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(54) J-TUBES AND A PROCESS AND APPARATUS FOR MANUFACTURE THEREOF

(71) We, PLASTIC CONSULTANTS (N.Z.) LIMITED, of 347 Andersons Bay Road, Dunedin, New Zealand, a company organised and existing under the laws of New Zealand, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns tubes and a process and apparatus for making tubes. The invention provides a process and apparatus which is intended for use in the manufacture of J-tubes, namely tubes consisting of a straight portion merging into a single bend, the curvature of which conforms to the shape of part of a circle, usually a semi-circle, a tube of this shape being adapted for connection to another of similar shape so as to form an S-trap that are incorporated into the waste outlet of a wash bowl, bath or the like.

Such tubes are commonly formed by a moulding operation in a die having the external shape of the tube and a multi-part core which is situated in the mould cavity to define the bore of the tube and which must be extracted from the tube after the moulding and cooling stage.

In order to reduce the moulding cycle period to a minimum, the core should be constructed such that it can be repositioned in the mould by merely reversing the extraction movement. If the core is made in two parts, that is, a straight cylindrical portion and a curved portion, the extraction of the straight portion is easy because simple reciprocation serves to operate the core throughout the cycle. Extraction of the curved core is difficult in that it has to be extracted in an arcuate path which means that the freshly moulded straight part of the J-tube obstructs the emerging curved core because the J-tube is constructed in one plane.

In one process therefore, the core lying in the curved part of the tube is made of

three sections. The core is extracted in stages and the operator detaches a third of the core at each stage, and finally replaces the dismantled core with a fresh three-part core. This extraction is manual, time-consuming and tedious. Moreover, the cores are hot to the touch because the composite core cannot house a coolant channel.

According to one aspect of the invention, there is provided a method of manufacturing a J-tube having a straight portion and a curved portion wherein the curved portion forms part of a helix, said method using a core including a curved component which in use occupies only the lumen of the curved portion; wherein, when said component of the core which occupies the lumen of the curved portion is extracted from the curved portion during a manufacturing cycle, said component of the core moves in a helical path about the longitudinal axis of a virtual cylinder defined by the helix of which the curved portion is a part.

The curved core is thus extractable in one operation and therefore replaceable in the moulding position again in one operation. The invention permits extraction of this portion of the core in one non-manual operation and re-position for a successive moulding cycle in one non-manual operation.

According to another aspect of the invention, there is provided a core for use in forming a J-tube, according to the method described above, including a straight component for forming at least part of the lumen of the straight portion of the tube, and a helical component for forming the lumen of the curved portion of the tube, wherein the curved component of the core is of helical configuration and extends over an arc of from 90° to 180°.

One or both components of the core may be cooled, for example by water or oil channels provided in the same.

According to yet another aspect of the invention, there is provided a core component for use in forming the curved portion of a J-tube according to the method des-

cribed above, wherein said component forms part of a helix.

According to a further aspect of the invention there is provided a J-tube formed according to the method described above, wherein the curved portion is of helical configuration, that is, the curved portion forms part of a helix.

One example of carrying out the invention is now described with reference to the accompanying drawing in which:

Figure 1 is a part sectioned view of a J-tube constituting the top half of a domestic trap;

Figure 2 is a part sectioned side view of a J-tube constituting the bottom half of a domestic trap;

Figure 3 is a perspective view of a trap made from the tubes shown in Figures 1 and 2;

Figure 4 is a diagrammatic plan of the die at the first moulding stage with the cores in position;

Figure 5 is a diagrammatic plan of the same with the cylindrical core in situ but the curved core is half extracted, and

Figure 6 is a diagrammatic plan of the same with both cores fully extracted.

Referring firstly to Figure 1, the J-tube is made of polypropylene and has a straight portion 2 and a curved portion 4. The curved portion 4 is of helical configuration in that it is displaced in 180° of curvature by just in excess of half a tube diameter. The inlet 6 has an external flange 8. The outlet 10 has an external flange 12. Referring next to Figure 2, the complementary J-tube also has a straight portion 2 and a curved portion 4 of helical configuration as in Figure 1. The outlet 10 has a thread for a locking nut (not shown). The inlet 6 has a recess 16 for receiving the flanged outlet of the other J-tube.

When the two J-tubes are joined together to make a trap 18 as shown in Figure 3, the helical formation is clearly seen, and although the conventional S-conformation is not shown, clearly the two tubes can be rotated to give this shape of trap if desired.

Referring now to Figures 4, 5 and 6, the die is made in two sections, only the lower section 29 being shown in the plan. The lower section 20 has a half cavity generally indicated at 22, which corresponds in shape exactly to half of the external surface of the J-tube to be produced.

The die also has two other cavities. One cavity 24 houses the piston 26 which carries the straight core component for the tube. The other cavity which is mostly in the top section (not shown), houses the block 30 which carries the curved core component 32 for the tube. The block 30 is rotatably mounted on a vertical pivot pin 34 which is secured to the lower section. Revolution of

the block 30 about the pin 34 is produced by a hydraulic motor (not shown). The block 30 contains a water cooling channel 36, which extends into the curved core component for cooling the core after the injection stage; likewise, the piston 26 and straight core component 38. Whereas the piston 26 and straight core component 28 reciprocate in a straight line, the block 30 pivots and in doing so, the curved core component moves in a helical path about the axis of the pivot pin 34 and the core component and block move clear of the straight part 2.

Thus the sequence of operation is as follows: The lower and upper die sections close. When the straight core component 28 and the curved core component 32 are in situ, the injection stage follows. After the cooling stage, during which the water is circulated through the channels 36, 38 in the core components and the die sections, the die sections separate. The block 30 is revolved on the pin 34 by the hydraulic motor which causes the core component 32 to be withdrawn in one movement, firstly to the position shown in Figure 5 and secondly to that shown in Figure 6. Thereafter, the piston 26 is actuated, and the straight core component 28 is withdrawn. The sprue is cut, and the tube ejected, whereupon the core components are repositioned and the die sections close in preparation for the repeat cycle.

In commercial production, one extruder will supply melt for four tubes simultaneously. The cores for the tubes will be grouped in one pair of dies.

The advantage of the above embodiment is that it reduces the cycle from about three minutes to a period of the order of half a minute.

WHAT WE CLAIM IS:—

1. A method of manufacturing a J-tube having a straight portion and a curved portion wherein the curved portion forms part of a helix, said method using a core including a curved component which in use occupies only the lumen of the curved portion; wherein, when said component of the core which occupies the lumen of the curved portion is extracted from the curved portion during a manufacturing cycle, said component of the core moves in a helical path about the longitudinal axis of a virtual cylinder defined by the helix of which the curved portion is a part.

2. A method as claimed in Claim 1, wherein during the manufacturing cycle the component of the core which occupies the lumen of the curved portion is extracted from the tube in one non-manual operation and is repositioned for a successive forming cycle in a second non-manual operation.

cribed above, wherein said component forms part of a helix.

According to a further aspect of the invention there is provided a J-tube formed according to the method described above, wherein the curved portion is of helical configuration, that is, the curved portion forms part of a helix.

One example of carrying out the invention is now described with reference to the accompanying drawing in which:

Figure 1 is a part sectioned view of a J-tube constituting the top half of a domestic trap;

Figure 2 is a part sectioned side view of a J-tube constituting the bottom half of a domestic trap;

Figure 3 is a perspective view of a trap made from the tubes shown in Figures 1 and 2;

Figure 4 is a diagrammatic plan of the die at the first moulding stage with the cores in position;

Figure 5 is a diagrammatic plan of the same with the cylindrical core in situ but the curved core is half extracted, and

Figure 6 is a diagrammatic plan of the same with both cores fully extracted.

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When the two J-tubes are joined together to make a trap 18 as shown in Figure 3, the helical formation is clearly seen, and although the conventional S-conformation is not shown, clearly the two tubes can be rotated to give this shape of trap if desired.

Referring now to Figures 4, 5 and 6, the die is made in two sections, only the lower section 29 being shown in the plan. The lower section 20 has a half cavity generally indicated at 22, which corresponds in shape exactly to half of the external surface of the J-tube to be produced.

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the block 30 about the pin 34 is produced by a hydraulic motor (not shown). The block 30 contains a water cooling channel 36, which extends into the curved core component for cooling the core after the injection stage; likewise, the piston 26 and straight core component 38. Whereas the piston 26 and straight core component 28 reciprocate in a straight line, the block 30 pivots and in doing so, the curved core component moves in a helical path about the axis of the pivot pin 34 and the core component and block move clear of the straight part 2.

Thus the sequence of operation is as follows: The lower and upper die sections close. When the straight core component 28 and the curved core component 32 are in situ, the injection stage follows. After the cooling stage, during which the water is circulated through the channels 36, 38 in the core components and the die sections, the die sections separate. The block 30 is revolved on the pin 34 by the hydraulic motor which causes the core component 32 to be withdrawn in one movement, firstly to the position shown in Figure 5 and secondly to that shown in Figure 6. Thereafter, the piston 26 is actuated, and the straight core component 28 is withdrawn. The sprue is cut, and the tube ejected, whereupon the core components are repositioned and the die sections close in preparation for the repeat cycle.

In commercial production, one extruder will supply melt for four tubes simultaneously. The cores for the tubes will be grouped in one pair of dies.

The advantage of the above embodiment is that it reduces the cycle from about three minutes to a period of the order of half a minute.

WHAT WE CLAIM IS:—

1. A method of manufacturing a J-tube having a straight portion and a curved portion wherein the curved portion forms part of a helix, said method using a core including a curved component which in use occupies only the lumen of the curved portion; wherein, when said component of the core which occupies the lumen of the curved portion is extracted from the curved portion during a manufacturing cycle, said component of the core moves in a helical path about the longitudinal axis of a virtual cylinder defined by the helix of which the curved portion is a part.

2. A method as claimed in Claim 1, wherein during the manufacturing cycle the component of the core which occupies the lumen of the curved portion is extracted from the tube in one non-manual operation and is repositioned for a successive forming cycle in a second non-manual operation.



3. A method as claimed in claim 1 or 2, wherein during the manufacturing cycle the component of the core occupying the lumen of the curved portion is extracted in one revolving movement and inserted ready for the next forming cycle by reversing said movement.
4. A method as claimed in claim 1, 2 or 3, wherein said core also comprises a straight component for forming at least part of the lumen of the straight portion of the tube, and said straight component and said helical core component lie in unlocked abutment while a J-tube is formed therearound.
5. A core for use in forming a J-tube, according to the method as claimed in any one of claims 1 to 4, including a straight component for forming at least part of the lumen of the straight portion of the tube, and a helical component for forming the lumen of the curved portion of the tube, wherein the curved component of the core is of helical configuration and extends over an arc of from 90° to 180° .
6. A core as claimed in claim 5, wherein one or more components of the core contain a channel for coolant.
7. A core component for use in forming the curved portion of a J-tube according to the method as claimed in any one of claims 1 to 4, wherein said component forms part of a helix.
8. A core component, as claimed in claim 7, wherein said component contains a channel for coolant.
9. A J-tube formed according to the method of any one of claims 1 to 4, wherein the curved portion is of helical configuration, that is, the curved portion forms part of a helix.
10. A J-tube as claimed in claim 9 wherein the helix is of such an angle as will produce a displacement between the inlet of the J-tube and the outlet of the J-tube of at least half a tube diameter.
11. A J-tube as claimed in claim 9 or 10 wherein the helical configuration extends through an angle of from 90° to 180° .
12. A J-tube as claimed in any one of claims 9 to 11 wherein the tube is rigid.
13. An S-trap for a plumbing installation made from two interconnected J-tubes as claimed in any one of claims 9 to 12.
14. A J-tube as claimed in Claim 9 and substantially as herein described with reference to and as illustrated in Figs. 1—3 of the accompanying drawings.
15. A method of manufacturing a J-tube substantially as herein described.
16. A two-part core for manufacturing a J-tube, as claimed in Claim 5 and substantially as herein described with reference to and as illustrated in Figs. 4—6 of the accompanying drawings.
17. A core component for manufacturing a J-tube, as claimed in Claim 7 and substantially as herein described with reference to and as illustrated in Figs. 4—6 of the accompanying drawings.

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