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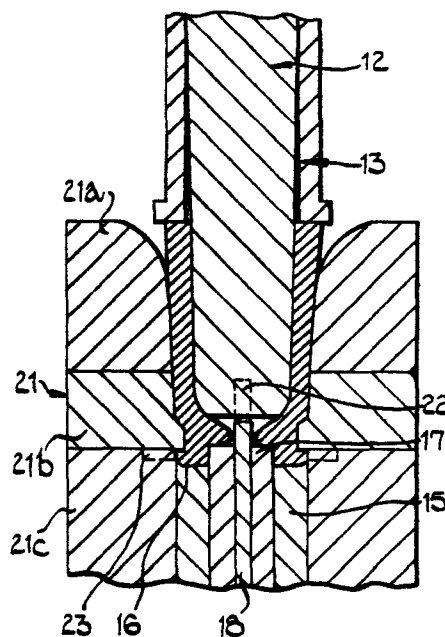
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⑤ **Process for producing tubular articles.**

⑤ A process for the manufacture of a tubular metal container or vessel, such as a shell or cartridge case, in which an open-ended hollow metal tube (10) is mounted on a mandrel (12), and in which the mandrel (12) and a forming punch (17) are moved relative to one another in a die (21) such that the metal at one end of the tube (10) is displaced inwardly from around the circumference of the tube to form a central hole at the said end of the tube, the displaced metal being formed with an external recess or pocket communicating with the said hole.



EP 0 000 438 A1

This invention relates generally to a process for producing tubular articles which are closed or partially closed at one end to form a tubular vessel or container. The invention is particularly concerned with a process for the manufacture of shell and
5 cartridge cases.

A known process for the manufacture of shell and cartridge cases consists of stamping a disc from a brass sheet, forming the disc into a tube closed at one end, progressively drawing the tube to the required
10 length, stamping a primer pocket in the base of the tube, and finally drilling a hole through the base of the tube, the drilled hole communicating with the pocket to form a primer vent. Such a process involves several different operations and is therefore time
15 consuming and relatively expensive. Moreover, the tube is extended to three or four times its original length and it must therefore be annealed during the drawing process.

In accordance with the present invention a
20 process for the manufacture of a tubular metal container or vessel comprises mounting an open-ended metal tube on a first forming tool and relatively moving the first forming tool and^a/second forming tool such that the metal at one of the tube is displaced inwardly around
25 the circumference of the tube to close or partially close that end of the tube.

When forming a shell or cartridge case by a process embodying the invention, the inwardly displaced metal forms a central hole at the said end of the tube and the relative movement of the forming tools simultaneously forms an external recess or pocket in the displaced metal, the recess or pocket communicating with the said hole.

In a preferred embodiment of the invention the tube is mounted on a mandrel and the second forming tool consists of a die and a punch.

By way of example only, a process embodying the invention will now be described with reference to the accompanying drawings in which:

Figs. 1 - 4 represent diagrammatically a sequence of steps in the formation of a cartridge case.

Referring first to Fig.1, an annealed brass tube 10 is shown inserted into a three-part die 21. The tube 10 is mounted on a spring loaded mandrel 12. A sleeve 13 surrounding the mandrel 12 is provided with an outer collar (not shown) which prevents the wall of the tube 10 deforming as the tube is progressively necked in the die parts 21a and 21b.

The die part 21c has a punch 15 slidably received therein. The face 16 of the punch 15 includes an annular projection 17 having an outer diameter substantially equal to the internal diameter of the necked

portion of the tube 10. A pin 18 is slidably received in the central hole of the projection 17.

Once the tube 10 has been necked as shown in Fig.1, the next step in the process is shown in Fig.2. The mandrel 12 and the punch 15 are moved toward one another with the pin 18 locked in a position protruding above the annular projection 17. As the punch engages the necked portion of the tube 10, the metal of the tube 10 is displaced inwardly through substantially 90°. This is the only space available into which the metal can flow when compressed between the mandrel 12 and the surface 16 of the punch 15. The pin 18 finally enters the hole 22 in the mandrel 12 as shown in Fig.4. The resulting distribution of metal at the bottom of the tube 10 provides a base which includes a recess or pocket having a shape corresponding to the projection 17 and which further includes a hole corresponding to the shape of the pin 18, this hole communicating with the recess and being positioned centrally thereof.

The pocket thus forms the conventional primer pocket for receiving a primer charge when the tube 10 has been drawn and filled with a propellant mixture for the cartridge projectile.

The tube 10 is drawn to about two or three times its length by means of the swaging die 19 as shown in Figs. 3 and 4. In these figures the angles

of the swaging work faces are exaggerated. The final motion of the swaging die 19 over the shoulder 20 of the mandrel 12 automatically trims the tube 10 to the required length.

If it is required to form the head of the
5 cartridge with an external projecting rim or flange (such cartridges being known as "rimmed" cartridges), the die 14 is recessed as shown in dashed outline in Fig.2, and the mandrel is displaced an extra distance. This additional movement of the mandrel
10 displaces metal into the recess 23 and thus forms the projecting rim.

The required variation in wall thickness for a particular case can, if the case is short, be provided by the final motion of the die. Larger cases
15 may be swaged by reverse motion of the die.

The manufacture of a shell case can usually be accomplished with a single die in a one stage operation. However, for a case of bottle-neck design, a second die is used to neck and trim the case to the correct
20 length.

C L A I M S

1. A process for the manufacture of a tubular metal container or vessel characterised by mounting an open-ended metal tube on a first forming tool and relatively moving the first forming tool and a
5 second forming tool such that the metal at one end of the tube is displaced inwardly from around the circumference of the tube to close or partially close that end of the tube.

2. A process for the manufacture of a shell or
10 cartridge case characterised by forming the metal at one end of an open-ended hollow metal tube such that the metal is displaced inwardly from around the circumference of the tube to form a central hole at the said end of the tube, and simultaneously forming an external
15 recess or pocket in the displaced metal, the recess or pocket communicating with the said hole.

3. A process for the manufacture of a shell or cartridge case characterised by mounting an open-ended hollow metal tube on a mandrel and relatively moving
20 the mandrel and a forming punch in a die such that the metal at one end of the tube is displaced inwardly from around the circumference of the tube to form a central hole at the said end of the tube, the displaced metal being formed with an external recess or pocket
25 communicating with the hole.

4. A process according to Claim 3 further characterised in that, before forming the said hole, the tube is initially necked by relatively moving the mandrel and the die.

5. A process according to Claim 3 or Claim 4 further characterised in that, after forming the said hole, the body of the tube is swaged by relatively moving the mandrel and a swaging portion of the die.

6. A process according to Claim 5 further characterised in that the tube is automatically trimmed to length in response to movement of the swaging die over a shoulder in the mandrel.

Fig 1

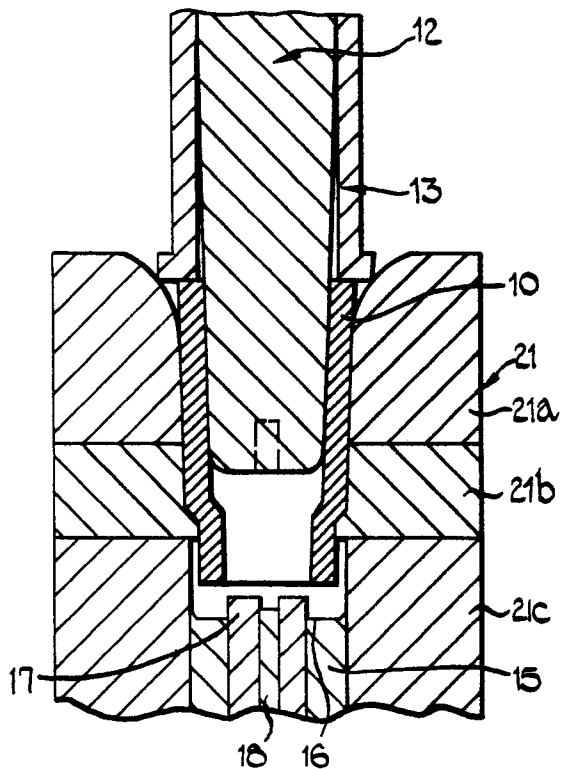


Fig 2

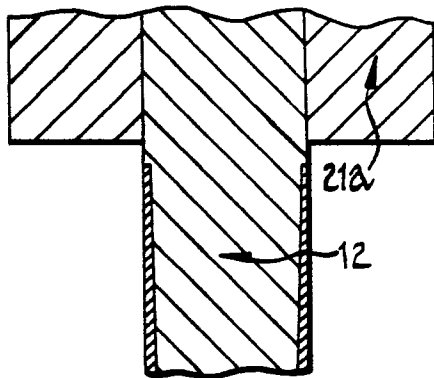
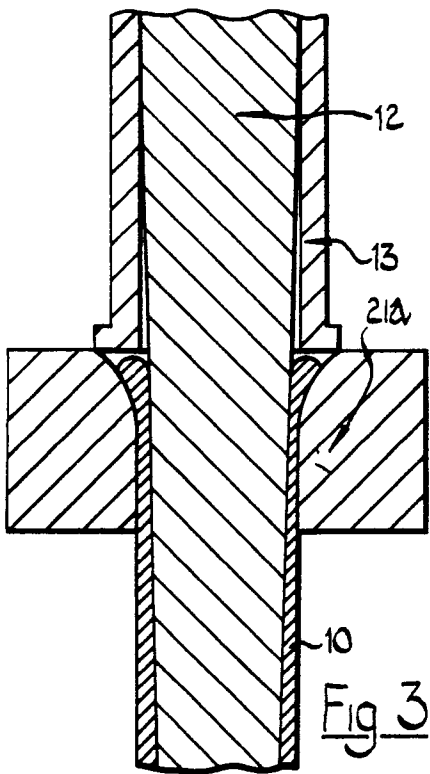
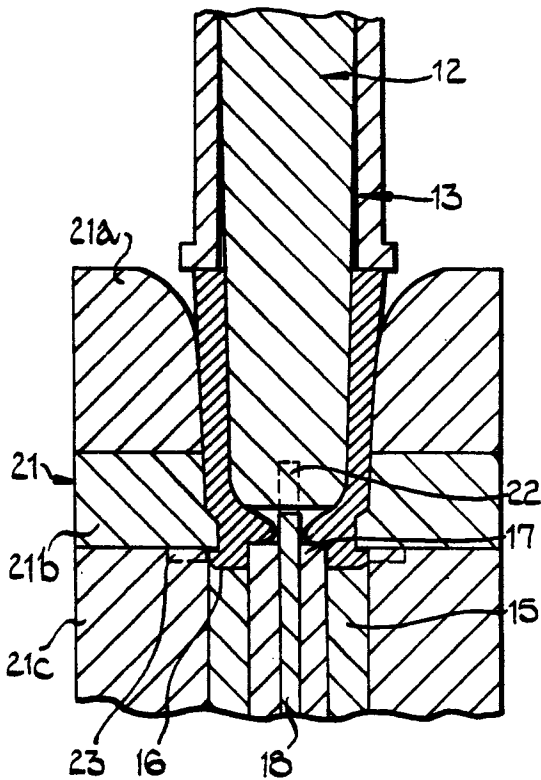
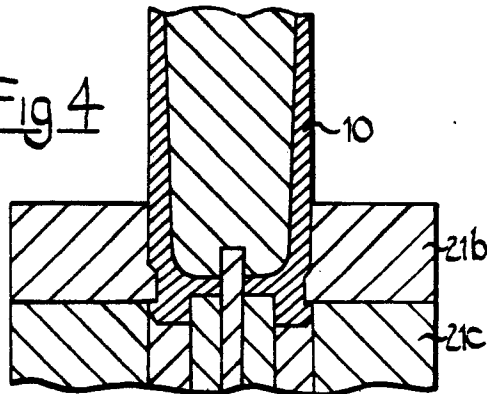


Fig 4





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>BE - A - 514 800 (BARKWAY)</u> * Page 2, line 23 to page 3, line 8; claims; figure * --	1-3	B 21 D 51/54 B 21 K 21/14
X	<u>US - A - 2 089 912 (BIGINELLI)</u> * Page 1, right-hand column, lines 7-23; claims; figures * --	1	
	<u>DE - C - 893 936 (LEUSSLER)</u> * Page 2, lines 17-33; claims; figures * --	1, 2, 4	
	<u>CH - A - 178 286 (BIGINELLI)</u> * Claim; figures 13 to 24 * --	1	
	<u>GB - A - 931 768 (BARKWAY)</u> * Claim 1; figures * --	1	
	<u>GB - A - 779 730 (BARKWAY)</u> * Claims 1,8; figures * --	1-3	
	<u>US - A - 3 948 073 (LOVELL)</u> * Column 6, line 42 to column 7, line 20; figures 6 to 8 * ----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.)
			B 21 K 21/14 B 21 K 21/12 B 21 K 21/06 B 21 K 21/04 B 21 D 51/54
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
Place of search The Hague			
Date of completion of the search 18-09-1978			
Examiner THE			

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The present search report has been drawn up for all claims