May 10, 1955 C. L. INGLEFIELD, JR 2,708,171

METHOD OF CONTROLLING COATING THICKNESS IN CONTINUOUS GALVANIZING

Filed July 8, 1952

3 Sheets-Sheet 1

FIG. 1

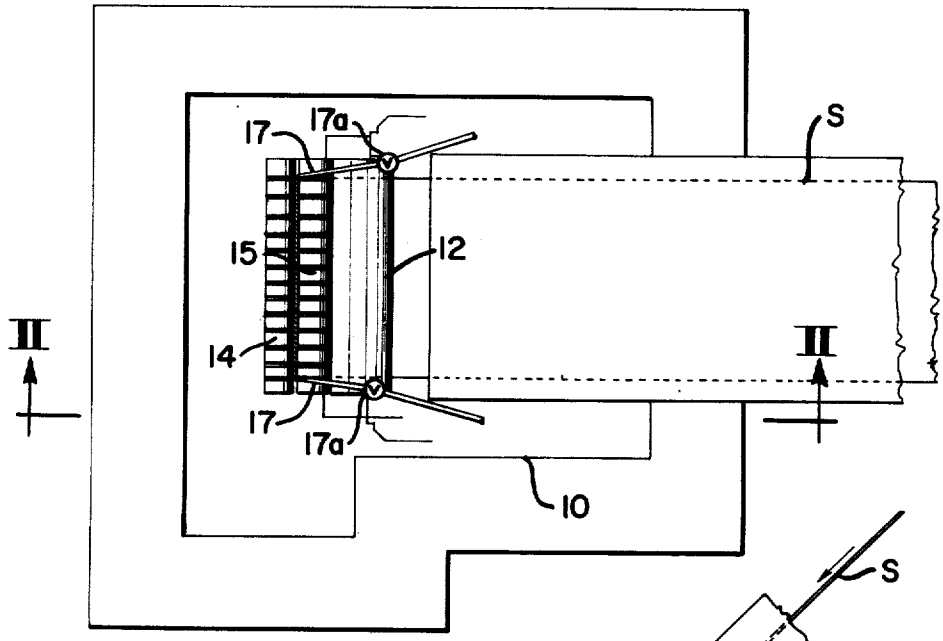
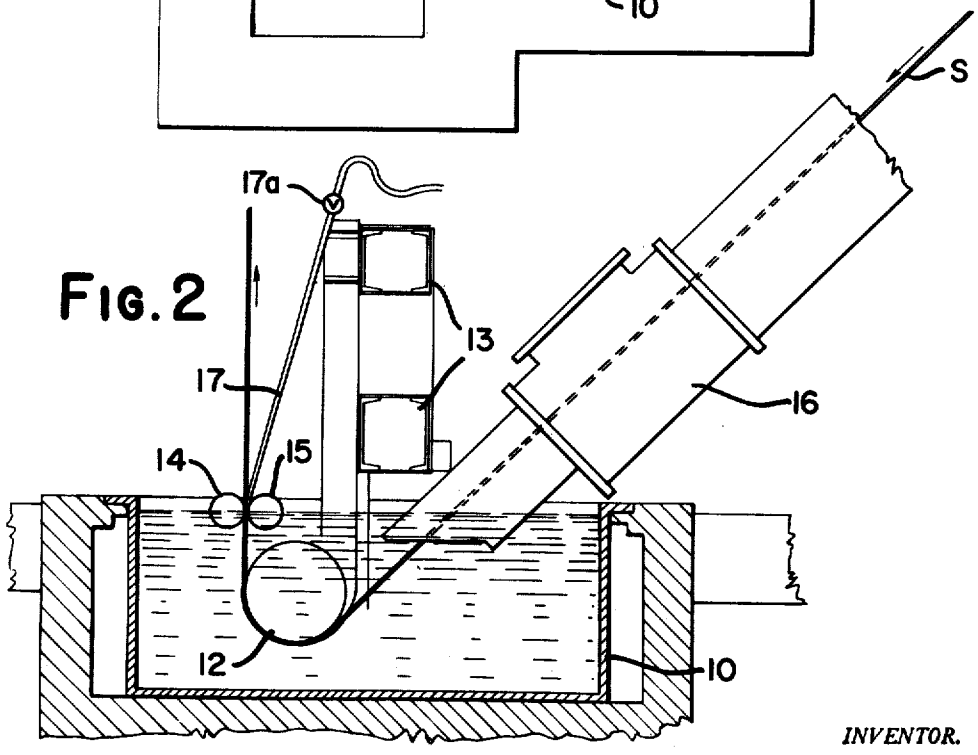


FIG. 2



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FIG. 3

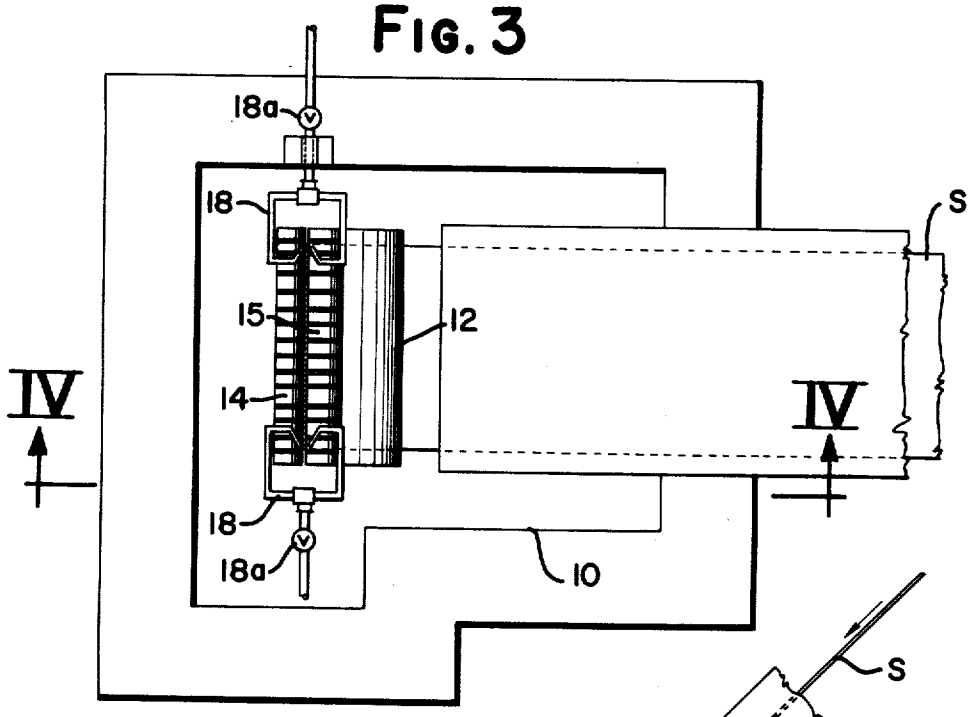
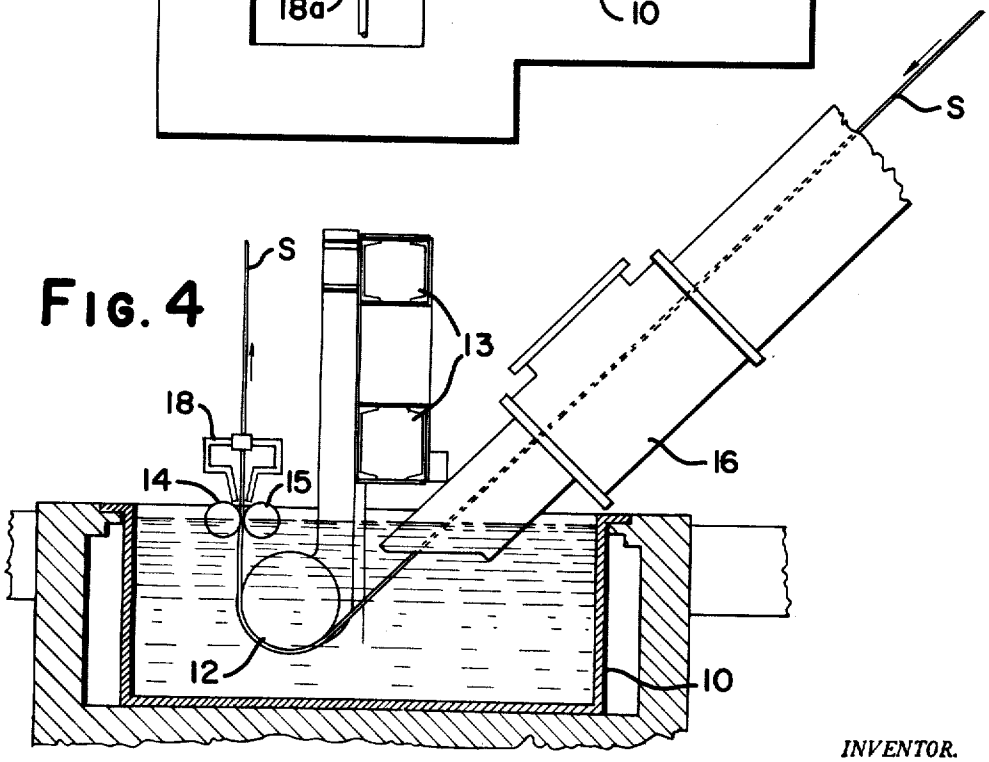


FIG. 4



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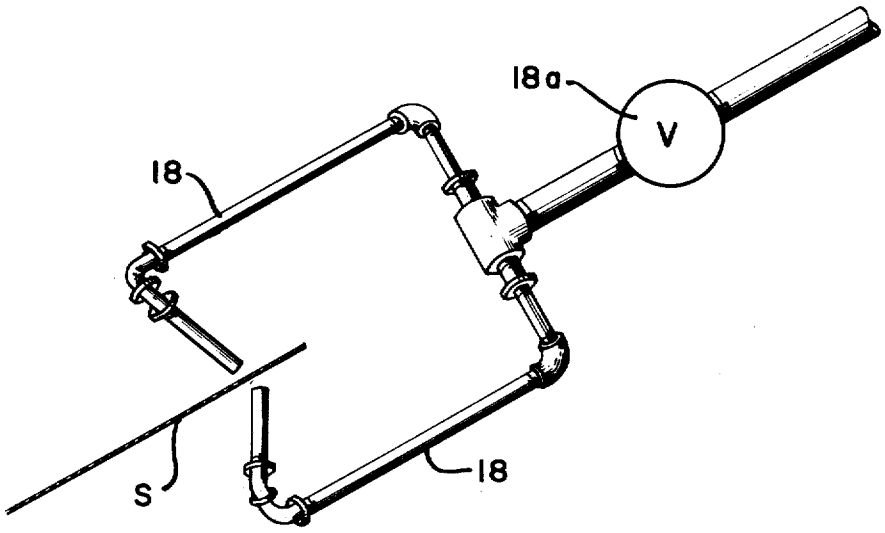
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FIG. 5



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2,708,171

Patented May 10, 1955

2,708,171

METHOD OF CONTROLLING COATING THICKNESS IN CONTINUOUS GALVANIZING

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Application July 8, 1952, Serial No. 297,697

3 Claims. (Cl. 117—46)

This invention relates to continuous strip galvanizing and particularly to improved methods of controlling the coating thickness adjacent the strip edges.

Continuous galvanizing lines conventionally include a galvanizing pot which contains a bath of molten zinc at a temperature of about 800° to 875° F. A continuous steel strip is led into the pot, passes around a sink roll at the lower portion thereof and emerges between a pair of grooved coating rolls at the bath surface. It is known that at higher speeds the coating rolls tend to draw out the coating near the strip edges so that the coating attains a greater thickness adjacent the edges than in the central part of the strip. This tendency produces undesirable variations in both the final strip thickness and its corrosion characteristics, which variations must be minimized to make an acceptable product. This tendency has limited the speed at which such lines can operate to about 100 feet per minute.

An object of the present invention is to provide an improved method of preventing the zinc coating from attaining excessive thickness adjacent the strip edges, which method involves mechanically blowing molten zinc from the edge portions while applying heat thereto and is applicable to conventional existing lines and enables them to operate at higher speeds.

A more specific object is to provide improved methods of preventing the coating adjacent the strip edges from attaining an excessive thickness by the action of gas flames which mechanically blow away the excess and at the same time heat the strip surface near its edges only and thus maintain these edges for a longer time at the temperature at which they emerge from the bath without appreciably raising their temperature.

A further object is to provide improved methods of preventing the coating adjacent the strip edges from becoming excessively thick by the combined mechanical action and heating effect of gas jet flames directed downwardly against the surface of the strip adjacent its edges.

In accomplishing these and other objects of the invention, I have provided improved details of structure, preferred forms of which are shown in the accompanying drawings, in which:

Figure 1 is a top plan view of a galvanizing pot of a continuous line equipped with heating means in accordance with the present invention;

Figure 2 is a sectional view taken on line II—II of Figure 1;

Figure 3 is a top plan view similar to Figure 1 but showing a modification;

Figure 4 is a sectional view taken on line IV—IV of Figure 3; and

Figure 5 is a diagrammatic plan view on a larger scale of the modification of Figure 3 showing more clearly the relative positions of the gas jets and the strip.

Figures 1 and 2 show somewhat diagrammatically a portion of a continuous galvanizing line which includes a galvanizing pot **10**, a sink roll **12** in the lower portion of said pot, a support **13** for said sink roll, and a pair

of grooved coating rolls **14** and **15**. The pot contains molten zinc at a temperature of 800° to 875° F. to a level about as indicated in Figure 2, which is approximately the diametric plane of the two coating rolls. A continuous steel strip S is led from an annealing furnace, not shown, through an enclosing snout **16**, into the pot, around the sink roll and up between the coating rolls. The strip surface picks up a zinc coating, the thickness of which is controlled by the coating rolls. After leaving these rolls, the strip passes upward to the top of a cooling tower, not shown, and thence downward to subsequent treating equipment. The equipment and process thus far described are well known and therefore are not shown nor described in detail.

Also as known in the art, at line speeds greater than about 100 feet per minute the zinc bath reaches higher levels adjacent the ends of the bite of the coating rolls than it does in the central part. This difference in bath level causes more zinc to be deposited on the strip adjacent the edges than at the central part. Various remedial measures have been proposed to overcome this tendency. For example, it is possible to use rolls which have grooves of greater cross sectional area at the central part than near the end, whereby more zinc can flow up between them at the central part. However, such rolls are difficult and costly to machine.

In accordance with the present invention, gas burners **17**, equipped with control valves **17***a*, are directed downwardly against the strip edges just above the coating rolls. These burners are positioned so that the gas jets emerging therefrom impinge on both faces of the strip adjacent the edges. The flow of gas actually impinges on the coating before combustion takes place. Consequently the gas velocity has a mechanical effect of blowing excess molten zinc downwardly off the strip surface. The flames are regulated not to heat the surface of the strip adjacent the edges appreciably above the temperature at which the edges emerge from the coating rolls, but merely to maintain them at this temperature longer than the remainder of the strip. The resultant heating of the edge portions prevents formulation of a cobweb structure while maintaining a spangled appearance in the finished product. It is possible also that the heating alone may cause some run off of the excess coating adjacent the strip edges and thus combine with the mechanical effect of the jets in eliminating this excess.

It is critical that the gas flames do not appreciably raise the temperature of the strip and its coating, or else a nonuniform product would result. For example, it is known in the art that a nonspangled galvanized product can be produced by heating the strip across its full width to temperatures around 1000° F. as it leaves the bath, which heating alloys the coating with the strip surface. In the method of the present invention, the burners do not heat the strip sufficiently to cause this alloying effect.

Figures 3, 4 and 5 show a modification in which gas burners **18** equipped with control valves **18***a* are directed downwardly and outwardly against both sides of the strip. This modification enhances the mechanical effect of the jets in blowing away the molten zinc, and also furnishes better control in heating both sides of the strip uniformly.

While two embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the appended claims.

I claim:

1. In the high speed continuous galvanizing of steel strip, wherein the strip is led continuously at minimum speeds of about 100 feet per minute through a bath of molten zinc at a temperature of 800° to 875° F. and

emerges between a pair of grooved coating rolls located at the bath surface, a method of controlling the coating thickness and yet maintaining a uniformly spangled surface across the width of the strip comprising mechanically blowing away excess molten zinc from the portions of the strip surfaces immediately adjacent the side edges as the strip emerges from the coating rolls before the coating solidifies, and simultaneously heating the same portions of the strip, such heating being confined to these portions and controlled to maintain them at the temperature at which they leave the bath for a longer time than the portion of the strip inwardly of the side edges without appreciably raising the temperature of any portion of the strip above that of the galvanizing bath.

2. In the high speed continuous galvanizing of steel strip, wherein the strip is led continuously at minimum speeds of about 100 feet per minute through a bath of molten zinc at a temperature of 800° to 875° F. and emerges between a pair of grooved coating rolls located at the bath surface, a method of preventing the zinc coating on the strip from attaining excessive thickness immediately adjacent the side edges of the strip and yet maintaining a uniformly spangled surface across the

width of the strip comprising directing gas flames downwardly against the portions of the strip surface immediately adjacent the side edges as the strip emerges from the coating rolls before the coating solidifies, and thereby both mechanically blowing away excess zinc and heating these portions of the strip, such heating being confined to these portions and controlled to maintain them at the temperature at which they leave the bath for a longer time than the portions of the strip inwardly of the side edges without appreciably raising the temperature of any portion of the strip above that of the galvanizing bath.

3. A method as defined in claim 2 in which the flames are directed downwardly and outwardly against the side edge portions of the strip on both faces thereof.

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