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(54) **Method for producing one-side zinc hot dipped steel sheets.**

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DE-A-2 609 968
DE-A-3 006 664
US-A-4 177 303
US-A-4 285 995

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Description

Background of the Invention

This invention relates to a system for producing one-side zinc hot dipped steel sheets or strips used in automobiles or the like.

It is well known in the motor industry that one-side zinc plated steel sheets are widely used as automobile body steel sheets which are substantially free of severe local corrosion in the interior and give an excellent painting appearance on the exterior of the vehicle body.

One-side zinc plated steel sheets are generally produced either by hot dipping process or by electrodeposition process. In general, the former process is advantageous in increased plating speed and thickness while the latter is suitable for producing thin coatings. Since the one-side plating, whether it is by the hot dipping or electrodeposition, encounters much technical difficulty as compared with usual both-sides plating, the cost of plating is not necessarily low irrespective of a one-half reduction in the quantity of zinc plated. Attempts have been made to produce one-side zinc plated steel sheets at low cost. Typical proposals include (1) one-side cutting process, (2) meniscus process, and (3) the use of an antiplating agent.

The one-side cutting process is by plating the both sides of a steel sheet followed by cutting off a zinc plating on one side. Apparently, this process is inefficient and expensive, and the sheet surface from which the zinc plating has been cut away is poor in quality. The meniscus process is designed so as to contact only one surface of a strip with molten zinc by the utilization of ultrasonic, electromagnetic pump, or other means Temper color appears on the cold rolled surface of a strip since the strip is exposed to the ambient atmosphere before the strip temperature is sufficiently lowered. Pickling must be carried out to remove such temper color, resulting in products of non-uniform quality. The temper color is undesirably enhanced when the zinc plating must be subjected to an alloying treatment. Removal of such enhanced temper color is also a problem.

A number of proposals have also been made for the use of anti-plating agents, but none of them have enjoyed successful results in commercial production. Zinc remains in the form of entrained particles on the surface of an antiplating film on a steel strip emerging from a molten zinc bath, resulting in a limited line speed. The entrained zinc particles are adhered or transferred to the surface of a carry/guide roll; causing dents in the steel strip.

In these years, the likelihood of entraining zinc particles was significantly reduced due to improvements in releasability of an anti-plating film and the use of a flame wiper.

Prior art document US-A-4, 177, 303 discloses a method of galvanizing a portion only of a ferrous metal article in which a strip having on one surface thereof a thin film known as talc is passed through an exit looper assembly. This looper assembly comprises a plurality of parallel rolls, one of these rolls contacting the film bearing sur face of the strip.

Further, prior art document DE-A-30 06 664 describes a one-side hot dipping process in which a foil strip is sticked to a zinc-free surface of a steel sheet by means of an adhesive. The steel sheet covered with foil strip emerges vertically upward from a zinc bath and passes through an air-cooling unit before the foil strip is peeled off and wound on a take-up roll directly above the cooling unit and the zinc bath.

Finally, prior art document DE-A-26 09 968 describes a method for carrying out one-side zinc hot dipping process of the type wherein a steel sheet having a film of an anti-plating agent coated on one surface thereof by applying said anti-plating agent to said one surface, drying and baking the anti-plating agent, is passed through a molten zinc bath to plate the other surface of the steel sheet with zinc. The anti-plating film is then removed immediately after said zinc bath by peeling to produce a one-side zinc plated steel sheet, so that the anti-plating film on the steel sheet does not contact any rigid member while the sheet is moved from the molten zinc bath to the anti-plating film peeling site.

It is an object of this invention to provide an improved method for producing one-side zinc plated steel sheets in such a manner that dent formation is thoroughly precluded even when a few zinc particles remain on the anti-plating film surface.

The present invention provides a method for carrying out one-side zinc hot dipping process of the type wherein a steel sheet having a film of an anti-plating agent coated on one surface thereof by applying said anti-plating agent to said one surface, drying and baking the anti-plating agent followed by cooling, is passed through a molten zinc bath to plate the other surface of the steel sheet with zinc, and the anti-plating film is then removed by peeling to produce a one-side zinc plated steel sheet, said method being characterized in that the steel sheet is guided along a re-entrant way extending from the molten zinc bath to the peeling machine, the sheet being turned round three guide rolls in the same direction so that the anti-plating film on the steel sheet does not contact any rigid member while the sheet is moved from the molten zinc bath to the anti-plating film peeling site.

Brief Description of the Drawings

The above and other objects, features and advantages of this invention will be more fully understood from the following description when taken in conjunction with the accompanying drawings, in which;

Fig. 1 is a schematic illustration of a prior art system for producing one-side zinc hot dipped steel sheets; and

Fig. 2 is a schematic illustration of the one-side zinc hot dipped steel sheet producing system according to this invention.

Description of the Preferred Embodiments

In order to facilitate understanding of the invention, reference is first made to a prior art system shown in Fig. 1. A strip or sheet 1 of steel which is previously cleaned is transported in the direction of an arrow to a roll coater 2 where an anti-plating agent is applied to one surface of the sheet. The steel sheet having the anti-plating agent applied thereon enters an annealing furnace 3 where it is heated for drying and baking to form an anti-plating film temporarily firmly adhered to the sheet. After cooling, the steel sheet 1 is immersed in a molten zinc bath 4 for zinc hot dipping. The steel sheet is turned around a sink roll in the bath and emerges vertically upward from the bath. The zinc dipped sheet, which possesses the antiplating film on one surface 5 and a zinc plating on the other surface 7, passes across a flame wiper 6 immediately above the bath for wiping off zinc entrained on the anti-plating film 5, and then across a plating thickness control 8 in the form of a wiper for adjusting the thickness of the zinc plating 7. Subsequently, the sheet is passed through an alloying furnace 9 and a cooling unit 10, and then introduced into a peeling machine 12 through a deflector roll 11 where the anti-plating film is removed from the sheet by peeling. After washing, a one-side zinc plated steel sheet is obtained. The steps of coating and drying the anti-plating agent may, of course, be previously carried out in a separate line.

Such a process of producing one-side zinc hot dipped steel sheets has the likelihood that zinc particles deposited or entrained on the anti-plating film 5 of the emerging hot-dipped sheet will make dents in the sheet, as described earlier. The inventors have found that such dent formation is caused by the contact of the anti-plating film 5 on the sheet with the deflector roll 11. As a result of such contact, zinc particles remaining on the anti-plating film surface are captured by the deflector roll 11 to form dent-causing projections on the roll surface.

To eliminate the cause of dent formation, the present invention guides the sheet 1 along a path from the molten zinc bath 4 to the peeling machine 12 while keeping the anti-plating film 5 on the sheet out of contact with any rigid member such as a deflector roll.

One preferred embodiment for such guiding is shown in Fig. 2. The system shown in Fig. 2 also includes the same steps applied to a steel sheet as described in connection with the prior art system shown in Fig. 1, that is, steps of applying an anti-plating agent to one surface 5 of a steel strip or sheet 1, drying and baking the anti-plating agent followed by cooling, zinc plating in a molten zinc bath 4, wiping off zinc entrained on the anti-plating film by means of a flame wiper 6, controlling the thickness of a zinc plating by means of a thickness controller 8, optionally effecting an alloying treatment in an alloying furnace 9, cooling in a cooling unit 10, and removing the anti-plating film from the sheet by peeling through a peeling machine 12 followed by a suitable post treatment. The system shown in Fig. 2 includes a reentrant way extending from the molten zinc bath 4 to the peeling machine 12 where the sheet 1 is turned around three guide rolls in the same direction. All the guide rolls are in contact with only the zinc plating 7 on the sheet 1. Differently stated, the system is arranged such that the anti-plating film 5 on the sheet 1 does not contact any rigid member such as a deflector roll while the sheet 1 is moved from the outlet of the molten metal zinc bath 4 to the inlet of the peeling machine 12. With this arrangement, formation of dents on the sheet surface is thoroughly precluded since zinc particles entrained on the anti-plating film 5 are no longer depressed onto the confronting sheet surface in the absence of any rigid roll in a line leading to the film peeling-off stage.

The peeling machine may be of any desired type including water cooling, mechanical bending, and brushing as well as any combination of these types. The position in which the peeling machine is disposed is not limited to the position shown in Fig. 2, and it may be disposed in the position of the cooling unit 10 or connected downstream of the cooling unit 10. Such peeling machines per se are well known in the art and as such form no particular part of the present invention except in combination with the other elements thereof. It is critical for the present invention that the system is arranged such that the anti-plating film 5 on the sheet 1 does not contact any rigid member such as a deflector roll while the sheet 1 is moved from the molten zinc bath 4 to the peeling machine 12.

Since an anti-plating film on a steel sheet does not contact any rigid member such as rolls or experience any compression by such rigid members during passage of the sheet from a molten zinc bath to a film peeling machine, the present invention can effectively prevent dent formation even in the presence of zinc particles or deposits remaining on the anti-plating film. The prevention of dent formation is of great advantage in the commercial manufacture of one-side zinc plated steel sheets using anti-plating agents since significant improvements are accomplished including increased line speed, mitigated requirements for the flame wiper, and the use of a wider range of anti-plating agents.

Claim

A method for carrying out one-side zinc hot dipping process of the type wherein a steel sheet (1) having a film of an anti-plating agent coated on one surface (5) thereof by applying said anti-plating agent to said one surface (5), drying and baking the anti-plating agent followed by cooling, is passed through a molten zinc bath (4) to plate the other surface of the steel sheet (1) with zinc, and the anti-plating film is then removed by peeling to produce a one-side zinc plated steel sheet, characterized in that the steel sheet (1) is guided along a re-entrant way extending from the

molten zinc bath (4) to the peeling machine (12), the sheet (1) being turned round three guide rolls (11) in the same direction so that the anti-plating film on the steel sheet (1) does not contact any rigid member while the sheet (1) is moved from the molten zinc bath (4) to the anti-plating film peeling site.

Patentanspruch

Verfahren zur Durchführung einer einseitigen Feuerverzinkung der Art, bei der ein Stahlblech (1) mit einem auf einer Oberfläche (5) aufgetragenen Film eines Antiplattiermittels, der durch Applikation des Antiplattiermittels auf die eine Oberfläche (5), Trocknen und Brennen des Antiplattiermittels und schließlich Kühlen erzeugt wurde, durch eine Zinkschmelze (4) zur Verzinkung der anderen Oberfläche des Stahlblechs (1) hindurchgeleitet und danach der Antiplattiermittelfilm zur Herstellung eines einseitig verzinkten Stahlblechs durch Abziehen entfernt wird, dadurch gekennzeichnet, daß das Stahlblech (1) längs eines sich von der Zinkschmelze (4) zu der Abziehvorrichtung (12) erstreckenden Umlenkweg geführt wird, wobei das Blech (1) um drei Führungswalzen (11) in dieselbe Richtung gewendet wird, so daß der Antiplattiermittelfilm auf dem Stahlblech (1) während der Bewegung des Blechs (1) von der Zinkschmelze (4) zu der Stelle, an der der Antiplattiermittelfilm abgezogen wird, nicht mit irgendeinem starren Teil in Berührung gelangt.

Revendication

Procédé pour effectuer le zingage à chaud d'une seule face, du type dans lequel une tôle d'acier (1), qui comporte sur une face (5) un revêtement constitué par une pellicule d'un agent anti-placage obtenue en appliquant ledit agent anti-placage à ladite face (5), et en séchant et en cuisant, puis en refroidissant, l'agent anti-placage, traverse un bain de zinc fondu (4) pour le placage au zinc de l'autre face de la tôle d'acier (1), la pellicule anti-placage étant ensuite enlevée par pelage pour fournir une tôle d'acier plaquée au zinc sur une seule face, caractérisé en ce que la tôle d'acier (1) est guidée suivant un trajet rentrant qui s'étend depuis le bain de zinc fondu (4) jusqu'à la machine de pelage (12), la tôle (1) passant dans le même sens autour de trois rouleaux de guidage (11), de manière que la pellicule anti-placage de la tôle d'acier (1) ne vienne en contact avec aucun organe rigide lorsque la tôle (1) est déplacée depuis le bain de zinc fondu (4) jusqu'au poste de pelage de la pellicule anti-placage.

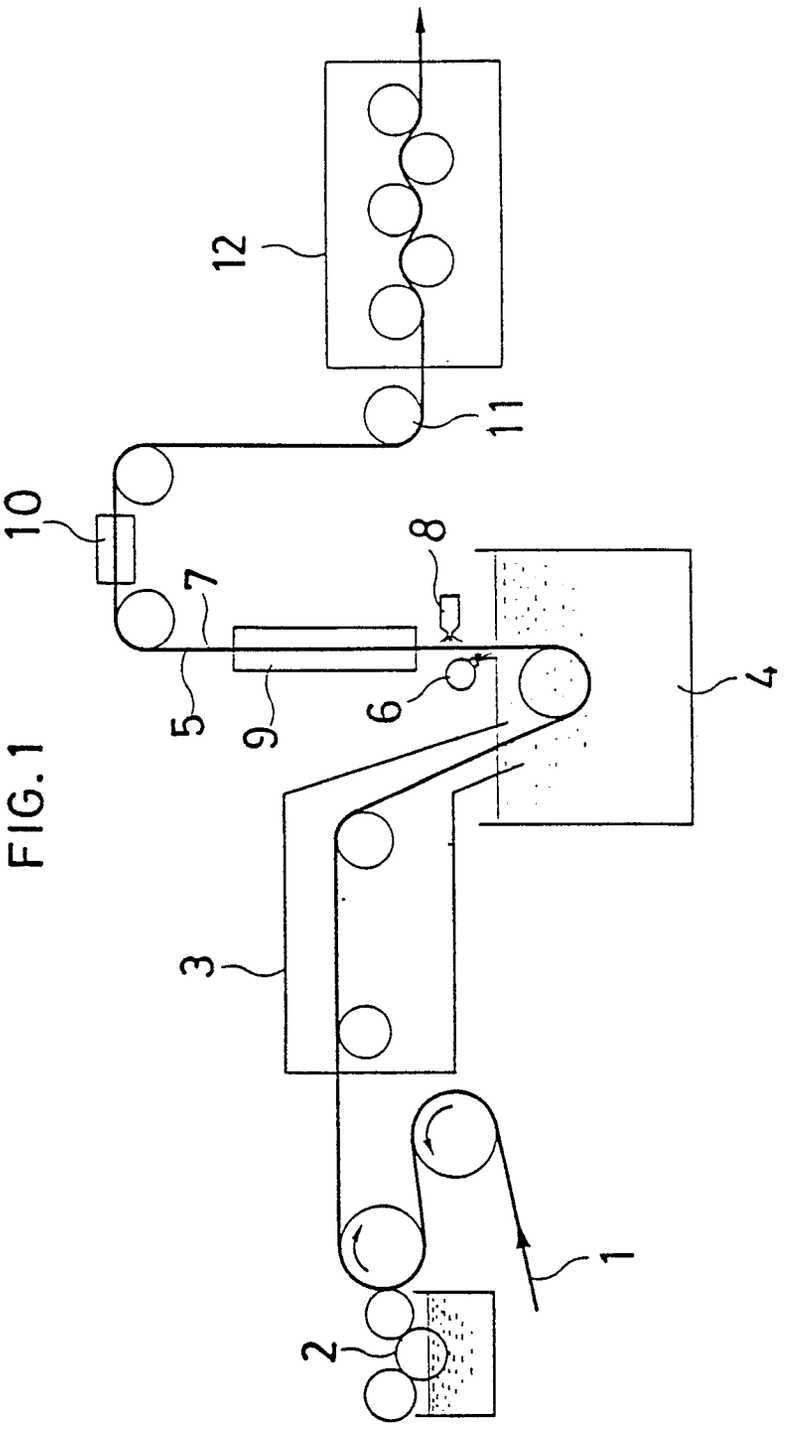

FIG. 1

FIG. 2