

THE APPLICATION OF PRECISION FORMING TECHNOLOGY FOR AIRBAG GENERATOR IN CHINA

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Abstract

Airbag is important part for ensuring the driver and passenger's safety. The generator parts are typical parts difficult to be formed. BRIMET developed precision forming technologies for these parts and the technology has been applied in batch production. The parts produced by these technologies have been installed in some domestic trade mark cars. The technologies all have applied for patent.

Keyword: precision forming, airbag generator parts

1. Introduction

Airbag is important part for ensuring the driver and passenger's safety. It is high technology product for its high performance and difficulty to be manufactured. In advanced countries airbag has been equipped in car for many years. In China it has not been applied until three years ago and all airbag products are imported. Some airbag parts such as generator are very hard to produce. This restrained the development of airbag manufactured by domestic factories. The BRIMET developed the forming technology for the airbag generator after very deep research to meet the demand of it. Now the technology has been applied in manufacturing the airbag generator.

The precision forming technology for airbag generator consists of two technologies: damp forming and cold extrusion-sheet forming complex forming process. The most of airbag generator used in China are divided into two types. Their forming processes are introduced in detail as below.

2. The forming process of 60ml airbag generator parts

The airbag generator is made up of two parts: shell and cover. Shell is formed of three layers of ringlike wall shown in Fig.1. It is difficult to manufacture the part by carrying out normal cold extrusion process. The extrusion for the shell is a reverse extrusion in multi-passageway, the flow speed is different between the layers. That result in the different heights of each ringlike wall after cold extrusion. The height of the outer ring is highest, inner ring comes second and the middle ring is the lowest. The BRIMET developed structure damp

forming technology to resolve the problem. The principle of the process is change local figure of the mold to adjust the resistance when the material flows by the changed position. So the flow speed of each part can be adjusted and the forming of the part can be controlled.

The forming process of the shell should control the material flow of the outer ring because the flow of this part is too fast. The method is adding a convex part to the punch corresponding to the outer ring. The material of the outer ring will be forced to flow into the narrow way when it contacts with the convex part. The resistance of the second deformation restrains the material flow of the root part of the outer ring effectively. So the metal in each passageway has the same flow speed and the uniform height of the walls is realized. Fig 2 shows the computer simulation result of the normal extrusion and damp forming process. Now the structure damp forming technology obtain utility model patent and has been applied in actual production.

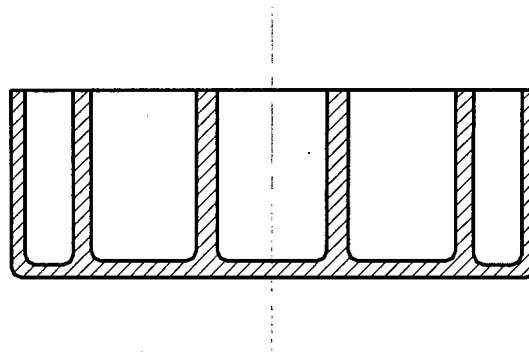
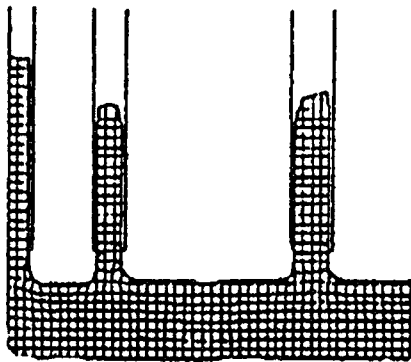
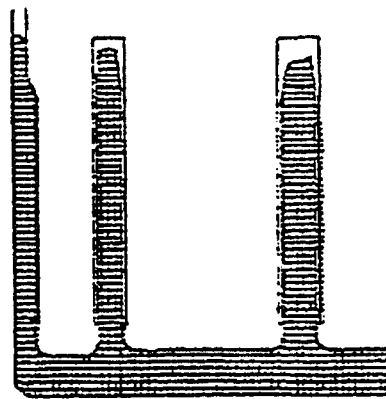


Fig 1. The shell part



FEM result of normal forming process



FEM result of damp forming process

Fig 2. The compare of two process

The forming process for the cover is quite different. Its' outer ring is higher than inner one, accord with the metal flow tendency. So its ringlike walls can be formed when normal extrusion is applied. The key of the forming technology is

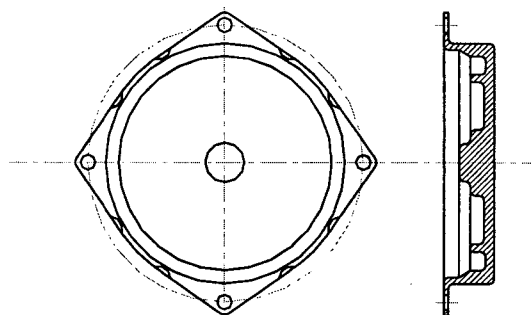


Fig 3. The cover part

forming the flange. The flange is rectangle and its thickness less than the thickness of the outer ring. If the normal extrusion is adopt to forming the flange, the capacity of the press must be large. Thus the cost of the production is raised. The BRIMET has developed cold extrusion- sheet forming complex forming process aiming at the part. That means cold extrusion forming the bottom and the ringlink walls and then sheet forming the outer ringlike wall to form the flange. The sheet forming process is: edge coiling→flattening→thinning→punching and cutting edge (Fig 4). Only three sets of molds are needed for all these procedure. Therefore it simplifies the working process, realizes that parts with complex structure could be finished by precision forming on small tonnage press with less stations. This technology has obtained the invent patent and been applied in production. Fig 5 shows the 60ml airbag generator parts produced with the technology developed by BRIMET.

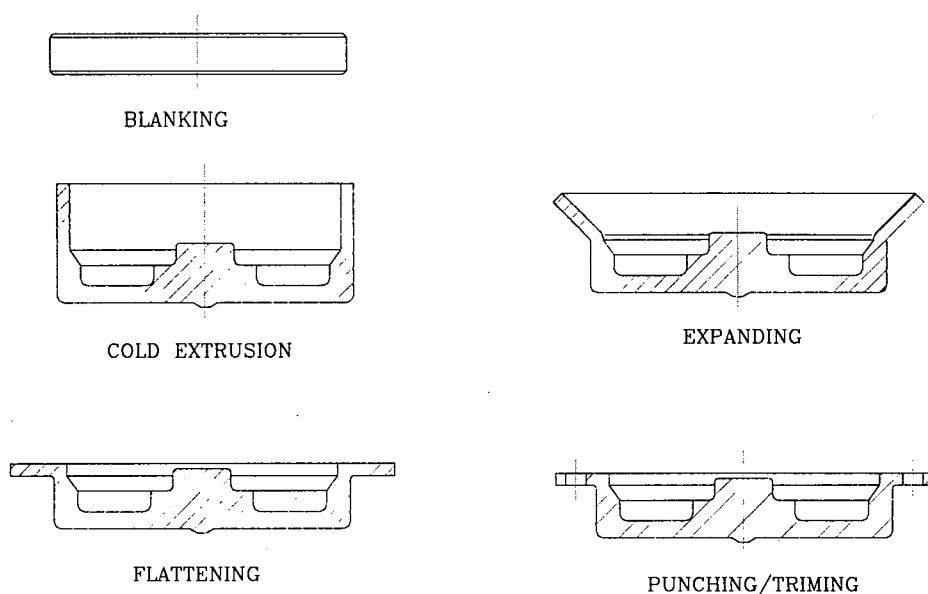


Fig 4. The forming process of the cover

3. The forming process of 40ml airbag generator parts

The forming process of the shell is similar with the one of 60ml. The cover has its own specialty. Its inner wall is higher than outer one. The structure damp forming technology cannot get the ideal result when it is applied on the cover. The ideal difference of height cannot be realized if the damp is little but the large damp will affect the dimension of the figure. The BRIMET adapts another way to

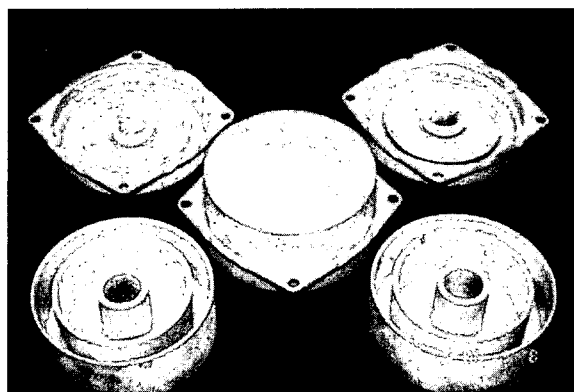


Fig 5. The 60 ml forming parts

control the flow of the material. The method is put back pressure on the forming end of the outer wall to increase the resistance against the material which flow faster than other part. The flow of the material is controlled and the ideal height difference between outer wall and inner wall can be realized. The magnitude of the back pressure is calculated by FEM. In actual process the back pressure is offered by hydraulic system or nitrogen springs. The method has been used in batch production and has been applied for patent. Fig 6 is sketch map of the principle of the back pressure forming technology for the cover.

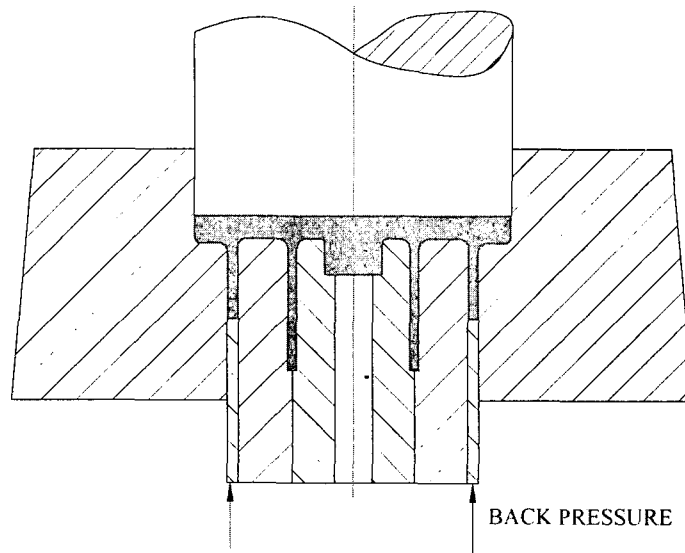


Fig 6 The sketch map of the back pressure forming technology

4. Conclusion

The precision and mechanic behavior of the airbag generator parts produced with the precision forming technology developed by the BRIMET all fulfill the consumers' requirements. The airbags used these parts have passed the impact test and fix on some domestic trade mark cars such as CHERRY and GEELY. The technology will be applied more widely on account of the increasing of the output of cars in China.

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