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Inventor(s)

SPREAFICO; Enrico Davide

APPARATUS FOR MAKING CAPSULES AND RELATIVE METHOD FOR MAKING CAPSULES

Abstract

An apparatus for making capsules, includes: a receiving station for receiving capsule bodies having bottom and side walls defining a filling cavity with an opening opposite the bottom and a flange surrounding the opening. A forming station for making sealing rings includes a device for feeding a sheet from a reel. A coupling station couples each ring to a capsule body at the respective flange. A welding station welds the rings to respective capsule bodies. Groups of receiving seats receive the capsule bodies. An etching device etches pre-cutting lines along the edges of the rings, so that a central portion of the rings is detached from the etched sheet. Detaching elements detach from the sheet the rings that had been etched onto the sheet and bring them into contact with the flange at the coupling station. The etching device operates remotely and separately from the coupling station.

Inventors: SPREAFICO; Enrico Davide (Garlate (Lecco), IT)

Applicant: I.M.A. INDUSTRIA MACCHINE AUTOMATICHE S.P.A. (Ozzano Dell'Emilia (BO), IT)

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Background/Summary

TECHNICAL FIELD

[0001] This invention relates to an apparatus for making capsules and a relative method for making capsules.

BACKGROUND ART

[0002] In the food sector, the prior art teaches the making of capsules or containers, containing a food preparation, which can be used in machines for dispensing a beverage.

[0003] Generally speaking, these capsules are made from a sheet of aluminium foil or other deformable material, which is cut and suitably deformed to define a space for containing the product, and to constitute an outer case.

[0004] According to an alternative technique, the capsules may be made by means of a process for injecting material.

[0005] The case has a bottom wall, a lateral wall which define a cavity and a peripheral flange.

[0006] It should be noted that the product is housed inside the cavity and that the capsule has an opening on the opposite side relative to the bottom wall.

[0007] After inserting the product, through the opening, the prior art comprises closing the opening, in a hermetically sealed fashion, using a sheet of aluminium or multilayer plastic film, thereby sealing the product inside the cavity.

[0008] A problem encountered in the capsules made starting from a sheet of aluminium or other material is a certain difficulty in guaranteeing the seal between the peripheral flange of the capsule and the housing of the capsule of the dispensing machine.

[0009] In effect, the flange is in the order of a few tenths of a millimetre and, therefore, having a reduced thickness, is easily deformable.

[0010] The seal is important in order to prevent percolations of the product in the dispensing machine during the preparation of the beverage, so as to also allow the production of a beverage under perfect quality conditions and keep the dispensing machine in perfect conditions of efficiency and cleaning.

[0011] In order to improve the seal of the capsule relative to the housing of the dispensing machine, a sealing element (ring) (made, for example, of elastomeric material) is generally applied to the capsule.

[0012] The sealing element generally has the shape of a ring, and is inserted on the lateral wall of the capsule in contact with the flange. When the capsule is inserted in the dispensing machine, the sealing element is flattened against a contact element of the housing of the capsule of the dispensing machine, so that deforming guarantees a certain seal.

[0013] According to the prior art machines for making capsules the sealing element is made of elastic material, and may consist of a ring inserted elastically on the lateral wall of the capsule, or fixed to the lateral wall, in contact with the surface of the flange facing the opposite side relative to the opening of the cavity of the capsule.

[0014] The ring may also be made by applying (according to different techniques) a composition of

elastomers, silicones, plastic materials in a liquid or viscous form on the outer surface of the capsule, and subsequently hardening said composition.

[0015] However, the making of said annular sealing element is complex and costly, thus increasing the production costs of the capsule.

[0016] There is therefore a strongly felt need for providing an apparatus for making capsules which can, advantageously, operate with reduced costs, using environmentally-friendly materials, without adversely affecting a perfect cleaning, safety, and reliability, and at the same time allowing capsules to be made which, once used, guarantee an optimum seal with the dispensing machine.

DISCLOSURE OF THE INVENTION

[0017] An aim of the invention is therefore to satisfy the need expressed in the introduction, that is to say, to provide an apparatus and a method for making capsules for beverages which can operate with perfect cleanliness, safety and reliability.

[0018] Said aims are fully achieved by an apparatus and a method for making capsules for beverages according to the appended claims.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0019] The invention will be described with reference to the accompanying drawings, provided by way of example only and without limiting the scope of the invention, in which:

[0020] FIG. 1 is a perspective view of an apparatus for making capsules equipped with sealing rings according to the invention;

[0021] FIG. 2 is a perspective view of certain details of the apparatus of FIG. 1 relating to a first zone of the station for feeding capsules;

[0022] FIG. 3 is a perspective view of certain details of the apparatus of FIG. 1 relating to a second zone of the station for feeding capsules;

[0023] FIG. 4 is a perspective view of certain details of the apparatus of FIG. 1, more specifically a conveyor for transporting capsules forming part of the apparatus of FIG. 1;

[0024] FIG. 5 is a perspective view of certain details of the apparatus of FIG. 1, more specifically a zone for releasing the capsules made by the apparatus of FIG. 1;

[0025] FIG. 6 is a perspective view of certain details of the apparatus of FIG. 1, more specifically a first zone relative to the station for making sealing rings for capsules of the apparatus of FIG. 1;

[0026] FIG. 7 is a perspective view of certain details of the apparatus of FIG. 1, more specifically a second zone relative to the station for making sealing rings for capsules of the apparatus of FIG. 1;

[0027] FIG. 8 is a perspective view of certain details of the apparatus of FIG. 1, more specifically a third zone relative to the station for making sealing rings for capsules of the apparatus of FIG. 1;

[0028] FIG. 9 is a perspective view, according to different cross section planes, of a detail of FIG. 8 relative to a shearing device for making the sealing rings;

[0029] FIGS. 10A, 10B and 11 are perspective views of certain details of the apparatus of FIG. 1, more specifically a zone relative to the station for the sealing of sealing rings for capsules of the apparatus of FIG. 1;

[0030] FIGS. 12A and 12B schematically illustrate the station for the sealing of sealing rings for capsules illustrated in FIGS. 10A, 10B and 11 with the elements in different positions;

[0031] FIGS. 13 and 14 are perspective views of certain details of the apparatus of FIG. 1;

[0032] FIGS. 15 and 16 schematically illustrate a capsule according to the processing in the apparatus of FIG. 1, with the sealing ring not coupled and coupled, respectively, to the capsule body.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0033] With reference to the accompanying drawings, and with particular reference to FIGS. 1 to

14, the apparatus according to the invention, labelled **100** in its entirety, is used for making capsules.

[0034] The apparatus **100** comprises a receiving station **ST1** for receiving capsule bodies **8** having a bottom **2** and side walls **3** defining, in combination, a filling cavity **4** provided with an opening **5** opposite the bottom **2** and a flange **6** positioned to surround said opening.

[0035] The capsule bodies **8** are well illustrated in FIG. **15**.

[0036] The receiving station **ST1** comprises a container **31** designed to contain capsule bodies **8** (the container **31** is filled with loose capsule bodies **8**).

[0037] The container **31** releases the capsules to a conveyor **32** which suitably conveys them to a predetermined release zone **43** (shown in FIG. **3**).

[0038] The apparatus **100** comprises, in the release zone **43**, a pickup device **34** comprising a plurality of pickup units **35**.

[0039] Each pickup unit **35** is equipped with a suction cup, to allow a single capsule body **8** to be picked up from the conveyor **32**.

[0040] It should be noted that the pickup device **34** releases the capsule bodies **8** to a successive conveyor **14** (clearly visible in FIG. **4**), which is described in more detail below, forming part of the apparatus **100**.

[0041] According to another aspect, the apparatus **100** comprises a station **ST2** for making sealing rings **10** comprising a device **7** for feeding a sheet **12** unwound from a reel **B** (clearly visible in FIG. **6**).

[0042] Preferably, the sheet **12** is made of paper material.

[0043] According to another aspect, the apparatus **100** comprises a station **ST3** for coupling said sealing rings **10** with the respective capsule bodies **8** (clearly visible in FIG. **10**), configured for coupling each sealing ring **10** to a capsule body **8** at the respective flange **6**.

[0044] The coupling station **ST3** comprises a plurality of detaching elements **38**, preferably defined by punches **45**, configured to detach the sealing rings **10** from the sheet **12** and position them on the flanges **6** of the capsule bodies **8** positioned at the coupling station **ST3**.

[0045] FIG. **16** illustrates, by way of example, a capsule body **8** with the sealing ring **10** applied.

[0046] The apparatus also comprises a sealing station **ST4** (clearly visible in FIGS. **11** and **12A**) designed for sealing said rings **10** to the respective capsule bodies **8**.

[0047] Moreover, the apparatus **100** comprises a plurality of groups **G1,G2,G3,G4,G5,G6** (for simplicity, only six groups are indicated in the accompanying drawings) of seats **S** for receiving said capsule bodies **8** and means **9** for handling said groups **G1,G2,G3,G4,G5,G6** of receiving seats **S**, configured to allow a handling of the capsule bodies **8** between the station **ST1** for receiving capsule bodies **8**, the station **ST3** for coupling said sealing rings **10** with the respective capsule bodies **8**, and the sealing station **ST4**.

[0048] The apparatus **100** further comprises etching means **11** designed to etch the sheet **12** creating pre-cutting lines **33** along the (outer) edges of said sealing rings **10**, in such a way that a central portion of the sealing rings **10** is detached from the etched sheet **12**, whilst the sealing rings **12** remain anchored to the sheet **12** by means of anchor points on the sheet **12** defined by the pre-cutting lines **33**.

[0049] The etching means **11** are clearly visible in FIGS. **9** and **10**.

[0050] Further, the apparatus **100** comprises a plurality of detaching elements **38** configured to detach from the sheet **12** the sealing rings **10** which have been etched on the sheet **12** and move them into contact with the flange **6** in the coupling station **ST3**.

[0051] The detachment means **38** are positioned at the coupling station **ST3**.

[0052] FIG. **10B** illustrates a sheet **12** in which, by means of the shearing device **18**, the etches have been made relative to the different sealing rings **10**: it should be noted that the central portion (disc) of each sheet delimited by the innermost edge of the sealing ring **10** is removed, whilst the line **33** (pre-cutting) of the outermost edge of the sealing ring **10** is illustrated, with a dashed line.

[0053] The dashed line **33** of the outermost edge of the respective sealing ring **10** comprises a preferential pre-cutting line **33**, defined by actual notches and portions of sheet **12** which allow the ring **10** to be kept coupled to the remaining part of the sheet **12**.

[0054] It should be noted that the etching means **11** operate at an etching station ST5 (far) and separate from the coupling station ST3 (illustrated in FIGS. **8** and **9**), more precisely in an etching station ST5 not superposed on the path of the seats **S**.

[0055] More specifically, in effect, the etching station ST5 does not affect the path of the capsule bodies **8**, that is to say, it is not positioned above them. In this way, the waste material generated does not affect the capsule bodies **8**, and thus prevents the capsule bodies **8** from being accidentally contaminated with dust.

[0056] With reference to the sealing station ST4, illustrated in FIGS. **10** and **11**, that station comprises a plurality of sealing elements **39**.

[0057] Each sealing element **39** operates on a capsule body **8**.

[0058] Preferably, the sealing elements **39** heat seal the sealing ring **10** on the capsule body **8**.

[0059] According to this aspect, the sealing elements **39** comprise a heating element.

[0060] It should be noted that the sealing elements **39** are located above the conveyor **14**, and are movable vertically between a non-operating position (illustrated in FIG. **12A**), wherein the sealing element **39** is not in contact with the sealing ring **10**, and an operating position (illustrated in FIG. **12B**), that is to say, a sealing position, wherein the sealing element **39** is in contact with the sealing ring **10** to seal the sealing ring **10** to the capsule body **8**.

[0061] The sealing station ST4 is configured to allow several groups of seats **S** (illustrated in FIG. **11**) to be activated simultaneously on the capsule bodies **8**, preferably three groups of seats **S**.

[0062] The apparatus **100** also comprises a plurality of contact elements **40**.

[0063] The contact elements **40** are positioned at the sealing station ST4.

[0064] The contact elements **40** are shaped to match the cavity **4** of the capsule body **8**, and each also has a movable flange **41** configured to abut on the flange **6** of the capsule bodies **8** positioned in the seats **S** at the sealing station ST4.

[0065] The contact elements **40** are movable vertically between a non-operating position (illustrated in FIG. **12A**) and an operating position (illustrated in FIG. **12B**).

[0066] The contact means **40** are located below the capsule bodies **8**.

[0067] It should be noted that the capsule bodies **8** are transported by the conveyor **14** in the respective seats **S** with the opening **5** facing downwards.

[0068] In the operating position, illustrated in FIG. **12B**, the sealing is performed: in this position the movable flange **41** of each contact element **40** comes into contact with the flange **6** of a capsule body **8** positioned in the seats **S** and the sealing element **39** comes into contact with the sealing ring **10** to perform the sealing.

[0069] According to another aspect, the groups of seats **S** for receiving said capsule bodies **8** comprise first groups of seats for receiving (**G1,G2,G3**) and second groups (**G4,G5,G6**) of seats **S** for receiving.

[0070] These first groups (**G1,G2,G3**) and second groups (**G4,G5,G6**) of receiving seats are different and independent from each other with regard to the handling, as described in more detail below.

[0071] In essence, and more precisely, each group of receiving seats, belonging to the first or second groups, comprises seats **S** aligned in a direction **Y** transversal to the direction **X** of conveying the seats (as illustrated in FIG. **4**).

[0072] More specifically, along the conveying direction **X**, the first groups (**G1,G2,G3**) are alternated with the second groups (**G4,G5,G6**), that is to say, along the conveying direction **X** there is an alternation of first and second groups of seats **S**.

[0073] It should be noted that the means **9** for handling the groups of receiving seats **S** comprise first handling means **9A**, operating on said first groups (**G1,G2,G3**) of receiving seats **S**, and

second handling means **9B**, operating on said second groups (**G4,G5,G6**) of receiving seats **S**.
[0074] The first and second handling means **9A**, **9B** are independent of each other, to allow an independent handling, respectively, of said first groups (**G1,G2,G3**) and second groups (**G4,G5,G6**) of receiving seats **S**.
[0075] In short, the operation of the first groups (**G1,G2,G3**) and the second groups (**G4,G5,G6**) of receiving seats **S** is independent of each other, as described in more detail below.
[0076] It should be noted that the apparatus **100** comprises a control unit **13** configured to control the first and second handling means **9A**, **9B** in such a way as to allow a step-by-step handling, respectively, of the first groups (**G1,G2,G3**) and second groups (**G4,G5,G6**) of receiving seats **S**.
[0077] The expression step-by-step handling is used to mean a handling wherein the first and second handling means **9A**, **9B** are periodically started/stopped according to a predetermined time frequency (corresponding to a step).
[0078] More precisely, the control unit **13** is configured for controlling said first and second handling means **9A**, **9B** in such a way as to allow a handling of the receiving seats **S** in accordance with the following time sequence which is cyclically repeated: [0079] a first motion phase, wherein said first handling means (**9A**) are active while said second handling means (**9B**) are inactive, so as to move said first groups (**G1,G2,G3**) of seats (**S**) closer to the second groups (**G4,G5,G6**) of seats (**S**); followed by [0080] a second motion phase, wherein said first handling means (**9A**) are active and said second handling means (**9B**) are simultaneously active, so as to move said first groups (**G1,G2,G3**) and second groups (**G4,G5,G6**) of seats (**S**) simultaneously; followed by [0081] a third motion phase, wherein said second handling means (**9B**) are active while said first handling means (**9A**) are inactive, so as to move said second groups (**G4,G5,G6**) of seats (**S**) away from said first groups (**G1,G2,G3**) of seats (**S**).
[0082] The time sequence described above is repeated cyclically, so as to move each group of seats **S** between the various stations.
[0083] In effect, the groups (**G1,G2,G3,G4,G5,G6**) of seats **S** are moved along a closed path, preferably a loop-shaped path (defined by the conveyor **14**), so that they cyclically come into contact with the various stations receiving a capsule body **8** and performing on it the operations which will be described in more detail below.
[0084] The handling means **9** are described below in more detail.
[0085] As illustrated in FIG. **4**, the handling means **9** comprise a loop conveyor **14** configured to define a closed-loop path **P** for handling the groups of receiving seats **S**.
[0086] More specifically, the first handling means **9A** comprise a first loop conveyor **14A**, configured to define a first closed-loop path for handling the first groups (**G1,G2,G3**) of receiving seats.
[0087] The second handling means **9B** comprise a second loop conveyor **14B**, configured to define a second closed-loop path for handling the second groups (**G4,G5,G6**) of receiving seats **S**.
[0088] It should be noted that, in effect, the first and second loop paths are coincident.
[0089] The first conveyor **14A** comprises a first drive unit **15A** and first belts **16A** extending in a loop.
[0090] The first belts **16A** comprise a pair of belts, **16A'** and **16A''**, positioned, relative to the conveying direction **X** of the seats **S**, on opposite sides.
[0091] The first belts **16A** are connected to the first drive unit **15A** for being driven and to the first groups (**G1,G2,G3**) of receiving seats for handling them.
[0092] Similarly, the second conveyor **14A** comprises a second drive unit **15B** and second belts **16B**.
[0093] The second belts **16B** comprise a pair of belts, **16B'** and **16B''**, positioned, relative to the conveying direction **X** of the seats **S**, on opposite sides.
[0094] The second belts **16B** extend in a loop and are connected to the second drive unit **15B** for being actuated.

[0095] It should be noted that the second belts **16B** are positioned alongside said first belts **16A** and connected to the second groups of receiving seats **S** for handling the receiving seats **S**.

[0096] More specifically, the belt **16A'** is alongside the belt **16B'** and the belt **16A''** is alongside the belt **16B''**.

[0097] With reference to the longitudinal conveying direction **X** of the receiving seats **S**, the first belts **16A** are positioned substantially parallel, at a predetermined distance along the transversal direction **Y**.

[0098] Similarly, with reference to the longitudinal conveying direction **X** of the receiving seats **S**, the first belts **16A** are positioned substantially parallel, at a predetermined distance along the transversal direction **Y**.

[0099] Each group (**G1,G2,G3,G4,G5,G6**) of seats **S** comprises a respective connecting body **32**, in which the seats **S** are made and is connected on both sides to the first belts **16A** or, alternatively, to the second belts **16B**.

[0100] The seat **S** is shaped in such a way as to house the capsule body **8** with the opening **5** positioned downwards.

[0101] The various stations, respectively the station **ST1** for receiving capsule bodies **8**, the station **ST3** for coupling said sealing rings **10** with the respective capsule bodies **8**, the sealing station **ST4**, are positioned at the first and the second conveyor **14A** and **14B**, that is to say, they affect areas connected to the conveyors **14A** and **14B**.

[0102] On the other hand, the etching station **ST5** is positioned in a spatial region which does not affect the first and second conveyors **14A** and **14B**.

[0103] In this way, advantageously, the waste generated during the etching by the etching means **9** does not affect the region of the conveyors **14A** and **14B**, where the capsule bodies **8** are positioned in the respective seats **S**, thus increasing overall the cleaning, efficiency and food safety of the apparatus **100**.

[0104] In effect, it should be noted that the first loop conveyor **14A** and the second loop conveyor **14B** are configured in such a way that the path of the first group of seats **S** and of the second group of seats **S** is substantially coincident.

[0105] According to another aspect, the feeding device **7** comprises a roller **17** for supporting and unwinding the reel **B** (as illustrated in FIG. **6**).

[0106] The sheet **12** is a sheet generally made of paper material.

[0107] It should be noted that the feeding device **7** is configured to unwind the reel **B** at a constant speed without stopping, whilst the etching means **11** operate with the sheet stationary.

[0108] In essence, according to the apparatus **100**, in a predetermined region **33** corresponding to the etching station **ST5**, the sheet **12** can be stopped, whilst it is generally unwound continuously from the reel **B**.

[0109] In this regard, in order to allow operation in this way, the apparatus **100** comprises a compensation zone **30** of variable length along the sheet **12** feeding path.

[0110] In the compensation zone **30**, therefore, the sheet **12** has a length along the unwinding path which is variable from a minimum to a maximum: the maximum length is reached when the sheet **12** is stationary at the etching station **ST5**, to be etched by the etching means **9**, and the reel **B** is simultaneously unwound (its unwinding having caused the elongation in the compensation zone **30**).

[0111] FIG. **7** illustrates, on the other hand, auxiliary means **37** for pulling the sheet **12**, upstream of the etching station **ST5**, forming part of the apparatus **100**.

[0112] The auxiliary means **37** comprise at least one pair of rollers **37A** and **37B**.

[0113] Preferably, the auxiliary drive means **37** may be coupled to or uncoupled from the sheet **12**.

[0114] The apparatus **100** further comprises main means **42** for driving the sheet **12**, illustrated in FIGS. **13** and **14**, positioned preferably downstream of the etching station **ST5**.

[0115] The means **42** for driving the sheet **12** preferably comprise a motor, preferably of the

brushless type.

[0116] Moreover, preferably, the apparatus **100** comprises a winding reel, not illustrated, configured to wind the remaining portion of the sheet **12**, etched in the etching station ST5, in which the rings **10** have been made.

[0117] According to another aspect, the control unit **13** is configured to rotate the supporting and unwinding roller **17** at a constant and coordinated speed with the handling means **9** of the receiving seats G.

[0118] In effect, the apparatus **100** comprises a drive unit (not illustrated) operatively connected to the supporting roller **17** to allow its rotation, and the control unit **13** is connected to the drive unit.

[0119] According to another aspect, the etching means **11** comprise a shearing device **18**, comprising a plurality of cutting elements **19** which can be activated on said sheet **12** for etching it and defining a plurality of shapes defining said sealing rings **10**.

[0120] The shearing device **18** is illustrated in FIGS. **8** and **9**.

[0121] According to an aspect, said shearing device **18** is configured in such a way that the cutting elements **19** operate in a cutting plane P in a substantially planar portion of said sheet **12**.

[0122] It should be noted that the shearing device **18** does not in any way affect the region above the conveyor **14**: in this way, the waste and/or dust generated during shearing does not affect the capsules.

[0123] According to an aspect, the shearing device **18** operates on a portion of the sheet **12** stopped (that is to say, under stationary conditions) below the shearing device **18**.

[0124] According to another aspect, at the etching station ST5, the apparatus **100** comprises a suction device **46**, configured to act on the sheet **12** in such a way as to detach the central portions from the sealing rings **10** etched on the sheet **12**.

[0125] According to an embodiment not illustrated, the etching means **11** comprise a pair of rotary etching elements, acting in conjunction with each other to etch the sheet **12** and make the shapes of the sealing rings **10** on it. According to this embodiment, not illustrated, it should be noted that one of said rotary elements is equipped with etching elements defining punches (i.e. “knives”) and the other of said rotary elements is provided with cavities, configured to receive said etching elements, defining a die.

[0126] The sheet **12** is interposed between said rotary elements. These rotary units substantially operate the etching of the sheet **12** during their rotation, in a coordinated fashion, that is to say, preferably the sheet **12** is not stopped and the rotary units perform the etching during the pulling of the sheet **12**.

[0127] According to another aspect, the apparatus **100** comprises a device **21** for controlling the sealing rings **10** configured for detecting, after the etching, a parameter inherent to a shape and/or a colour and/or a presence/absence of said sealing rings **10** on said sheet **12**.

[0128] According to yet another aspect, the apparatus **100** comprises a device **22** for controlling the capsule bodies **8** configured for detecting a parameter inherent to a shape and/or a colour and/or a presence/absence of the capsule bodies **8** in said receiving seats S.

[0129] According to yet another aspect, the apparatus **100** comprises a device **23** for controlling the sealing configured for detecting a parameter inherent to a shape and/or a colour and/or a presence/absence of an assembly defined by the capsule body **8** and the sealing ring **10** sealed to each other, said sealing control device **23** being positioned downstream of the sealing station ST4.

[0130] According to yet another aspect, the apparatus **100** comprises a device **44** for controlling the correct coupling of the sealing ring **10** on the capsule body **8**, positioned downstream of, or at, the coupling station ST3 to check if each sealing ring **10** has been correctly coupled on the relative capsule body.

[0131] Advantageously, the apparatus **100** is particularly efficient in allowing the production of capsules, guaranteeing an optimum cleaning and conditions with a high level of food safety and hygiene.

[0132] With reference to FIG. 5, the apparatus **100** comprises a pickup device **36**, configured for picking up the capsule bodies **8** to which the sealing ring **10** has been applied by the conveyor **14**, more specifically by the seats **S**.

[0133] The pickup device **36** releases the capsules to a subsequent transport line (not illustrated), for the storage and/or packaging.

[0134] According to another aspect, a method is defined for making capsules, comprising the following steps: [0135] preparing a plurality of capsule bodies **8**, provided with a bottom **2** and side walls **3** defining, in combination, a filling cavity **4** provided with an opening **5** opposite the bottom **2** and a flange **6** positioned to surround said opening **5**; [0136] arranging said capsule bodies **8** inside groups of receiving seats **S**; [0137] moving said groups of receiving seats **S** along a feed path, preferably in a closed loop; [0138] preparing a reel **B** of sheet material (preferably paper) and unwinding said reel **B** to make available a sheet **12**; [0139] obtaining sealing rings **10** from said sheet **12**; [0140] coupling in a coupling station **ST3** each sealing ring **10** to the respective capsule body **8** at the respective flange **6**; [0141] sealing each sealing ring **10** to the body **8** on which it is inserted, and wherein the step of obtaining capsule sealing rings **10** from said sheet **12** includes the sub-step of etching the sheet **12** by creating pre-cutting lines **33** along edges of said sealing rings **10**, so that a central portion of the sealing rings **10** having a discoidal shape is detached from the etched sheet **12**, while the sealing rings **10** remain anchored to the sheet **12** by means of anchor points present in the pre-cutting lines **33**.

[0142] The step of coupling in a coupling station **ST3** each sealing ring **10** to the respective capsule body **8** is preceded by a step of detaching from the sheet **12** the sealing rings **10** which had been etched on the sheet **12**.

[0143] The sub-step of etching the sheet **12** is performed in an etching **ST5** far from and separate from the coupling station **ST3**, where the step of detaching the sealing rings **10** from the sheet **12** is performed.

[0144] According to another aspect, the step of positioning the capsule bodies **8** inside groups of receiving seats **S** comprises a step of positioning a first portion of said capsule bodies **8** inside first groups (**G1,G2,G3**) of receiving seats and a second portion of said capsule bodies **8** inside second groups (**G4,G5,G6**) of receiving seats.

[0145] Moreover, the step of moving the groups of receiving seats **S** along the feeding path comprises a step of handling independently said first groups (**G1,G2,G3**) of receiving seats relative to the second groups (**G4,G5,G6**) of receiving seats **S**.

[0146] According to another aspect, the step of moving said groups of receiving seats **S** along the feeding path is performed with a step-by-step movement.

[0147] In other words, the step-by-step handling presupposes, over time, stoppages of the groups (**G1,G2,G3,G4,G5,G6**) of seats **S** at the different stations or processing devices, to allow simultaneous processing on different groups of capsule bodies **8**. Generally speaking, during the stoppages, processing or activities are performed on capsule bodies **8** which are stationary at different stations/regions.

[0148] According to another aspect, the step of moving said groups of receiving seats **S** along the feeding path comprises the following steps, in the following time sequence, which is repeated cyclically: [0149] moving said first groups (**G1,G2,G3**) of receiving seats **S** closer to the second groups (**G4,G5,G6**) of receiving seats **S**; then [0150] moving at the same time said first groups (**G1,G2,G3**) of receiving seats **S** and said second groups (**G4,G5,G6**) of receiving seats **S**; then [0151] moving said second groups (**G4,G5,G6**) of receiving seats **S** away from the first groups (**G1,G2,G3**) of receiving seats **S**.

[0152] It should be noted that, preferably, the step of simultaneously moving said first groups (**G1,G2,G3**) of receiving seats **S** and said second groups (**G4,G5,G6**) of receiving seats **S** comprises an *n* number of steps, whilst the step of moving the first groups (**G1,G2,G3**) of receiving seats **S** towards the second groups (**G4,G5,G6**) of receiving seats **S** comprises an *m* number of steps.

According to an aspect, $n > 1$ $m > 1$ and $m > n$.

[0153] According to this aspect, during the movement of the first groups (G1,G2,G3) of receiving seats S towards the second groups (G4,G5,G6) of receiving seats S, a portion of the second groups (G4,G5,G6) of receiving seats S is kept at the sealing station ST4. According to another aspect, the step of moving said first groups (G1,G2,G3) of receiving seats closer to the second groups of receiving seats S is performed by keeping said second groups (G4,G5,G6) of receiving seats in a fixed position, and the step of moving said second groups (G4,G5,G6) of receiving seats S away from the first groups (G1,G2,G3) of receiving seats S is performed by keeping said first groups (G1,G2,G3) of receiving seats S in a fixed position.

[0154] According to a yet further aspect, the step of etching said sheet 12 to determine sealing rings 10 occurs with the sheet 12 in a stoppage position, whilst the reel B continues to unwind (without stopping).

[0155] According to another aspect, the step of unwinding said reel B occurs at a constant speed.

[0156] According to a further aspect, the step of etching said sheet 12 to determine sealing rings 10 defined on said sheet 12 with pre-cutting lines 33 comprises a step of shearing said sheet 12 using a plurality of shearing elements 19 for defining, on said reel B, a corresponding plurality of shapes of sealing rings 10.

[0157] Further, according to another aspect, during the step of cutting the shapes of the sealing rings 10 from the sheet 12, the shearing elements 19 operate in a cutting plane P on a portion of the sheet 12 of said substantially planar reel B.

[0158] According to another aspect, the step of detaching said sealing rings 10 from the sheet 12 comprises a step of sucking the sealing rings 10, in such a way as to detach the sealing rings 10 etched in the reel B.

[0159] According to another aspect, the method further comprises a step of controlling the sealing rings 10, wherein a parameter inherent to a shape and/or a colour of said sealing rings 10 is detected.

[0160] Further, the method comprises a step of controlling said capsule bodies 8, wherein a parameter inherent to a shape and/or a colour of the capsule bodies 8 is detected.

[0161] According to another aspect, the method further comprises a step of controlling the sealing, wherein a shape and/or colour parameter of an assembly defined by the capsule bodies 8 and sealing rings 10 sealed to each other is detected.

[0162] According to another aspect, the step of coupling the sealing ring 10 to the capsule body 8 is performed by mutually moving the sealing ring 10 and the capsule body 8 along a vertical direction (more specifically, the capsule body 8 is kept in a predetermined vertical position whilst the sealing ring 10 is moved vertically).

[0163] It should be noted that the step of positioning said capsule bodies 8 inside groups of receiving seats S is performed by placing inside the seats S the capsule bodies 8 resting, respectively, with the flanges 6 below and the bottoms 2 at the top.

[0164] Advantageously, the proposed method for making capsules is particularly simple, and effective in terms of cleanliness and food safety.

Claims

1. An apparatus for making capsules, comprising: a receiving station for receiving capsule bodies having a bottom and side walls defining, in combination, a filling cavity provided with an opening opposite the bottom and a flange surrounding said opening, a forming station for making sealing rings comprising a device for feeding a sheet unwound from a reel; a coupling station for coupling said sealing rings with respective capsule bodies, configured to couple each sealing ring to a capsule body at the respective flange; a welding station configured to weld said rings to respective capsule bodies; a plurality of groups of receiving seats for receiving said capsule bodies and

handling means of said groups of seats for receiving, configured to allow a handling of the capsule bodies between the station for receiving capsule bodies, the station for coupling said rings with the respective capsule bodies, the welding station, the apparatus being characterized in that it further comprises etching means configured to etch the sheet forming pre-cutting lines along the edges of said sealing rings, so that a central portion of the sealing rings is detached from the etched sheet, while the sealing rings remain anchored to the sheet by means of anchor points spaced by the pre-cutting lines, and by further comprising a plurality of detaching elements configured to detach from the sheet the sealing rings that had been etched onto the sheet and bring them into contact with the flange at the coupling station, the etching means operating at an etching station remote and separate from the coupling station.

2. Apparatus according to claim 1, wherein said groups of receiving seats comprise first groups of receiving seats and second groups of receiving seats, and wherein the handling means of said groups of receiving seats comprise first handling means operating said first groups of receiving seats, and second handling means operating said second groups of receiving seats, said first and second handling means (9A,9B) being independent from each other, in order to allow an independent movement of respectively said first groups and second groups of receiving seats.

3. Apparatus according to claim 2, further comprising a control unit configured to control said first and second handling means so as to allow a movement of the receiving seats in accordance with the following cyclically repeating sequence: a first phase of motion, wherein said first handling means are active while said second handling means are inactive, so as to move said first groups of seats closer to the second groups of seats; followed by a second phase of motion, wherein said first handling means are active and said second handling means are simultaneously active, so as to move said first groups and second groups of seats simultaneously; followed by a third motion phase, wherein said second handling means are active while said first handling means are inactive, so as to move said second groups of seats away from said first groups of seats.

4. Apparatus according to claim 2, wherein said first handling means comprise a first loop conveyor, configured to define a first handling closed-loop path for the first groups of receiving seats and wherein said second handling means comprise a second loop conveyor, configured to define a second handling closed loop path for the second groups of receiving seats said first and second loops being preferably parallel.

5. Apparatus according to claim 4, wherein said first conveyor comprises first belts developing along a loop and driven by the first drive, said first groups of receiving seats being connected to the first belts to move with them, and wherein said second conveyor comprises second belts developing along a loop and driven by a second drive, said second groups of receiving seats being connected to the second belts to move with them, the first and the second belts being arranged side by side.

6. Apparatus according to claim 1, wherein the feeding device comprises a supporting roller for supporting and unwinding the reel, said feeding device being configured to unwind the reel at a constant speed, while the etching means operate with the sheet at a standstill.

7. Apparatus according to claim 1, wherein the etching means comprise a shear which comprises a plurality of cutting elements operable on said sheet for etching it and defining a plurality of said sealing rings.

8. Apparatus according to claim 1, wherein the apparatus comprises a suction device configured to act on the sheet to detach the central portions from the sealing rings etched on the sheet.

9. A method for making capsules, comprising the following steps: providing a plurality of capsule bodies having a bottom and side walls defining, in combination, a filling cavity provided with an opening opposite the bottom and a flange arranged to surround said opening; arranging said capsule bodies inside groups of receiving seats; moving said groups of receiving seats along an advancement path, preferably in a closed loop; providing a reel and unwinding said reel to make available a sheet; obtaining sealing rings from said sheet; coupling in a coupling station each

sealing ring to the respective capsule body at the respective flange; welding each sealing ring to the body to which it is coupled, wherein the step of obtaining capsule sealing rings from said sheet includes the sub-step of etching the sheet by creating pre-cutting lines along edges of said sealing rings, so that a central portion of the sealing rings having a discoidal shape is detached from the etched sheet, while the sealing rings remain anchored to the sheet by means of anchor points spaced by the pre-cutting lines, and wherein the step of coupling in a coupling station each sealing ring to the respective capsule body is preceded by a step of detaching from the sheet the sealing rings which had been etched on the sheet, the sub-step of etching the sheet being carried out in an etching station remote and separate from the coupling station.

10. Method according to claim 9, wherein the step of arranging said capsule bodies within groups of receiving seats comprises a step of arranging a first portion of said capsule bodies within first groups of receiving seats and a second portion of said capsule bodies within second groups of receiving seats and wherein the step of moving said groups of receiving seats along the advancement path comprises a step of independently moving said first groups of receiving seats with respect to said second groups of receiving seats.

11. Method according to claim 10, wherein the step of moving said groups of receiving seats along the advancement path is carried out stepwise and comprises the following steps, in the following cyclically sequence: moving said first groups of receiving seats closer to the second groups of receiving seats; then moving at the same time said first groups of receiving seats and said second groups of receiving seats; then moving said second groups of receiving seats away from the first groups of receiving seats.

12. Method according to claim 11, wherein the step of moving said first groups of receiving seats closer to said second groups of receiving seats is performed by keeping said second groups of receiving seats in a fixed position, and the step of moving said second groups of receiving seats away from the first groups of receiving seats is performed by keeping said first groups of receiving seats in a fixed position.

13. A method according to claim 9, wherein the step of etching said sheet to form sealing rings on said sheet comprises a step of blanking said sheet by means of a plurality of cutting elements to define, on said sheet, a plurality of said sealing rings.

14. A method according to claim 9, wherein the step of detaching said sealing rings from said sheet comprises a step of suctioning said sealing rings, so as to detach said sealing rings from the sheet.
