Japanese Patent Application Publication No. 2007-2274 describes a method in which a cation exchange membrane is used, and an alkali component is supplemented to an alkaline anolyte. However, this method requires an additional apparatus, liquid management, and the like, which complicate the operations.

In addition, Published Japanese Translation of PCT International Application No. 2008-539329 discloses a zinc alloy plating bath in which a cathode and an anode are separated from each other by a filtration membrane. However, a test conducted by the present inventors has shown that the disclosed filtration membrane is incapable of preventing movement between the catholyte and the anolyte, and incapable of preventing decomposition of a chelating agent at the anode. In addition, since a zinc alloy plating liquid is used also as the anolyte, the decomposition of the anolyte is promoted very much. Accordingly, the anolyte has to be exchanged, and when the anolyte is not exchanged, the decomposition product moves into the plating liquid at the cathode. For this reason, it has been found that this method does not lead to substantial extension of the lifetime of the liquid.

Summary ~~of Invention~~

An object of the present ~~invention~~ disclosure is to provide a plating method which can achieve lifetime extension of a zinc alloy plating bath by maintaining the performance of the zinc alloy plating bath with an economical apparatus in which the anode separation is achieved easily and in which the liquid level is easy to manage.

In one aspect of the present disclosure, there is provided a zinc alloy electroplating method comprising applying a current through an alkaline zinc alloy electroplating bath

comprising a cathode and an anode, wherein

a cathode region including the cathode and an anode region including the anode are separated from each other by an anion exchange membrane,

a catholyte contained in the cathode region is an alkaline zinc alloy plating liquid, and

an anolyte contained in the anode region is an aqueous alkaline solution.

The present disclosure ~~invention~~ has been made based on the following finding. Specifically, zinc alloy electroplating is carried out in an alkaline zinc alloy electroplating bath comprising

a cathode and an anode in which a cathode region including the cathode and an anode region including the anode are separated from each other by an anion exchange membrane, an alkaline zinc alloy plating liquid is used as a catholyte contained in the cathode region, and an aqueous alkaline solution is used as an anolyte contained in the anode region. In this case, not only zinc ions and the like in the plating liquid can be prevented from moving to the anode region, but also the amine-based chelating agent in the bath is prevented from moving to the anode region, so that no oxidative decomposition occurs. In addition, it has been found that the electrolyte in the anode region does not move to the cathode region, either, and the liquid level in each chamber does not change, so that the liquid levels can be managed without any problem. Specifically, the present ~~invention~~ disclosure provides a zinc alloy electroplating method comprising applying a current through an alkaline zinc alloy electroplating bath comprising a cathode and an anode, wherein a cathode region including the cathode and an anode region including the anode are separated from each other by an anion exchange membrane, a catholyte contained in the cathode region is an alkaline zinc alloy plating liquid, and an anolyte contained in the anode region is an aqueous alkaline solution.

The present disclosure ~~invention~~ makes it possible to provide a plating method which can achieve lifetime extension of a zinc alloy plating bath by maintaining the performance of the zinc alloy plating bath with an economical apparatus in which the anode separation is achieved easily and in which the liquid level is easy to manage.

Brief Description of Drawings

Fig. 1 shows plating test results (appearance of plating)