corrected for the high demands on the micro-injection moulded article, can thus only take place in the opened state of the mould. An alignment error of the mould or the insert/inserts can again occur during or after the closing of the mould. In particular, series production of injection moulded articles with the same mould or the same insert/inserts for the injection moulding cannot therefore be carried out sufficiently precisely.

Embodiments of the present invention disclose a device and a method, which at least partially, in particular completely, overcome the drawbacks of the prior art. Embodiments of the present invention disclose an improved device for injection moulding and an improved method for injection moulding.

In particular, embodiments of the present invention disclose a device and a method with which the production precision of the produced components or injection moulded articles is increased.

All combinations of at least two features specified in the description, in the claims and/or the drawings also fall within the scope of the invention. In the stated value ranges, values lying within the stated limits should also be deemed to be disclosed as limiting values and can be claimed in any combination.

According to a first aspect of the present invention, there is provided a device for injection moulding to produce an injection moulded article, the device including: a mould with a first mould half and a second mould half, wherein the first mould half and the second mould half define an injection moulding space in a closed state of the mould, at least one insert arranged in the injection moulding space, at least one further insert arranged in the injection moulding space, wherein the at least one insert at least partially comprises a polymer, wherein the injection moulded article can be removed from the at least one insert and measured, wherein an alignment error can be determined by comparison with set values, wherein the at least one of the insert and/or the further insert has a plurality of alignment marks, wherein the at least one of the insert and/or the further insert is/are produced by means of imprint lithography, wherein the at least one insert and/or the at least one further insert can be aligned in the closed state of the mould, and wherein the alignment error can be iteratively improved by repeatedly carrying out the alignment.

The mould comprises at least one insert, which comprises at least partially a polymer. The device can also comprise two inserts or more, which at least partially comprise a polymer.

The at least one insert can preferably be aligned, in particular with a further insert, in the closed state of the mould.

According to a second aspect of the present invention, there is provided a method for injection moulding, wherein an injection moulding space is defined by a mould with a first mould half and a second mould half in a closed state of the mould, wherein at least one insert arranged in the injection moulding space, at least one further insert arranged in the injection moulding space, and wherein the at least one insert at least partially comprises a polymer, the method including: producing an injection moulded article, removing the injection moulded article from the at least one insert, measuring the injection moulded article, determining an alignment error by comparison with set values, wherein the at least one insert, wherein the at least one of the insert and/or the further insert has a plurality of alignment marks, wherein the at least one of the insert and/or the further insert is/are produced by means of imprint lithography, aligning the at least one insert and at least one further insert arranged in the injection moulding space, in particular a moulding surface of the at least one insert and/or a moulding surface of the at least one further insert, with one another in the closed state of the mould in the injection moulding space, and repeatedly carrying out the aligning to iteratively improve the alignment error.

Two or more inserts can also be arranged in the injection moulding space, which are at least partially comprise a polymer.

The at least one insert is preferably aligned in the closed state of the mould, in particular with a further insert.

Claims

1. A device for injection moulding to produce an injection moulded article, the device comprising:

a mould (1) with a first mould half (2) and a second mould half (3), wherein the first mould half (2) and the second mould half (3) define an injection moulding space (10) in a closed state of the mould (1),

at least one insert (5) arranged in the injection moulding space (10),

at least one further insert (5’) arranged in the injection moulding space (10),

wherein the at least one insert (5) at least partially comprises a polymer,

wherein the injection moulded article can be removed from the at least one insert (5) and measured,

wherein an alignment error can be determined by comparison with set values,

wherein the at least one of the insert (5) and/or the further insert (5') has a plurality of alignment marks (5m, 5m'),

wherein the at least one of the insert (5) and/or the further insert (5')′ is/are produced by means of imprint lithography,

wherein the at least one insert (5) and/or the at least one further insert (5’) can be aligned in the closed state of the mould (1), and

wherein the alignment error can be iteratively improved by repeatedly carrying out the alignment.

2. The device according to claim 1, wherein the at least one insert (5) and/or the at least one further insert (5’) in each case

comprises/comprise a moulding surface (5s, 5s') with elastic structures.

3. The device according to claim 2, wherein the moulding surface (5s) of the at least one insert (5) and the moulding surface (5s') of the at least one further insert (5') can be aligned with one another in the closed state of the mould (1).

4. The device according to claim 2 or 3, wherein the elastic structures of the moulding surface (5s) of the at least one insert (5) and the structures of the moulding surface (5s') of the at least one further insert (5') can be aligned with one another in the closed state of the mould (1).

5. The device according to at least one of the preceding claims, wherein at least one heating element is/are integrated into the at least one insert (5), into the at least one further insert (5') and/or into the respective structures, so that the injection moulding space (10), in particular an injection moulding compound which can be conveyed through a filling opening (8) into the injection moulding space (10), can be heated in a targeted manner by means of the at least one heating element.

6. The device according to at least one of the preceding claims, wherein the first mould half (2) and/or the second mould half (3) comprises/comprise an inspection window (4), so that the at least one insert (5) and/or the at least one further insert (5') can be aligned and/or can be aligned with one another by means of the plurality of alignment marks (5m, 5m') in the closed state of the mould (1).

7. The device according to at least one of the preceding claims, wherein the first mould half (2) and/or the second mould half (3) in each case comprises/comprise at least one positioning mechanism (6), so that the at least one insert (5) and/or the at least one further insert (5') can be aligned with the aid of the plurality of alignment marks (5m, 5m') in the closed state in the mould (1).

8. The device according to at least one of the preceding claims, wherein, with the aid of the plurality of alignment marks (5m, 5m') on the rear side (5b) of the at least one insert (5) and/or on the rear side (5b') of the at least one further insert (5'), the structures of the moulding surface (5s) of the at least one insert (5) and the structures of the moulding surface (5s') of the at least one further insert (5') can be aligned with one another in the closed state of the mould (1)

9. A method for injection moulding, wherein an injection moulding space (10) is defined by a mould with a first mould half (2) and a second mould half (3) in a closed state of the mould (1),wherein at least one insert (5) arranged in the injection moulding space (10) , at least one further insert (5') arranged in the injection moulding space (10), and wherein the at least one insert (5) at least partially comprises a polymer, the method comprising:

producing an injection moulded article,

removing the injection moulded article from the at least one insert (5),

measuring the injection moulded article,

determining an alignment error by comparison with set values, wherein the at least one insert (5), wherein the at least one of the insert (5) and/or the further insert (5') has a plurality of alignment marks (5m, 5m'), wherein the at least one of the insert (5)

and/or the further insert (5')′ is/are produced by means of imprint lithography,

aligning the at least one insert (5) and at least one further insert (5’) arranged in the injection moulding space (10), in particular a moulding surface (5s) of the at least one insert (5) and/or a moulding surface (5s’) of the at least one further insert (5’), with one another in the closed state of the mould (1) in the injection moulding space (10), and

repeatedly carrying out the aligning to iteratively improve the alignment error.

10. The method according to claim 9, wherein the aligning of the at least one insert (5) and/or at least one further insert (5’) includes aligning with the aid of a plurality of alignment marks (5m, 5m’) provided on the at least one insert (5) and/or the at least one further insert (5’).

11. The method according to claim 9 or 10, wherein the aligning of the at least one insert (5) and/or of the at least one further insert (5’) is carried out on the basis of a measurement of an injection moulded article.

12. The method according to claim 9, 10 or 11, wherein an alignment is carried out by a reworking of the at least one insert (5) and/or of the at least one further insert (5’).