CLAIMS

1. An in-mould labelling process for the manufacture of a labelled article comprising the steps of:

- feeding a labelstock web into a mould;
- forming an article in the mould such that the formed article contacts and effectively adheres to a label of the labelstock web;
- detaching the adhered label from the labelstock web; and
- removing the formed and labelled article from the mould.

2. A process according to claim 1 wherein the process further comprises a step of recovering the remainder of the labelstock web from the mould.

3. A process according to claim 2 wherein the remainder of the labelstock web is provided in the form of a continuous residual web comprising at least one aperture corresponding to the site from which the label is detached during the process.

4. A process according to any one of the preceding claims wherein detaching the adhered label from the labelstock web is effected without the aid of a cutting tool.

5. A process according to any one of the preceding claims wherein the labelstock web is provided with at least one area of weakness for facilitating detachment of the label therefrom.

6. A process according to any one of the preceding claims wherein the labelstock web comprises a label attached to the labelstock web via one or more micro-tags.

7. A process according to any one of the preceding claims wherein the label comprises a film.

8. A process according to claim 7 wherein the film comprises a polyolefin film selected from polyethylene, polypropylene, mixtures thereof and/or other known polyolefins.

9. A process according to claim 7 wherein the film comprises a biopolymeric film, a polyester film, a polyamide film or an acetate film.

10. A process according to any one of the preceding claims wherein the label comprises an adhesive layer at least partially covering a surface of the label contacting the article.

11. A process according to claim 10 wherein said adhesive layer is heat activatable.

12. A process according to claim 11 wherein the heat activatable adhesive layer comprises a polyolefin such as polypropylene, polyethylene or polybutylene; a polystyrene; a polyamide; a polyvinyl acetate; a polycarbonate; a polyacrylate; a polyester; a polyurethane; a fluoropolymer, an ethylene-vinyl acetate co-polymer; a starch such as PLA; or co-polymers, terpolymers or combinations thereof.

13. A process according to any one of claims 10 to 12 wherein the adhesive layer comprises an ethylene-vinyl acetate co-polymer.

14. A process according to any one of the preceding claims wherein the label is pre-printed.

15. A process according to claim 14 wherein the print on the label accounts for any expansion of the label during the process.

16. A process according to claim 14 or claim 15 wherein the label comprises at least one face and wherein the face opposite of the print on the label is laminated with a

thermolacquer which is optionally a reversible thermolacquer and is adapted to weld at temperatures above 50°C, optionally above 60°C and optionally above 65°C.

17. A process according to any one of the preceding claims wherein the article is formed by stretch blow moulding.

18. A process according to any one of the preceding claims wherein the article is formed by stretch blow moulding a preform.

19. A process according to claim 17 or claim 18 wherein the heat and pressure of the blown article against the label causes the label to effectively adhere to the article.

20. A process according to any one of claims 17 to 19 wherein the temperature of the blown article is such that it activates the adhesive layer without decomposing the label substrate.

21. A process according to any one of the preceding claims wherein the label is effectively adhered to the article whilst still being attached to the labelstock web.

22. A process according to any one of the preceding claims wherein the step of detaching the adhered label from the labelstock web is effected by removing the formed and labelled article from the mould or by the action of the moulding step.

23. A process according to any one of the preceding claims wherein the article is made of a polymeric material.

24. A process according to claim 23 wherein the polymeric material is selected from polyolefins such as polypropylene or polyethylene; polyvinyl halides such as polyvinyl chloride; polyesters such as PET, PEN, PEF, Tritan^{RTM} or PLA; polystyrenes; polyamides; polyvinyl acetates; or polycarbonates.

25. A process according to any one of the preceding claims wherein the article is made of PET.

26. A process according to any one of the preceding claims wherein once the adhered label is detached from the labelstock web and the formed and labelled article is removed from the mould, a second label is fed into the mould and a second article is labelled according to the process of claim 1.

27. A process according to any one of the preceding claims wherein the process may be run continuously.

28. A process for manufacturing an in-mould labelled article, the process comprising the steps of:

- placing a filmic label whilst still attached to a labelstock web into a mould for injection moulding, thermoforming, or blow moulding;
- holding the labelstock web in position;
- injecting a polymeric melt into, or thermoforming or blowing a polymeric preform in said mould so as to bind with the label; and
- removing the article from the mould,

wherein the label is detached from the labelstock web during or after binding of the injected melt or the thermoformed or blown polymeric preform with the label.

29. A process according to any one of the preceding claims wherein the mould defines a cavity and wherein the labelstock web is fed through a path provided in the mould along a movement direction into and out of the cavity.

30. A process according to claim 29 wherein the path is formed by a slit or tunnel provided in the mould.

31. A process according to claim 29 or claim 30 wherein the path corresponds to a plane intersecting the mould such that opposite lateral edges of the path extend within the mould, wherein the plane is preferably flat or curved in one or in two

directions.

32. A process according to claim 31 wherein the form and/or size of the label corresponds to the area defined by the intersection between the path and the cavity of the mould.

33. A process according to any one of the preceding claims wherein the mould defines a cavity and wherein prior to the forming of the article the label is positioned in the mould such that only the label but not the remaining web extends within the cavity.

34. A process according to any one of the preceding claims wherein the mould comprises a mould wall and wherein the label of the labelstock web is positioned at a distance from the mould wall.

35. A process according to any of the preceding claims wherein the mould comprises a mould wall and wherein the label deforms while pressed against the mould wall, producing one of embossings, debossings, concave and convex label structures.

36. A process according to any one of the preceding claims wherein a gap of between 0.01 mm and 1.5 mm, optionally between 0.1 mm and 1 mm and optionally between 0.3 mm and 0.8 mm, is provided between the label and the labelstock web, wherein the gap is optionally bridged by a plurality of spaced apart connecting elements, optionally in the form of micro-tags.

37. A process according to any one of the preceding claims wherein the labelstock web is unwound on a first side of the mould and rewound on a second side of the mould.

38. A process according to any one of the preceding claims wherein the labelstock web is equipped with position marks.

39. A process according to any one of the preceding claims wherein the mould defines a cavity and wherein the labelstock web is fed through a plurality of cavities arranged one after the other.

40. A process according to any one of the preceding claims wherein multiple labelstock webs are fed into the mould so that two or more labels are attached to the article simultaneously.

41. An article labelled by a process according to any one of the preceding claims.

42. A process for removing a label from an in-mould labelled article according to claim 41, comprising the steps of:

- contacting the in-mould labelled article with a wash fluid;
- heating the wash fluid to an intended or selected wash-off temperature; and
- removing the label from the in-mould labelled article.

43. A process according to claim 42 wherein the process further comprises the step of comminuting the in-mould labelled article.

44. A process according to claim 43 wherein the in-mould labelled article is comminuted prior to entering the wash fluid.

45. A process according to any one of claims 42 to 44 wherein the label and the in-mould labelled article separate after the label is removed.

46. A process according to claim 45 wherein the label and the in-mould labelled article separate by density separation.

47. A process according to any one of claims 42 to 46 wherein the label has a lower density than the in-mould labelled article.

48. A process according to any one of claims 42 to 47 wherein the label has a lower density than the wash fluid.

49. A process according to any one of claims 42 to 48 wherein the label or the in-mould labelled article or both the label and the in-mould labelled article are recovered from the wash fluid.

50. A process according to any one of claims 42 to 49 wherein the wash fluid is an aqueous solution.

51. A process according to any one of claims 42 to 50 wherein the wash fluid is a caustic solution.

52. A process according to any one of claims 42 to 51 wherein the wash fluid comprises sodium hydroxide.

53. A process according to any one of claims 42 to 49 wherein the wash fluid is a solvent.

54. A process according to any one of claims 42 to 53 wherein the wash fluid is heated to at least about 50°C, to at least about 60°C, to at least about 70°C or to at least about 80°C.

55. A process according to any one of claims 42 to 54 wherein the process is run continuously.

56. A mould for manufacturing an in-mould labelled article comprising at least a first mould part and a second mould part, which first and second mould parts, when combined, define a mould cavity with an inner shape corresponding to the outer shape of the article to be formed in the mould, wherein in at least one of the mould parts a slit or tunnel is provided which intersects the mould cavity.

57. A mould according to claim 56 wherein the slit or tunnel has a first outer opening leading to a first inner opening and a second inner opening leading to a second outer opening.

58. A mould according to claim 56 or 57, wherein the first and second inner openings are connected via one or two grooves within and/or extending along a surface of the mould cavity.

59. A mould according to any one of claims 56 to 58, wherein the area between the first and second inner openings substantially corresponds to the size of a label to be applied to an article in an in-mould labelling process.

60. A mould according to any one of claims 56 to 59, wherein the slit or tunnel defines a gap substantially corresponding to the width and thickness of a labelstock web fed through the slit or tunnel.

61. A mould according to any one of claims 56 to 60, wherein the slit or tunnel defines a plane or curved path.

62. A mould according to any one of claims 56 to 61, wherein the mould comprises a recess for forming a protrusion or bulge on the article, on which the label is applied during the in-mould labelling process.

63. A mould according to claim 62, wherein the slit or tunnel intersects the recess in a plane substantially parallel to a bottom face of the recess.

CLAIMS

1. An in-mould labelling process for the manufacture of a labelled article comprising the steps of:

- feeding a labelstock web into a mould;
- forming an article in the mould such that the formed article contacts and effectively adheres to a label of the labelstock web;
- detaching the adhered label from the labelstock web; and
- removing the formed and labelled article from the mould.

2. A process according to claim 1 wherein the process further comprises a step of recovering the remainder of the labelstock web from the mould, optionally wherein the remainder of the labelstock web is provided in the form of a continuous residual web comprising at least one aperture corresponding to the site from which the label is detached during the process; and/or

wherein detaching the adhered label from the labelstock web is effected without the aid of a cutting tool; and/or

wherein the labelstock web is provided with at least one area of weakness for facilitating detachment of the label therefrom; and/or

wherein the labelstock web comprises a label attached to the labelstock web via one or more micro-tags.

3. A process according to any one of the preceding claims wherein the label comprises a film;

optionally wherein the film comprises a polyolefin film selected from polyethylene, polypropylene, mixtures thereof and/or other known polyolefins; or

optionally wherein the film comprises a biopolymeric film, a polyester film, a polyamide film or an acetate film.

4. A process according to any one of the preceding claims wherein the label comprises an adhesive layer at least partially covering a surface of the label contacting the article, optionally wherein said adhesive layer is heat activatable, and wherein the heat activatable adhesive layer may comprise a polyolefin such as polypropylene, polyethylene or polybutylene; a polystyrene; a polyamide; a polyvinyl acetate; a polycarbonate; a polyacrylate; a polyester; a polyurethane; a fluoropolymer, an ethylene-vinyl acetate co-polymer; a starch such as PLA; or co-polymers, terpolymers or combinations thereof; and/or

optionally wherein the adhesive layer comprises an ethylene-vinyl acetate co-polymer.

5. A process according to any one of the preceding claims wherein the label is pre-printed, optionally wherein the print on the label accounts for any expansion of the label during the process; and/or

optionally wherein the label comprises at least one face and wherein the face opposite of the print on the label is laminated with a thermolacquer which is optionally a reversible thermolacquer and is adapted to weld at temperatures above 50°C, optionally above 60°C and optionally above 65°C.

6. A process according to any one of the preceding claims wherein the article is formed by stretch blow moulding and/or by stretch blow moulding a preform;

optionally wherein the heat and pressure of the blown article against the label causes the label to effectively adhere to the article; and/or

optionally wherein the temperature of the blown article is such that it activates the adhesive layer without decomposing the label substrate.

7. A process according to any one of the preceding claims wherein the label is effectively adhered to the article whilst still being attached to the labelstock web; and/or

wherein the step of detaching the adhered label from the labelstock web is effected by removing the formed and labelled article from the mould or by the action of the moulding step; and/or

wherein the article is made of a polymeric material, optionally wherein the polymeric material is selected from polyolefins such as polypropylene or polyethylene; polyvinyl halides such as polyvinyl chloride; polyesters such as PET, PEN, PEF, Tritan^{RTM} or PLA; polystyrenes; polyamides; polyvinyl acetates; or polycarbonates; and/or

wherein the article is made of PET; and/or

wherein once the adhered label is detached from the labelstock web and the formed and labelled article is removed from the mould, a second label is fed into the mould and a second article is labelled according to the process of claim 1; and/or

wherein the process may be run continuously.

8. A process for manufacturing an in-mould labelled article, the process comprising the steps of:

- placing a filmic label whilst still attached to a labelstock web into a mould for injection moulding, thermoforming, or blow moulding;
- holding the labelstock web in position;
- injecting a polymeric melt into, or thermoforming or blowing a polymeric preform in said mould so as to bind with the label; and
- removing the article from the mould,

wherein the label is detached from the labelstock web during or after binding of the injected melt or the thermoformed or blown polymeric preform with the label.

9. A process according to any one of the preceding claims wherein the mould defines a cavity and wherein the labelstock web is fed through a path provided in the mould along a movement direction into and out of the cavity, optionally wherein the path is formed by a slit or tunnel provided in the mould; and/or
optionally wherein the path corresponds to a plane intersecting the mould such that opposite lateral edges of the path extend within the mould, wherein the plane is preferably flat or curved in one or in two directions and wherein the form and/or size of the label may correspond to the area defined by the intersection between the path and the cavity of the mould.

10. A process according to any one of the preceding claims wherein the mould defines a cavity and wherein prior to the forming of the article the label is positioned

in the mould such that only the label but not the remaining web extends within the cavity; and/or

wherein the mould comprises a mould wall and wherein the label of the labelstock web is positioned at a distance from the mould wall; and/or

wherein the mould comprises a mould wall and wherein the label deforms while pressed against the mould wall, producing one of embossings, debossings, concave and convex label structures; and/or

wherein a gap of between 0.01 mm and 1.5 mm, optionally between 0.1 mm and 1 mm and optionally between 0.3 mm and 0.8 mm, is provided between the label and the labelstock web, wherein the gap is optionally bridged by a plurality of spaced apart connecting elements, optionally in the form of micro-tags; and/or

wherein the labelstock web is unwound on a first side of the mould and rewound on a second side of the mould; and/or

wherein the labelstock web is equipped with position marks; and/or

wherein the mould defines a cavity and wherein the labelstock web is fed through a plurality of cavities arranged one after the other; and/or

wherein multiple labelstock webs are fed into the mould so that two or more labels are attached to the article simultaneously.

11. An article labelled by a process according to any one of the preceding claims.

12. A process for removing a label from an in-mould labelled article according to claim 11, comprising the steps of:

- contacting the in-mould labelled article with a wash fluid;

- heating the wash fluid to an intended or selected wash-off temperature; and

- removing the label from the in-mould labelled article;

optionally wherein the process further comprises the step of comminuting the in-mould labelled article, which may be comminuted prior to entering the wash fluid.

13. A process according to claim 12 wherein the label and the in-mould labelled article separate after the label is removed, optionally wherein the label and the in-mould labelled article separate by density separation; and/or

wherein the label has a lower density than the in-mould labelled article; and/or

wherein the label has a lower density than the wash fluid; and/or

wherein the label or the in-mould labelled article or both the label and the in-mould labelled article are recovered from the wash fluid; and/or

wherein the wash fluid is an aqueous solution; and/or

wherein the wash fluid is a caustic solution; and/or

wherein the wash fluid comprises sodium hydroxide; and/or

wherein the wash fluid is heated to at least about 50°C, to at least about 60°C, to at least about 70°C or to at least about 80°C; and/or

wherein the process is run continuously.

14. A process according to claim 12 wherein the wash fluid is a solvent; and/or

wherein the wash fluid is heated to at least about 50°C, to at least about 60°C, to at least about 70°C or to at least about 80°C; and/or

wherein the process is run continuously.

15. A mould for manufacturing an in-mould labelled article comprising at least a first mould part and a second mould part, which first and second mould parts, when combined, define a mould cavity with an inner shape corresponding to the outer shape of the article to be formed in the mould, wherein in at least one of the mould parts a slit or tunnel is provided which intersects the mould cavity.

16. A mould according to claim 15 wherein the slit or tunnel has a first outer opening leading to a first inner opening and a second inner opening leading to a second outer opening; and/or

wherein the first and second inner openings are connected via one or two grooves within and/or extending along a surface of the mould cavity; and/or

wherein the area between the first and second inner openings substantially corresponds to the size of a label to be applied to an article in an in-mould labelling process; and/or

wherein the slit or tunnel defines a gap substantially corresponding to the width and thickness of a labelstock web fed through the slit or tunnel; and/or

wherein the slit or tunnel defines a plane or curved path; and/or

wherein the mould comprises a recess for forming a protrusion or bulge on the article, on which the label is applied during the in-mould labelling process, optionally wherein the slit or tunnel intersects the recess in a plane substantially parallel to a bottom face of the recess.