

Claims :

1. A closing station (100) for a capsule filling machine, said station (100) comprising:

5 a bottom closing unit (110) positioned underneath a body holder (B) of the capsule filling machine having a plurality of capsule body sections (114) therein, said bottom closing unit having a bottom pin (112) for each capsule body section (114) axially aligned with a corresponding vertical through-hole (O) of said body holder (B);

10 a top closing unit (120) positioned overhead a cap holder (C) having a capsule cap section (124) therein for each capsule body section (114), said top closing unit having a top pin (122) for each cap section (124) axially aligned with a corresponding vertical through-hole (O) of said cap holder (C); and

a control unit configured to:

15 initiate vertical displacement of said bottom (110) and top (120) closing units towards each other;

urge each said bottom pin (112) into said through-holes (O) of said body holder (B) to contact and slide closed ends of each capsule body sections (114) into said open ends of each capsule cap sections (124);

20 close cap (124) and body sections (114) of each capsule partially against an exerting pre-compressive force of said top pins (122); and

close cap (124) and body sections (114) of each said partially closed capsule telescopically and completely against an exerting biasing force of a biasing means (130) positioned within said top pins (122).

- 5 2. The closing station (100) as claimed in claim 1, wherein said control unit is in communication with a sensing means (140) positioned within said top closing unit (120), said control unit is configured to:

receive a positive feedback signal generated by said sensing means (140) on sensing biasing of said top pins (122) to a predetermined threshold position, indicative of complete telescopic closure of good capsule (170) with both said
10 body section (114) and cap section (124), and

invoke a control signal based on said generated positive feedback signal to segregate and remove only said good capsules (170) from capsule holders.

- 15 3. The closing station (100) as claimed in claim 1, wherein control unit is in communication with a first sensing means (150) and a second sensing means (160) equidistantly spaced apart and positioned adjacent to said top pins (122) within said top closing unit (120), said control unit is configured to:

receive a positive feedback signal generated only by said first sensing
20 means (150) on sensing biasing of said top pins (122) to only a first predetermined threshold position, indicative of complete telescopic closure of good capsule (170) having both said body section (114) and cap section (124);

receive a positive feedback signal generated by said first sensing means (150) and said second sensing means (160) on sensing biasing of said top pins (122) to first and a second predetermined threshold position, indicative of incomplete telescopic closure of capsule (190) having a dent either in said body section (114) or cap section (124); and

receive negative feedback signal generated by said first sensing means (150) and/or said second sensing means (160) indicative of non-biasing of said top pins (122) to said first and/or second predetermined threshold position, and non-telescoped capsule (180) with either only said body section (114) or cap section (124).

4. The closing station (100) as claimed in claim 4, wherein said control unit is configured to:

invoke a control signal based on said received positive feedback signal generated by said first sensing means (150) to segregate and remove only said good capsules (170) from capsule holders;

invoke a control signal based on said received positive feedback signal generated by said first and second sensing means (150, 160) to reject dent capsule (190); and

invoke a control signal based on said received negative feedback signal generated by said first and/or second sensing means (150, 160) to reject non-telescoped capsule (180).

5. The closing station (100) as claimed in claims 1-4, wherein said control unit is configured to displace said bottom (110) and top (120) closing units with a predetermined pressure in synchronized time intervals.
- 5 6. The closing station (100) as claimed in claims 1-5, wherein said biasing means (130) includes a spring.
7. The closing station (100) as claimed in claims 1-6, wherein said body (B) and cap (C) holders include at least one row of predetermined diameters configured to
10 accommodate plurality of said body (114) and cap sections (124).
8. The closing station (100) as claimed in claims 1-7, wherein each said top pin (122) includes at least one stepped surface to aid biasing of said top pins (122).
- 15 9. The closing station (100) as claimed in claims 1-8, wherein said predetermined threshold position, first and/or second predetermined threshold positions, are determined by said control unit.
10. A capsule filling machine comprising:
20 a closing station (100) including:
 a bottom closing unit (110) positioned underneath a body holder (B) of the capsule filling machine having a plurality of capsule body sections (114)

therein, said bottom closing unit having a bottom pin (112) for each capsule body section (114) axially aligned with a corresponding vertical through-hole (O) of said body holder (B);

5 a top closing unit (120) positioned overhead a cap holder (C) having a capsule cap section (124) therein for each capsule body section (114), said top closing unit having a top pin (122) for each cap section (124) axially aligned with a corresponding vertical through-hole (O) of said cap holder (C);

10 at least one sensing means (140) configured to sense biasing of each said top pins (122) to a predetermined threshold position, indicative of complete telescopic closure of good capsule (170) with both said body section (114) and cap section (124); and

15 a control unit in communication with said at least one sensing means (140) is configured to receive a positive feedback signal and invokes a control signal based on said generated positive feedback signal to segregate and remove only said good capsules (170) from capsule holders.

11. The capsule filling machine as claimed in claim 10, wherein control unit is configured to:

20 initiate vertical displacement of said bottom (110) and top (120) closing units towards each other;

urge each said bottom pin (112) into said through-holes (O) of said body holder (B) to contact and slide closed ends of each capsule body sections (114) into said open ends of each capsule cap sections (124);

5 close cap (124) and body sections (114) of each capsule partially against an exerting pre-compressive force of said top pins (122); and

 close cap (124) and body sections (114) of each said partially closed capsule telescopically and completely against an exerting biasing force of a biasing means (130) positioned within said top pins (122).

10 12. The capsule filling machine as claimed in claims 10-11, wherein said at least one sensing means (140) is positioned within said top closing unit (120).

 13. The capsule filling machine as claimed in claims 10-12, wherein said control unit is in communication with a first sensing means (150) and a second sensing means (160) equidistantly spaced apart and positioned adjacent to said top pins (122) within said top closing unit (120), said control unit is configured to:

15 receive a positive feedback signal generated only by said first sensing means (150) on sensing biasing of said top pins (122) to only a first predetermined threshold position, indicative of complete telescopic closure of good capsule (170) having both said body section (114) and cap section (124);

20 receive a positive feedback signal generated by said first sensing means (150) and said second sensing means (160) on sensing biasing of said top pins

(122) to first and a second predetermined threshold position, indicative of incomplete telescopic closure of capsule (190) having a dent either in said body section (114) or cap section (124); and

5 receive negative feedback signal generated by said first sensing means (150) and/or said second sensing means (160) indicative of non-biasing of said top pins (122) to said first and/or second predetermined threshold position, and non-telescoped capsule (180) with either only said body section (114) or cap section (124).

10 14. The capsule filling machine as claimed in claims 10-13, wherein said control unit is configured to:

invoke a control signal based on said received positive feedback signal generated by said first sensing means (150) to segregate and remove only said good capsules (170) from capsule holders;

15 invoke a control signal based on said received positive feedback signal generated by said first and second sensing means (150, 160) to reject dent capsule (190); and

20 invoke a control signal based on said received negative feedback signal generated by said first and/or second sensing means (150, 160) to reject non-telescoped capsule (180).

15. A method of operating a closing station (100) of a capsule filling machine, the method comprising the steps of:

5 initiating, by a control unit, a vertical displacement of a bottom closing unit (110) and a top closing unit (120) towards each other for urging bottom pins (112) to contact and slide closed ends of each capsule body sections (114) into open ends of each capsule cap sections (124);

closing, by a control unit, cap (124) and body sections (114) of each capsule partially against an exerting pre-compressive force of said top pins (122);

10 closing, by a control unit, cap (124) and body sections (114) of each said partially closed capsule telescopically and completely against an exerting biasing force of a biasing means (130) positioned within said top pins (122);

processing, by a control unit, plurality of received feedback signals generated by said first sensing means (150) and second sensing means (160); and

15 invoking, by a control unit, a control signal based on said received positive feedback signal to segregate and remove only good capsules (170) having both said body sections (114) and cap sections (124) from capsule holders.