to the length of a pouch to be formed,
- transverse sealing means arranged for sealing transverse sides of said tube spaced apart by the length of the pouch.

**[0021]** In addition to the guiding cylinder, a guiding collar may be provided.

**[0022]** Guiding cylinder and container are preferably positioned substantially vertical. In this way gravity ensures that the fish always have the maximum available amount of water at their disposition. Gravity can then also be used to automatically release the fish into the pouch when the bottom or part thereof is opened.

**[0023]** Preferably the guiding cylinder is arranged so as to enclose the container at least partially. In this way the dimensions of the apparatus, especially the height is kept to a minimum. This makes entering fish into the inlet, which is commonly situated in the upper part of the container, more convenient.

**[0024]** Details on the means for drawing the packaging material down the guiding cylinder are described further on in great detail with reference to the drawings.

**[0025]** Another aspect of the present invention relates to a three-side sealed water-tight pouch for live creatures formed from a web of packaging material folded so as to have one overlapping side comprising live creatures, fluid such as water and gas such as oxygen or air.

**[0026]** Still another aspect of this invention relates to a method of packaging live creatures such as live fish comprising the steps of

- feeding said live creatures into a container having a bottom that can be opened at least partially,
- automatically forming from a web of packaging material a water-tight three-seam pouch around said container so that the pouch has two sealed sides and an open mouth, said open mouth enclosing at least the part of said bottom of the container that can be opened,
- releasing said live creatures into said pouch,
- sealing said mouth of the pouch.

**[0027]** Further embodiments and advantages of the present invention will become apparent from the following detailed description and from the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0028]**

Fig. 1 shows an apparatus for packaging live fish according to the present invention,

Fig. 2 - 19 illustrate the procedural steps sequentially performed.

## DETAILED DESCRIPTION OF THE INVENTION

**[0029]** Figure 1 shows an embodiment of a packaging apparatus for automatically packaging live fish, according to the present invention.

**[0030]** The apparatus comprises a cylindrical container 4 having an inlet 5 for entering fish and water. The cylindrical container is placed substantially vertical. At the bottom, the cylindrical container is closed by a stop-valve 9.

**[0031]** Container 4 is enclosed by a second cylinder 3, further referred to as guiding cylinder. The guiding cylinder is made of perforated steel plate.

**[0032]** Packaging material, in this particular embodiment being high density polyethylene, is provided in the form of a single web drawn from a supply roll 1. The packaging material is folded around collar 2 and around guiding cylinder 3. The dimensions of the guiding cylinder 3 are chosen so that two opposite sides of the web overlap each other, when the web is folded around the guiding cylinder 3.

**[0033]** An elongate vertical seal bar 8 extending parallel to the longitudinal axis of tube 3 is arranged to enable sealing of the overlapping part of the packaging material.

**[0034]** Clamping members 7 are arranged along the side of the guiding cylinder to clamp the packaging material to the guiding cylinder 3.

**[0035]** Underneath cylinder 3 further clamping members 6 are provided. The function of these clamping members will be explained further on.

**[0036]** Clamping members 6 are positioned so that they enclose a pair of parallel, horizontal seal bars 10. A cutting means 11 is positioned in between the two seal bars 10.

**[0037]** The consecutive steps performed when operating the device are illustrated in figures 2-17 and will be explained below.

**[0038]** First fish are catched and brought into the vicinity of the apparatus (see figure 2). The fish are fed together with water into container 4 via inlet 5.

**[0039]** Through control electronics 12 (only schematically shown in figure 3) an indication is given of the dimensions of the pouch that is to be produced. In the described embodiment of the present invention a selection can be made among four formats, each format having the same width but a different length.

**[0040]** The following description is given for an example wherein format 3 is selected. Format 3 refers to a pouch which is three times as long as a pouch of format 1.

**[0041]** The web of polyethylene material drawn from supply roll 1 is guided by collar 2, (see figure 1) around guiding cylinder 3 until opposite, elongate sides of the web overlap.

**[0042]** The principle of using a collar to guide a material around a tube so that elongate sides overlap is not illustrated by figures 2 to 17.

**[0043]** The polyethylene foil forms a tube. This tube is pulled in downward direction along guiding cylinder 3.

**[0044]** Several mechanisms may be used for pulling the tube in downward direction.

**[0045]** In one example at least two sides of the guiding cylinder are provided with a transport belt which, when driven, pull the plastic foil in downward direction.

**[0046]** Belts, however, have to be driven by an electric motor. Since the environment in which the fish are kept and packaged is very humid, one should avoid the use of electricity in the close neighbourhood of the apparatus.

**[0047]** Further, the guiding cylinder 3 might occasionally be wet e.g. as a consequence of the humid surroundings and/or due to spilling of water when feeding fish into the apparatus. A film of water on the guiding cylinder might cause the tube of packaging material to stick to the cylinder. As a consequence, it might be difficult to pull the tube of packaging material in downward direction.

**[0048]** This problem could be solved by slightly removing the packaging material from the guiding cylinder when it is pulled down (e.g. by pulling vacuum). However, this solution is rather complex.

**[0049]** Alternatively, clamping members e.g. in the form of two half cylinders surrounding guiding cylinder 3 might be provided to pull the tube of packaging material down.

**[0050]** Although this embodiment is simpler, means are still to be provided to overcome the sticking of the tube to the wet guiding cylinder.

**[0051]** To overcome the problem of the sticking, cylinder 3 can be perforated. Since the sticking also occurs at the collar, this collar is preferably also perforated.

**[0052]** An alternative embodiment of means for pulling the tube of packaging material in downward direction comprises 4 rollers which are positioned underneath guiding cylinder 3.

**[0053]** Since this method avoids clamping the foil against cylinder 3, the problems of sticking have diminished.

**[0054]** This embodiment however is to be positioned underneath cylinder 3 and hence enlarges the height of the apparatus.

**[0055]** Feeding fish into the inlet of the machine might become more difficult. Furthermore the complex drive of the rolls would increase the cost of the apparatus.

**[0056]** In a preferred embodiment of means for pulling the tube of packaging material in downward direction comprise clamping members 6 and 7.

**[0057]** Clamping members 7 are situated around guiding cylinder 3 and clamping members 6 enclose the horizontal sealing bars 10.

**[0058]** Figure 4-7 show this embodiment. These figures illustrate the way in which an appropriate length of packaging material is obtained. This will now be explained.

**[0059]** The packaging material is pulled downward through co-operation of clamping members 6 and clamping members 7.

The sequence of the actions starts with clamping members 6 in start position underneath guiding cylinder 4. The sequence is as follows:

(1)close second set of clamping members 6,
(2)open first set of clamping members 7,
(3)displace said second set over a predetermined distance an downward direction thereby drawing the tube of packaging material in the same direction,
(4)close first set of clamping members 7,
(5)open second set of clamping members 6,
(6)displace second set of clamping members 6 again to start position,
(7)repeat steps 1 to 6 until a length of packaging material is pulled down equal to an envisaged length of the pouch.

**[0060]** For a pouch of format 3, the displacement is three times performed.

**[0061]** Figure 4 shows the starting position where clamping members 6 are closed and clamping members 7 are open so that the tube of packaging material is clamped between clamping members 6.

**[0062]** Vertical sealing bar 8 seals the overlapping side of the tube of packaging material.

**[0063]** Next, appropriate control electronics (not shown) control that the clamping members 6 are displaced in downward direction thereby also drawing the vertically sealed tube of packaging material in the same direction (see figure 5).

**[0064]** The next step is shown in figure 6 where clamping members 6 are opened while clamping members 7 are closed. Always one pair of clamping members is closed while the other is open.

**[0065]** While clamping members 7 hold the tube of packaging material and prevent it from further sliding down guiding cylinder 3, clamping members 6 are displaced upwardly to their start position (same position as shown in figure 4).

**[0066]** Next, clamping members 6 are closed and clamping members 7 are opened again and the downward displacement of clamping members 6 is repeated.

**[0067]** This sequence is repeated as many times as required for selected pouch format.

**[0068]** Each time the overlapping vertical seam of the tube of packaging material is sealed by vertical sealing bar 8.

**[0069]** Figure 7 illustrates vertical sealing of the overlapping side of the tube of packaging material.

**[0070]** The arrows shown in figure 8 indicate the actions that are performed (the sequence of actions having been described higher).

**[0071]** Once the pouch is formed (see figure 9), valve 9 is opened so that the water and the fish are released from container 4 into the pouch. This is illustrated in figure 10.

**[0072]** Means 13 can be provided for spraying water or another fluid into container 4 (see figure 11). These spraying means serve two purposes: (1) spraying of water into the container prohibits that fish are left in the container (and stick e.g. to the inner wall of the container) and (2) water (or another fluid) can be added to the pouch so that a prescribed ratio of fluid/gas is always obtained.

**[0073]** A sensor, e.g. an hydrostatic sensor can be provided in the bottom of container 4 for sensing the amount of water that was brought into the container together with the fish.

**[0074]** Means can be provided for calculating the difference between the amount of water that is sensed and the amount of water that is required in the pouch and for controlling the operation of the spraying means so that water is added to the container until the amount that was sensed corresponds to an envisaged amount.

**[0075]** Figure 11 illustrates the situation where the fish are released into the pouch and figure 12 illustrates the situation in which valve 9 is closed again while clamping members 7 still remain closed. At this moment the container 4 can already be filled again with new fish to be packaged.

**[0076]** Next, the pouch is pulled vacuum by means of a vacuum pump. (see figure 13)

**[0077]** Clamping means 6 are again approached so that they are almost but not entirely closed.

**[0078]** This position of the clamping means 6 permits that an amount of oxygen can be blown into the pouch through the opening in between the members 6. (see fig. 15).

**[0079]** Next the clamping members 6 are fully closed (see figure 16).

**[0080]** The horizontal sealing bars 10 can then make a transverse seal in the pouch (see figure 16 and 17).

**[0081]** In the embodiment shown, the transverse sealing arrangement comprises a horizontal seal bar which is arranged to make two parallel seals separated about 1 cm from each other. The lower seal closes the pouch that has been filled and the upper seal forms the bottom of a next pouch.

**[0082]** When the sealing bars are retracted again, a cutting means which is provided in between the parallel sealing bars is approached to cut between both seals. In this way pouches are separated from each other, or separated from rest of material. (figure 18)

**[0083]** Finally, clamping members 6 are opened again and the pouch is ejected from the apparatus.

**[0084]** Having described in detail preferred embodiments of the current invention, it will be apparent to those skilled in the art that numerous modifications can be made therein without departing from the scope of the invention as defined in the appending claims.

## Claims

1. Apparatus for automatically packaging live creatures such as live fish comprising

   - a container (4) with an inlet (5) for entering live creatures to be packaged and with a bottom (9) that can be opened at least partially,
   - means ( 1, 2, 3, 8) for forming a pouch from at least one web of packaging material, the mouth of the pouch enclosing the part of the bottom of said container that can be opened,
   - means for controlling opening of said part of the bottom that can be opened when the pouch has been formed so as to release the live creatures from container (4) into the pouch,
   - means (10)for sealing said pouch after filling.

2. Apparatus according to claim 1 wherein said pouch is formed by means of a single web of packaging material.

3. Apparatus according to any of the preceding claims wherein said means for forming a pouch comprise

   - a guiding cylinder (3) for guiding said web of packaging material so as to form a tube with an overlapping seam,
   - sealing means (8) for sealing said overlapping seam,
   - means (6, 7) for drawing an amount of packaging material down the guiding cylinder, said amount being at least equal to the length of a pouch to be formed,
   - transverse sealing means (10) arranged for sealing transverse sides of said tube spaced apart by the length of the pouch.

4. Apparatus according to claim 3 wherein said container (4) and said guiding cylinder (3) are arranged in a substantially vertical position.

5. Apparatus according to claims 3 or 4 wherein said guiding cylinder (3) at least partially encloses said container.

6. Apparatus according to any of claims 3 to 5 wherein said means for drawing an amount of packaging material down the guiding cylinder comprise

   - a first set of clamping members (7) arranged to clamp said tube of packaging material against said guiding cylinder (3),
   - a second set of clamping members (6) enclosing said transverse sealing means,
   - means for displacing said second set of clamping members in the direction of the longitudinal axis of said guiding cylinder between a start

position and an end position spaced apart from said start position by a predetermined distance,

- control means for controlling clamping of said first and second set of clamping members and for controlling displacement of said second set of clamping members according to the following sequence:

  (1)close second set of clamping members (6),
  (2)open first set of clamping members (7),
  (3)displace said second set (6) down over said predetermined distance thereby drawing said tube of packaging material in downward direction,
  (4)close first set of clamping members (7),
  (5)open second set of clamping members (6),
  (6)displace second set of clamping members (6) to start position,
  (7)repeat steps 1 to 6 until a length of packaging material is pulled down equal to an envisaged length of the pouch.

**7.** Apparatus according to any of the preceding claims provided with means for deflating said pouch in between filling and closing of the pouch and with means for adding gas into the pouch in between filling and closing of the pouch.

**8.** Apparatus according to any of the preceding claims provided with means for determining the amount of fluid in the container and with means for spraying a fluid into the pouch.

**9.** Apparatus according to claim 8 provided with control means for controlling the amount of fluid sprayed by the spraying means on the basis of the determined amount of fluid.

**10.** Apparatus according to any of the preceding claims comprising (a)transverse seal bar(s) arranged to make two parallel seals and comprising a cutting means (11) arranged to cut in between the two parallel seals.

**11.** A three-side sealed, water-tight pouch for live creatures formed from a web of packaging material folded so as to have one overlapping seam, said pouch comprising live creatures, fluid and gas.

**12.** A method of packaging live creatures such as live fish comprising the steps of

- feeding said live creatures into a container having a bottom that can be opened at least partially,
- automatically forming from a web of packaging material a water-tight three-sided seamed pouch around said container so that the pouch has two sealed sides and an open mouth, said open mouth enclosing at least the part of said bottom of the container that can be opened,
- releasing said live creatures into said pouch,
- sealing the mouth of the pouch.

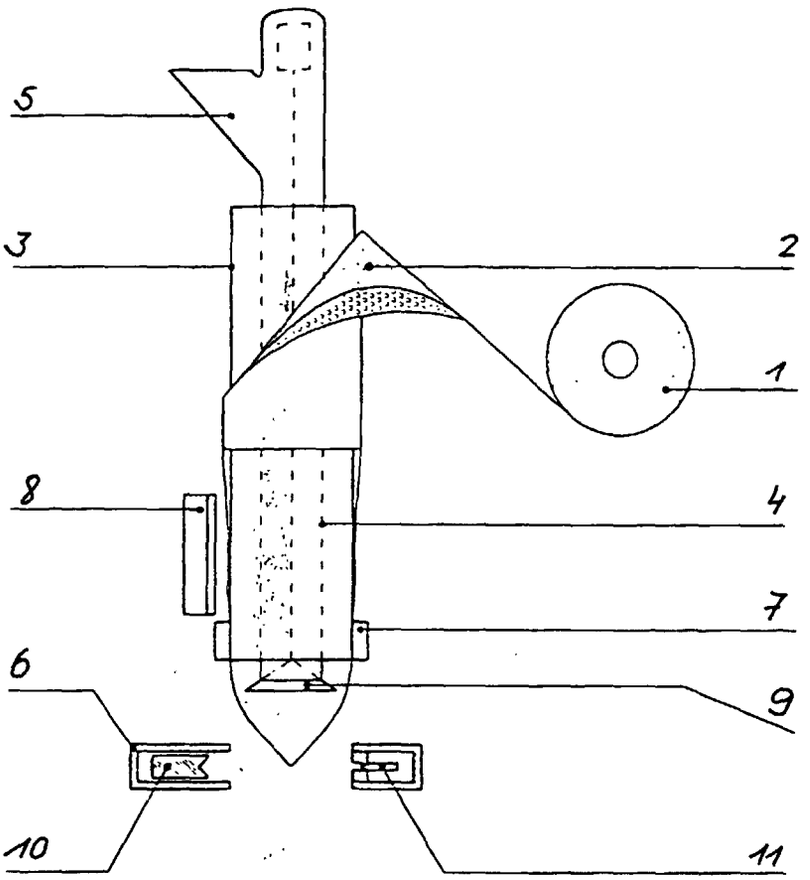


Fig. 1

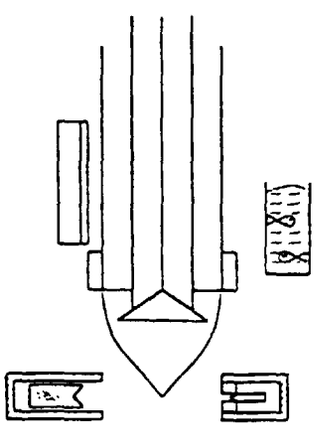

Fig. 2

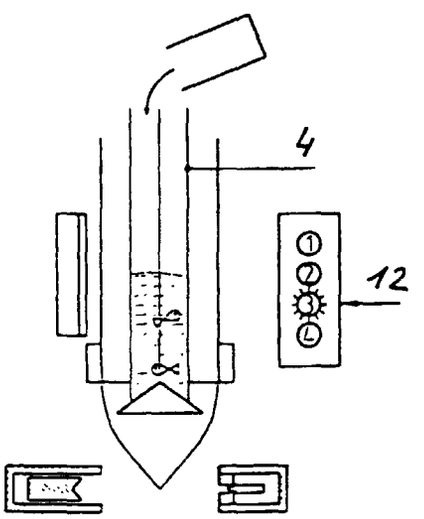


Fig. 3

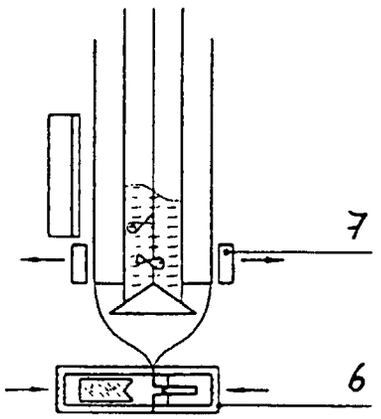


Fig. 4

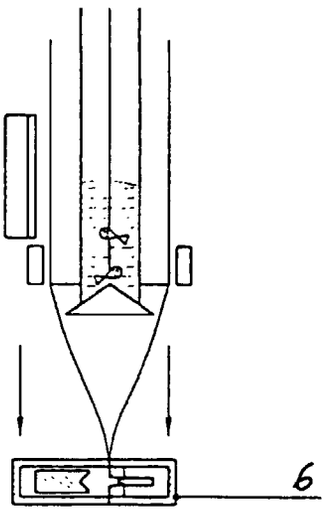


Fig. 5

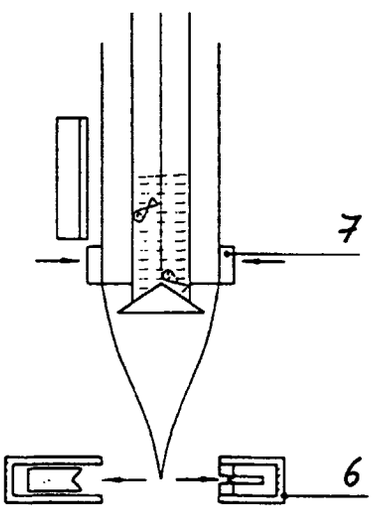


Fig. 6

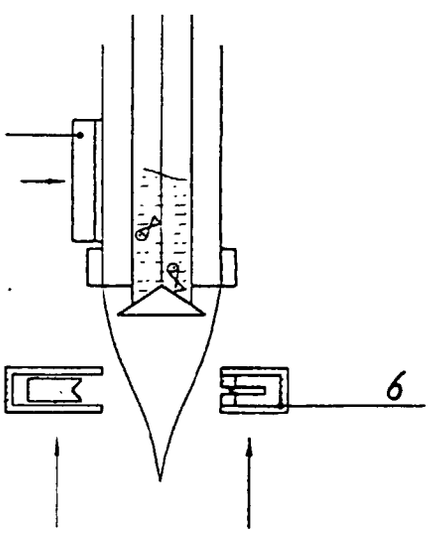


Fig. 7

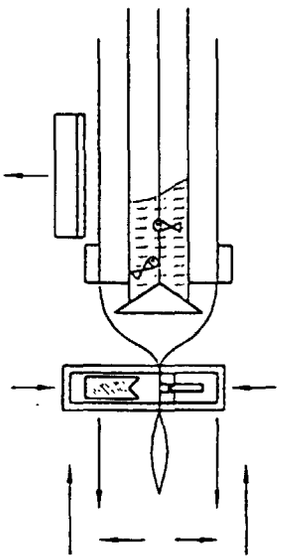

Fig. 8

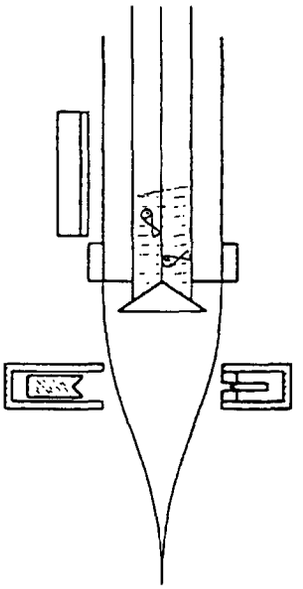

Fig. 9

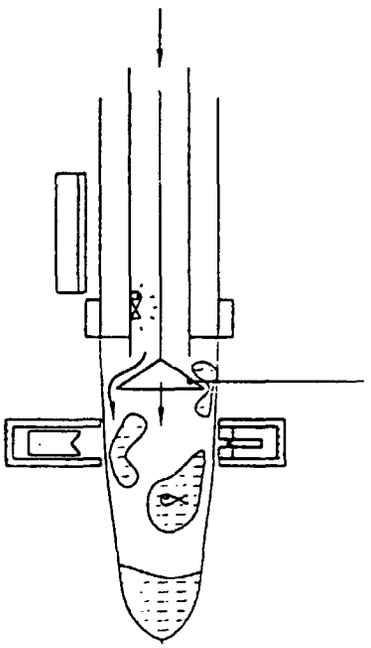

Fig. 10

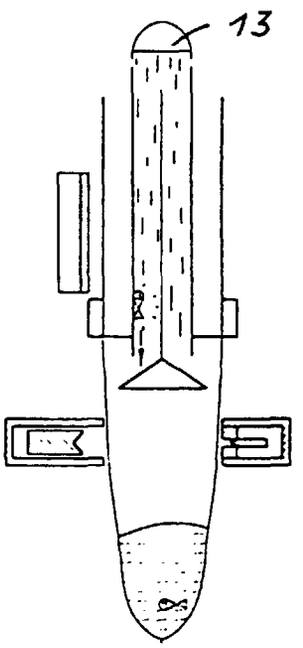


Fig. 11

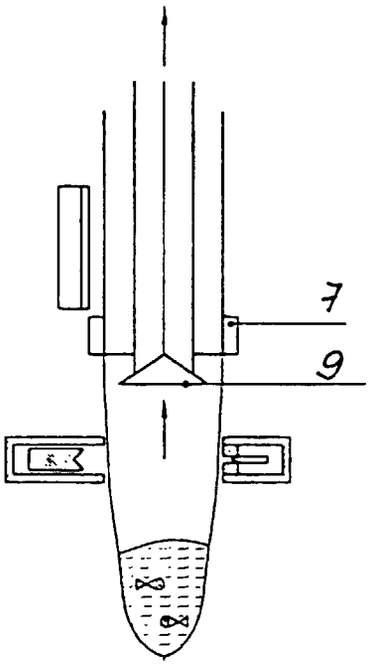


Fig. 12

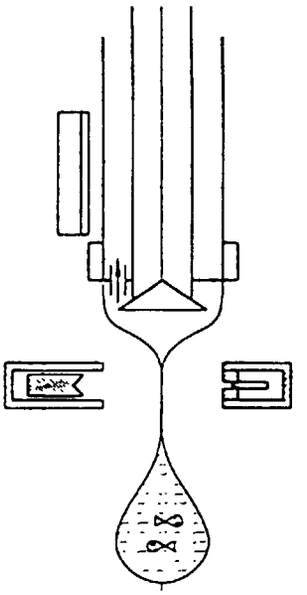

Fig. 13

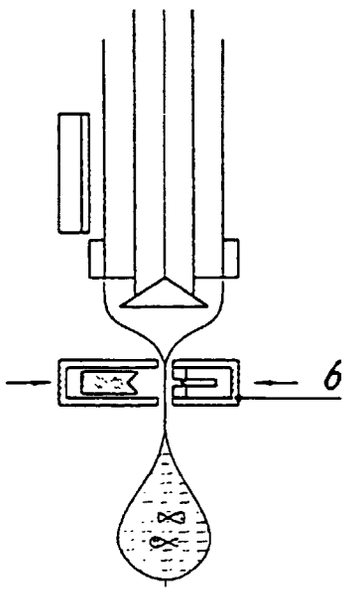


Fig. 14

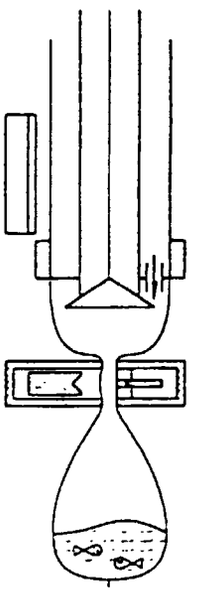

Fig. 15

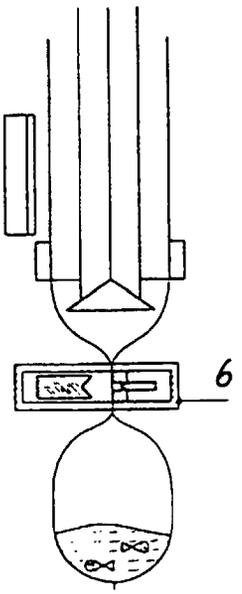


Fig. 16

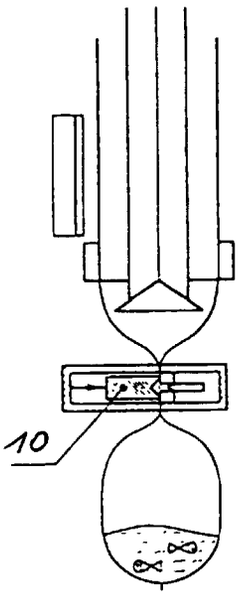


Fig. 17

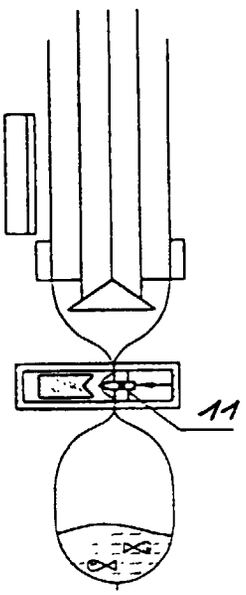


Fig. 18

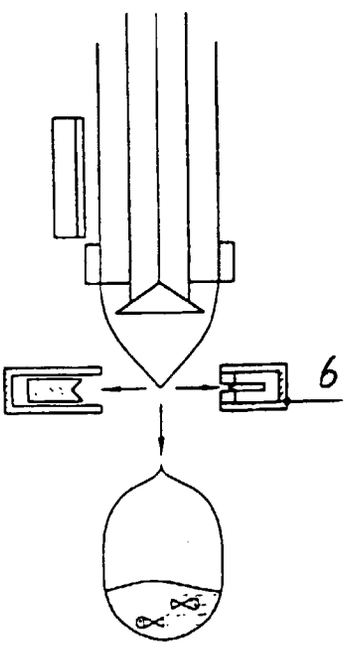


Fig. 19

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 98 20 1836

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
|---|---|---|---|
| X<br>Y | DE 23 55 957 A (SEEBERGER KG) 15 May 1975<br>* the whole document * | 1-5,10<br>6,7,11,<br>12 | B65B9/20 |
| Y | US 4 043 098 A (PACKAGE MACHINERY)<br>23 August 1977<br>* column 6, line 47-62; figure 10 * | 6 | |
| Y | US 3 579 945 A (FR. HESSER MASCHINENFABRIK) 25 May 1971<br>* column 1, line 35-70; figure 1 * | 7 | |
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| A | US 4 964 259 A (BORDEN) 23 October 1990<br>* column 2, line 35-48; figures 1,2 * | 7 | |
| A | US 3 886 714 A (PREPAC) 3 June 1975<br>* column 2, line 57 - column 3, line 3; figures 1,2 * | 8 | TECHNICAL FIELDS SEARCHED (Int.Cl.6)<br>B65B |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 2 November 1998 | Lenoir, C |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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