

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in and relating to Footwear

We, THE BRITISH BATA SHOE COMPANY LIMITED, a British Company, of East Tilbury, Essex, 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:—

The invention relates to the manufacture from synthetic resinous material of articles of footwear or parts thereof.

It has been previously proposed to provide apparatus for the mass production of articles of footwear which have parts made from different synthetic resinous materials or from synthetic resinous materials of the same composition but different colours, but such previous proposals have not been readily adaptable to automatic operation or alternatively have been cumbersome and expensive.

It is an object of the present invention to obviate or mitigate the above disadvantage by providing apparatus which is suited to automatic operation and yet is simple and inexpensive.

According to the invention there is provided apparatus for the manufacture from synthetic resinous material of articles of footwear or parts thereof, the apparatus including a mould having a moulding cavity therein and closure members of different forms each of which is insertible in said cavity, said closure members being rotatable in unison to align any selected one of same with said cavity, and there being means for effecting relative movement of said closure members and said mould to and from one another to close or open said cavity.

Preferably, said closure members are mounted on a carrier rotatable about an axis normal to or inclined to the general plane of the open end of said cavity and offset from said open end.

Said carrier may take the form of a solid conical body or a plurality of diverging arms lying on the surface of an imaginary cone. Alternatively the carrier may carry the closure members in a radial arrangement in one plane parallel to the plane of the open end of said cavity.

Preferably the carrier comprises a pair of arms arranged at 90° to one another and rotatable about an axis inclined at 45° to the plane of the open end of said cavity.

By using the closure members in succession, desired portions of the moulding cavity may be filled in turn with moulding material of different colour or composition.

The apparatus may be used to mould a composite sole from, for example, two synthetic resinous materials, either as a complete operation in itself, or to simultaneously attach the sole to an upper. In this case the moulding cavity is in the shape of the final sole, and one closure member is initially placed in position to close off part of the cavity which is then filled with synthetic resinous material. Thereafter the closure member is removed and the carrier rotated to bring into use another closure member which does not close off any of the cavity. A different synthetic resinous material is then injected into the space between the first layer of synthetic resinous material and the new closure member thus forming a composite sole of the desired shape and dimensions.

The apparatus is preferably incorporated in an injection moulding machine including a turntable on which the apparatus and a plurality of similar apparatuses are mounted, and a plurality of injection heads angularly displaced from one another and adapted to communicate with the moulds in succession.

An embodiment of the invention will now be described, by way of example only, with

reference to the accompanying drawings, in which Fig. 1 is a plan view of an injection moulding machine and Figs. 2 to 15 illustrate the sequence of moulding operations.

5 Referring to the drawings, Figure 1 shows an injection moulding machine including a turntable 20 on which are carried a plurality of moulds 22. During rotation of the turntable each mould passes through ten angular positions numbered 1 to 10 in the drawings. Injection heads 24 and 26 are located at positions 1 and 3 and automatic means are provided to cause mutual engagement between the heads and the moulds in these positions.

15 The moulds 22 are shown in detail in Figs. 2 to 15. Each comprises a body portion 30 having two co-operating halves 30a and 30b and a central core 30c (Fig. 1) which co-operate to form a cavity 31 in the form of a boot. Only one half 30a of the mould is shown in Figs. 2 to 15 for purposes of clarity. The cavity could take the form of any other article of footwear or part thereof. The mould illustrated is designed to apply

25 a composite sole of synthetic resinous material to a ready-made boot upper 32.

A pair of closure members 33 and 34 are carried on arms 35 of a carrier 36, the arms being at right angles to one another and the carrier being rotatable about a shaft 37 passing through and forming an extension of the bisector of the right angle. The shaft 37 projects from a control box 38 disposed adjacent the mould 22 and incorporating a rack and pinion and cam mechanism through which the shaft 37 may be rotated. In addition the whole unit comprising the control box 38, carrier 36 and closure members 33 and 34 may move in a generally vertical direction

30 relative to the mould.

In operation, the mould halves are opened, the lasted upper 32 is inserted and the mould closed. With closure member 33 in position closing the mould cavity (Fig. 2), the space

45 between the upper 32 and the inner surface of the closure member 33 is less than the desired thickness of the sole. In position 1 a suitable synthetic resinous material 40 is injected through the closure member into the space within the mould by the injection head

50 24.

When the mould rotates to position 2 the control box 38 is raised (Fig. 3) thus lifting the closure member 33 clear of the mould.

55 The shaft 37 is then rotated (Figs. 4 and 5) to bring the other closure member 34 above the mould. The control box 38 is then lowered (Fig. 6) to bring the closure member 34 into operative position and the mould rotates to position 3. The closure member 34 is dimensioned to leave a space between the material injected at position 1 and the inner surface of the closure member, such that when this space is filled, the sole will be of the desired

65 final thickness. In position 3 a further syn-

thetic resinous material 41 of a different composition is introduced into the space in the mould 22 by the injection head 26.

In positions 4, 5 and 6 the material cools and hardens and in position 7 the control box 38 is again raised (Fig. 9) to lift the closure member 34 clear of the mould, and the shaft 37 is turned through 90° (Fig. 10) to permit easy removal of the complete boot when the mould is split at position 8 (Fig. 11). A new boot upper 32 is then inserted and the mould halves closed together at position 9 (Fig. 12), and at position 10 the shaft 37 is rotated through a further 90° (Figs. 13 and 14) to bring the closure member 33 above the mould, and the latter is then lowered into operative position in position 1 (Fig. 15). Thereafter the operation is repeated.

An advantage of the embodiment is that there are no loose mould parts to be attached or removed during moulding and precise moulding is achieved through the positive positioning of the mould parts. Moreover the movements of the carrier 36 relative to the mould may simply and easily be effected automatically throughout the operating cycle.

Many modifications are possible within the ambit of the invention. For example, more than two closure members may be provided, arranged in generally conical configuration around the axis of rotation of the carrier, so that soles and heels can be formed from several layers of synthetic resinous material. Alternatively the closure members may be mounted on a solid conical carrier instead of on diverging arms. In a further modification the closure members may be mounted on a carrier in a radial arrangement in one horizontal plane.

Moreover in order to separate the closure members and the mould the mould may move away from the closure members instead of the latter moving away from the mould. While in the embodiment material is injected through the closure members, it may instead be injected at a suitable location in the body member, for example adjacent the heel. If desired, the turntable could be dispensed with and articles produced on a small scale by use of a general mould.

In use of the embodiment of the above modifications it is possible to produce articles of footwear having a variety of different characteristics. For example, sole and heel may be made of different materials or different colours of the same material. Multi-layer soles and heels may be made of layers of the same material but different colours, and articles having parts of different material and colour may be produced. The apparatus can be used for the manufacture of soles and heels as separate integers to be subsequently attached by glueing, stitching or fusing to pre-formed uppers. Alternatively the apparatus may be used to produce complete articles of footwear,

the upper and sole portions being composed of different materials. If desired, uppers of different materials or colours could also be produced.

5 WHAT WE CLAIM IS:—

1. Apparatus for the manufacture from synthetic resinous material of articles of footwear or parts thereof, the apparatus including a mould having a moulding cavity therein and closure members of different forms each of which is insertible in said cavity, said closure members being rotatable in unison to align any selected one of same with said cavity, and there being means for effecting relative movement of said closure members and said mould to and from one another to close or open said cavity.

2. Apparatus according to claim 1, in which said closure members are mounted on a carrier rotatable about an axis normal to or inclined to the general plane of the open end of said cavity and offset from said open end.

3. Apparatus according to claim 2, in which said carrier comprises a plurality of diverging arms lying on the surface of an imaginary cone.

4. Apparatus according to claim 3, in which only two arms are provided which are arranged at right angles to one another and are rotatable about an axis inclined at 45° to the general plane of the open end of said cavity.

5. Apparatus according to claim 2, in which said carrier carries the closure members in a radial arrangement in one plane parallel to the general plane of the open end of said cavity.

6. Apparatus according to any preceding claim incorporated in an injection moulding machine including a turntable on which the apparatus is mounted, and a plurality of injection heads angularly displaced from one another and adapted to communicate with the mould in succession.

7. Apparatus for the manufacture of footwear substantially as hereinbefore described with reference to Figs. 2 to 15 of the accompanying drawings.

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10 and closure members of different forms each of which is insertible in said cavity, said closure members being rotatable in unison to align any selected one of same with said cavity, and there being means for effecting
15 relative movement of said closure members and said mould to and from one another to close or open said cavity.

2. Apparatus according to claim 1, in which said closure members are mounted on a carrier
20 rotatable about an axis normal to or inclined to the general plane of the open end of said cavity and offset from said open end.

3. Apparatus according to claim 2, in which said carrier comprises a plurality of
25 diverging arms lying on the surface of an imaginary cone.

4. Apparatus according to claim 3, in which only two arms are provided which are arranged at right angles to one another and are rotatable about an axis inclined at 45° to the
30 general plane of the open end of said cavity.

5. Apparatus according to claim 2, in which said carrier carries the closure members in a radial arrangement in one plane parallel to the general plane of the open end of said
35 cavity.

6. Apparatus according to any preceding claim incorporated in an injection moulding machine including a turntable on which the apparatus is mounted, and a plurality of
40 injection heads angularly displaced from one another and adapted to communicate with the mould in succession.

7. Apparatus for the manufacture of footwear substantially as hereinbefore described
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