

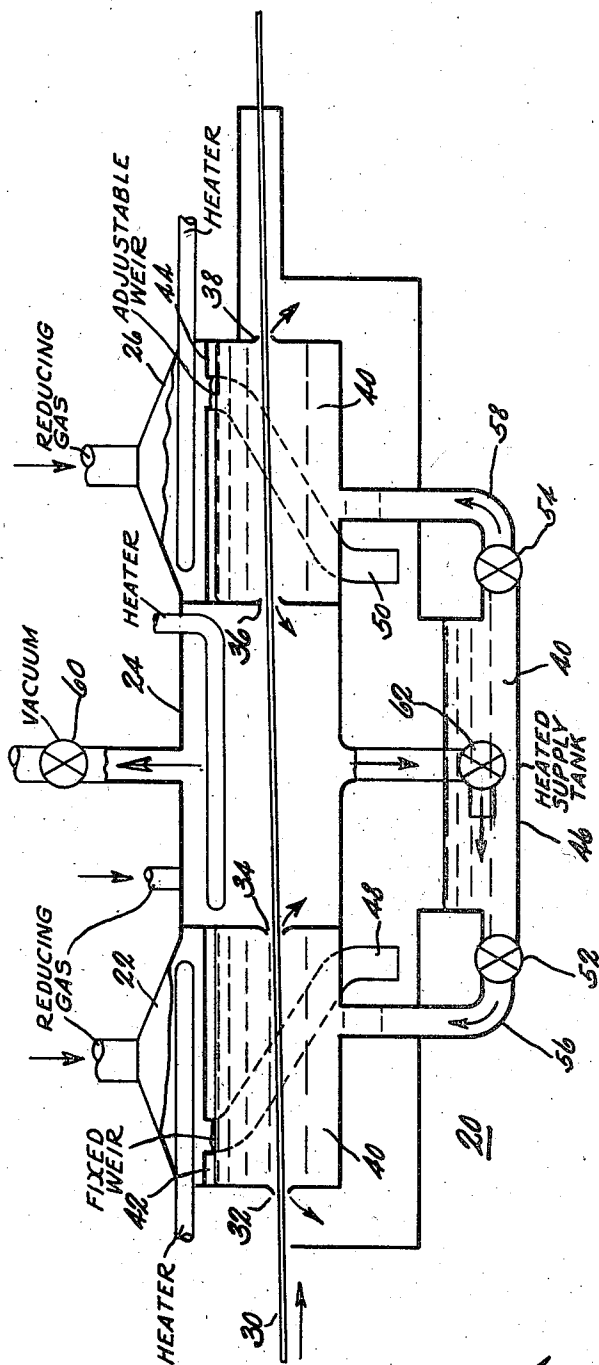
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METHOD AND APPARATUS FOR IMPREGNATING STRIP STOCK

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METHOD AND APPARATUS FOR IMPREG-
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This invention relates to a method and apparatus for continuously applying soft or lower melting point metal to the surface of a metallic strip, and is more particularly concerned with the method and apparatus for continuously applying and simultaneously impregnating porous metallic strip material with a lower melting point metal.

An object of the invention is to provide a method and apparatus whereby porous strip material or composite strip material which includes a porous metal layer thereon may be continuously impregnated under sub-atmospheric conditions.

In carrying out the above object, it is a still further object of the invention to carry out the vacuum impregnating step while the strip material is substantially in the flat condition.

This application is a continuation in part of my copending application, Serial No. 376,512, directed to a method and apparatus for applying molten metal on strip stock. This application is directed to somewhat similar subject matter, but is modified with particular respect to the vacuum impregnating step and apparatus whereby the apparatus is simplified to some extent.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein preferred embodiments of the present invention are clearly shown.

In the drawing:

The drawing shows a diagrammatic view of a vacuum impregnating apparatus showing the various pumps and conduits with a strip being run therethrough.

Referring particularly to the drawing, a vacuum impregnating apparatus is shown at 20 which includes an elongated tunnel-like structure broken down into three main sections, namely, the first section 22, a vacuum chamber 24 and a third section 26. Sections 22, 24 and 26 are aligned and contain entries and exits so that a strip 30 may pass therethrough in a substantially flat condition. Strip 30 enters chamber 22 through an entrance 32 and leaves through an opening 34 which is an entrance to the vacuum chamber 24. It then passes through the vacuum chamber and leaves said chamber through exit 36 which is the entrance to chamber 26. Finally the strip passes out of chamber 26 through exit 38.

Chambers 22 and 26 contain a predetermined volume of molten metal 40, in this case babbitt, the height of which is controlled by weirs 42 and

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44 respectively. When the level of babbitt exceeds the level of the weirs, the excess babbitt is drained back to a supply tank 46 through conduits 48 and 50 respectively. A supply tank 46 contains a substantial volume of babbitt 40 and also is provided with heating means, not shown, for maintaining the babbitt in the molten condition.

In order to supply babbitt to chambers 22 and 26, the supply tank 46 is provided with two pumps 52 and 54 respectively. These pumps convey babbitt from supply tank 40 upwardly through supply conduits 56 and 58 to chambers 22 and 26 respectively. The pumps 52 and 54 have sufficient pumping capacity to always maintain an excess of babbitt flowing into the chamber so that there is always a return of babbitt through conduits 48 and 50. It is also apparent that there will be a leakage of babbitt around the entrance 32 and exit 38 of the apparatus, which babbitt is likewise suitably conveyed back to the supply tank 46.

The intermediate chamber 24 is evacuated by means of a vacuum pump 60 which cooperates with the second pump 62 that is immersed in the babbitt supply. Pump 62 is utilized to return babbitt leaking into the vacuum chamber 24 through openings 34 and 36. Thus the pump 62 while pumping babbitt into the supply tank 46 also induces a vacuum on the intake side thereof which cooperates with pump 60 to produce a very high vacuum in the chamber 24.

It is preferable to supply a reducing gas to chambers 22 and 26 to maintain as clean a condition as possible on the surface of the babbitt whereby oxidation is reduced, if not eliminated. This lessens the amount of slag formed and eliminates the possibility of clogging of the pumps. In this instance the supply tank 46 is closed to the atmosphere and may either be supplied with a reducing atmosphere thereover or the molten babbitt may be protected by flotation of a refractory material such as bentonite on the surface thereof.

The pumps 60 and 62 maintain a pressure of about 2 to 3 mm. of Hg abs. in the vacuum chamber. Reducing atmosphere is admitted to this chamber through conduit 63 in sufficient quantity to bring the pressure in the vacuum chamber to about 7 mm. of Hg abs. The reducing atmosphere prevents any oxidation of the babbitt in this chamber.

In operation, the device is similar to the device shown in my copending application, Serial No. 376,512. Strip 30 enters the apparatus through the entrance 32, having first had the surface

thereof cleaned of any oxidation, dirt or grease by means of a suitable fluxing apparatus, several embodiments of which are shown in my copending application above referred to.

The strip 30 includes at least a portion thereof of porous material which requires impregnation. The strip enters under the surface of the babbitt 40 in chamber 22 and partial impregnation is obtained. This portion of the strip then progresses into the vacuum chamber where any gas remaining in the pores escapes due to the rarefaction of the atmosphere thereover. This causes an impregnating of the babbitt into the pores to replace any gas which was evacuated therefrom. This portion of the strip then progresses into the chamber 26 where it enters under the surface of the babbitt, and additional babbitt is thereby supplied to complete the impregnation. The strip then passes out of the exit 38 into a suitable casting apparatus, not shown, but described in detail in my copending application Serial No. 376,512. This casting apparatus permits any desired thickness of babbitt to be cast on the strip, but forms no part of the present invention.

It is manifest from the foregoing that a complete impregnation can be obtained in this apparatus without any bending of the material. This is particularly necessary when operating on heavy strips where the cross sectioned area of the strip is such as to make bending difficult or impossible. The entire operation therefore is carried out continuously while the strip remains in a flat condition moving in a single plane.

It will be noted that the use of pump 62 eliminates the necessity of the sump and barometric leg utilized in my copending application 376,512 in that the intake side of the pump balances the vacuum in chamber 24 so that pump 62 cooperates with pump 60 to produce the desired vacuum. Furthermore pump 62 has the additional function of removing the babbitt from the vacuum chamber which babbitt has flowed or leaked therein from chambers 22 and 26 in returning same to the supply tank 46.

It is manifest that in place of babbitt any other lower melting point metal may be utilized, lead, tin, antimony, aluminum, or alloys thereof may all be used with porous strips having a higher melting point whereby substantially complete impregnation is possible.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a machine for continuously impregnating porous strip material in the substantially flat condition, an impregnating chamber including throat portions at either end thereof for restricting the flow of impregnant therefrom around a strip passing therethrough, a communicating vacuum chamber at the egress end of said first chamber, means for partially evacuating said vacuum chamber, and a second impregnating chamber connected with the egress end of said vacuum chamber and including throat portions at either end thereof for restricting the flow of impregnant therefrom around a strip passing therethrough, a supply tank for containing the impregnant, pump means for pumping impregnant to each of said impregnating chambers, said pump means having sufficient capacity to maintain a defined level of impregnant in each of said chambers above the level of said strip regardless of the

leakage into the vacuum chamber and out of the machine, and means cooperating with said first mentioned means for partially evacuating said vacuum chamber and for returning the impregnant which leaks out of said throat portions to said supply tank.

2. In a machine for continuously impregnating porous strip material in the substantially flat condition, an impregnating chamber including throat portions at either end thereof for restricting the flow of impregnant therefrom around a strip passing therethrough, a communicating vacuum chamber at the egress end of said first chamber, means for partially evacuating said vacuum chamber, and a second impregnating chamber connected with the egress end of said vacuum chamber and including throat portions at either end thereof for restricting the flow of impregnant therefrom around a strip passing therethrough, a supply tank for containing the impregnant, pump means for pumping impregnant to each of said impregnating chambers said pump means having sufficient capacity to maintain a defined level of impregnant in each of said chambers above the level of said strip regardless of the leakage into the vacuum chamber and out of the machine, means cooperating with said first mentioned means for partially evacuating said vacuum chamber and for returning the impregnant which leaks out of said throat portions to said supply tank, said last named means being immersed in said impregnant, supply means for providing a reducing atmosphere over the impregnant in said two end chambers and for providing a measured predetermined pressure of reducing atmosphere in said vacuum chamber.

3. An apparatus for continuously impregnating metallic strip material including a porous metal layer thereon, said material being in a substantially flat condition during the impregnation thereof, comprising in combination; a babbitt chamber adapted to be partially filled with babbitt through which said strip may pass and including throats at either end thereof which closely fit the strip as it passes into and out of said chamber; a communicating chamber at the egress end of said first chamber adapted to be evacuated; means for partially evacuating said communicating chamber, a third chamber at the egress end of said second chamber and including throat portions at either end thereof, said third chamber also being at least partially filled with molten babbitt; a heated supply tank for holding an adequate supply of molten babbitt metal therein; pump means connected with said supply tank and with said first and third mentioned chambers for maintaining the level of babbitt in said first and third chambers substantially constant and above the surface of the strip, whereby the molten babbitt maintains a vacuum seal at the egress end of the said first chamber and at the egress end of said second chamber; return means connected with said first and third chambers for returning excess babbitt to said supply tank, a second evacuating means for partially evacuating said communicating chamber, said last means also having the dual function of pumping babbitt from the communicating chamber to said supply tank, said two means for partially evacuating the communicating chamber cooperating to produce the desired vacuum therein, and means for supplying a reducing atmosphere to said first and third chambers and a measured quantity of reducing atmosphere to said communicating chamber said

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quantity being predetermined so as not to reduce the vacuum appreciably.

4. An apparatus as claimed in claim 3 wherein weirs are provided in said first and third chambers to maintain the desired level of babbitt therein.

5. An apparatus as claimed in claim 3 wherein heating means are included in said first and third chambers for maintaining the babbitt in a molten condition.

6. An apparatus as claimed in claim 3 wherein said first chamber includes a fixed weir for maintaining a defined level of babbitt therein and wherein said third chamber includes an adjustable weir whereby the babbitt level in said third chamber may be maintained at any desirable depth.

7. In a method of continuously impregnating porous metal strip material in a substantially flat condition, the steps comprising: providing two impregnating chambers containing molten impregnating metal, providing an intermediate vacuum

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chamber connecting said impregnating chambers, all of said chambers being in substantially the same horizontal plane and so constructed that leakage can occur from said impregnating chambers into said vacuum chamber around said strip, passing said strip through all of the chambers in substantially flat and unbent condition and in a single horizontal plane and beneath said impregnant in said impregnating chambers, supplying sufficient impregnant to each of said impregnating chambers to maintain the level of molten metal constant so that the impregnant leakage from said impregnating chambers into said vacuum chamber is compensated for by the new impregnant being supplied into said chambers whereby a seal is maintained between said chambers and said vacuum chamber and finally removing said leakage from said vacuum chamber whereby the evacuation from said chamber is at least partially accomplished by removal of said impregnant therefrom.

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