Aug. 28, 1934. H. S. HUNT ET AL 1,971,376

APPARATUS FOR COATING CENTRIFUGAL PIPE MOLDS

Filed Oct. 29, 1932

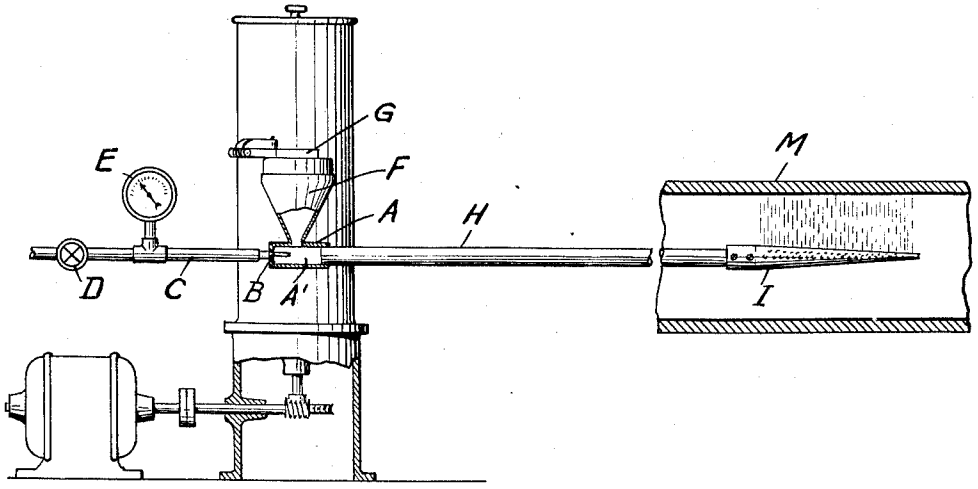

FIG. 1.

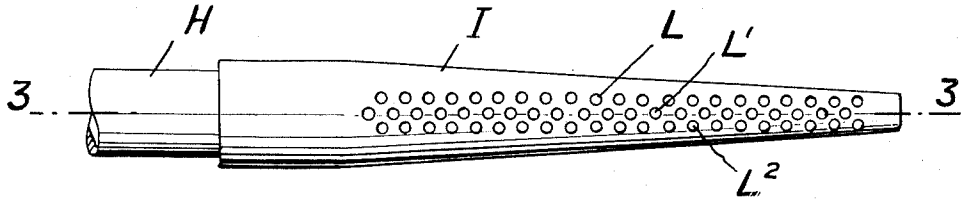

FIG. 2.

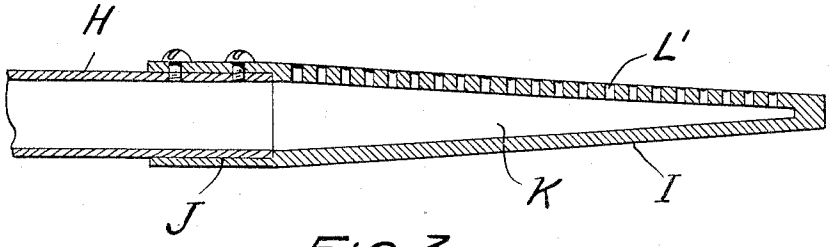

FIG. 3.

INVENTORS

Horace S. Hunt

Paul L. Arnold

By Francis Chandler

ATTORNEY.

WITNESS:

Robt. R. Ketchel

Patented Aug. 28, 1934 1,971,376

UNITED STATES PATENT OFFICE

1,971,376

APPARATUS FOR COATING CENTRIFUGAL PIPE MOLDS

Horace S. Hunt, Burlington, and Paul L. Arnold, Edgewater Park, N. J., assignors to United States Pipe and Foundry Company, Burlington, N. J., a corporation of New Jersey

Application October 29, 1932, Serial No. 640,257

4 Claims. (Cl. 22—88)

Our invention relates to apparatus for coating the inside of centrifugal pipe molds with finely divided dry coating material and particularly to that class of apparatus described in the patent application of Messrs. Russell and Langenberg, filed October 19, 1932, Serial No. 638,480, in which a carrier gas conduit is provided with means at its outer end for injecting a jet of a carrier gas into the conduit and with means for delivering finely divided dry coating material to the jet, the delivery end of the carrier gas conduit being so located and relatively adjusted, with regard to a rotating centrifugal pipe mold as to deliver a jet of the carrier gas, carrying the finely divided, dry, coating material, progressively against the side of the mold so as to build up thereon a helical band of the coating material.

The object of our invention is to combine with such apparatus a nozzle forming an extension of the carrier gas conduit which will effect a substantially even distribution of the finely divided particles of dry coating material carried into the nozzle by the jet of carrier gas over a definite area of the mold and progressively over the entire inner surface of the mold under conditions which will build up a coating of substantially uniform thickness and with the least possible loss of the coating material; and our invention consists, essentially, in the combination with apparatus of the kind indicated of a delivery nozzle directly attached to the end of the carrier gas conduit and having the especial constructive features by means of which the aforesaid results are effected in what we believe to be the most effective and successful manner.

While we believe that the nozzle, which we have designed for the described use in connection with mold coating apparatus, involves novel features of construction, we make no claim to the structure of the nozzle, apart from its combination with and coactive relation to apparatus of the kind indicated for coating the inside of molds with dry, finely divided material.

The important and effective features of the nozzle which we attach to the end of the carrier gas conduit are the construction of the nozzle with an open end adapted to be connected with the conduit for carrier gas and an elongated interior chamber extending from said open end and formed with gradually decreasing cross-sectional area and the provisions of outlet openings through the wall of the nozzle communicating with the contracting interior chamber of the nozzle along its length. By preference, the delivery openings through the wall of the nozzle consist of a multiple series of parallel holes of uniform cross-sectional area and disposed in parallel, longitudinal rows with the holes of adjacent rows staggered with respect to each other and, also by preference, the aggregate cross-sectional area of the delivery openings is materially greater than the cross-sectional area of the nozzle at its widest point. In practice we have found it advisable to use holes of an aggregate area approximating three times the maximum cross-sectional area of the nozzle. The maximum cross-sectional area of the nozzle, it will be understood, is approximately the same as the cross-sectional area of the carrier gas conduit to which the nozzle is attached.

The purpose which we had in view in designing the nozzle for use in apparatus of the kind described is the deposit upon the surface of the rotating mold of a helical band of finely divided, dry, solid material having as nearly as possible a uniform thickness and it will be understood that the formation of this helical band is effected both by the uniformity with which the solid particles issuing from the nozzle are distributed among the outlet openings and by the relative movements of the rotating and longitudinally moving mold with respect to the nozzle. Other considerations which we have had in view are that sufficient kinetic energy should be imparted to the particles of solid matter issuing from the nozzle to carry them into contact with the wall of the mold while at the same time the carrier gas issuing through the delivery openings of the nozzle should have its energy and velocity so reduced that it will not contact with the surface of the mold with sufficient energy to displace or blow away the particles of solid matter. The formation of the nozzle with the tapered longitudinal chamber, preferably conical as shown, counteracts the tendency which would otherwise exist for an undue proportion of the carrier gas and, consequently, of the particles carried by the gas, to issue from the nozzle toward its outer end and makes it feasible to secure a practically uniform flow of gas and solid particles through all of the delivery holes of the nozzle. The disposition of the holes is such as to bring about what we may call a composite jet of the carrier gas of the desired form, that is to say, of a form which will deposit upon the rotating and relatively longitudinally retracting surface of the mold a helical band of the solid particles of approximately even thickness. The construction of our nozzle will be better under-

stood as described in connection with the drawing, in which

Figure 1 is an elevation showing diagrammatically the apparatus in connection with which our improved nozzle is intended to be used, with our nozzle indicated as attached to the apparatus.

Figure 2 is a plan view of our nozzle and

Figure 3, a longitudinal section on the line 3—3 of Fig. 2.

A indicates what may be called a gun having at its end a nozzle B connected with a source of gas (preferably air) under pressure by a conduit C, D indicating a regulating valve and E a gauge, The nozzle B opens in line with the cylindrical chamber A^1 of the gun, with which is connected a hopper F into which finely divided dry, solid material is fed by any suitable feeding apparatus, diagrammatically indicated at G. Connected and in line with the chamber A^1 of what we have called the gun is a conduit or pipe H, to the other end of which is attached our nozzle, indicated at I, having an open end J which communicates directly with the conduit pipe H and an elongated internal chamber of gradually contracting cross-sectional area, indicated at K. As shown, the chamber is of conical form. L, L^1, and L^2 indicate three rows of holes formed through the wall of the nozzle and in communication with its conical interior. These rows, as shown, are parallel with each other but the holes in the middle row L^1 are staggered with respect to the holes in the outer rows L and L^2. The holes, as shown, are of equal diameter and have an aggregate cross-sectional area considerably greater than that of the largest cross-sectional area of the nozzle. In practice we have found it advantageous to have the aggregate cross-sectional area of the holes about three times that of the larger cross-sectional area of the nozzle which is approximately the same as the cross-sectional area of the conduit pipe H. M, Fig. 1, indicates a fragmentary showing of the pipe casting mold in connection with which our nozzle is intended to operate.

In operation, a jet of air or other gas is delivered into the chamber A^1 through the nozzle B, the pressure of the gas being in effect converted into velocity in said chamber so that finely divided solid particles fed to the hopper F by the feeding apparatus indicated at G, are drawn into the chamber A^1 and carried forward by the high velocity gas jet into the carrier gas conduit H. The velocity of the carrier gas jet is, of course, communicated to the solid particles fed to it so that both the gas and the particles are moving with a high velocity when they reach the nozzle I. This velocity would tend to carry both the gas and the particles toward the outer end of the nozzle but, by forming the interior chamber of the nozzle of contracting area, this tendency is overcome and it is made possible to deliver approximately equal volumes of gas and equal quantities of the finely divided material carried by the gas through all the holes of the longitudinal rows forming the delivery openings of the nozzle and by providing a sufficient number of holes of sufficient individual diameter, so that their aggregate area will be considerably greater than that of the largest cross-sectional area of the nozzle, the velocity of the issuing jets of gas is so reduced that, while sufficient velocity still exists in the particles of solid matter to carry them forward into contact with the wall of the mold, the velocity of the issuing jets of gas is so reduced that they will not contact with the mold wall with sufficient energy to displace the particles of solid matter.

Having now described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In apparatus for applying to centrifugal pipe molds a coating made up of finely divided, dry coating material comprising a carrier gas conduit, means for injecting a jet of a carrier gas into said conduit and means for delivering finely divided dry coating material to said jet of carrier gas, a delivery nozzle having an elongated internal chamber of contracting cross-sectional area, said nozzle having a multiple series of outlet openings formed through its wall and communicating with the internal chamber at different points along the length thereof, said outlet openings being also so disposed as to extend through the wall of the nozzle in two or more laterally separated rows.

2. Apparatus as called for in claim 1, in which the individual outlet openings in laterally disposed rows are so located as to be staggered with respect to the outlet openings in adjacent rows.

3. Apparatus as called for in claim 1, in which the aggregate area of the outlet openings formed through the wall of the nozzle, materially exceeds the cross-sectional area of the nozzle at its point of largest diameter.

4. Apparatus as called for in claim 1, in which the delivery openings formed through the wall of the nozzle have their wall surfaces substantially parallel to each other.

HORACE S. HUNT.
PAUL L. ARNOLD.