EUROPEAN PATENT SPECIFICATION

(54) Equipment for the injection molding of containers or preforms for containers of plastics material

Vorrichtung zum Spritzgießen von Behältern oder Vorformlingen für Behälter aus Kunststoff
Dispositif pour mouler par injection des récipients ou des préformes pour récipients en matière plastique

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US-A- 4 047 873

- PATENT ABSTRACTS OF JAPAN vol. 11 no. 6 (M-551) [2453], 8 January 1987 & JP-A-61 185417 (MITSUBISHI PLASTICS IND LTD)
- PATENT ABSTRACTS OF JAPAN vol. 4 no. 76 (M-14) [558], 3 June 1980 & JP-A-55 037335 (NITSUSEI JIYUSHI KOGYO)

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The present invention relates in general to equipment for the injection-moulding of plastics containers or parisons for containers produced by blow-moulding. More specifically, the present invention relates to equipment for moulding parisons for the manufacture of containers with the use of two different types of plastics material.

As is known, nowadays, most plastics bottles for foodstuffs used, for example, for the distribution and sale of liquids such as mineral waters and other drinks, are made of a plastics material known as polyethylene terephthalate, commonly known in short as PET. These PET bottles have become very widespread during recent years and the annual consumption can now be measured in thousands of millions of units.

These bottles are manufactured by a process which is commonly known as blow-moulding. More specifically, in order to produce a PET bottle, it is necessary first to manufacture a parison of this material. The parison has essentially the shape of a test-tube of smaller dimensions than the finished bottle and having relatively thick walls. This parison is produced by a conventional injection-moulding operation widely known in the art.

The parison is heated and then expanded by the blowing operation which is also widely known in the art, to achieve the desired shape and size. Clearly, in the course of the blowing operation, the thickness of the walls decreases considerably as a result of expansion.

Typically, however, the region near the opening of the parison is left unchanged. In fact, this portion is intended to form the neck of the bottle and therefore has to have sufficient thickness to give it the necessary rigidity.

For this reason, this portion is moulded in its final shape during the moulding of the parison and is kept unchanged during the blow-moulding operation. Typically, this portion is threaded to allow the PET bottle to be closed by a screw cap.

Given the typical production volumes of these PET bottles, the equipment for the injection moulding of the parisons uses dies with multiple cavities in order to achieve high productivity and thus to be economically competitive. Normally, this moulding equipment uses dies with 48 or 96 cavities.

The foregoing is widely known and does not therefore need to be detailed further. The present invention relates specifically to the injection-moulding of the parisons. The aspects which are characteristic of the invention will therefore be considered in detail below, whereas the aspects which remain unchanged in comparison with the prior art will be described briefly since they are generally within the competence of an expert in the art.

A serious problem connected with PET bottles is the need to use very pure plastics material, that is, PET. In fact, if this were not done any impurities present in the plastics material could contaminate the liquid foodstuffs in the PET bottles, altering their characteristics, particularly their organoleptic characteristics. It is therefore necessary to use new plastics material, commonly known as virgin material, to manufacture the parisons. This is clearly disadvantageous, since virgin PET is much more expensive than recycled PET. These PET bottles in fact represent a serious ecological problem since they are not normally re-used but, at the same time, they make available large quantities of recycled PET.

Moreover, it can be foreseen that, in the near future, the new regulations for the protection of the environment will make it obligatory to use at least a percentage of recycled plastics material in the manufacture of these PET bottles. The coming into force of a regulation of this type is already envisaged in California.

It is clear from the foregoing that there is an ever greater need to produce PET bottles with the use of at least some recycled material. As stated, up to now, this has not been possible, in order not to contaminate drinks and foodstuffs contained in PET bottles. However, only the internal surface of the bottle can cause contamination of its contents and is therefore required to be made of virgin PET. The remaining portion, on the other hand, can be made of recycled PET without this giving rise to problems of any kind.

Systems for manufacturing these PET bottles with the use of some virgin PET and some recycled PET have therefore recently been proposed. One of these systems will now be described with reference to Figures 1 to 4.

As stated above, the equipment for injection-moulding the parisons uses dies having large numbers of cavities so as to permit economically advantageous production volumes. For this reason, this equipment is of considerable size and cost and, typically, has two plasticator units, for example, of the screw plunger type.

Figure 1 shows, schematically and not to scale, moulding equipment of this type formed for producing parisons partially of recycled PET. The equipment comprises two screw plasticator units VA and VB. The plasticator unit VA is supplied with virgin PET and the plasticator unit VB is supplied with recycled PET. For this reason, a filter FT is provided in the outlet duct of the plasticator unit VB to intercept any particles and impurities present in the recycled PET. Two metering pistons MPA and MPB are also provided in the ducts coming out of the two plasticator units VA and VB, respectively, for precisely controlling the quantity of material injected by each of the two plasticator units VA and VB.

The outlet ducts of the units VA and VB supply, through supply ducts D, the injectors which are intended to inject the plastics material into the cavities of a die S in order to manufacture the parisons F. For simplicity, a single injector and a single cavity in the die
The object of the present invention is to provide injection moulding equipment which solves all the problems indicated above in a satisfactory manner.

The parison F such as that shown in Figure 5 is constituted by a first, inner portion of virgin plastics material A and a second, outer portion of recycled plastics material B. Naturally, the two portions are joined inseparably so that the parison F is a single piece.

The parison F is then removed from the die S in conventional manner and used as a conventional parison F.

This solution, however, has disadvantages due essentially to the fact that, during injection, the plastics material often does not follow the theoretical behaviour just described. In fact, during the injection operation, it is very easy for the recycled material B to come into contact with the surfaces of the cavity of the die S, thus rendering the result of the moulding operation unacceptable.

More in detail the present invention refers to an equipment for the injection-moulding of articles of plastics materials having the features disclosed in the preamble of claim 1. Such an equipment is disclosed in prior art document FR-A-2 538 297.

The object of the present invention is to provide injection moulding equipment which solves all the problems indicated above in a satisfactory manner.

According to the present invention, this object is achieved by virtue of injection-moulding equipment having the characteristics indicated in the claims which follow the present description.

Further advantages and characteristics of the present invention will become clear from the following detailed description, given with the aid of the appended drawings provided by way of non-limiting example, in which:

Figure 1 shows schematically moulding equipment according to the prior art and has already been described,

Figures 2 to 4 are schematic views, in section, showing the operation of the equipment of Figure 1 and have already been described,

Figure 5 is a schematic view, in section, of a parison produced by a equipment according to the present invention,

Figure 6 is a schematic view of moulding equipment according to the present invention,

Figure 7 is a schematic view, in section, of a portion of the equipment of Figure 6,

Figures 8 and 9 are two different schematic sectional views of the portion of the equipment shown in Figure 7,

Figure 10 is a schematic view of a component of the equipment of Figure 6,

Figure 11 is a schematic view of a further component of the equipment of Figure 6,

Figure 12 is an overall view of the component shown in Figure 11, and

Figures 13-17 are schematic views of portions of the equipment of Figure 6, showing its operation.

The equipment according to the present invention consists essentially of equipment for the manufacture of a container or parison comprising two portions of different plastics materials, for example, in the specific embodiment, a first portion of virgin plastics material and a second portion of recycled plastics material. A parison F produced by the equipment according to the invention, shown in Figure 5, is constituted by a first, inner portion of virgin plastics material A and a second, outer portion of recycled plastics material B. Naturally, the two portions are joined inseparably so that the parison F is a single piece.

A parison F such as that shown in Figure 5 performs extremely well the task of permitting the use of a percentage of recycled plastics material and simultaneously ensuring an absolutely pure inner surface is in contact with the foodstuffs .

The equipment according to the present invention has in fact been developed and designed specifically for the manufacture of the aforementioned PET bottles. However, the invention can clearly be used advantageously whenever it is necessary to produce a
container or a parison comprising essentially two portions, an inner portion and an outer portion, of different plastics materials.

The two portions, that is, the inner portion A and the outer portion B, of the parison F of Figure 5 are produced by means of the equipment according to the invention, by two separate injection-moulding steps. More specifically, in a first step, the inner portion A is moulded in virgin plastics material and the second, outer portion B of recycled plastics material is then moulded over the first, inner portion A in a second step. There is thus no risk that recycled material will reach the inner surface of the parison F, since the first moulding step enables with absolute certainty that the inner layer of the parison F is of virgin plastics material A. This safety, imparted by the production process, also enables the manufacture of parisons F having a considerable percentage of recycled plastics material B.

Preliminary tests carried out by the Applicant have ascertained that parisons F having a percentage of the order of 50% of recycled plastics material B can easily be manufactured. However, it is probably possible to produce parisons F having even greater percentages of recycled material B.

For convenience, the portion of virgin material A, that is, in practice, the parison after the first moulding step, will be indicated F1. The portion of recycled material B, and sometimes, by extension, the completed parison F, that is, after the second, over-moulding step, on the other hand, will be indicated F2. Similarly, both the virgin material and the first portion of the parison will be indicated A; a corresponding arrangement will apply to B.

It is widely known in the art to produce components having two different types of plastics material by over-moulding. If it is desired to produce a container or parison F of the type shown in Figure 5, this is possible with the use of conventional moulding techniques. Dies having three distinct elements are normally used for injection-moulding concave objects having a shape of the aforementioned type. One of the elements, commonly known as the male element, is substantially cylindrical and rounded at the end and defines the inner surface of the parison F. The other two elements, which are fitted together, on the other hand, define the outer surface of the parison F.

These two elements, which are usually known as matrices, are separate from one another so that they can be moved apart, for example, by moving in directions perpendicular to the principal axis of the parison F, to permit the removal thereof. In fact, given the presence, on the neck of the bottle, of projections such as the thread for the cap or a flange (which is typically present on these bottles), it would be impossible to remove the parison F from the cavity which defines its outer surface if the two matrices could not be opened to release the parison F.

The removal of the male element which defines the inner surface of the parison F does not present problems, however, since the inner surface is typically formed without raised portions, undercuts or projections of other types and is smooth and of uniform or tapered (slightly raised portions) cross-section. The plastics material is typically injected from the end opposite the neck of the parison F in an axial position.

This technique for injection-moulding the parisons F is widely known to experts in the art.

In order to produce a parison F of the type shown in Figure 5, the first portion F1 of the parison F can be moulded in the manner just described, that is, with the use of a male element and a pair of matrices which, when they are assembled, define in cooperation with one another, a cavity corresponding to the portion F1. The two matrices are then moved apart, thus releasing the first portion F1. At this point, the first portion F1 is inserted, without the male element being removed therefrom, between a second pair of matrices defining a cavity corresponding to the outer surface of the second portion F2, that is, of the finished parison F.

Once the male element, carrying the first portion F1, and the second pair of matrices have been fitted together, the over-moulding of the second portion F2, for example, of recycled material B, can take place. After this over-moulding step, the parison F is completed and can be removed in wholly conventional manner as if it were a parison F produced by a single injection moulding step.

The injection takes place in conventional manner, from the bottom end opposite the opening or neck of the parison F, in both the moulding step and the over-moulding step.

This system for manufacturing the parison F shown in Figure 5 according to the prior art thus provides for the use of a single male element and two different pairs of matrices for producing the first portion F1 and the second portion F2. The male element therefore has to be translated or moved so as to be brought to one or other pair of matrices. Alternatively, of course, the pairs of matrices could be translated or moved to bring them to the male element.

This system of producing parisons F of the aforementioned type is the simplest and most convenient method according to the prior art and is within the capabilities of experts in the art.

However, although it is relatively easy to translate or move a single male element or a pair of matrices, the equipment currently used for the production of parisons for PET bottles use multiple matrices with 48 or 96 cavities. These are therefore machines of enormous dimensions, weight and complexity. Typically, this equipment has two plates, a first plate carrying the male elements, for example, 96 male elements, and a second plate carrying the pairs of matrices, for example, 96 pairs. Clearly, therefore, this equipment and the plates used thereby are very complex and difficult to produce.
The production of equipment of this type, which has two different plates of matrices and permits movement of male elements relative to a plate is a technical problem which is extremely difficult to solve. Even if it were possible to produce equipment of this type, it would certainly not be competitive because of its complexity and cost.

This problem is also further complicated by the fact that the die plates for both the male elements and the matrices require conditioning. In fact, ducts are provided in the plates for the forced circulation of liquid for heating and cooling the plates according to operational needs during the various stages of the moulding.

Typically, the plates carrying the male elements have only cooling circuits to enable the parisons F to be cooled after the injection step. The plates carrying the matrices, on the other hand, typically have heating systems so as to maintain the temperature of the ducts supplying the plastics material. In fact, since injection takes place from the bases of the parisons F, this means that it takes place from the portions of the plates carrying the matrices which, for this reason are provided with supply ducts for bringing the plastics material into the various cavities of the die.

Given the complexity and the dimensions of the plates, if it were possible to produce equipment having plates movable in the manner described it would therefore be extremely difficult and prohibitively expensive.

The equipment according to the present invention overcomes this problem, however, by the use of only two plates, as in conventional equipment, the plates being modified to permit the manufacture of the parisons F shown in Figure 5.

Figure 6 shows moulding equipment according to the invention, by way of example, schematically and not to scale. Naturally, the moulding equipment 1 has two plasticator units VA and VB for plasticating the virgin material A and the recycled material B, respectively. The structure of the equipment 1, however, is quite similar to the structure of conventional moulding equipment. In fact, it comprises a plate PS carrying the matrices and a plate PM carrying the male elements M, the plates, of course, being provided with all the conditioning provided for in this type of equipment (heating, cooling, etc.).

The two plates PS and PM are not, however, provided with a system for permitting additional or supplementary movement, rotation or translation in comparison with equipment of the prior art. The differences in comparison with the prior art in fact lie essentially in the structure and the configuration of the two plates PS and PM.

More specifically, in the equipment 1 according to the present invention, the plate PS carrying the matrices has matrices of two types, a first type defining a cavity corresponding to the external surface of the first portion F1 and a second type defining a cavity corresponding to the outer surface of the second portion F2.

As can be seen, in this case also, although the increased complexity of the plate PM of the die carrying the male elements M is more substantial, it is nevertheless limited. The specific embodiment described herein provides for these pairs of male elements M carried by rotatable supports SG to have cooling ducts (not...
For a better understanding, Figure 10 shows a pair of rotatable supports SG each carrying a pair of male elements M. Clearly, the rotation of the rotatable supports SG, which can be achieved by actuators of known type, causes the male elements M of each rotatable support SG to change places.

Figure 11 is a front view of a portion of a plate PS carrying the matrices of the first type S1 and of the second type S2, in which it can be seen that they are disposed in an alternating configuration and, more specifically, in sets of two pairs of matrices, of different types, each set being in a position exactly corresponding to each pair of male elements M carried by the rotatable supports SG.

Finally, Figure 12 shows a whole plate PS carrying 50 pairs of matrices of the first type S1 and 50 pairs of matrices of the second type S2, thus forming a total of 50 sets of the type described. The corresponding plate PM carrying the male elements M (not shown) therefore has 50 rotatable supports SG disposed in a corresponding configuration.

A method which enables the parisons F of Figure 5 to be produced is therefore clear, given equipment 1 according to the invention having the plates PS, PM just described.

In fact, the first portions F1 can be moulded in the pairs of matrices of the first type S1 by means of a conventional moulding step. The matrices are then moved away and the rotatable supports SG are rotated through 180°, naturally without separating the first portions F1 from the male elements M, and these are then re-inserted in the matrices which are closed again. At this point, given the configuration just described, the male elements M carrying the first portions F1 which have just been moulded are inserted between the matrices of the second type S2. The second portions F2 can thus be moulded over the first portions F1 during the second moulding step, thus forming the desired parisons F.

Upon completion of the second moulding or over-moulding step, the finished parisons F can be removed and used to produce bottles by blowing.

Tests carried out by the Applicant have shown that the equipment 1 described herein and the corresponding method can achieve considerable efficiency in the production of parisons F which are composed of two different portions and are clearly more complex than parisons manufactured from a single material.

Equipment according to the prior art operates with cycles typically of the order of 20 seconds, that is, every 20 seconds it produces a number of parisons F corresponding to the number of cavities of the die used. The equipment 1 according to the present invention, on the other hand, can operate with two half cycles of about 15 seconds. That is, a moulding step is completed every 15 seconds by virtue of the fact that the cooling times are shorter since only one portion is moulded. The complete production cycle of a parison F thus lasts for about 30 seconds, a number of parisons F equal to half the number of cavities (or male elements M) of the matrix used being produced, in practice, every 15 seconds. This is also due to the fact that the rotation of the rotatable supports SG which enables the male elements M to change places is an operation which requires only about 0.2 seconds.

By contrast, if one were to succeed in producing moulding equipment in which the plates PS or PM were moved (translated or rotated), this operation would require a much longer time, probably of the order of 5 seconds, and would be highly penalizing economically.

For a better understanding, the method of manufacturing the parisons F will now be described with reference to Figures 13 to 17, which illustrate the main steps thereof.

Figure 13 shows a pair of rotatable supports SG each carrying a pair of male elements M. Figure 13 relates to the end of the first moulding step in which the first portion F1 has been moulded on the male elements M which are in the lower positions in the drawing.

Figure 14 shows the next stage in which it can be seen that the rotatable supports SG have been rotated through 180° about their axes of rotation RA. The male elements M carrying the first portions F1 have therefore changed places with the other male elements and are therefore now in the lower positions in the drawing.

Figure 15 shows the end of a second moulding step in which the second portion F2 has been moulded over the first portion F1.

In fact, the first portion F1 is moulded on each male element M when it is in the upper position. The male element M is then rotated to the lower position and the second portion F2 is moulded over it.

The end of this step is shown in Figure 15. Figure 15 also shows schematically the step of the removal of the finished parisons F2 which takes place essentially in conventional manner by means of an extractor device G used in a currently-preferred embodiment of the present invention, which will now be described.

In this specific embodiment, the matrices are actually formed slightly differently from those described up to now. In particular, the matrices comprise a further element G which corresponds to the opening or neck regions of the parisons F and also has the function of an extractor device. This element G is composed of two portions, sometimes called cheeks, which can be separated to allow the parisons F to be removed.

If an extractor element G of the type described is used, the remaining portions of the matrices S1 and S2 (visible, for example, in Figure 16) can be formed in a single, inseparable piece, since the portions F1 or F2 can be removed therefrom simply by being...
As can be seen, in this drawing, the matrix portions S1 and S2 have already been moved away so that the portions F1 and F2 have been pulled out of them. Moreover, in Figure 15, the male elements are shown moving away from the extractor elements G. As can be seen, during this operation, given the configuration of the male elements M and of the extractor elements G, the portion F1 on the male element M in the upper position remains thereon and is then pulled out of the extractor element G corresponding to the matrix portion S1. Given the presence of the flange and the thread described above, the portion F2, however, remains locked in the extractor element G corresponding to the matrix portion S2 whilst the male element M in the lower position is pulled out of it.

Upon completion of this operation, the situation is that shown in Figure 16 in which, as can be seen, the portions F1 which remain on the male elements M in the upper positions have been moved away whilst the portions F2 have been retained by the extractor elements G and have therefore been pulled off the male elements M in the lower positions.

Figure 16 also shows a portion of the plate PS carrying two sets of matrix portions of the first type S1 and of the second type S2. As already stated, the matrix portions of the first type S1 are disposed in the upper positions, and the matrix portions of the second type S2 are in the lower positions.

At this point, therefore, the extractor elements G can be separated to release the finished parisons F. This operation is shown in Figure 17, which in fact shows the step of the expulsion of the finished parisons F from the extractor elements G.

Clearly, moreover, apart from the first moulding step when production starts, the steps of the moulding of the first portion F1 and of the second portion F2 in the matrices of the two types S1 and S2 can take place simultaneously. Typically, therefore, in each moulding step, a first portion F1 is moulded onto half of the male elements M whilst a second portion F2 is moulded onto the second half of the male elements M. The finished parisons F, that is, those having the second portion F2, are then removed and the pairs of male elements M are changed around so that in the next moulding step, the second portion F2 is moulded on the first set of male elements M whilst a first portion F1 is moulded again on the second set of male elements M which has just completed the parisons F.

In operation, the production process thus enables moulding to be carried out in all of the cavities of the matrix for each operation, thus achieving extremely high productivity as is clear from the cycle times given above, with equipment, the cost and complexity of which are little greater than those of conventional equipment.

A currently-preferred embodiment provides for a substantially annular recess CA, indicated for simplicity only in Figure 9, disposed at the base of the male element M. This annular recess CA is to compensate for the shrinkage which occurs after the moulding of the first portion F1. Moreover, it achieves a better seal between the extractor device G and the male element M during the moulding of the second portion F2.

An alternative embodiment of the equipment 1 according to the present invention, using the same principle, can also be produced. For example, equipment 1 having identical sets of matrices or pairs of matrices can be produced. The male elements M carried by the rotatable supports SG, on the other hand, have different shapes; in particular, a first male element M has a shape such as to define the internal surface of the second portion F2, whereas a second male element M has a shape such as to define the internal surface of the first portion F1.

With equipment of this type, it is therefore possible to mould the second portion F2, to remove the corresponding male element M, leaving the second portion F2 in the matrix, to turn the male element M round, and then to mould the first portion F1 inside the second portion F2. In practice, the order of the moulding steps is reversed, since the outer portion F2 is moulded first and the inner portion F1 is then moulded inside it. If the plastics material is injected from the matrix side, naturally it is necessary to provide a hole in the outer portion F2 to allow the plastics material required for the moulding of the inner portion F1 to pass through and it is advantageous, in order to make the production cycle more efficient, to use rotatable supports SG carrying four male elements M of the two types for each set of matrices defining two cavities.

It can be seen from the foregoing that the present invention is suitable for many applications and can thus be used not only for the moulding of containers F but, more generally, for the moulding of components of plastics material comprising at least a first portion of a first plastics material and a second portion of a second, different plastics material.

Naturally, the principle of the invention remaining the same, the details of construction and forms of embodiment may be varied widely with respect to those described and illustrated, without thereby departing from the scope of the present invention.

Claims

1. Equipment (1) for the injection-moulding of articles (F) of plastics material, each comprising a first portion (F1) of a first plastics material (A) and a second portion (F2) of a second plastics material (B), the equipment comprising:
- first and second die means (M, S1, S2) carried by first and second support means, respectively, and defining first and second surfaces of the article (F), respectively, the first and second die means being capable of being coupled in order to mould the article (F), wherein

- the second die means comprise a first portion (S1) and a second portion (S2) which are supported in respective fixed relative positions,

- the first and second support means comprise a movable support (SG) for causing the first die means (M) to adopt at least first and second predetermined operative positions, in which the first die means (M) are coupled with the first portion (S1) and with the second portion (S2) of the second die means, respectively, the first portion (S1) of the second die means defining, when coupled with the first die means (M), a first cavity for moulding the first portion (F1) of the article (F), and the second portion (S2) of the second die means defining, when coupled with the first die means (M) and the first moulded portion (F1) of the article (F), a second cavity for the moulding of the second portion (F2) of the article (F), said equipment being characterized in that the first support means comprise a plurality of movable supports (SG) and the second support means comprise a corresponding plurality of the first and second portions (S1, S2) of the second die means.

2. Equipment (1) in which the article is a container (F) according to Claim 1, characterized in that

- the first die means are convex die means (M),

- the first portion of the second die means comprises first concave die means (S1),

- the second portion of the second die means comprises second concave die means (S2),

- the convex die means (M), when coupled with the first concave die means (S1), defining a first cavity for moulding the first, inner portion (F1) of the container (F), and the convex die means (M) carrying the first, inner portion (F1), when coupled with the second concave die means (S2), defining a second cavity for the moulding of the second, outer portion (F2) of the container (F).

3. Equipment (1) in which the article is a container (F) according to Claim 1, characterized in that

- the first die means are concave die means,

- the first portion of the second die means comprises first convex die means,

- the second portion of the second die means comprises second convex die means,

- the concave die means, when coupled with the first convex die means, defining a first cavity for moulding a first, outer portion of the container (F), and the concave die means, carrying the first, outer portion, when coupled with the second convex die means, defining a second cavity for the moulding of a second, inner portion of the container (F).

4. Equipment (1) according to Claim 2, characterized in that each movable support (SG) carries at least one convex die means (M) movable between the first and second predetermined operative positions.

5. Equipment (1) according to Claim 4, characterized in that each movable support is a rotatable support (SG) which can rotate about a rotation axis (RA) so as to cause the at least one convex die means (M) to move between the first and second predetermined operative positions.

6. Equipment (1) according to Claim 5, characterized in that each rotatable support (SG) comprises two convex die means (M) disposed in a manner such that when a first of the two convex die means (M) is in the first predetermined operative position, a second of the two convex die means (M) is in the second predetermined operative position, and vice versa.

7. Equipment (1) according to Claim 6, characterized in that the two convex die means (M) are disposed on the rotatable support (SG) in diametrically opposed positions with respect to the axis of rotation (RA), and in that the rotatable support (SG) is rotated through 180° so as to cause the two convex die means (M) to adopt the first and second predetermined operative positions.

8. Equipment (1) according to any one of Claims 4 to 7, characterized in that it comprises first and second plasticator means (VA, VB), and in that the first concave die means (S1) are supplied with the first plastics material (A), through first supply means, by the first plasticator means (VA) and the second concave die means (S2) are supplied with the second plastics material (B), through second supply means, by the second plasticator means (VB).

9. Equipment (1) according to any one of Claims 4 to 8, characterized in that each movable support (SG) carries at least one concave die means (M) movable between the first and second predetermined operative positions.

10. Equipment (1) according to Claim 9, characterized in that each movable support is a rotatable support (SG) which can rotate about a rotation axis (RA) so as to cause the at least one concave die means (M) to move between the first and second predetermined operative positions.

11. Equipment (1) according to Claim 10, characterized in that each rotatable support (SG) comprises two concave die means (M) disposed in a manner such that when a first of the two concave die means (M) is in the first predetermined operative position, a second of the two concave die means (M) is in the second predetermined operative position, and vice versa.

12. Equipment (1) according to Claim 11, characterized in that the two concave die means (M) are disposed on the rotatable support (SG) in diametrically opposed positions with respect to the axis of rotation (RA), and in that the rotatable support (SG) is rotated through 180° so as to cause the two concave die means (M) to adopt the first and second predetermined operative positions.

13. Equipment (1) according to any one of Claims 4 to 12, characterized in that it comprises first and second plasticator means (VA, VB), and in that the first convex die means (S1) are supplied with the first plastics material (A), through first supply means, by the first plasticator means (VA) and the second convex die means (S2) are supplied with the second plastics material (B), through second supply means, by the second plasticator means (VB).
8, characterized in that the plurality of movable supports are a plurality of rotatable supports (SG) and the second support means (PS) comprise a corresponding plurality of the first and second concave die means (S1, S2).

10. Equipment (1) according to Claim 9, characterized in that the first support means comprise a first plate (PM) carrying the rotatable supports (SG) carrying the convex die means (M) and the second support means comprise a second plate (PS) carrying the concave die means (S1, S2) defining die cavities corresponding to the first and second portions (F1, F2).

11. Equipment (1) according to Claim 10, characterized in that the first and second concave die means comprise first and second matrices (S1, S2).

12. Equipment (1) according to Claim 11, characterized in that the first and second matrices (S1, S2) comprise extractor means (G) for enabling the first portion (F1) and the container (F) to be removed from the matrices (S1, S2).

13. Equipment (1) according to Claim 12, characterized in that the extractor means (G) comprise two separable portions for allowing the container (F) to be expelled.

14. Equipment (1) according to Claim 13, characterized in that it is configured in a manner such as to permit simultaneous moulding of the first and second portions (F1, F2) in the first and second matrices (S1, S2).

15. Equipment (1) according to Claim 14, characterized in that the first and second supply means in the second plate (PS) are two sets of ducts for supplying the first and second plastics materials (A, B), the two sets of ducts being disposed in two offset planes in the second plate (PS).

16. Equipment (1) according to Claim 15, characterized in that the convex die means (M) comprise ducts for the circulation of a cooling fluid.

17. Equipment (1) according to Claim 16, characterized in that the second plate (PS) and the matrices (S1, S2) comprise heating means for keeping them at a temperature suitable for moulding.

18. Equipment (1) in which the containers are parisons (F) used for the manufacture of bottles of a plastics material by blowing, according to any one of Claims 4 to 17, characterized in that it is configured for moulding a first, inner portion (F1) of very pure plastics material (A) and a second, outer portion (F2) of recycled plastics material (B).

19. Equipment (1) according to Claim 18, characterized in that the very pure plastics material is new polyethylene terephthalate (A) and the recycled plastics material is recycled polyethylene terephthalate (B).

Patentansprüche

1. Vorrichtung (1) zum Spritzgießen von Gegenständen (F) aus Kunststoff, wobei jeder Gegenstand einen ersten Teil (F1) aus einem ersten Kunststoff (A) sowie einen zweiten Teil (F2) aus einem zweiten Kunststoff (B) enthält, wobei die Vorrichtung enthält:

- eine erste und zweite Form (M, S1, S2), die von einer ersten bzw. zweiten Halterungseinrichtung getragen wird und eine erste bzw. zweite Oberfläche des Gegenstands (F) festlegt, wobei die erste und zweite Form gekuppelt werden können, um den Gegenstand (F) zu formen, wobei
- die zweite Form einen ersten Teil (S1) sowie einen zweiten Teil (S2) enthält, die in entsprechenden festen Relativstellungen gehalten werden,
- die erste und zweite Halterungseinrichtung eine bewegbare Halterung (SG) enthalten, damit die erste Form (M) zumindest eine erste und zweite vorgegebene Arbeitsstellung einnehmen kann, in der die erste Form (M) mit dem ersten Teil (S1) bzw. mit dem zweiten Teil (S2) der zweiten Form gekuppelt ist, wobei der erste Teil (S1) der zweiten Form dann, wenn er mit der ersten Form (M) gekuppelt ist, einen ersten Hohlraum bildet, um den ersten Teil (F1) des Gegenstands (F) zu formen, und wobei der zweite Teil (S2) der zweiten Form dann, wenn er mit der ersten Form (M) und dem ersten geformten Teil (F1) des Gegenstands (F) gekuppelt ist, einen zweiten Hohlraum bildet, um den zweiten Teil (F2) des Gegenstands (F) zu formen, wobei die Vorrichtung dadurch gekennzeichnet ist, dass die erste Halterungseinrichtung eine Vielzahl von bewegbaren Halterungen (SG) enthält, und die zweite Halterungseinrichtung eine entsprechende Vielzahl von ersten und zweiten Teilen (S1, S2) der zweiten Form enthält.

2. Vorrichtung (1) gemäß Anspruch 1, wobei der Gegenstand ein Behälter (F) ist, dadurch gekennzeichnet, dass

- die erste Form eine konvexe Form (M) ist,
- der erste Teil der zweiten Form eine erste kon-
kave Form (S1) enthält,
- der zweite Teil der zweiten Form eine zweite konkave Form (S2) enthält,
- die konvexe Form (M) dann, wenn sie mit der ersten konkaven Form (S1) gekuppelt ist, einen erste Hohlraum bildet, um den ersten inneren Teil (F1) des Behälters (F) zu formen, und die konvexe Form (M), die den ersten inneren Teil (F1) trägt, dann, wenn sie mit der zweiten konkaven Form (S2) gekuppelt ist, einen zweiten Hohlraum bildet, um den zweiten äußeren Teil (F2) des Behälters (F) zu formen.

3. Vorrichtung (1) gemäß Anspruch 1, wobei der Gegenstand ein Behälter (F) ist, dadurch gekennzeichnet, dass
- die erste Form eine konkave Form ist,
- der erste Teil der zweiten Form eine erste konvexe Form enthält,
- der zweite Teil der zweiten Form eine zweite konvexe Form enthält,
- die konkave Form dann, wenn sie mit der ersten konvexen Form gekuppelt ist, einen erste Hohlraum bildet, um einen ersten äußeren Teil des Behälters (F) zu formen, und die konkave Form, die den ersten äußeren Teil trägt, dann, wenn sie mit der zweiten konvexen Form gekuppelt ist, einen zweiten Hohlraum bildet, um einen zweiten inneren Teil des Behälters (F) zu formen.

4. Vorrichtung (1) gemäß Anspruch 2, dadurch gekennzeichnet, dass jede bewegbare Halterung (SG) zumindest eine konvexe Form (M) trägt, die zwischen der ersten und zweiten vorgegebenen Arbeitsstellung bewegbar ist.

5. Vorrichtung (1) gemäß Anspruch 4, dadurch gekennzeichnet, dass jede bewegbare Halterung eine drehbare Halterung (SG) ist, die um eine Drehachse (RA) gedreht werden kann, so dass eine Bewegung der zumindest einen konvexen Form (M) zwischen der ersten und der zweiten vorgegebenen Arbeitsstellung hervorgerufen wird.

6. Vorrichtung (1) gemäß Anspruch (5), dadurch gekennzeichnet, dass jede bewegbare Halterung (SG) zwei konvexe Formen (M) enthält, die so angeordnet sind, dass dann, wenn eine erste der beiden konvexen Formen (M) in der ersten vorgegebenen Arbeitsstellung liegt, eine zweite der beiden konvexen Formen (M) in der zweiten vorgegebenen Arbeitsstellung liegt und umgekehrt.

7. Vorrichtung (1) gemäß Anspruch (6), dadurch gekennzeichnet, dass die beiden konvexen Formen (M) auf der drehbaren Halterung (SG) im Hinblick auf die Drehachse (RA) diametral gegenüberliegend angeordnet sind, und dass die drehbare Halterung (SG) um 180° gedreht wird, so dass die beiden konvexen Formen (M) die erste und zweite vorgegebene Arbeitsstellung einnehmen.

8. Vorrichtung (1) gemäß irgendeinem der Ansprüche 4 bis 7, dadurch gekennzeichnet, dass die Vorrichtung zumindest eine erste und zweite Plastikatoreinrichtung (VA, VB) enthält, und dass die erste konkave Form (S1) mit dem ersten Kunststoff (A) über eine erste Beschickungseinrichtung von der ersten Plastikatoreinrichtung (VA) angespeist wird und die zweite konkave Form (S2) mit dem zweiten Kunststoff (B) über eine zweite Beschickungseinrichtung von der zweiten Plastikatoreinrichtung (VB) angespeist wird.

9. Vorrichtung (1) gemäß irgendeinem der Ansprüche 4 bis 8, dadurch gekennzeichnet, dass die Vielzahl von bewegbaren Halterungen eine Vielzahl von drehbaren Halterungen (SG) ist, wobei die zweite Halterungseinrichtung (PS) eine entsprechende Vielzahl von ersten und zweiten konvexen Formen (S1, S2) enthält.

10. Vorrichtung (1) gemäß Anspruch 9, dadurch gekennzeichnet, dass die erste Halterungseinrichtung eine erste Platte (PM) enthält, die die drehbaren Halterungen (SG) trägt, die die konvexen Formen (M) tragen, und die zweite Halterungseinrichtung eine zweite Platte (PS) enthält, die die konvexen Formen (S1, S2) trägt, die jene Formhöhlräume bilden, die den ersten und zweiten Teilen (F1, F2) entsprechen.

11. Vorrichtung (1) gemäß Anspruch 10, dadurch gekennzeichnet, dass die erste und die zweite konvexe Form eine erste und eine zweite Matrize (S1, S2) enthalten.

12. Vorrichtung (1) gemäß Anspruch 11, dadurch gekennzeichnet, dass die eine erste und die zweite Matrize (S1, S2) eine Anzieheinrichtung (G) enthalten, um den ersten Teil (F1) und den Behälter (F) aus den Matrizen (S1, S2) entfernen zu können.

13. Vorrichtung (1) gemäß Anspruch 12, dadurch gekennzeichnet, dass die Anzieheinrichtung (G) zwei trennbare Teile enthält, damit der Behälter (F) ausgestoßen werden kann.

14. Vorrichtung (1) gemäß Anspruch 13, dadurch gekennzeichnet, dass die Vorrichtung so aufgebaut ist, dass ein gleichzeitiges Formen des ersten und des zweiten Teils (F1, F2) in den ersten und zweiten Matrizen (S1, S2) möglich ist.
15. Vorrichtung (1) gemäß Anspruch 14, dadurch gekennzeichnet, dass die erste und die zweite Beschickungseinrichtung in der zweiten Platte (PS) aus zwei Reihen von Leitungen bestehen, um den ersten und zweiten Kunststoff (A, B) zuzuführen, wobei die beiden Reihen von Leitungen in zwei versetzten Ebenen in der zweiten Platte (PS) angeordnet sind.

16. Vorrichtung (1) gemäß Anspruch 15, dadurch gekennzeichnet, dass die konvexe Form (M) Leitungen für den Umlauf einer Kühlflüssigkeit enthält.

17. Vorrichtung (1) gemäß Anspruch 16, dadurch gekennzeichnet, dass die zweite Platte (PS) und die Matrizen (S1, S2) Heizeinrichtungen enthalten, um sie auf einer Temperatur zu halten, die für einen Formvorgang geeignet ist.

18. Vorrichtung (1) gemäß irgendeinem der Ansprüche 4 bis 17, wobei die Behälter Kübel (F) sind, die dazu verwendet werden, um Flaschen aus Kunststoff zu blasen, dadurch gekennzeichnet, dass die Vorrichtung so aufgebaut ist, um einen ersten inneren Teil (F1) aus sehr reinem Kunststoff (A) sowie einen zweiten äußeren Teil (F2) aus einem recycelten Kunststoff (B) zu formen.

19. Vorrichtung (1) gemäß Anspruch 18, dadurch gekennzeichnet, dass der sehr reine Kunststoff neues Polyäthylenterephtalat (A) und der recycelte Kunststoff recyceltes Polyäthylenterephtalat (B) ist.

Revendications

1. Dispositif pour un moulage par injection d'articles (F) en matière plastique, chaque article comprenant une première partie (F1) constituée d'une première matière plastique (A) et une deuxième partie (F2) constituée d'une deuxième matière plastique (B), le dispositif comprenant:
- des premiers et deuxièmes moyens de moulage (M, S1, S2) supportés, respectivement, par des premiers et deuxièmes moyens de support et définissant, respectivement, des première et deuxième surfaces de l'article (F), les premiers et deuxièmes moyens de moulage pouvant être couplés afin de mouler l'article (F), dans lequel,
- les deuxièmes moyens de moulage comprennent une première partie (S1) et une deuxième partie (S2), qui sont supportées dans des positions respectives relativement fixes,
- les premiers et deuxièmes moyens de support comprennent un support mobile (SG) de façon à ce que les premiers moyens de moulage (M) adoptent au moins des première et deuxième positions de fonctionnement prédéterminées, où les premiers moyens de moulage (M) sont couplés, respectivement, à la première partie (S1) et à la deuxième partie (S2) des deuxièmes moyens de moulage, la première partie (S1) des deuxièmes moyens de moulage définissant, lorsqu'elle est couplée aux premiers moyens de moulage (M), une première cavité permettant le moulage de la première partie (F1) de l'article (F), et la deuxième partie (S2) des deuxièmes moyens de moulage définissant, lorsqu'elle est couplée aux premiers moyens de moulage (M) et à la première partie molée (F1) de l'article (F), une deuxième cavité permettant le moulage de la deuxième partie (F2) de l'article (F), ledit dispositif étant caractérisé en ce que les premiers moyens de support comprennent une pluralité de supports mobiles (SG) et les deuxièmes moyens de support comprennent une pluralité correspondante de premières et deuxième parties (S1, S2) des deuxièmes moyens de moulage.

2. Dispositif (1) dans lequel l'article est un récipient (F) selon la revendication 1, caractérisé en ce que
- les premiers moyens de moulage sont des moyens de moulage convexes (M),
- la première partie des deuxièmes moyens de moulage comprend des premiers moyens de moulage concaves (S1),
- la deuxième partie des deuxièmes moyens de moulage comprend des deuxième moyens de moulage concaves (S2),
- les moyens de moulage convexes (M), lorsqu'ils sont couplés aux premiers moyens de moulage concaves (S1), définissant une première cavité permettant de mouler la première partie intérieure (F1) du récipient (F), et les moyens de moulage convexes (M) supportant la première partie intérieure (F1), lorsqu'ils sont couplés aux deuxième moyens de moulage concaves (S2), définissant une deuxième cavité permettant de mouler la deuxième partie exterrière (F2) du récipient (F).

3. Dispositif (1) dans lequel l'article est un récipient (F) selon la revendication 1, caractérisé en ce que
- les premiers moyens de moulage sont des moyens de moulage concaves,
- la première partie des deuxièmes moyens de moulage comprend des premiers moyens de moulage convexes,
- la deuxième partie des deuxièmes moyens de moulage comprend des deuxième moyens de moulage convexes,
- les moyens de moulage convexes, lorsqu'ils sont couplés aux premiers moyens de moulage convexes, définissant une première cavité permettant de mouler la première partie extérieure du récipient (F), et les moyens de moulage concaves supportant la première partie extérieure, lorsqu'ils sont couplés aux deuxièmes moyens de moulage convexes, définissant une deuxième cavité permettant de mouler la deuxième partie intérieure du récipient (F).

4. Dispositif (1) selon la revendication 2, caractérisé en ce que chaque support mobile (SG) supporte au moins un moyen de moulage convexe (M) mobile entre la première et la deuxième positions de fonctionnement prédéterminées.

5. Dispositif (1) selon la revendication 4, caractérisé en ce que chaque support mobile est un support rotatif (SG), qui peut tourner autour d'un axe de rotation (RA) de façon à provoquer un déplacement du au moins un moyen de moulage convexe (M) entre la première et la deuxième positions de fonctionnement prédéterminées.

6. Dispositif (1) selon la revendication 5, caractérisé en ce que chaque support rotatif (SG) comprend deux moyens de moulage convexes (M) disposés de telle manière que, lorsqu'un premier des deux moyens de moulage convexes (M) est dans la première position de fonctionnement prédéterminée, un deuxième des deux moyens de moulage convexes (M) est dans la deuxième position de fonctionnement prédéterminée, et vice versa.

7. Dispositif (1) selon la revendication 6, caractérisé en ce que les deux moyens de moulage convexes (M) sont disposés sur le support rotatif (SG) dans des positions à angle droit opposées par rapport à l'axe de rotation (RA), et en ce que le support rotatif (SG) est tourné de 180° afin que les deux moyens de moulage convexes (M) adoptent la première et la deuxième positions de fonctionnement prédéterminées.

8. Dispositif (1) selon l'une quelconque des revendications 4 à 7, caractérisé en ce qu'il comprend deux premiers moyens de plastification (VA, VB) et en ce que les premiers moyens de moulage concaves (S1) sont alimentés avec la première matière plastique (A), à travers un premier moyen d'alimentation, par le premier moyen de plastification (VA) et les deuxièmes moyens de moulage concaves (S2) sont alimentés avec la deuxième matière plastique (B), à travers un deuxième moyen d'alimentation, par le deuxième moyen de plastification (VB).

9. Dispositif (1) selon l'une quelconque des revendications 4 à 8, caractérisé en ce que la pluralité de supports mobiles sont une pluralité de supports rotatifs (SG) et en ce que les deuxièmes moyens de support (PS) comprennent une pluralité de premiers et deuxième moyens de moulage concaves (S1, S2) correspondants.

10. Dispositif (1) selon la revendication 9, caractérisé en ce que les premiers moyens de support comprennent une première plaque (PM) supportant les supports rotatifs (SG) supportant les moyens de moulage convexes (M) et les deuxième moyens de support comprennent deuxième plaque (PS) supportant les moyens de moulage concaves (S1, S2) définissant des cavités de moulage correspondant aux première et deuxième parties (F1, F2).

11. Dispositif (1) selon la revendication 10, caractérisé en ce que les premiers et deuxièmes moyens de moulage concaves comprennent des premières et deuxième matrices (S1, S2).

12. Dispositif (1) selon la revendication 11, caractérisé en ce que les moyens d'extraction (G) comprennent deux parties séparables permettant de dégager le récipient (F).

13. Dispositif (1) selon la revendication 12, caractérisé en ce qu'il est configuré de telle manière qu'il permette un moulage simultané des première et deuxième parties (F1, F2) dans les première et deuxième matrices (S1, S2).

14. Dispositif (1) selon la revendication 13, caractérisé en ce qu'il est configuré de telle manière qu'il permette un moulage simultané des première et deuxième parties (F1, F2) dans les première et deuxième matrices (S1, S2).

15. Dispositif (1) selon la revendication 14, caractérisé en ce que les premiers et deuxième moyens d'alimentation dans la deuxième plaque (PS) sont deux ensembles de conduits destinés à fournir la première et deuxième matières plastiques (A, B), les deux ensembles de conduits étant disposés dans deux plans décalés dans la deuxième plaque (PS).

16. Dispositif (1) selon la revendication 15, caractérisé en ce que les moyens de moulage convexes (M) comprennent des conduits destinés à la circulation d'un liquide de refroidissement.

17. Dispositif (1) selon la revendication 16, caractérisé en ce que la deuxième plaque (PS) et les matrices (S1, S2) comprennent des moyens de chauffage destinés à les maintenir à une température adéquate pour le moulage.
18. Dispositif (1) dans lequel les récipients sont des préformes (F) destinées à être utilisées pour la fabrication de bouteilles en matière plastique par soufflage, selon l'une quelconque des revendications 4 à 17, caractérisé en ce qu'il est configuré pour un moulage d'une première partie intérieure (F1) constituée d'une matière plastique très pure (A) et d'une deuxième partie extérieure (F2) constituée de matière plastique recyclée (B).

19. Dispositif (1) selon la revendication 18, caractérisé en ce que la matière plastique très pure est du polyéthylènetéréphtalate neuf (A) et la matière plastique recyclée est du polyéthylène-téréphtalate recyclé (B).