Fixed permanent mounting magnet having a face adapted to slidingly engage a plate of magnetic material which carries a jet nozzle extension. Releasable non-magnetic guide structure is provided to insure vertical location of the plate with respect to the magnet.

3 Claims, 3 Drawing Figures
RELEASABLE MELTING MEANS FOR MOVABLE FLUID NOZZLE EXTENSION

BACKGROUND OF THE INVENTION

Broadly speaking, this invention relates to the finishing of a molten metallic coating applied to a ferrous base strand. An exemplary process of this character contemplates the thorough cleaning of the surface of a ferrous base strand, followed by the immersion of the strand in a bath of molten coating metal. This invention relates in particular to the finishing of the molten coating which adheres to the ferrous strand as it is drawn upwardly from the bath of molten coating metal in a vertical path of travel.

It is well known in the art that finishing this still molten coating can advantageously be accomplished by directing an elongated jet of fluid under pressure against the coated strand. Exemplary processes and apparatus for such practice are disclosed in U.S. Pat. Nos. 3,499,418 in the name of Mayhew, 3,480,469 in the name of Shaffer, and 3,390,007 in the name of Sherman.

It has been observed that when a fluid jet according to these patents is directed at a traveling strand carrying still molten coating metal, excessive heavy coatings occur in a narrow zone adjacent each edge of the strand. Careful investigation of this phenomenon have shown that except for these edge portions, the coating is substantially uniform across the remainder of the strand width.

The precise nature of this problem is not fully understood. One theory is set forth in U.S. Pat. No. 5,526,204 issued on Sept. 1, 1970, in the names of Paul E. Schenieder and James C. Young. This patent teaches the utilization of nozzle extensions which are effective to increase the wiping action of an elongate fluid jet in a very narrow zone which may be positioned adjacent the edges of a moving strand.

It will be recognized by the skilled worker in the art that the nozzle extensions according to this patent must be movable with respect to the jet nozzle with which they are associated. Specifically, a given metallic coating line may be utilized to coat varying strip widths. With each change in the width of a strip being coated, the nozzle extensions must be adjusted so as to effectively increase the wiping action of the fluid jet at the proper points. Similarly, in certain coating lines, the path of travel of the web may vary slightly, and the nozzle extensions should be adjusted to compensate for this wandering of the strand.

It will also be recognized by the skilled worker in the art that the mechanism or arrangement for mounting and positioning the nozzle extensions must be very simple in order to retain reliability of operation at the high temperature and in the environment normally associated in close proximity to a bath of molten coating metal.

In addition, the mounting structure should be designed so as to allow for occasional, but unintentional, collisions with the edges of the strip without causing damage to the nozzle extensions, the mounting structure, or the strip itself.

In addition, the mounting structure should provide for easy and remote replacement of the nozzle extensions during operation.

SUMMARY OF THE INVENTION

This invention contemplates the provision of a fixed mounting magnet which is provided with a face portion adapted to slidingly engage a plate of magnetic material which carries a jet nozzle extension. Releasable non-magnetic guide structure is provided cooperating between the plate and mounting magnet so as to insure and retain vertical alignment of the components, while readily permitting horizontal adjustment.

FIG. 1 is a perspective view showing the mounting structure of this invention with a schematic illustration of a nozzle extension.

FIG. 2 is a cross sectional view along the line 2—2 of FIG. 1 and showing in addition, a portion of a jet nozzle to which the mounting structure can be applied.

FIG. 3 is a perspective view of a jet nozzle extension with which the mounting structure of this invention may be utilized.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As already indicated, this invention relates to a mounting structure for a nozzle extension adapted to be used in conjunction with an otherwise conventional jet nozzle. Referring first to FIG. 2, a portion of a conventional jet nozzle is shown generally at 10. The precise form of the nozzle does not matter, so long as it forms a part of this invention, but it will be understood that the nozzle will be such as to provide an elongate opening 12 which will direct a jet of fluid under pressure against a coated base strand.

The nozzle extension is illustrated in the drawings generally at 14. As explained in U.S. Pat. No. 5,526,204 referred to earlier, the nozzle extension 14 shown in the drawings is effective to reduce the distance between the strand being coated and the discharge opening of the nozzle only in a relatively narrow zone adjacent the edge of the strand. To this end, the nozzle extension has a back surface 16 which will be mounted adjacent the discharge opening 12 of the nozzle. The front edges 18 of the nozzle extension are angularly related to the rear surface 16, so that, in effect, the distance between the effective discharge opening of the nozzle and nozzle extension and the strand being coated is sharply decreased in a narrow zone.

According to this invention, the mounting structure for the nozzle extension 14 includes the channel shaped permanent magnet 20. In FIG. 2, the magnet 20 is shown securely mounted to the nozzle body 10, but it will be understood that other forms of mounting are satisfactory, so long as the channel of the magnet is substantially parallel to the nozzle opening 12.

The nozzle extension 14 may be mounted in any suitable fashion to the plate 22 which is of any suitable magnetic material. In the embodiment shown, the nozzle extension may be mounted by means of the machine screws 24.

As best seen in FIG. 1, the plate 22 of magnetic material is adapted to be in sliding engagement with the front surfaces 26, 28 of the magnet 20. It will be observed that these surfaces define a plane which is substantially parallel to the path of travel of the strand as it emerges from the coating metal bath.

In order to assure vertical alignment between the plate 22 (and hence the nozzle extension 14) and the mounting magnet 20, the guide member 30 is provided. This guide member will be constructed of any suitable non-magnetic material, such as brass, bronze, and the like. It will be of a size and shape to be slidingly received in the channel 32 in the magnet 20.

As best seen in FIG. 2, a portion of the guide member 30 extends outwardly beyond the faces 26 and 28 of the magnet to define a key. The key is provided with the top and bottom sides 34 and 36 which are annularly related. The included angle between the sides 34 and 36 should be at least 60° and not more than about 120° to provide for easy displacement without damage during any inadvertent contact between the strip and the mounting structure. Preferably, the included angle between the sides 34 and 36 should be on the order of 90°.

It will of course be seen that a mating notch is provided in the back surface of the plate 22. It will also be observed that the guide member 30 is not rigidly secured to the plate 22 in any way. Thus, the guide member, key and mating slot serve to accurately maintain vertical alignment between the plate 22 and the magnet 20, and yet permit ready removal of the nozzle extension 14 and mounting plate 22 by simply overcoming the holding force of the magnet 20.

It was indicated at the outset of this specification that under some circumstances, the nozzle extensions must be moved horizontally. The structure thus far described readily accomplishes such horizontal movement. In FIG. 1, it will be seen that the guide member 30 is provided with the end plates 38
which extend past the side edges of the mounting plate 22. These plates are also of non-magnetic material, and may be secured to the guide member as by the machine screws 40. It will be apparent that these end plates serve to prevent relative horizontal movement between the guide member 30 and the plates 22.

The nozzle extension may be removed horizontally by means of the control rod 42 which may be secured in any suitable fashion to the guide member 30 or end plate 38. It will of course be apparent that the rod 42 may be actuated manually or by suitable automatic control systems. It will of course be apparent that flexible cables or the like could be used for such horizontal movement, provided of course that cables were attached to each end of the guide member 30 to accommodate movement in two directions.

It is believed that the foregoing constitutes a full and complete disclosure of the invention. Numerous modifications may be made without departing from its scope and spirit, and no limitations are intended except as specifically set forth in the claims which follow.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In apparatus for coating a ferrous base strand with a molten metallic coating including a bath of molten coating metal, means for withdrawing said strand in a vertically upward path of travel from said bath whereby a quantity of said molten coating metal adheres to said strand, nozzle means for direct-

ing an elongate jet of fluid under pressure against said strand, and nozzle extension means for increasing the wiping action of said fluid jet adjacent the edges of said strand; the improved structure for mounting said nozzle extension means comprising:

   a. a mounting magnet having a horizontally disposed channel arranged parallel to said elongate jet;
   b. a plate of magnetic material;
   c. means for rigidly securing said nozzle extension means to said plate;
   d. a guide member of non-magnetic material slidably disposed within said channel and extending outwardly thereof;
   e. a groove in said plate receiving said outwardly extending portion of said guide member whereby to vertically fix and align said plate and nozzle; and
   f. means attached to said guide member and lying within said channel whereby to horizontally position the assemblage of said member, plate and nozzle.

2. The improved structure claimed in claim 1, including means for preventing relative horizontal movement between said guide member and said plate.

3. The improved structure claimed in claim 1, wherein the included angle between the top and bottom sides of said outwardly portion of said guide member is at least 60° and not more than 120°.