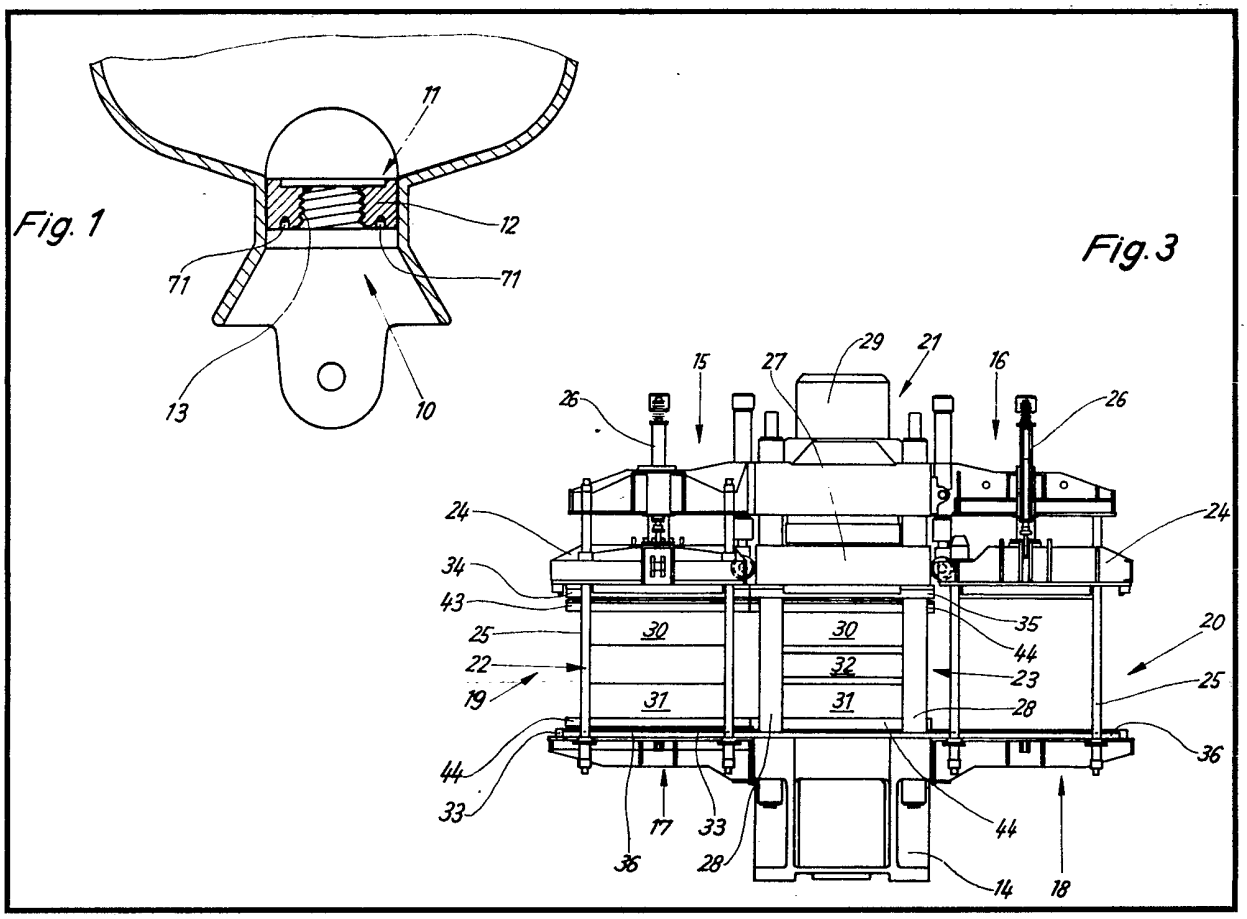
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(54) Moulding hollow articles

(57) A hot-water bottle with an opening 10 is made by joining together and completing the curing of previously-made partially cured part-mouldings around a separately-made neck insert 11 which has an elastomer body 12 moulded around a screw-threaded metal sleeve 13. In the body 12 are recesses 71 for engagement by locating pins.

For making such bottles an apparatus comprises a central injection-moulding station 21, two vulcanising stations 19 and 20, and two mould sets 22 and 23, the latter moving alternately and sequentially to-and-fro between the station 21 and a respective station 19 or 20. A core 32 is common to both mould sets and remains in the station 21. Each mould set comprises an upper mould 30 and a lower mould 31, secured respectively to carrier plates 34, 35 and 33.



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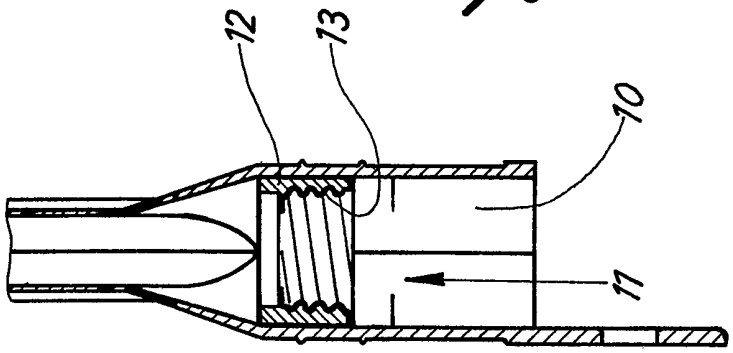


Fig. 2

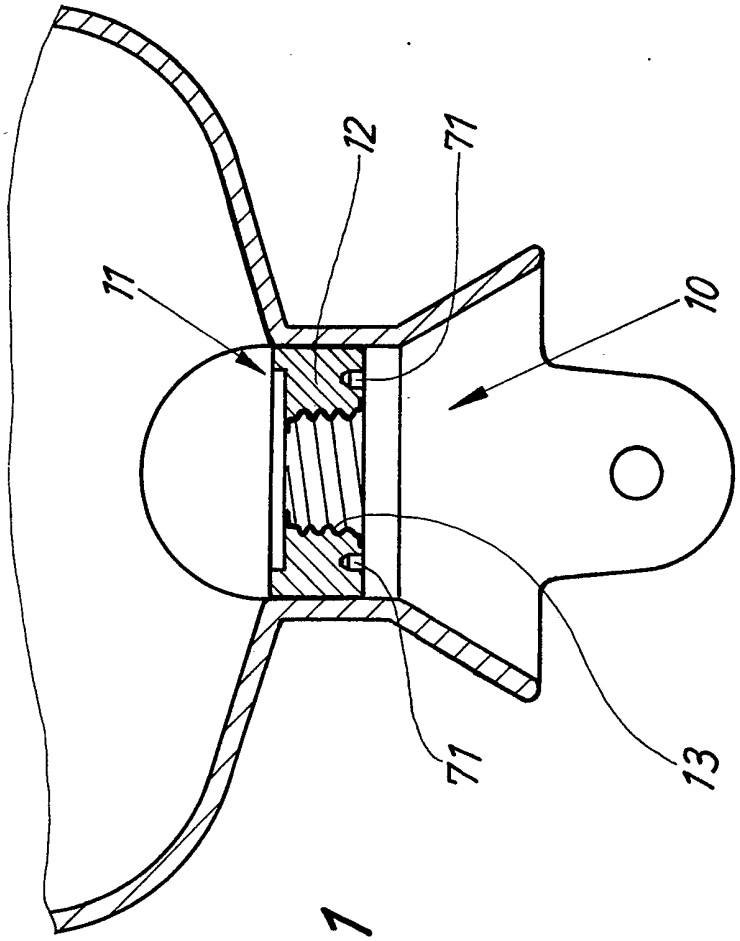


Fig. 1

Fig. 3

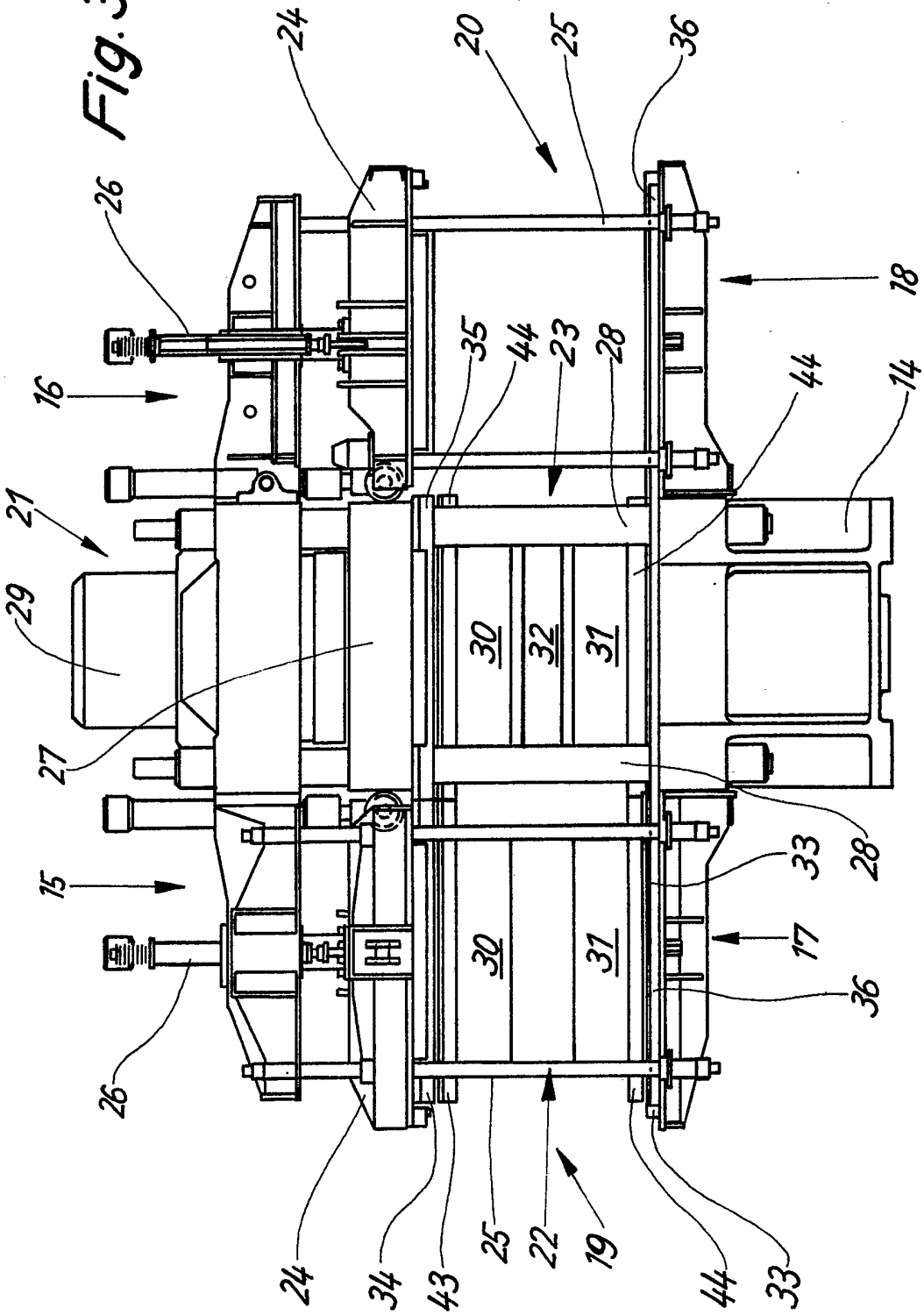
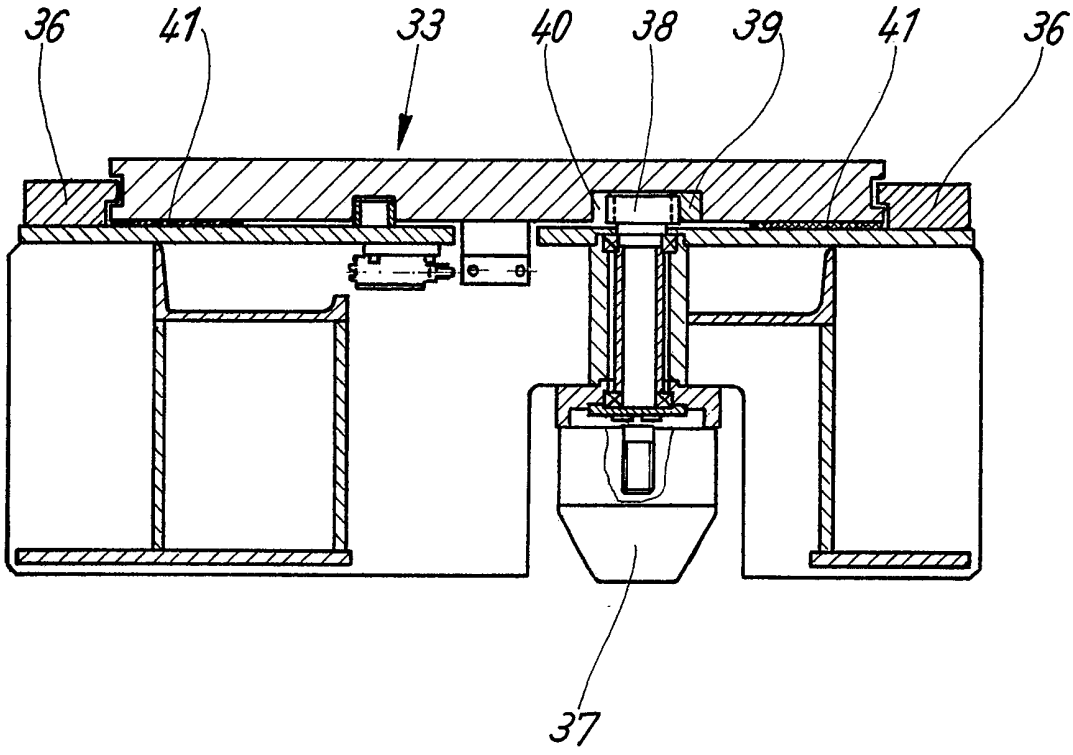

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Fig. 4



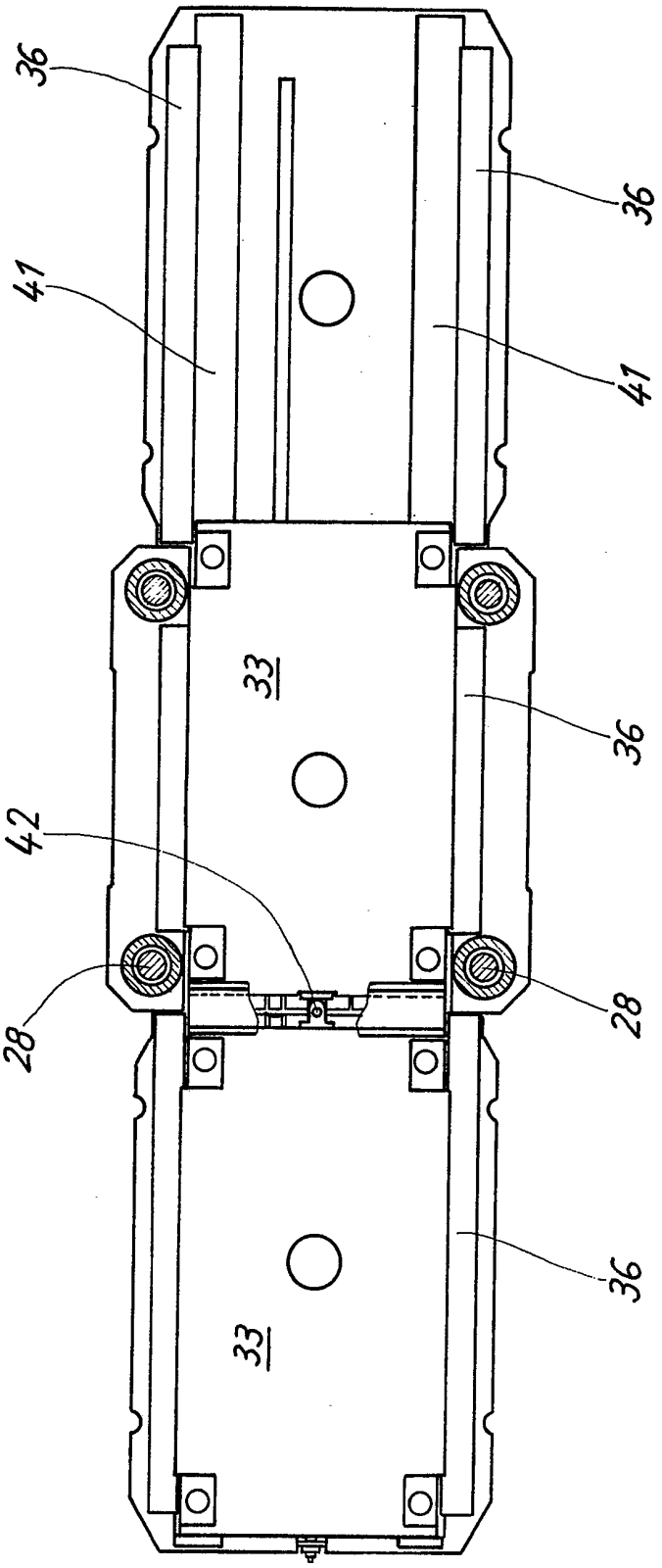


Fig. 5

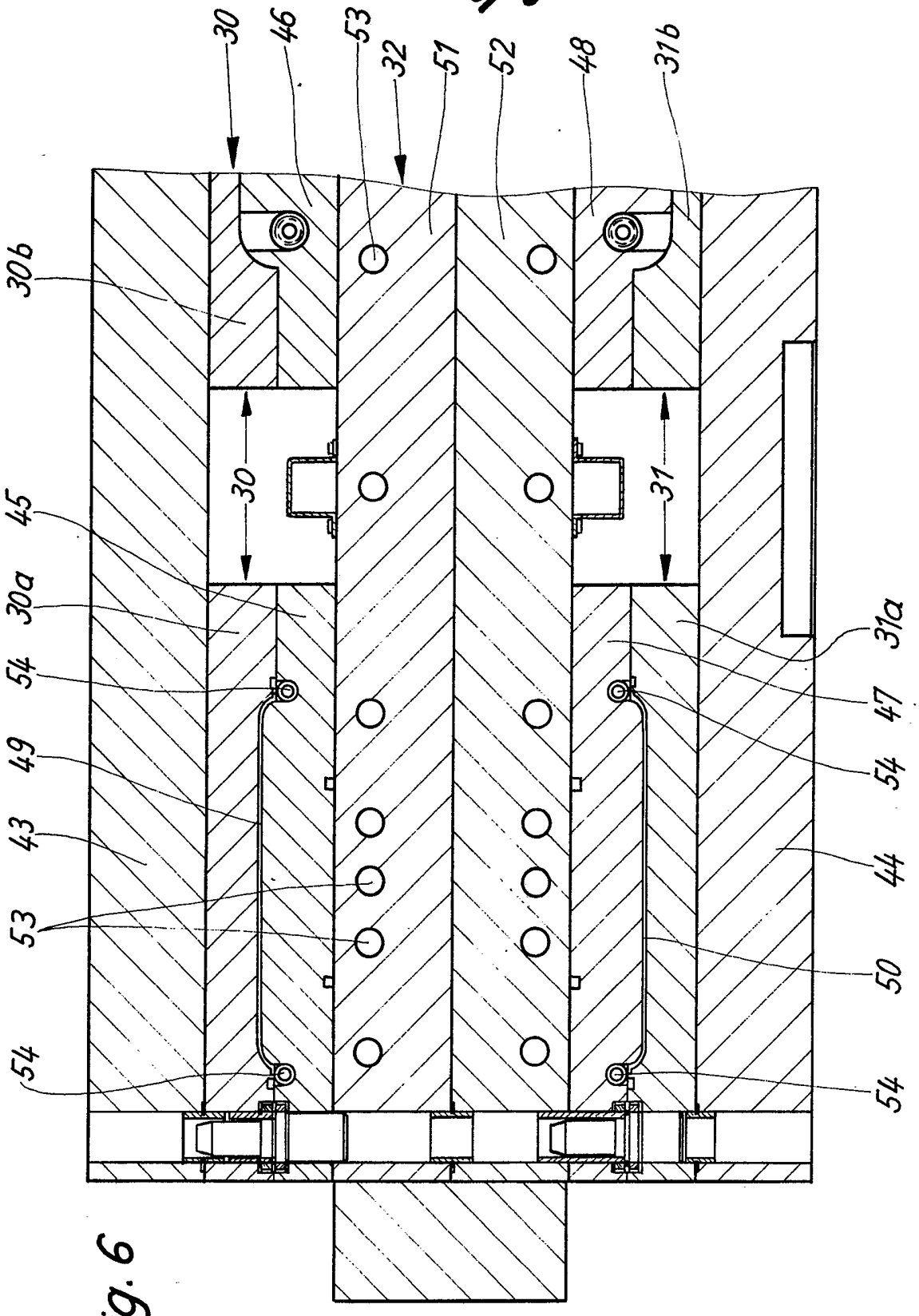
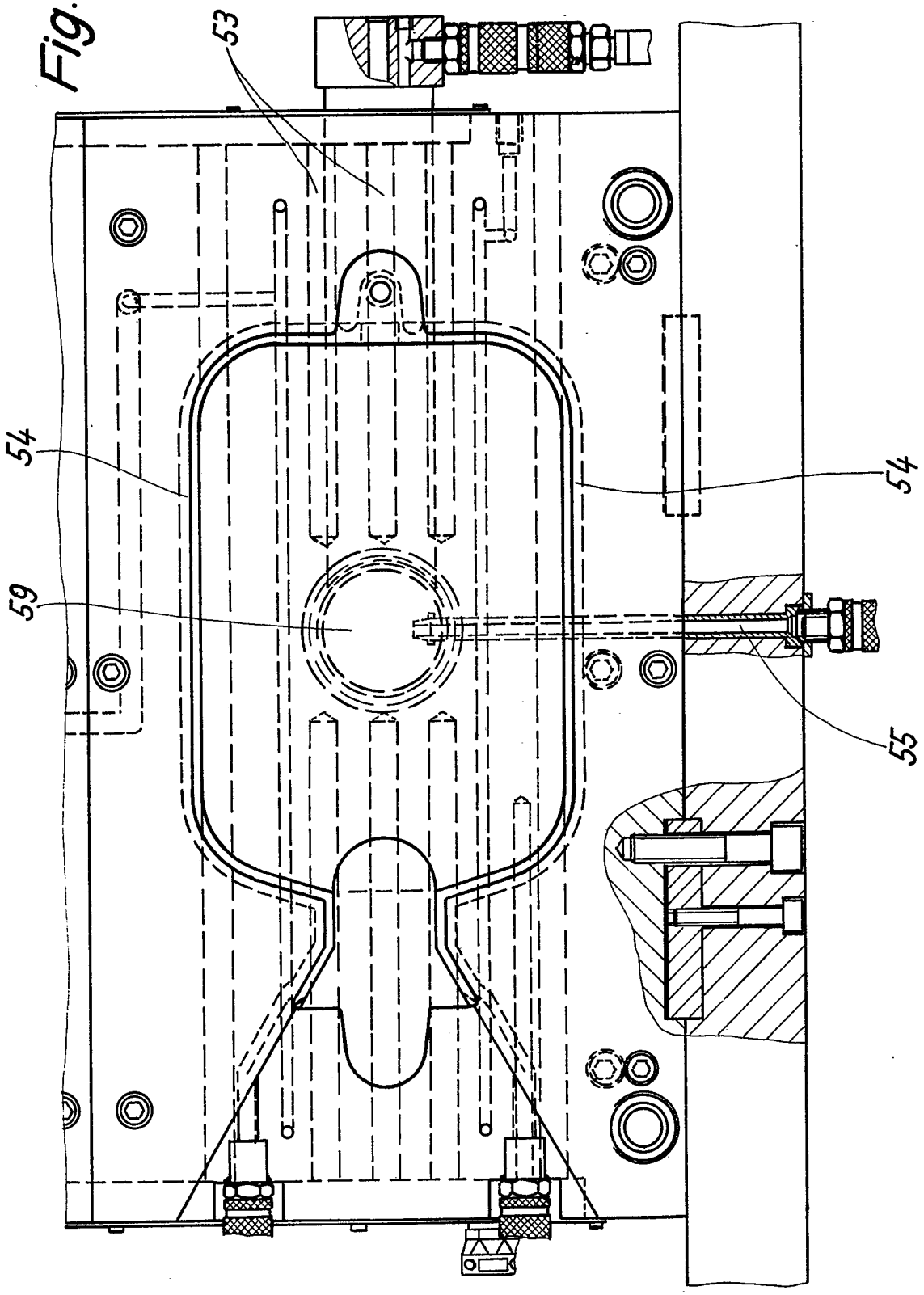

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Fig. 6

Fig. 7



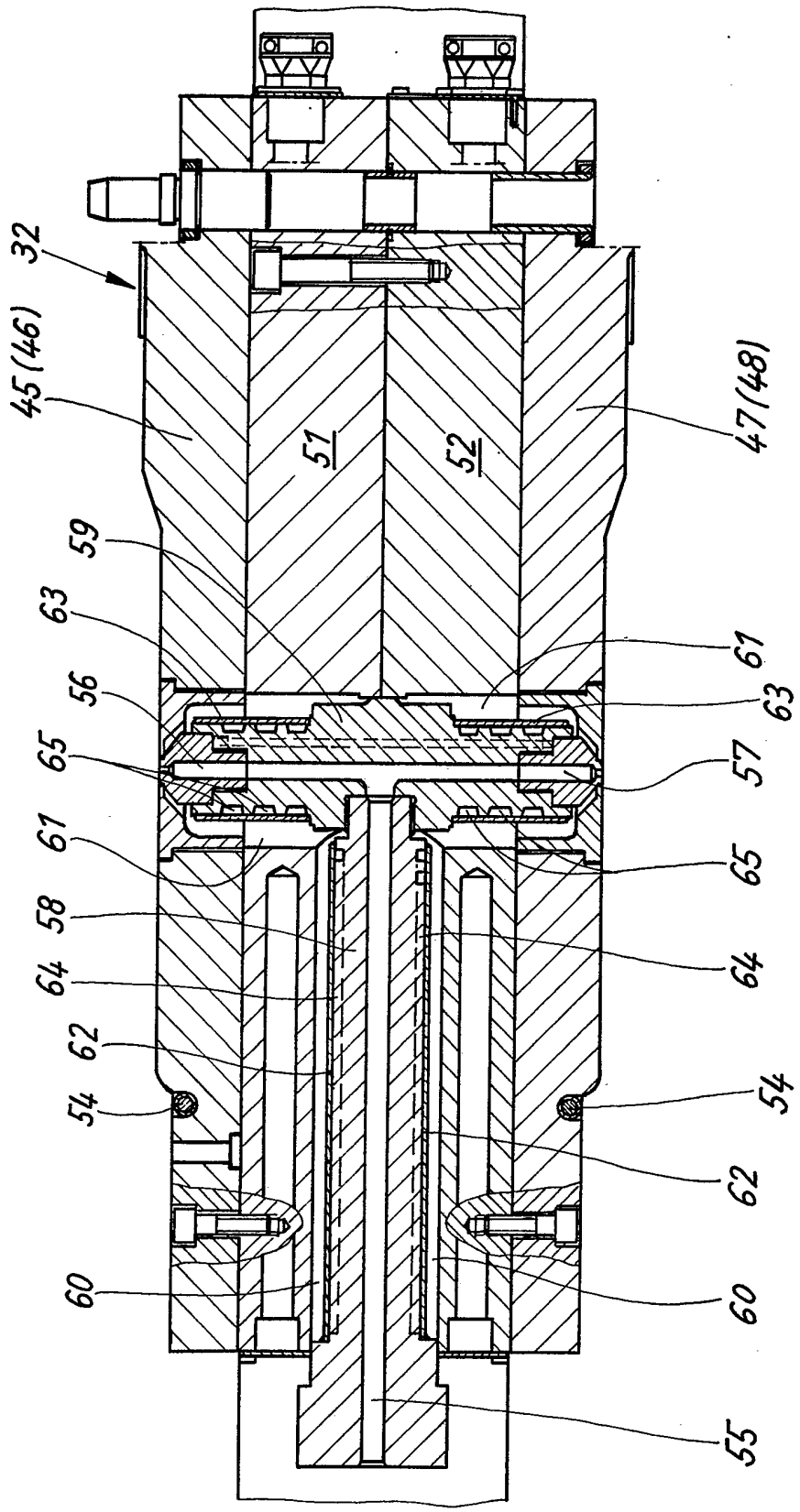
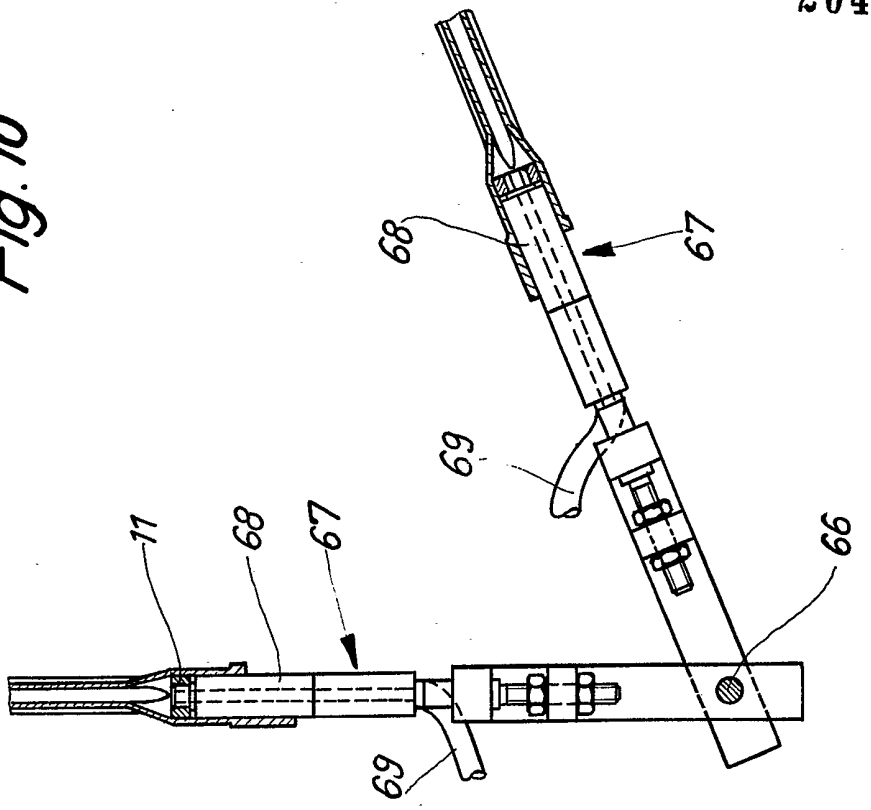

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Fig. 8

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Fig. 10



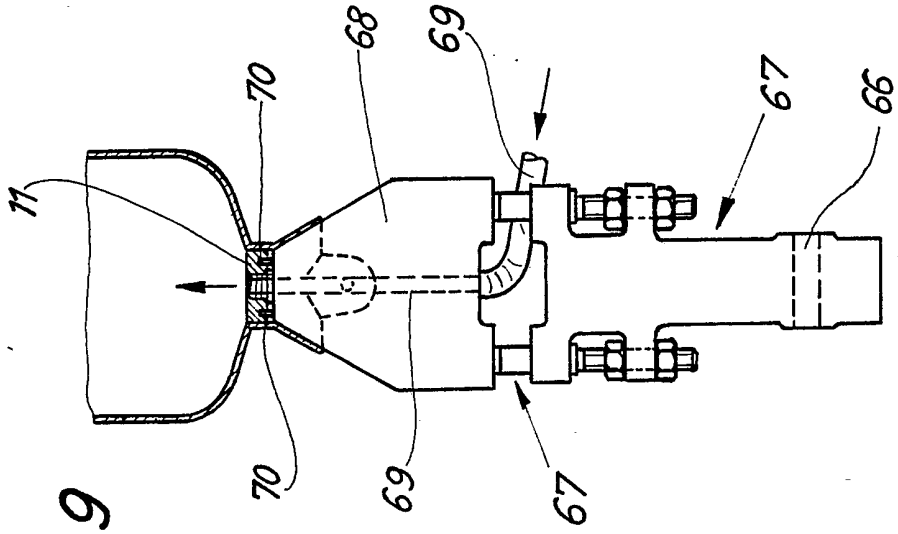


Fig. 9

SPECIFICATION

A method of and apparatus for making hot-water bottles or other hollow articles of polymers

The invention relates to a method for producing hollow articles, especially hot-water bottles, from polymer materials, especially elastomers (rubber), by pre-shaping and pre-setting of partial mouldings, especially hollow body halves, and subsequent joining together and curing thereof. The invention further relates to an apparatus comprising an injection-moulding assembly for the pre-moulding of the hollow articles halves by injection-moulding, and an apparatus for joining together and curing, especially completion of vulcanisation of the moulding.

In the production of hollow articles from elastomer materials it is already known to produce two hollow article halves simultaneously but separately from one another by injection-moulding. The partial mouldings are then merely pre-set, namely partially vulcanised. Subsequently the hollow article halves are joined together with the free edges and connected with one another by completion of vulcanisation.

The apparatus for carrying out this method consists of two component moulds, each with a mould pocket to receive a hollow article half. Between the component moulds a core is arranged which separates the component moulds from one another and at the same time defines the mould cavities for the hollow article halves. After the production of the hollow article halves by injection-moulding the component moulds are withdrawn from the core and the latter is conveyed out of the region between the component moulds. Now the component moulds are brought together, whereby the free edges of the hollow article halves come into connection with one another. The moulding is now completed and hardened by completion of vulcanisation. During this phase compressed gas is introduced into the hollow article.

This known apparatus is expensive in handling and not capable of high production. The production of a finished hollow article requires two successive working steps. Furthermore sprecial requirements in the manufacture of special hollow articles, especially hot-water bottles, are not taken into account.

The invention is based upon the problem of further developing and improving a method and an apparatus for the production of hollow articles having the initially stated features, to such effect that the output is increased without faster working cadences, and that especially hot-water bottles can be manufactured rationally.

To solve this problem the method according to the invention is characterised in that in the joining together of the hollow article halves insert pieces, especially a separately manufactured hot-water bottle mouthpiece, are introduced between these halves and are connected with the latter by curing, especially completion of vulcanisation of the joined-together hollow article halves.

This proposal of the invention aims especially at the manufacture of hot-water bottles. These must be provided with a special insert piece which accommodates a usually metallic threading piece. According to the invention for the introduction of this mouthpiece no special working step is needed. In the bringing together of the halves of the hot-water bottle the mouthpiece, appropriately held ready, is accommodated in the exact relative position. The mouthpiece is integrated into the hollow article by the completion of vulcanisation of the hollow article halves.

The apparatus according to the invention which is suitable for the production of hollow articles by injection-moulding and vulcanising together is formed in a special manner. In accordance with the invention in this apparatus a closure assembly, especially a vulcanising press, is allocated on each of two opposite sides to one injection station common to all component moulds, to which assembly the component moulds can be fed in such a way that in each case one group of component moulds is accommodated in the injection assembly and another group in the one or the other vulcanising press.

Such an apparatus is capable of working with high production capacity. The component moulds provided with part mouldings by injection-moulding are driven out of the injection-moulding assembly into one of the immediately adjacent vulcanising presses. At the same time the insertion of a group of the previously emptied and prepared component moulds into the injection assembly takes place, for charging with material for part mouldings. The two groups of component moulds are accordingly conveyed alternately out of the injection assembly to the one side or the other. Thus with each working cycle at least one moulding is completed, namely by vulcanising together, and a next moulding is prepared, namely by injection-moulding of the part mouldings.

Further features of the invention relate to the development of a table to such effect that the component moulds, arranged on carrier plates or the like; are transversely displaceable when the injection assembly is opened and the vulcanising presses are likewise opened.

Features of the invention further relate to the formation of the component moulds or moulds including the core for the component moulds.

Finally an apparatus is proposed with which, in the manufacture of hot-water bottles or similar mouldings, insert pieces can be held

ready in exact relative position in the region of the vulcanising presses.

The invention will be explained in greater detail below by reference to examples of embodiment thereof which are illustrated in the accompanying drawings, wherein:—

Figure 1 shows the stopper end of a hot-water bottle, in horizontal section,

Figure 2 shows a section, turned through 90°, of the detail of the hot-water bottle according to Fig. 1,

Figure 3 shows the apparatus for the production of hollow articles, especially hot-water bottles, in diagrammatic lateral elevation,

Figure 4 shows a detail of the apparatus according to Fig. 3 in cross-section, on an enlarged scale,

Figure 5 shows a plan view and horizontal section of the apparatus according to Figs. 3 and 4,

Figure 6 shows an associated group of component moulds with one common core, in vertical section on an enlarged scale,

Figure 7 shows a part region of a mould or group of component moulds in plan view,

Figure 8 shows the vertical section, turned through 90° in comparison with Fig. 6, through a core of a group of component moulds,

Figure 9 shows a detail of the apparatus, namely a retainer for an insert piece, in diagrammatic plan view,

Figure 10 shows the apparatus acccording to Fig. 9 in diagrammatic lateral elevation, in two different positions.

In the drawings, in Figs. 1 and 2 parts of hot-water bottles, namely the zones adjacent to an opening 10, are shown in two sections. Hot-water bottles are mouldings which can be produced preferably, but not exclusively, by the form of embodiment of an apparatus which is to be described in detail hereinafter.

The particular feature of these mouldings consists in that an insert 11, consisting of a body 12 of rubber or the like filling the cross-section of the opening 10 and a metallic threading piece 13 arranged centrally therein, is secured in the opening 10 of the moulding. The insert piece 11 is here connected with the hot-water bottle by vulcanisation or completion of vulcanisation of the bottle.

The apparatus for producing hot-water bottles or other hollow mouldings by injection-moulding consists according to Figs. 3 *et seq* of several stations assembled into one unit. A common central pedestal 14 is provided with upper and lower laterally protruding carrier arms 15, 16 and 17, 18. The mutually opposite carrier arms 15 and 17 on the one hand and 16 and 18 on the other form the carrier structure for two vulcanising stations 19 and 20. The middle region of the apparatus is an injection station 21. In this at least two moulding halves, four in the present example of embodiment, are produced by injection-moulding at each injection stroke and pre-hardened or pre-vulcanised. The moulding halves then pass alternately into the vulcanising station 19 or 20 and are completely vulcanised or cured therein, with joining together. In the production of hot-water bottles the insert piece 11 is introduced in the region of the vulcanising stations 19, 20 before the moulding halves are brought together.

In the present case the installation is equipped with two mould sets 22, 23. These are brought by transverse conveying alternately into the injection station 21 or into one of the vulcanising stations 19, 20.

The vulcanising stations 19, 20 are assembled in priniciple in known manner. An upper transverse member 24 is in each case movable upwards and downwards on upright guide rods 25, namely by a central pressure medium cylinder 26. The guide rodes 25 are each anchored in the upper and lower carrier arms 15, 17 and 16, 18.

Quite correspondingly the injection station 21 is equipped with an upper presser plate 27 which is movable on upright rods 28. The closure pressure is applied to the presser plate 27 by a pressure medium cylinder 29.

The mould sets 22, 23 are of multi-part information. Between an upper mould 30 and a correspondingly formed lower mould 31 in the region of the injection station 21 there is arranged a core 32 which is likewise multi-part in the present case. While accordingly the upper mould 30 and lower mould 31 are movable to and fro in alternation between the injection station 21 and the vulcanising stations 19, 20, the core 32 always remains in the region of the injection station 21 and accordingly serves as an alternating supplement for both mould sets 22, 23.

The lower part of the installation, consisting of the pedestal 14 and the carrier arms 17, 18, is equipped with a slider device. A carrier plate 33, divided in the present example of embodiment, is transversely displaceable on the carrier structure. On this plate again the lower moulds 31 of the mould sets 22 and 23 are accommodated with appropriate distance from one another. When the apparatus is open the carrier plate 33 is driven on the lower structure in the one or the other transverse direction so that the one or the other lower mould 31 is driven into the injection station 21 or out of it. The carrier plate 33 can be of one-piece formation.

In the region of the upper moulds 30 in the present case there are provided two mutually independent carrier plates 34 and 35. These each receive an upper mould 30 of the mould sets 22, 23. The upper carrier plates 34 and 35 are driven transversely in the one and in the other direction with the upper moulds 30 fitted thereon, likewise in common or individually. For this purpose the transverse members 24 and the presser plate 27 are

lifted, when the moulds are opened, so far that the upper mould 30 and the likewise raised core 32 are at a distance from one another and from the unlifted lower mould 31 which permits the transverse movements. Due to the absence of the core 32 in the region of the vulcanising stations 19 and 20, the upper moulds 30 are here lowered further, namely into immediate abutment on the lower mould 31. For this purpose a mutually independent movement of the upper carrier plates 34 and 35 is necessary.

The assembly of the (lower) sliding table is visible in greater detail from Figs. 4 and 5. On the pedestal 14 and the carrier arms 17 and 18 there are fitted lateral guide rails 36. The carrier plate 33 is accommodated in these with shape-engaging lateral guides. The drive of the carrier plate 33 here is effected by a hydraulic motor 37 driving a pinion 38. The latter again meshes with a rack 39 which is let into a longitudinal groove 40 on the under side of the carrier plate 33. The carrier plate 33 also slides on pads 41 of strip form of a suitable material.

As may be seen from Fig. 5 here the carrier plate 33 is formed from two component plates connected with one another by a disengageable coupling 42 and allocated each to a station. The two component plates are driven as a unit, namely as a carrier plate 33 in common, but can also be handled individually after the coupling 42 is released.

The assembly and function of the upper carrier plates 34, 35, that is those for the upper moulds 30, are of special significance. The carrier plates 34, 35 are mobile similarly to the lower carrier plate 33 in guide rails which are arranged on the under side of the transverse members 24, for the vulcanising stations 19, 20 on the one hand and on the under side of the presser plate 27 of the injection station 21 on the other, as rail sections. For the drive of the carrier plates 34, 35 a separate motor is provided in each case, namely a hydraulic motor in the formation and arrangement of the lower carrier plate 33. The racks of the upper carrier plates 34, 35, which are not visible in detail in the Figures, protrude laterally, namely to the free side in each case, beyond the relevant carrier plate. Thus the rack of each carrier plate 34, 35 always remains in engagement with the associated hydraulic motor, or its piston, the hydraulic motors both being arranged in the region of the vulcanising stations 19, 20. Due to the independent drive for the two upper carrier plates 34, 35 accordingly it is even possible to drive these simultaneously into the two vulcanising stations 19, 20, for example for cleaning and repair purposes.

Details of the mould sets 22, 23 may be seen from Figs. 6 to 8. Here each mould set 22, 23 is formed as double mould. Between upper and lower retaining plates 43, 44, which in turn are connected with the carrier plate 33 ... 35, in each case two upper moulds 30 and lower moulds 31 are accommodated. Each consists of two component moulds 30*a* and 30*b*, 31*a* and 31*b*. The core 32 is situated between these in the region of the injection station 21. This core is provided on the side facing the upper mould 30 and on that facing the lower mould 31 in each case with detachably fitted and therefore replaceable core pieces 45, 46 and 47, 48 respectively. These are formed in correspondence with the adjacent, dish-shaped component moulds 30*a*, 30*b* and 31*a*, 31*b* of the upper mould 30 and lower mould 31. The component moulds on the one hand and core pieces on the other define mould cavities 49 and 50 for the reception of a part moulding each, in the present case a half of a hot-water bottle each. In one common injection stroke accordingly in the present example four moulding halves are produced simultaneously. After termination of the injection stroke the mould set is opened in such manner that the upper and lower component moulds 30*a*, 30*b* and 31*a*, 31*b* remain connected with the associated retaining plates 43, 44. The upper retaining plate 43 is lifted away with the component moulds 30*a*, 30*b*. The core 32 with the core pieces 45 ... 48 follows this lifting movement along a part distance and in a middle height position is halted at a distance both from the component moulds 30*a*, 30*b* and from the lower component moulds 31*a*, 31*b*. By appropriate measures it is here ensured that the moulding halves remain adhering to the upper and lower component moulds 30*a*, 30*b* and 31*a*, 31*b*.

These are the moved with the carrier plates 33 and 34 or 35 out of the region of the injection station 21 and into one of the vulcanising stations 19, 20. Here the component moulds 30*a*, 30*b* and 31*a*, 31*b* with the moulding parts are moved together until they abut on one another. Now the completion of vulcanisation takes place, forming a one-piece moulding.

The core 32 consisting of core plates 51 and 52 with core pieces 45, 46 attached in detachable manner on both sides is formed with a system of elements for the production of different temperature conditions in the individual core parts.

The core plates 51, 52 and the predominant zones of the core pieces 45, 46 are brought by a plurality of heating cartridges 53 in the core plates 51, 52 to a temperature appropriate to the material in each case, so that pre-vulcanisation or cross-linking of the moulding halves is initiated during or after the injection-moulding. In the region of the margins of the moulding halves, that is in the region of the connecting seam to be formed in the next working action, the core pieces 45 and 46 are provided with temperature-moder-

ating passage 54. In these a specific temperature is generated by a suitable liquid medium in such manner that cross-linking of the material and thus curing is largely suppressed in the marginal zone of the moulding halves. Thus the joining together of the moulding halves is facilitated after transference into the vulcanising station 19,20 and the quality of the connection is improved.

In the core 32, namely predominantly in the core plates 51, 52, there extends an injection passage 55 having branches 56, 57 conducted upwards and downwards approximately in the middle zone of the core pieces 47, 48 and opening into the respective mould cavity 49, 50. The said passages 55, 56, 57 are accommodated in passage pieces 58, 59 and formed as cold passages. This has the advantage that the material which remains behind in the injection passage 55 and in the branches 56, 57 after an injection stroke is not cross-linked and thus cured, but can be introduced into the mould cavity 49, 50 at the next injection stroke.

For this purpose the passages or passage pieces 58, 59 are separated from the surrounding parts of the core 32 predominantly by an air gap 60, 61, that is they are insulated. Furthermore the passage pieces 58, 59 are surrounded over their predominant part by a jacket 62, 63 which covers a system of cooling passages 64, 65 to receive a cooling medium. With the aid of this insulation system adequate cooling of the passages 55, 56, 57 is also possible, when the mould is heated.

In the present case two injection units are allocated to the injection station 21, namely one each for mutually opposite component moulds 30*a*, 31*a* and 30*b*, 31*b*. The mould sets 22, 23 are accordingly each provided with two injection passages 55 and branches 56, 57 to which in each case an injection assembly is applied from the sides. This also provides the possibility of making the mould cavities 49, 50 different and/or charging them with different materials.

For the introduction of the insert piece 11 into a hot-water bottle according to Figs. 9 and 10 a special device is provided. In the region of the vulcanising stations 19, 20 a transversely directed spindle 66 extends which is preferably connected at a suitable height with the guide rods 25 on the operating side of the installation. On this spindle 66 a holder 67 to receive the insert piece 11 is pivotably or tiltably mounted. This holder 67 is provided with a conically tapering mouthpiece 68 on the forward end of which the insert piece 11 is held ready. This part of the mouthpiece 68 with the insert piece 11 enters the opening 10 of the moulding. The free end or the end face of the mouthpiece 68 is provided for this purpose with guide elements, namely pins 70, which enter corresponding recesses 71 of the insert piece 11.

The holder 67 is movable between a charging position and a working position, namely in the present case it is pivotable about and by means of the spindle 66. In the upright position (Fig. 10) the finished moulding can be taken from the holder 67 and an insert piece 11 can be fitted. By pivoting into a transverse position or an oblique position (Fig. 10) the holder 67 with the insert piece 11 is brought into the working position. Now in the manner as described the upper mould 30 and lower mould 31 with the moulding halves are brought together, namely by downward movement of the upper mould 30. The holder 67 is then brought out of the oblique position as shown in Fig. 10 into the horizontal position. This corresponds to the closure position of upper mould 30 and lower mould 31 and thus to the position for the completion of vulcanisation and vulcanising together of the hot-water bottle halves. In this position the insert piece 11 is held by the holder 67 exactly in the region of the opening 10 of the hot-water bottle. The insert piece 11 is connected with the moulding by completion of vulcanisation.

In the example of embodiment as illustrated the holder 67 is loaded by springs (not shown) into the oblique position as shown (Fig. 10). In the closing movement of upper mould 30 and lower mould 31 the holder 67 is moved against the loading of the springs into a horizontal position. Thus the object is achieved that in the opening of the mould, namely in the upward movement of the upper mould 30, the holder 67 with the moulding follows the movement into the oblique position. Thus the moulding automatically comes free from the upper mold 30 and lower mould 31.

Accordingly here the holder 67 carries out a double function: On the one hand the purpose is to introduce the insert piece 11 correctly into the region between the halves of the moulding. However this holder 67 also effects the removal of the finished moulding from the mould, namely by automatic detachment of the moulding from the upper mould 30 and lower mould 31.

In the present case the mouthpiece 68 is provided with a pressure-medium conduit 69. A gas, especially nitrogen or water vapour, is forced through this conduit into the moulding during the joining together of the moulding halves and during the completion of vulcanisation. This gas achieves the object that the coreless moulding is supported. The gas is here conducted through the hole in the insert piece 11 and in the threading piece 13 thereof.

CLAIMS

1. A method for producing hollow articles, especially hot-water bottles, from polymer

materials, especially elastomers (rubber) by pre-moulding and pre-setting of part mouldings, especially hollow article halves, and subsequent joining together and curing of these, characterised in that in the joining together of the hollow article halves, insert pieces (11), especially a separately manufactured hot-water bottle mouthpiece, are introduced between these and are connected with the joined-together hollow article halves by curing, especially by completion of vulcanisation, of the latter.

2. A method according to Claim 1, characterised in that the insert piece (11) consists of metal having a jacketing of elastomer material.

3. An apparatus for producing hollow articles, especially hot-water bottles, from elastomer materials, especially rubber, by pre-moulding, preferably injection-moulding, of part mouldings in an injection-moulding assembly having a plurality of mould sets, each consisting of component moulds, and by subsequent joining together of the part mouldings in the correspondingly assembled component moulds, characterised in that on each of two opposite sides a closure assembly (vulcanising station 19, 20) is associated with the injection station (21) common to all mould sets (22, 23), to which assembly component moulds (upper mould 30, lower mould 31) each with a part moulding can be fed in such a way that in each case one mould set (22, 23) is accommodated in the injection station (21) and another mould set (23, 22) is accommodated in the region of one of the vulcanising stations (19, 20).

4. An apparatus according to Claim 3, characterised in that the component moulds of the mould set (22, 23) are coupled in such a way that with the injection station (21) and the vulcanising stations (19, 20) simultaneously opened a mould set (22, 23) can be driven out of the injection station (21) and into a vulcanising station (19, 20), while a common core (32) remaining in the region of the injection station (21) is allocated to the mould sets (22, 23).

5. An apparatus according to Claim 3 or 4, characterised in that the upper mould (30) and lower mould (31) of the mould sets (22, 23) are each secured on an (upper and lower) carrier plates (33; 34, 35) and by means of this can be pushed to and fro between the stations (19, 20, 21).

6. An apparatus according to Claim 5, characterised in that each mould set (22, 23) comprises two or more mould cavities (49, 50) with the corresponding mould parts.

7. An apparatus according to Claim 5 and any one of the further Claims, characterised in that at top and/or bottom, two mutually independently movable or detachably mutually connected carrier plates (34, 35), each for the accommodation of a mould set (22, 23) (upper mould 30, lower mould 31) are transversely mobile.

8. An apparatus according to Claim 3 and any one of the further Claims, characterised in that upper mould (30) and lower mould (31) of a mould set (22, 23) are separated from one another in the injection station (21) by a central core (32), on the upper and lower sides of which core pieces (47, 48) corresponding with the upper mould (30) and lower mould (31) are detachably fitted.

9. An apparatus according to Claim 8 and any one of the further Claims, characterised in that heating cartridges (53) for the heating of the mould sets (22, 23) are arranged in the core (32) formed from core plates (51, 52).

10. An apparatus according to Claim 8, characterised in that the core pieces (47, 48) are provided in the region of the margins of the part mouldings with a temperature-moderating passage (54) extending along the margin.

11. An apparatus according to Claim 3 and any one of the further Claims, characterised in that at least one injection passage (55), formed in the core (32), with branches (56, 57) is formed as cold passage for insulation and cooling media.

12. An apparatus according to Claim 11, characterised in that the injection passage (55) and the branches (56, 57) leading above and below to the mould cavities (49, 50) are each formed in a passage piece (58, 59) which is separated by an air gap (60, 61) from the remaining part of the core (32) and is cooled by cooling passages (64, 65).

13. An apparatus according to Claim 3 and any one of the further Claims, characterised in that a holder (67) for the moulding is allocated to each of the vulcanising stations (19, 20) in such manner that when the mould set (22, 23) is opened, especially by lifting away of the upper mould (30), the finished and completely vulcanised moulding is detachable by the holder (67) from the mould set (22, 23)—upper mould (30) and lower mould (31).

14. An apparatus according to Claim 13, characterised in that the insert piece (11) for introduction into the mould is held by the holder (67) in the region of the vulcanising station (19, 20) at a level between the upper mould (30) and lower mould (31) in their closure position, in such manner that the insert piece (11) is situated in the region of the opening (10) of the moulding.

15. An apparatus according to Claim 13, characterised by a spindle (66) extending between upright guide rods (25) for the pivotable reception of the holder (67).

16. An apparatus according to any one of Claims 13 to 15, characterised in that the holder (67) is loaded by springs or the like into a position detaching the moulding from upper mould (30) and lower mould (31),

especially an oblique position.

17. An apparatus according to Claim 13 and any one of the further Claims, characterised in that a gas, especially nitrogen or water vapour, can be blow through the holder (67) and the insert piece (11) into the moulding.

18. A method for producing hollow articles, especially hot-water bottles, substantially as hereinbefore described.

19. An apparatus for producing hollow articles, especially hot-water bottles, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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