

1

**SHAFTLESS ROLLER
FOR LEAD FORMING APPARATUS**

5

FIELD OF THE INVENTION

This invention relates to a shaftless roller which is disposed in a lead forming apparatus for facilitating precision forming of fine-pitch leads on a semiconductor device while avoiding scratches and other nonconformities on the leads.

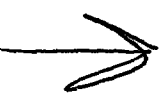
10

BACKGROUND OF THE INVENTION

It is well known to those skilled in the art the various methods of forming leads on semiconductor packages. A popular method uses a forming punch die or cam type punch as shown in Fig. 1A and FIG. 1B. Although this method has been available for some time and is currently widely used, it causes the leads to brush against the forming die to produce highly undesirable scratches on the leads, and resulting in the removal of tin or other important metal coating which is necessary to facilitate solid soldered contacts. This and other problems commonly associated with the conventional punch or cam forming are generally known to those skilled in the art and are described in detail in, among others, U.S. Pat. #5,375,630 (Kim).

15

20



The formation of scratches on the leads is a serious problem in the semiconductor industry. Hence, many design improvements have been made to lead forming apparatus to overcome this problem. As a result, a new lead forming process incorporating rollers--hence the term "roller forming"--has been developed. Unlike the conventional cam or punch forming where the leads of a semiconductor device brush against the lead forming apparatus, the basic principle of roller forming is to eliminate friction between the leads and the lead

25



All pages