Apparatus and Method for Improving Uniformity of Zinc Coatings on the Threaded Ends of Galvanized Pipes

Inventors: Charles H. Segraves, Harry A. Sutton, Jr.

Attorney

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APPARATUS AND METHOD FOR IMPROVING UNIFORMITY OF ZINC COATINGS ON THE THREADED ENDS OF GALVANIZED PIPES

Charles H. Segregard, 3512 146th St., and Harry A. Sutton, Jr., 6525 Delaware St., both of Hammond, Ind.
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In the production by hot dipping of galvanized pipes having threaded ends the threaded pipes are immersed in a galvanizing pot in which they remain for the time requisite for the molten zinc therein to adhere to their surfaces; they are then consecutively withdrawn by a dragout mechanism which moves them endwise from the pot in an upwardly inclined position and transports them into transverse alignment with conveying apparatus. To this latter they are consecutively translated and disposed on a horizontal position preparatory to being carried by the conveyors along an upwardly inclined path from which they are finally discharged onto subjacent reverse and downwardly inclined rails extending into a water containing bosh preparatory to their removal therefrom by another conveyor which deposits them on a runout table carrying them endwise to a desired receiving point for further treatment, storage or shipment.

However in the practice just described much difficulty is encountered through lack of uniformity of the ultimate zinc coating on the threads proximate the ends of the pipes and particularly on the ends thereof which constitute the trailing ones or so-called “drip ends” during the withdrawal of the pipes from the pot as the molten zinc upon them tends to run down and accumulate on the threads at said ends and hardens thereon necessitating its subsequent removal by chasing, buffing, filing or other time consuming and relatively expensive operations to adapt the threads for reception of internally threaded caps or fittings so as to render the pipes suitable for the market. In consequence production of the pipes is slowed and the cost increased, while because of the uncertainty of how much additional labor and time will be required to suitably condition the threads on a given lot of pipes the difficulty of meeting production schedules and filling customers’ orders on time is materially enhanced.

It is therefore the principal object of our invention to obviate the disadvantages just mentioned by provision of apparatus which in one aspect may be regarded as an improvement on that customarily employed in threaded pipe galvanizing but which is adapted to produce a substantially uniform and smooth zinc coating on the pipe threads during their progression from the dragout mechanism to the cooling bath so that after they leave the latter no further operations are required to condition the threads for commercial use.

A further object is the accomplishment of this result by employment of simple, relatively inexpensive means which may be readily associated and combined with existing pipe galvanizing apparatus and require little or no attention during normal galvanizing operations yet are fully effective to accomplish their intended purpose.

A still further object is the provision of a novel method of producing coatings of substantially uniform character on the threaded ends of pipes galvanized by the customary hot dip method.

Still further objects, advantages and novel features of design, construction and operation comprehended by our invention are hereinafter pointed out or will be apparent to those skilled in the art from the following description of a pipe galvanizing machine constructed and operating in accordance therewith and illustrated in the accompanying drawings in which:

FIG. 1 is a fragmentary top plan view of the machine and associated mechanisms with part of the invention omitted or shown more or less diagrammatically with diameters in some instances enlarged in scale for clarity in illustration;

FIG. 2 is an end view of said machine but omitting any showing of the dragout conveyor and mechanism which consecutively transfers the threaded and coated pipes from the galvanizing pot to the main conveyor of the machine; and

FIG. 3 is an enlarged fragmentary side elevation of a pipe end illustrating its relation to one group of the fluid conduits as the pipe passes through the machine.

As hitherto mentioned our invention envisions association and combination with galvanizing apparatus of usual construction of certain means and instrumentalities hereinafter described; hence brief reference will first be made to the former before incorporation therein of the elements we employ in the practice of our invention. Thus in normal operation of such apparatus the previously threaded pipes after receiving their zinc coating in the galvanizing pot are consecutively withdrawn therefrom axially in a somewhat upwardly inclined direction and moved along a dragout conveyor generally designated D in FIG. 1 until they are brought into substantial alignment with a main conveyor comprising a pair of upwardly inclined chains 1 respectively driven by sprockets 2 on a shaft 3 extending to a suitable source of power supply, for example a motor and reduction gear (not shown), the chains also passing over idlers 4, 5 at their ends proximate the dragout, the apparatus of course also including an appropriate frame comprising uprights 5, 6 and other structural members adequate to support the conveyor chains and various associated parts. To these chains the pipes P are consecutively transferred from the dragout by any suitable mechanism (not shown) interposed between the dragout and the main conveyor, and the chains which are provided with suitably spaced flights 7 carry the pipes upwardly until they pass over sprockets 2 and fall to subjacent downwardly inclined rails 10 the upper extremities of which proximate the sprockets may be curved more or less into conformity therewith; these rails extend into a cooling bath 11 disposed generally beneath chains 1 containing water or other coolant for the pipes which are still fairly hot as a result of their immersion in the molten zinc in the galvanizing pot and subsequent treatment in accordance with our invention as later described. From rails 10 the pipes fall onto a second conveyor comprising laterally spaced upwardly inclined flight carrying chains operative to carry the pipes over sprockets 17 at its upper extremity to oppositely downwardly inclined rails 18 from which they pass to a runout table generally designated 19 of any suitable construction operative to move them axially to a receiving station for such subsequent disposition as desired.

It will be understood that as the mechanisms normally utilized for effecting the aforesaid operations as just briefly described are in common use and well understood further description of them would be superfluous.

As hitherto mentioned during withdrawal of the pipes from the pot the molten zinc with which they are covered tends to run toward their lower or so-called “drip ends” and accumulate in and about the threads proximate thereto and although in the subsequent movements of the pipes some of this accumulated metal may be thrown off sufficient remains after hardening to cause clogging and over-coating of the threads and render the coating at the latter non-uniform; a like effect, moreover, frequently results at the threads at the upper or leading end of each pipe as it moves from the pot though usually to a lesser extent. Various expedients therefore have been tried in an effort to overcome these difficulties and produce a uni-
for aly smooth coating on the threads at both ends but as far as we are aware without optimum success. In accordance with our invention, however, we provide means for maintaining the coating metal on the threads at both ends of each pipe in a molten state as the pipe is carried upwardly by the main conveyor preparatory to its passage to rails 10, said means comprising preferably two sets each of three laterally spaced fluid carrying pipes 21, 22, 23 and 21', 22', 23' respectively disposed generally beneath and parallel to the path traversed by each pipe end 22, 23. In each set constantly circulating at their rear ends, considered in the direction of movement of the pipe upwardly on the conveyor, with a valve controlled header 25, 25' connected with a source of combustible gas and the inner pipes 22, 22', likewise valve controlled, with appropriate means for supplying gas to said valves so that by suitable manipulation of the respective valve gas, preferably at a pressure of the order of 0.10-0.15 p.s.i. (345-455 W.C.), can be admitted to the outermost pipes and air, preferably at pressure of approximately 2 p.s.i., to the intermediate one in each set.

These fluid pipes, suitably supported from the frame of the apparatus, extend for substantially the full length of the adjacent conveyor chains approximately parallel to the upper run thereof, and the middle pipe 22 of each set is arranged substantially midway of the sides of the path traversed by the threaded end portions of the superjacent coated pipes as they move along the main conveyor.

Each fluid pipe in each set is provided with a longitudinally spaced series of relatively small perforations, those in pipes 22 being directed vertically upward and those in outer pipes 21, 23 oppositely inward and upward, the several perforations being so spaced that one perforation 30 in each gas pipe will lie in the same transverse plane as a perforation 31 in the adjacent air pipe, thus forming a group of three whereby the gas jets from the outer pipes will meet the air jet from the intermediate one at a point somewhat below the superjacent coated pipe ends as each such end is carried over each group of jets, the hot bluish flame produced by the air-gas mixture operating by impingement on the zinc coating to maintain the former in the molten state.

To effect substantially uniform heating of the coating enveloping the threads it is desirable if not essential that the pipes be rotated as they move progressively over the groups of jets and suitable means adapted to insure this rotation are therefore provided such, for example, as fixed guide bars 33 arranged parallel to the conveyor chains with the major part of their upper surfaces somewhat above them. Hence as the pipes are consecutively carried along the forward ends of these bars, which are downwardly curved to enable an easy transition of the pipes thereto, they thereafter revolve as they are pushed along by the flights on the chains to thereby expose virtually constantly the entire peripheral surfaces of the coatings on the threads at each end of the pipe to the heat of the subjacent flames until the pipes reach the upper ends of the conveyors and guides and fall onto rails 10 down which they roll at progressively increasing speed into the bosh preparatory to removal therefrom by lower conveyor 15.

To insure proper alignment of the threaded pipe ends with the heating jets transversely separated fixed wing guide bars 35 consisting of oppositely angularly inwardly directed vertically extending plates are installed proximate the lower or forward ends of the fluid pipes so that as each coated pipe passes to the main conveyor it will be centered with respect to the latter as one guide or the other pushes it as it is carried along.

It results that as the coated pipes consecutively roll up the main conveyor their ends are heated by a progressively arranged series of flames thus causing the zinc enveloping the pipe threads to melt and while in that state and with the aid of its surface tension to flow evenly over the surfaces of the threads and form thereon a film or coating of substantially uniform thickness; thereafter the centrifugal forces developed as the pipes rapidly roll down rails 10 throw off any excess of the still fluid zinc which may be present, the natural adherence of zinc to the steel of the pipe insuring, however, retention of a uniform film or coating on the threads at both ends of each pipe after subsequent cooling.

In consequence, through the use of our invention thread coatings of satisfactory character suitable for immediate commercial use without subsequent treatment can be produced at an increase in cost, entailed solely by that of the gas and air expended, which is negligible in comparison with that of the length of the pipes being treated of thread coatings applied in accordance with customary practice.

While we have herein described and illustrated with considerable particularity apparatus of a character commonly employed in hot dip galvanizing of threaded pipe incorporating improvements in accordance with our invention and thus adapted for the performance of the method comprised therein, we do not thereby desire or intend to confine the use of our invention to any particular type of galvanizing apparatus nor to any particular details in the form, construction and arrangement of the elements we combine therewith in the practice of our invention as if desired these may be altered in numerous particulars in manners which will be readily apparent to those skilled in the art without departing from the spirit and scope of the invention as defined in the appended claims.

Claimed and requested for our invention we claim and desire to protect by Letters Patent of the United States:

1. In apparatus for hot dip galvanizing of pipes having threaded ends and comprising dragout mechanism for drawing the pipes consecutively from the galvanizing pot, an upwardly inclined conveyor proximate the dragout of less than the length of the pipes being treated, means adapted to translate the pipes from the dragout to the conveyor, a cooling bosh and downwardly inclined means for directing the pipes from the upper end of the conveyor to the bosh so disposed that a pipe freely rolling downward on the path formed thereby will attain a rotational speed sufficient to eject tangentially from the threaded ends molten zinc thereto adherent, that improvement which consists in the provision of means adjacent disposed laterally of the conveyor an end of each pipe during its progress on the conveyor for directing air and gas flame toward said end, and means for causing the pipe to revolve during said progress to thereby expose the entire periphery of the pipe end to the action of the flame prior to discharge of the pipe to said downwardly inclined means.

2. Apparatus as defined in claim 1 wherein the means for directing the pipes from the conveyor to the bosh comprise downwardly inclined spaced apart rails down which the pipes can consecutively roll into the bosh.

3. Apparatus of the character described comprising means for drawing endwise from a galvanizing pot a pipe having exteriorly threaded zinc coated ends, an upwardly inclined conveyor of width less than the unthreaded portion of the pipe, means for translating the pipe to a horizontal position on the conveyor, means operable to center the pipe axially with respect to the conveyor as it passes thereto from the translating means, means operative to cause the pipe to revolve as it is moved by the conveyor, a cooling bosh proximate the conveyor, means directed toward the bosh and likewise of width less than said unthreaded portion defining an inclined plane so disposed that a pipe freely rolling downward on the path formed by said last mentioned means and prior to passage into the bosh will attain and thereafter maintain a rotational speed before leaving said path sufficient to eject tangentially surplus molten zinc adherent to the threads on the pipe ends, and means adjacent and aligned with each threaded end of the pipe as it is moved by the conveyor adapted to direct toward said end during said movement an air-gas flame to melt
the zinc coating on the threads before the pipe reaches the path defining means.

4. The method of producing substantial uniformity in the coating on the threads of galvanized pipes which comprises the steps of coating the pipes with melted zinc, disposing them sequentially in substantially horizontal position, moving each pipe along an upwardly inclined path transversely of its axis and while maintaining the coating on its threads in fluent state causing it to revolve, and then dropping it from said path to a reversely inclined path for rolling therealong about its axis into a cooling medium at a peripheral speed sufficient to throw off surplus molten zinc from the threads while the pipe is traversing said last mentioned path.

5. The method of producing substantial uniformity in the coating on the threads of galvanized pipes which comprises the steps of coating each threaded zone on each pipe with zinc, disposing the pipe in a substantially horizontal position, moving it along an upwardly inclined path and while causing it to revolve reducing the coating to and maintaining it in fluid condition, dropping the pipe and rolling it down an inclined path to throw off excess molten zinc by centrifugal force, and then cooling the pipe.

6. The method of producing substantial uniformity in the coating on the threads of galvanized pipes which comprises the steps of coating each threaded zone on each pipe with zinc, disposing the pipe in a substantially horizontal position, moving it along an upwardly inclined path and while causing it to revolve directing toward each threaded zone oppositely angularly and inwardly inclined jets of combustible gas and between them a jet of air radially of the pipe to melt and maintain fluid the coating enveloping said zone, then dropping the pipe while the coating is fluid from said path and rolling it by gravity down another inclined path at a speed sufficient to throw off excess zinc by centrifugal force preparatory to cooling the residual coating.

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CERTIFICATE OF CORRECTION

Patent No. 3,105,774

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Charles H. Segraves et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, lines 42 and 43, strike out "adjacent" and insert the same after "conveyor" in line 43, same column 4.

Signed and sealed this 7th day of April 1964.

(SEAL)
Attest:

(Seal)
Attest:  EDWARD J. BRENNER

ERNEST W. SWIDER
Attesting Officer  Commissioner of Patents