

Apparatus and method for packaging components

Field of the Invention

[0001] The invention relates to advanced packaging technology in semiconductor industry, more particularly to an apparatus and a method for producing flip chip.

Background of the Invention

[0002] At present, the consumer demand for electronic products which implement microelectronic chips therein is constantly increasing, and the competition between products is becoming increasingly fierce. In order for microelectronics to win in this competition, time-to-market of product is very critical. In other words, the process from design to launch of product must be as short as possible in order to introduce the most innovative and technologically advanced products. In addition, the price of the product is also an important competitive factor. To this end, manufacturers of microelectronic products have been eager to own more innovative technologies to improve productivity, reduce unit costs, improve competitive advantages and meet huge consumer demand.

[0003] For example, in the production of flip-chips, the basic processes of a flip chip assembly apparatus comprise picking up die from wafer, flipping the die to invert upside down, applying flux to the die, aligning position at inspection camera and bonding the die on the substrate. A conventional flip chip assembly apparatus is provided with a single bond head, wherein the duty cycle of the apparatus comprises: the single bond head picking up a single die and dipping into flux and then bonding to the substrate. Another conventional flip chip assembly apparatus is provided with multiple bond heads, each bond head picking up one die, wherein the working cycle of the apparatus comprises: each bond head picks up one die one by one and dipping the die into flux one by one, and then bonding each die on the substrate one by one. With said such conventional flip chip assembly apparatus, it has been found that the effect of attempting to achieve higher productivity by speeding up the operation of the device is very limited, because the dies are picked up and dipped one by one, and the work cycle related to a die can begin only after the work cycle related to the previous die is completed.

[0071] Figure 12 illustrates another embodiment of a method according to the present invention. As shown, two different dies 70' and 70'' are bonded side by side to the same substrate 80. To implement this embodiment, some changes to the aforementioned method steps are required. First, the die 70' is loaded on one of the component supply devices of the component package apparatus shown in Figure 1, and the die 70'' is loaded on the other component supply device. Accordingly, the substrate supply device needs to be recombined so that two of the channels become one channel to provide one type of substrate on the substrate supply device. In the process, die 70' and die 70'' are processed by two independently operated component processing devices and component transfer devices, and are transferred to said one substrate for bonding. That is to say, this example enables a single apparatus to process two different dies simultaneously and achieves simultaneous bonding of two different dies on the same substrate. Those skilled in the art will understand, based on the spirit and principles of the present invention, more devices can be added to the component packaging apparatus so that more different types of dies can be bonded to the same substrate for more complex processing.

[0072] In addition to the above advantages, the present invention is particularly characterized by high processing efficiency. A technical effect regarding productivity in the present invention will be described below with reference to a typical prior art.

[0073] Figure 13 illustrates a prior art for packaging components using a single bond head. As shown, the bond head is returned to the home position for the picking step and dipping step for the next die after the picking step and the dipping step for the previous die are completed. It will be understood that for embodiments using six bond heads in the present invention, at least 90% time can be saved, i.e., the present invention can increase the productivity by at least 10 times than the prior art.

[0074] Figures 14A-14C shows a component packaging method using multiple bond heads in prior art. Referring to 14A and 14B, multiple bond heads are also used in the packaging method, but the bond heads are operated separately. In the prior art, a bond head picks up a die, and then the multiple bond heads must be moved together. So, the next bond head is aligned with the next die before the following die pick is implemented. This is because the distance between the multiple bond heads is fixed, but the distance between the dies, which are ready-to-pick, may not be fixed. And there may be one or several unqualified die (s) between the two ready-to-pick die, so the movement of the bond heads must be controlled based on the position of the qualified die to align the bond head with a single ready-to-pick die. To this end, the present invention can increase the productivity by at least 10 times in the