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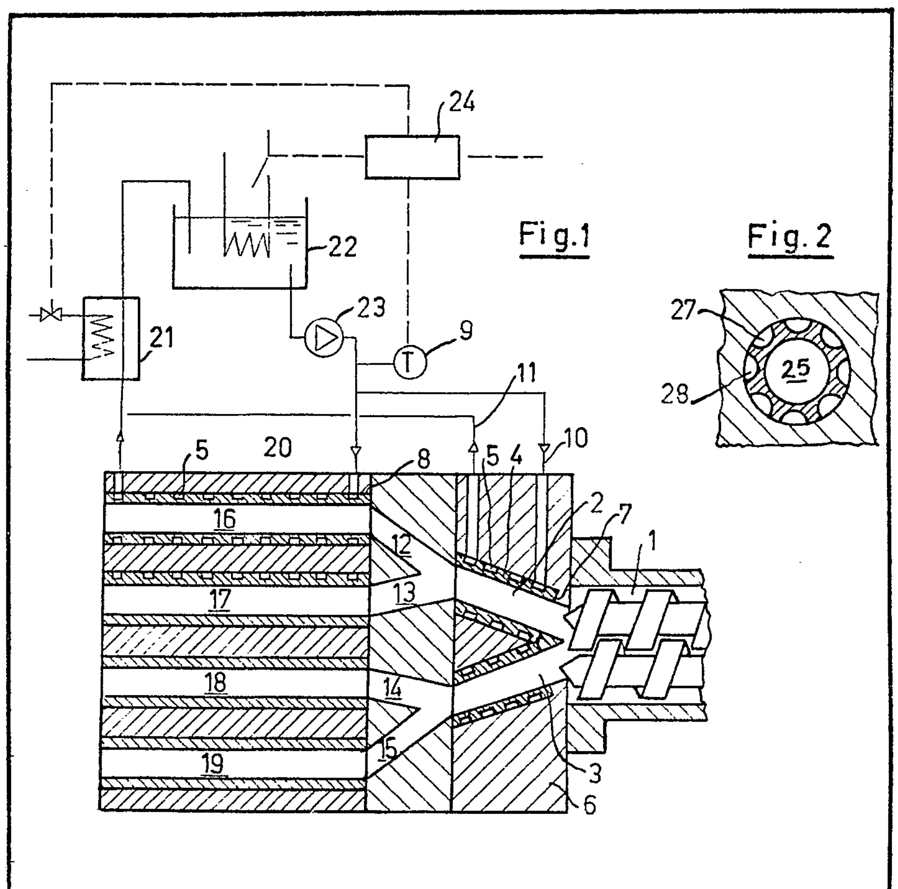
(54) Regulating the Temperature of Simultaneously Extruded Plastics Blow Moulding Parisons

(57) Plastics material flowing towards parison extrusion nozzles along ducts 2, 3, and 16 to 19 of a distributor, is temperature-controlled approximately to the same required temperature along the separate paths defined by the ducts, by means of a temperature-controlled i.e., heated or cooled medium, circulated along at least one section of the length of the respective flow path along the wall of the said flow path. Control may be effected from measurement of the plastics material temperature along the length section, and alteration of the flow circulation rate or of the temperature of the medium as measured at the inlet or outlet of the ducts. The medium is circulated by a circuit comprising cooling and heating means 21, 22, a pump 23 and temperature measuring means 9, and is circulated through helical or axially parallel ducts 5 or 27, 28, in sleeves 4 or 20. Heating and cooling medium i.e. oil, may be circulated through alternate groups of ducts 5 or 27, 28 around a path, or the alternate ducts may respectively contain electrical heating elements and the medium.



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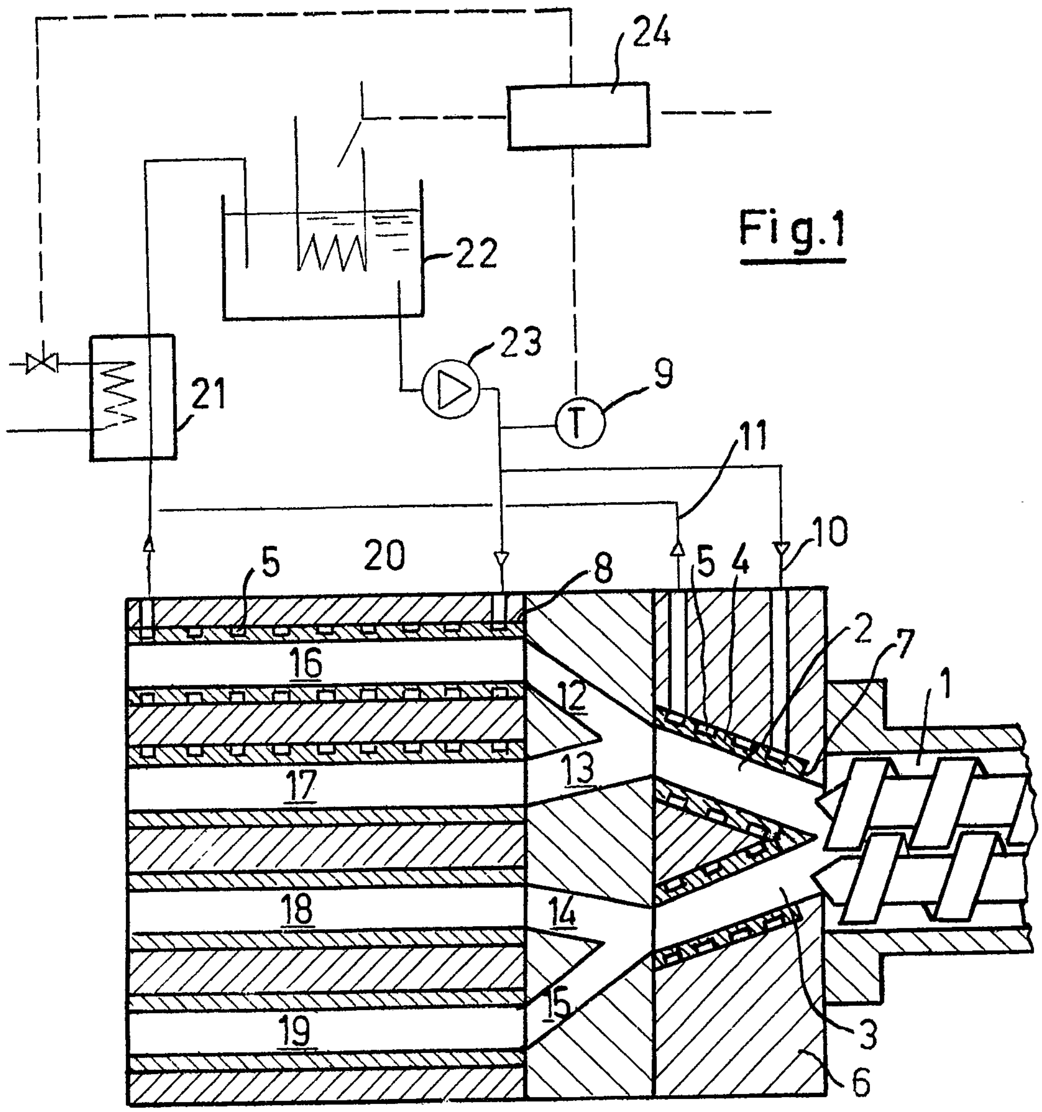
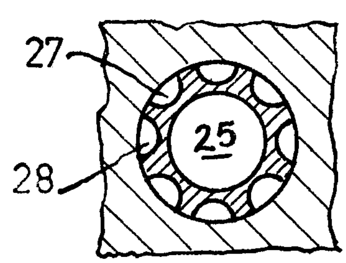


Fig.1

Fig. 2



SPECIFICATION

Method for the Guiding of a Plasticised Material in a Blow Moulding Machine

The invention relates to a method for guiding a plasticised plastics material, along ducts of a distributor in the simultaneous parallel production of a plurality of blow-moulded hollow plastics parts or articles in a blow moulding machine.

In a blow moulding machine for the production of blow moulded hollow articles, the plastics material is plasticised in an extruder, in which state it has a temperature specific to each kind of plastics material at which it can be shaped. The material is shaped by means of a nozzle to the form of a tube, which then becomes the desired hollow article in a blow mould. Along this path of flow the plasticity of the material must be maintained, and in the case of some kinds of plastics this depends to a very substantial extent on its temperature at the time. Thus it is often necessary to heat or cool the material en route. This governs the flowability of the material, which is essential for its deformability.

Problems with the flowability or deformability of material occur more particularly when it is attempted to effect the parallel production of several hollow plastics articles side by side at the same time. In such production, the flow of plastics material from the extruder is divided and guided through production paths of flow arranged in parallel with one another. For this purpose, use is made of a distributor which is arranged between the extruder and the nozzles and comprises a duct system, e.g., a duct system with two, three, four or more paths of flow.

Successful results have not been obtained hitherto in the above production method. The material issuing from the ducts did not have uniform deformability or flowability.

The invention seeks to find a method for the guiding of plasticised plastics material with which it is possible to produce from each parallel flow path a plastics material in each case with substantially identical deformability and flowability. According to the invention this is achieved by controlling the temperature of the plastics material in each individual flow path using a temperature controlled medium, normally a liquid which is guided along the wall, at least at one longitudinal section of each duct along which the plastics material flows. In this way a plastics material having substantially the same deformability and flowability is obtained in each parallel path.

A primary advantage of the invention is that the plastics material can equally well be heated as cooled. In one embodiment, the temperature of the medium to be supplied to or discharged from the duct sections is measured and the measured value is used as a controlled variable for temperature control, i.e., for heating or cooling the medium to be supplied.

The invention will now be described by way of example and with reference to the accompanying drawings showing apparatus in which the method may be carried out:

Figure 1 of the drawings shows a diagrammatic view, partly in longitudinal section, of apparatus for carrying out the invention; and

Figure 2 shows a detail cross-section of a modified component of the apparatus of Figure 1.

In the use of the apparatus of Figure 1, a plasticised plastics material issues from extruder 1. The stream of material is divided into parallel runs. After the extruder it is first driven through two ducts 2 and 3, each of which opens into two downstream ducts 12, 13 and 14, 15 respectively. These are continued in ducts 16, 17 and 18, 19 respectively which each lead to a respective nozzle, the nozzles not being shown here.

Thus four parallel paths are formed through which the plastics material is to be conducted.

The material is kept to approximately the same temperature in each of the paths, with the result that the material has the same flowability. This is achieved by conducting a temperature-controlled medium at at least one section of the length of each path along the wall thereof. For this purpose, ducts are provided about the paths, through which the medium; e.g., a temperature-controlled oil is conducted.

In the illustrated example a duct length section is formed with a sleeve inserted in a bore, such as the sleeves designated as 4 or 20. At its external side the sleeve is provided with a helical groove 5, forming a channel for guiding the temperature-controlled medium round the flow path. The construction of the sleeve ensures that the temperature-controlled medium is conducted as close as possible to the material whose temperature is to be controlled. This is to achieve a rapid transfer of heat, which is promoted by using a material for the sleeve which is a good conductor of heat.

The channels for guiding the medium are each connected to a circuit for temperature control of the medium.

This circuit comprises a cooling device 21, a heating device 22, a pump 23, and appropriate connecting conduits. A control system is provided for the operation of the circuit.

The temperature of the material flowing through the length section is measured and compared with the desired value of this parameter. The cooling or heating of the medium being temperature-controlled is regulated accordingly. The temperature of the circuit medium is measured before or after giving up its heat to or receiving heat from the flowing material. A measuring instrument 9 is provided for this purpose.

For the sake of simplicity the method is described and illustrated in the drawings in connection with only one flow path. The same is true of the other parallel flow paths through which the plasticised material is guided.

Apparatus are commercially obtainable for effecting automatic control of the medium whose temperature is to be controlled, and this may also include the delivery quantity of the circulation pump 9.

For manufacturing reasons the distributor is divided. Its first part with ducts 2 and 3 and sleeves 4 is designated as 6. A second part comprises the ducts 12, 13, 14 and 15. A third part comprises the ducts 16, 17, 18 and 19 with the sleeves 20.

To obviate direct contact of the temperature-controlled medium with the plastics material the sleeves which are inserted in the bores are provided with sealing means which are designated for example as 8 and 7.

It would be conceivable also to arrange the ducts or channels in the sleeves in other ways than that described hereinbefore. For example, situated parallel to the sleeve axis and all round and connected in parallel relatively to the medium flow. The actual heat exchange between the plastics material and the medium whose temperature is being controlled can be effected in a concurrent flow or countercurrent flow situation according to need.

In the constructional example, heat exchange is effected in a concurrent-flow situation both in the region of the sleeve 4 and also in the region of sleeve 20.

Figure 2 shows in cross-section the aforesaid arrangement with ducts 27 and 28 arranged parallel to the sleeve axis and all round the sleeve. The plastics material is guided through the flow path 25. The ducts 27 and 28, thus for example all eight as illustrated, can conduct the temperature-controlled medium, being connected to a common supply or discharge header. Or, arranged alternately in groups of four, one group, including duct 27, could be used for conducting a heating medium and the other group, with duct 28, could conduct cooling medium.

In a similar way, electrical heating elements could be installed in one duct group, the second group in that case conducting a medium temperature-controlled with a view to cooling.

A similar state of affairs would also be possible with helically arranged ducts which were arranged with a double helix. One of the helixes could then be used for installation of the electrical heating elements, and the second helix could conduct a cooling medium.

Claims

1. A method for guiding a plasticised plastics material along ducts of a distributor in the simultaneous parallel production of a plurality of blow-moulded hollow plastics articles in a blow moulding machine, wherein the plastics material is temperature-controlled substantially to the same temperature in each duct by conducting a temperature-controlled medium, at least at one section of each duct along the wall thereof.

2. A method according to Claim 1 wherein the temperature of the plastics material flowing through the flow path is measured and the measured value is used as a command variable or reference input in a closed loop control system for control of at least one of the flow rate and temperature of the temperature-controlled medium.

3. A method according to Claim 1 wherein the temperature of the medium at one of the inlet to and outlet from said at least one duct section is measured, the measured value being used as a controlled variable for temperature controlling the medium to be supplied.

4. A method according to any preceding Claim wherein the temperature-controlled medium is guided along said at least one duct section, along the wall thereof, through a passage which extends helically about the duct.

5. A method according to any of Claims 1 to 3 wherein the temperature-controlled medium is guided along said at least one duct section through passages which run parallel to the duct in a formation around the duct, and in the immediate vicinity thereof.

6. A method according to any preceding Claim wherein a temperature-controlled medium is conducted along one of two different flow paths defined along the wall of said at least one duct section.

7. A method for guiding a plasticised plastics material substantially as described herein with reference to Figure 1, or as modified by Figure 2, of the accompanying drawings.

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