United States Patent [19]

Hilgenbrink

[11] **3,845,653**

[45] **Nov. 5, 1974**

[54] **DOUBLE STAGE NECKING**

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[22] Filed: **Jan. 5, 1973**

[21] Appl. No.: **321,224**

Related U.S. Application Data

[62] Division of Ser. No. 126,681, March 22, 1971, Pat. No. 3,786,957.

[52] **U.S. Cl.** **72/354**

[51] **Int. Cl.** **B21d 19/02**

[58] **Field of Search** ..... 113/1 C, 120 R, 120 AA; 72/354, 356

[56] **References Cited**

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[57] **ABSTRACT**

This disclosure relates to the necking-in of can bodies for the purpose of applying smaller diameter or special ends thereon. Previously experienced extreme difficulties in properly necking-in can bodies have been eliminated by first necking-in a larger than normal end portion of a can body to an intermediate diameter and then utilizing tooling for performing the desired necking in operation to further neck-in the extreme end portion only of the previously necked-in longer end portion.

1 Claim, 4 Drawing Figures

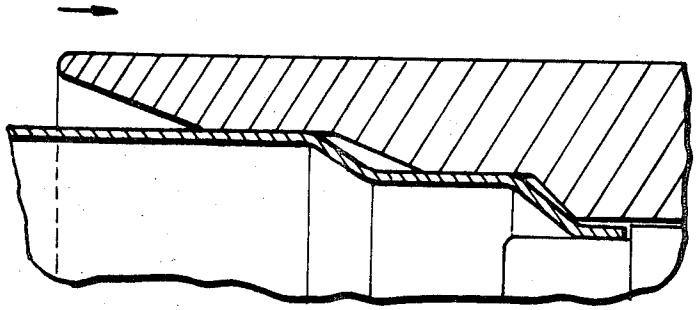


FIG.1

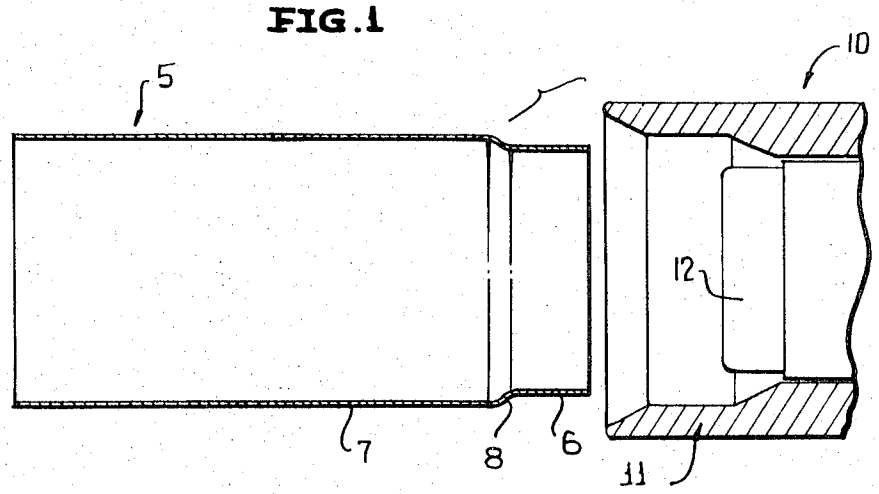


FIG.2

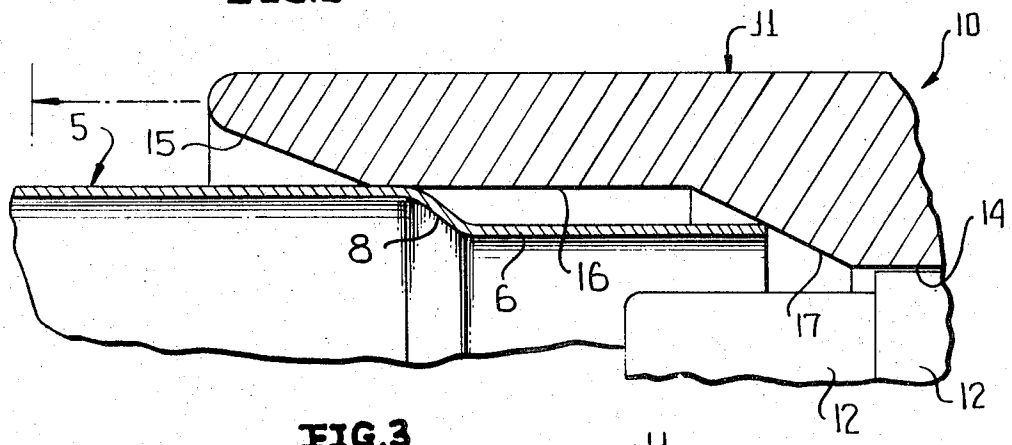


FIG.3

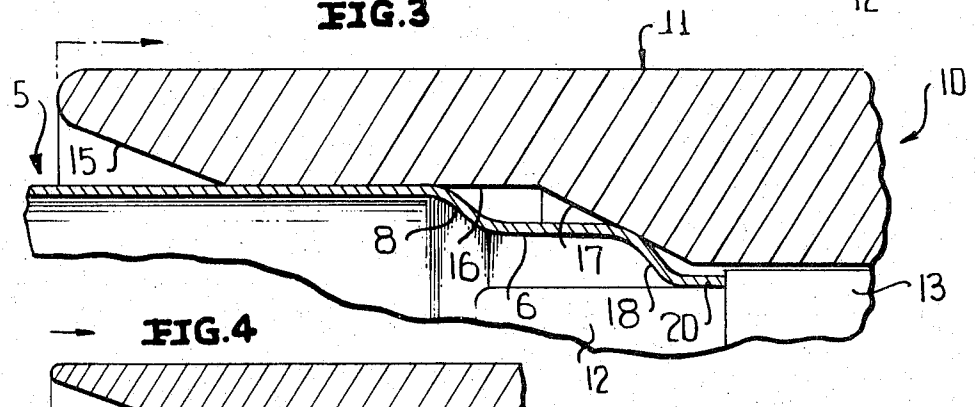
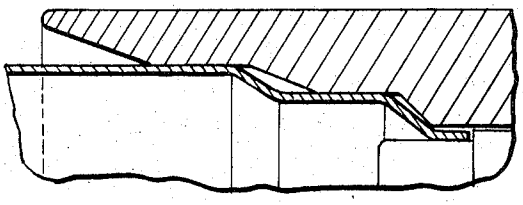


FIG.4



DOUBLE STAGE NECKING

This application is a divisional of Ser. No. 126,681 filed Mar. 22, 1971 now U.S. Pat. No. 3,786,957, issued Jan. 22, 1974.

This invention relates in general to new and useful improvements in the manufacture of containers and more particularly to the necking in of end portions of can bodies for either the reception of smaller than usual ends or special ends.

BACKGROUND OF THE INVENTION

Although it has been known for many years that it may be advantageous to neck-in end portions of can bodies for the reception of smaller diameter closures, only recently has there been a true commercial development of can bodies having necked-in end portions for the receipt of smaller diameter closures. However, extreme difficulties have been encountered. It is well known that tubular bodies may have the end portions thereof expanded inasmuch as metal will stretch. On the other hand, it is extremely difficult to compress metal.

It has been found that utilizing conventional necking dies, when extreme end of a tubular member, such as a can body, engages the sloping surface of the die, wrinkling immediately occurs. These wrinkles, when the necked-in end portion of the can body is later outwardly flanged or curled as part of a double seaming operation, are normally stretched, but minute cracks may occur either during the flanging operation or during the double seaming operation.

It is also been found that when the can body side seam construction is such that it must be coated with a side stripe, during the necking operation, the applied side stripe has a tendency to peel, particularly on the inner surface of the can body, with the result that the can body, after being necked-in, has an improper coating.

While diligent efforts have been made, and with a large degree of success, to commercially neck-in can bodies so that after the closures have been applied thereto the double seam between the can body and the closure will be disposed within the axial projection of the main portion of the can body, extreme difficulties have been experienced in further necking-in can bodies for the reception of even smaller closures, particularly closures of the aerosol type.

SUMMARY OF THE INVENTION

In the solution of the problem, dies for necking-in the end portions of can bodies to the desired reduced diameter were first constructed in accordance with prior commercially successful dies for the necking-in of like can bodies to a slightly larger diameter. However, these dies met with immediate failure. These failures were in the form of severe wrinkle formations in the neck and shoulder area of the necked-in end portions.

In view of the difficulties experienced in commercially necking-in can bodies to the larger diameter, it was thought that once the can bodies have been necked-in to the larger diameter, an ultimate necking-in operation had been performed on the particular can body. However, it was discovered that by first necking-in the can bodies to a larger than desired diameter on the order of or slightly greater than one-half the total desired reduction, and necking-in the end portion to a

greater length, these necked-in can bodies could then be worked upon by the previously formed dies with a portion only of the peviously necked-in end portion being successfully necked-in to the desired smaller diameter.

The net result of the double necking-in operation is one which met with commercial success and wherein the end portion of the can body which was necked-in had an intermediate portion of an intermediate diameter and there being two shoulders formed in the end portion. These shoulders, however, added to the decorative appearance of the can body.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

IN THE DRAWINGS:

FIG. 1 is a schematic sectional view showing a can body having a previously necked-in end portion about to be further necked-in in accordance with this invention.

FIG. 2 is an enlarged fragmentary sectional view showing the can body entered into the die.

FIG. 3 is an enlarged fragmentary sectional view similar to FIG. 2 and shows the die and the can body fully telescoped with the necking operation completed and the can body and die ready to be separated.

FIG. 4 is a fragmentary sectional view similar to FIG. 3 and shows a modified form of die.

Referring now to the drawings in detail, it will be seen that there is illustrated in FIG. 1 a can body which is generally identified by the numeral **5.** While the can body **5** is illustrated as being open at both ends, it is to be understood that as far as this invention is concerned, the can body may be of a drawn construction or may be provided with a side seam. It is envisioned that the can body **5** may possibly be of the type having a welded side seam or of a soldered side seam of the interrupted lock and lap type with an elongated lap, and wherein the side seam has been provided with an internal and external striping so that the coating of the can body, both externally and internally, is complete.

When the can body is to be utilized in the formation of an aerosol can, one end thereof will be more greatly reduced in diameter than normal. This is the primary usage of the can body of this invention. It is to be understood, however, that the can body may have both ends thereof necked-in, and the necking-in at the opposite ends of the can body may be identical or may be to different degrees. This invention has to do solely with the necking-in of at least one end of a can body to an extent greater than that which is normally commercially acceptable.

In accordance with this invention, an end portion **6,** at least at one end of the can body **5,** is necked-in to be of a reduced diameter. This necking-in is preferably the same as that which is commercially proven for the particular diameter of can body **5,** but may be of a different reduction.

The end portion **6** is separated from the remainder of the normal diameter portion **7** of the can body by a shoulder **8.** The end portion **6** is also of a greater than normal length inasmuch as normally the length of the necked-in end portion is only sufficient to effect the necessary double seaming operation.

In order to effect the further necking-in of the end portion **6**, there is provided a necking die assembly which is generally identified by the numeral **10**. The die assembly **10** includes an outer die ring **11** and a centrally located die plug **12**. If the can body is the type having a side seam which is thicker than the sheet material from which the can body is formed, the die plug **12** will be mounted for floating movement with respect to the die ring **11** with there being clearance between a base portion **13** of the die plug **12** and a corresponding wall **14** of the die ring **11**.

It is to be noted that the die ring **11**, at the free end thereof, is provided with a tapered entrance portion **15**, which leads into a cylindrical wall portion **16** which conforms generally to the external diameter of the intermediate portion **7** of the can body **5** so as to function as a guide for the same during the second necking-in operation. The die ring **11** further includes a tapered necking-in portion **17** which leads into the cylindrical portion **14**.

It will be seen that when there is relative axial movement between the can body **5** and the necking die assembly **10**, as is best shown in FIG. **3**, the leading portion of the reduced diameter portion **6** of the partially necked-in can body **5**, upon engagement with the tapered die portion **17**, will be deflected inwardly into engagement with the die plug **12** and a second necking-in operation will be performed on the can body **5**. As a result, the can body **5**, in addition to being provided with the shoulder **8** will have an intermediate portion, which is formed by that part of the necked-in portion **6** which has not been further acted upon, a second shoulder **18** and a terminal portion **20** of the desired necked-in diameter. It will be understood that the terminal portion **20** will be of a sufficient length to receive the desired end (not shown).

In order that there may be set forth here a practical example of the invention, a typical example of the can body **5** is one having a nominal diameter of 2 11/16 inches. In order that the can body **5** may have secured to one end thereof a special end closure, such as an aerosol end, it is necessary that the diameter of the can body be reduced in the end portion thereof to 2 and 7.5/16 inches. After such experimentation it has been found possible to commercially neck-in can bodies having a diameter of 2 and 11/16 inches to have a diameter of 2 and 9/16 inches. Since it is known that this necking-in can be commercially accomplished, it was decided, in accordance with this invention, to in a like manner neck-in the end of the can body **5**, but to a much greater extent than that which is necessary for the receipt of an end closure. This is the can body shown in FIG. **1**. Thereafter, the necked-in can body **5** was subjected to the necking die assembly **10** in the manner described above so as to reduce the end portion **20** thereof to the required diameter of 2 and 7.5/16 inches. The axial extent of the end portion **20** is much shorter than the axial extent of the intermediate portion **6** and is of only such length as is required to effect the necessary application of the end closure for which the can body is intended.

With particular reference to FIG. **4**, it will be seen that there is illustrated a modified form of necking-in die which is generally identified by the numeral **21**. The die **21** is specifically configurated to produce the same necking-in operation as does the die **10** but provides more support for the previously necked-in end portion during the necking-in of the extreme end portion to the desired degree.

The die assembly **21** includes an outer die ring **22** which corresponds to the outer die ring **11**, but it is of a modified construction. The die assembly **21** also utilizes a die plug which is identical with the die plug **12** and will be so identified.

With reference to FIG. **3**, it will be seen that the end portion **6** is substantially unsupported between the cylindrical wall portion **16** and the tapered necking-in portion **17**. As a result, during the second necking-in operation, the end portion may be unduly distorted in this unsupported area. For this reason, the die ring **22** has been provided.

The die ring **22**, like the die ring **11**, is provided at the free end thereof with a tapered entrance portion **23** which leads into a cylindrical wall portion **24**. The die ring **22** also includes a tapered necking-in portion **25** which leads into a cylindrical portion **26** which cooperates with the die plug **12**. It is also to be noted that there will be the same clearance between the base portion **13** of the die plug **12** and the cylindrical wall **26** so that limited shifting of the die plug **12** relative to the die ring **22** may occur when the can body being necked-in is provided with a side seam of a thickness greater than the nominal thickness of the metal from which the can body is formed.

It is to be noted that the die ring **22** differs from the die ring **11** in that intermediate the cylindrical wall portion **24** and the tapered necking-in portion **25** there is provided a tapered guide wall portion **27** and a cylindrical wall portion **28**. The cylindrical wall portion **28** has a diameter generally corresponding to the external diameter of the reduced diameter portion **6** of the can body **5**.

It will be readily apparent from FIG. **4** that when the can body **5** enters into the die ring **22**, the can body will be guided by both the tapered entrance portion **23** and the tapered wall portion **27** to a centered relationship and will be supported by both the cylindrical wall portion **24** and the cylindrical wall portion **28** during the necking-in operation performed by the die assembly **21**.

It will also be apparent that the die assembly **21** wild function to neck-in the already necked-in end portion **6** of the can body **5** to form thereon a second shoulder **18** and a terminal portion **20** of the desired necked-in diameter.

Although only a preferred embodiment of the invention has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the necking-in operation without departing from the spirit and scope of the invention, as defined by the appended claims.

I claim:

1. A method of necking-in thin wall can bodies to a degree heretofore impossible comprising the steps of necking-in an elongated end portion of a can body to a degree materially less than the desired degree of necking-in and then in a separate operation utilizing only an external die and a plug die further necking-in said previously necked-in portion to the desired degree, said further necking-in step being performed on a free end portion only of said necked-in elongated end portion said necked-in end portion includes an elongated cylindrical part, and said can body is supported adjacent said necked-in end portion during the further necking-in step and said necked-in end portion cylindrical part is separately supported during said further necking-in step adjacent that part of said necked-in portion being further necked-in.

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