Aug. 16, 1955 C. E. YATES 2,715,385

APPARATUS FOR APPLYING MOLD WASH TO MOLDS

Filed Sept. 25, 1951

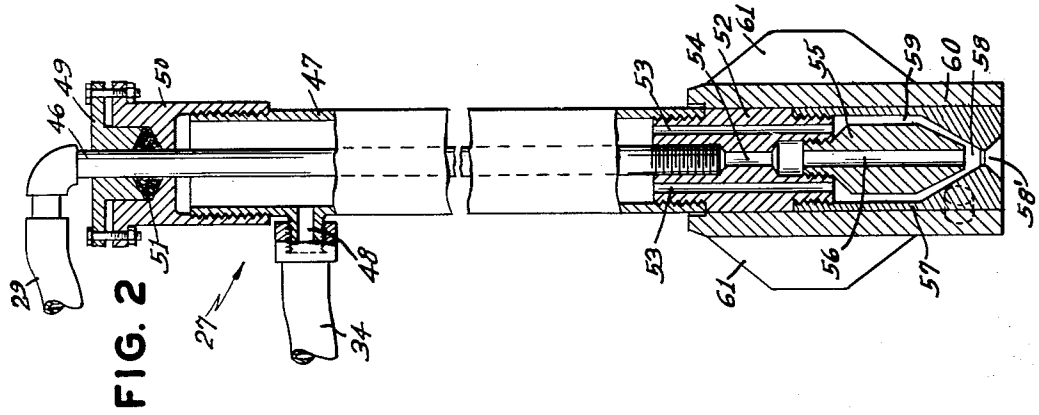


FIG. 2

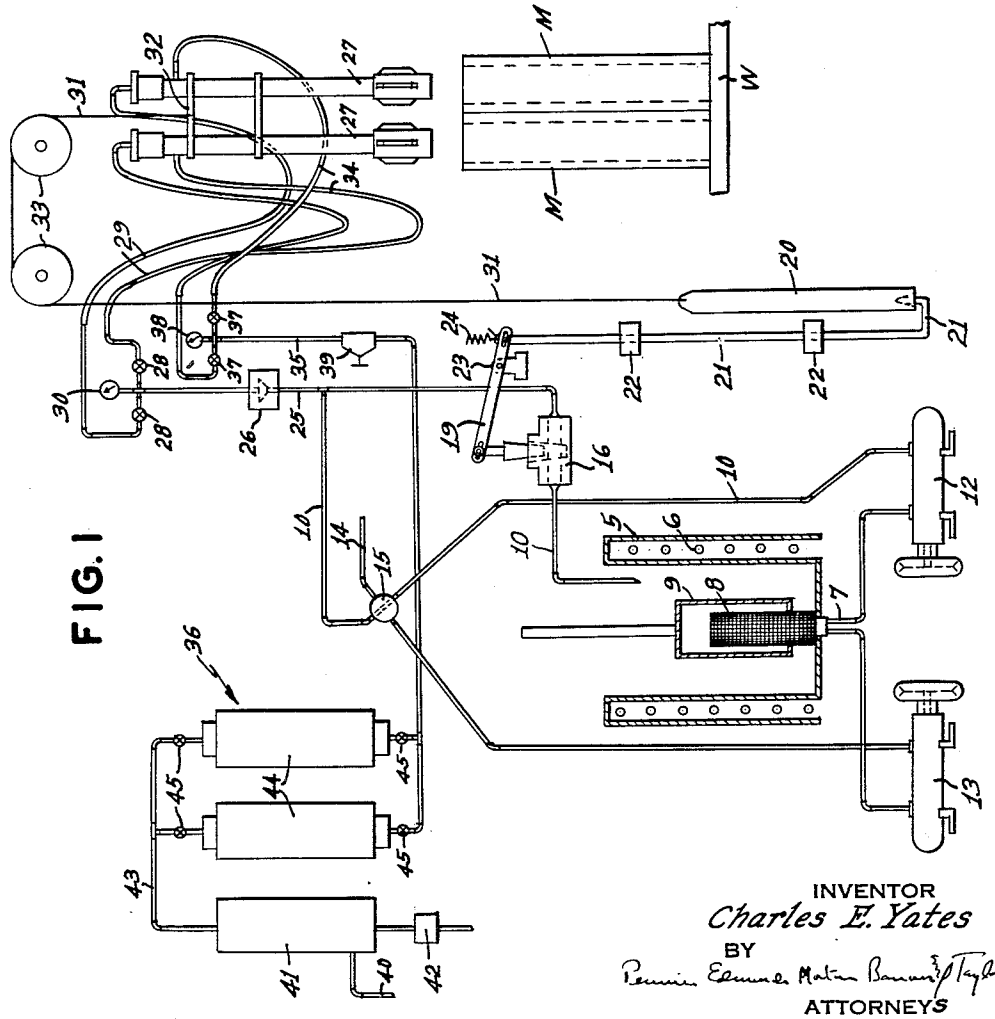


FIG. 1

INVENTOR
Charles E. Yates
BY
Pennie Edmonds Morton Barrows & Taylor
ATTORNEYS

United States Patent Office 2,715,385 Patented Aug. 16, 1955

2,715,385

APPARATUS FOR APPLYING MOLD WASH TO MOLDS

Charles E. Yates, New York, N. Y., assignor to International Smelting and Refining Company, a corporation of Montana

Application September 25, 1951, Serial No. 248,179

7 Claims. (Cl. 118—12)

This invention relates to apparatus for applying mold wash to the interior of molds, and for like purposes. It is particularly directed to apparatus having a system in which mold wash continuously circulates in a closed path, mold wash being withdrawn from a mold wash reservoir and reintroduced into the reservoir by a circulation pump, until a spray nozzle connected with the system is introduced into the interior of a mold and a circulation control valve is thereby automatically caused to close and thus to divert mold wash out of its circulation path to the nozzle which sprays it uniformly throughout the mold.

Metallic molds in which molten metal is cast are customarily coated with an oily or aqueous suspension of graphite or bone black or finely divided alumina or like material. Such a suspension is called "mold wash." The coating of mold wash reduces sticking of the castings to the molds, and helps to give each casting a smooth surface free from pits and other defects. It has been common practice heretofore, especially with respect to small-diameter vertical billet molds, to apply the mold wash manually by swabbing the mold interior with a mop dipped in mold wash.

The apparatus of the present invention greatly reduces the labor involved in applying mold wash and insures uniform coating of the mold interior. It also reduces the quantity of mold wash consumed in coating a given number of molds in comparison with the amount used in manual swabbing of the same number of molds.

The new apparatus comprises a tank containing mold wash, and an inlet pipe and an outlet pipe each communicating with said tank, together with a circulation pump connected between said pipes, whereby mold wash normally is circulated continuously from the tank through the outlet pipe and thence through the inlet pipe back again to the tank. A circulation control valve is connected in the inlet pipe. Spring means urging the valve to its closed position are provided, but the valve normally is held open, through a valve operating lever, so that circulation of the mold wash from the tank and back again to the tank may take place.

A feed pipe is connected with the inlet pipe between the circulation pump and the valve, and a spray nozzle is connected by a flexible connection to said feed pipe. Means are provided so that when the nozzle is introduced into a mold, to spray its interior with mold wash, the circulation control valve is caused to close, with the result that the mold wash is diverted from the circulation path and is delivered through the nozzle. In a particularly advantageous embodiment of the apparatus, the nozzle is suspended for movement vertically into or out of the mold, and is normally held out of the mold by a counterweight. The counterweight in turn actuates the valve operating lever to hold the valve open. When, however, the nozzle is lowered into the mold, the counterweight releases the valve operating lever, and the spring means thereupon causes it to close, so that mold wash is delivered to the nozzle and is sprayed into the mold in

the manner described. When the nozzle is removed from the mold by raising it to the upper limit of its path of travel, the counterweight again actuates the valve operating lever, opening the valve and restoring the flow of mold wash to its normal path of circulation from the tank and back again into the tank.

It is advantageous to incorporate a check valve in the feed pipe connected with the inlet pipe, such check valve being arranged so as to prevent flow of mold wash through the feed pipe toward the tank, and creating an appreciable resistance to the flow of mold wash therethrough from the tank. Thereby, inadvertent leakage of mold wash from the nozzle when it is out of the mold is rendered much less likely to occur, and at the same time the feed pipe itself and the connections between it and the spray nozzle may be kept full of mold wash at all times.

The foregoing and other features of the invention are described below with reference to the accompanying drawings, in which

Fig. 1 is a schematic showing of an advantageous embodiment of the invention; and

Fig. 2 is an elevation, partially in longitudinal section, of an advantageous form of nozzle.

In Fig. 1 the apparatus is shown in its normal condition ready for use. The apparatus comprises a mold wash supply tank **5** whose walls are surrounded by steam coils **6**. These steam coils heat the mold wash while it circulates through the tank and increase its fluidity. The supply tank has an outlet pipe **7**, leading from its bottom and communicating with the interior of the tank through a filter screen **8** which surrounds the open end of the outlet pipe **7** and serves to prevent circulation of any coarse solid impurities which may find their way into the tank. A scraper **9** can be slid up and down on the outer surface of the filter screen **8** to scrape off impurities which may block the holes in the screen and impede the flow of mold wash.

An inlet pipe **10** opens into the upper portion of the tank. The outlet pipe **7** and the inlet pipe **10** are each connected to a circulation pump **12**, thus together forming a mold wash circulation system in which the circulation pump **12** withdraws mold wash through the outlet pipe **7** and pumps it back into the tank through the inlet pipe **10**. A spare circulation pump **13** is a standby pump to supply mold wash through a similar circulation pipeline **14** to a spare spray unit (not shown in the drawing) identical with the main spray unit described below. The spare unit can be employed in case of breakdown of the main unit. A four-way cock **15** is placed at the juncture of circulation pipes **10** and **14** and is normally set so as to cut off the spare pipe unit **14** and to allow free flow through the pipeline **10**.

A circulation control valve **16** is connected in the inlet pipe **10**. Normally the valve **16** is open and permits the circulation pump **12** to continuously withdraw mold wash from the tank **5** through the outlet pipe **7** and return it thereto through the inlet pipe **10** and the valve **16**. The valve **16** should be of a quick-opening, quick-closing type, such as a gate valve. The valve is operated by a lever **19** attached by a slot and pin connection to its stem. Normally the valve **16** is held open by a weight **20** which rests upon the hooked lower end of a lever operating rod **21**. The rod **21** can slide freely up and down vertically in guide bearings **22**, and is attached to the valve lever **19** at its upper end by a slot and pin connection. The lever **19** pivots about a fulcrum support **23**. A spring **24** is attached to the lever **19** and continually urges the valve **16** to its closed position. When the weight **20** is raised, it releases the lever **19** and the spring **24** quickly closes the valve **16**.

A mold wash feed pipe **25** connects with the inlet pipe **10** at a point between the circulation pump **12**

and the quick-closing valve **16**. A check valve **26** is placed in the feed pipe **25** to prevent back-flow towards the supply tank **5**. Thereby, once the feed pipe and equipment connected to it have been filled with mold wash, they will be kept filled at all times. Also, the check valve **26** provides flow resistance in the feed pipeline **25** so that when the quick-closing valve **16** is open, mold wash will simply circulate back to the supply tank **5** through the valve **16** and will not tend to escape through the feed pipe **25**. The feed pipe **25** connects with a pair of pneumatic spray nozzles **27** through valves **28** and flexible mold wash hoses **29** (two spray nozzles are shown by way of example to illustrate the arrangement used for applying mold wash simultaneously to two molds positioned side-by-side). A pressure gauge **30** indicates the pressure in the feed pipe **25**.

A suspension cable **31** is attached at one end to a frame member **32** supporting the spray nozzles **27** and passes over a pair of pulleys **33**. The cable **31** has its opposite end attached to the counterweight **20** which rests upon the lever operating rod **21**. When the nozzles **27**, which are suspended from the cable **31** and can thus be lowered and raised in a vertical path into and out of the interior of molds, are at the upper limit of their vertical path, the counterweight **20** rests upon the lever hook **21** and holds the valve operating lever **19** in an open position, thus allowing mold wash to be circulated by the pump **12** through the open valve **16** back into the supply tank **5**. However, when the nozzles **27** are lowered, the counterweight **20** is raised from engagement with the lever operating rod **21** and the valve **16** is thereupon closed by the spring **24**, thus diverting the flow of mold wash into the feed pipe **25** and through the mold wash hoses **29** to the spraying nozzles **27**.

The apparatus as above described is of course particularly adapted for spraying mold wash into molds M which are mounted on a casting wheel W or other device by which they are advanced into position under the spray nozzles, and by which they are subsequently withdrawn from such position. The particular form of the molds, and of the device for moving them into and out of position under the spray nozzles, is conventional and forms no part of this invention.

Compressed dry air is supplied to the pneumatic spraying nozzles **27** through rubber air hoses **34** from an air line **35** connected to an air drier system **36**. Valves **37** are placed just before the air hoses **34** to regulate the air flow therein. An air gauge **38** indicates the air pressure in the compressed air line **35**, and a regulator valve **39** is connected in the air line **35** to regulate the air pressure. Compressed air is supplied to the air drier system **36** through an air supply pipe **40** and enters a storage tank **41** which is provided with a trap **42** to remove condensed water and other liquids. The air then passes through a pipe **43** to driers **44** of conventional design. One or both of these air driers **44** may be placed in operation to remove moisture from the compressed air by properly setting valves **45**. The compressed air then passes through the air line **35** and hoses **34** to the pneumatic spray nozzles **27**.

Fig. 2 shows in detail one of the pair of pneumatic spray nozzle assemblies **27** advantageously employed in the spraying apparatus described above. The nozzle structure comprises a central pipe **46** which communicates with the mold wash supply hoses **29** and extends down through the interior of an air supply cylinder **47** in concentrically spaced relationship with the walls of such cylinder. The air hose **34** communicates with the interior of the air supply cylinder **47** through a side intake **48**. The cylinder **47** is made airtight at the top by means of a cap plate **49** which is bolted to a packing gland bushing **50** so as to compress a packing washer **51** tightly against the walls of the central pipe **46**. The lower end of the bushing **50** is internally threaded and screws securely on to the corresponding threaded upper end of the cylinder **47**.

The lower end of the central pipe **46** is threaded into a nipple **52** which is itself screw-threaded to the lower end of the cylinder **47**. Air channels **53** are formed longitudinally through the nipple **52** in concentric relation about an axial mold wash channel **54**. A deflector **55** having a central mold wash channel **56** passing axially through it is threaded into the lower end of nipple **52** so that its channel **56** communicates with the axial mold wash channel of the nipple **52** and through it with the pipe **46**. A nozzle **57** screw-threaded to the lower end of the nipple defines a mixing cavity **58** at the lower end of the deflector **55**, to which cavity mold wash is delivered through the channel **56** and to which air is delivered through an annular air passage **59** formed between the wall of the nozzle and the deflector **55**. Air flowing from the intake **48** passes down through the air cylinder **47**, through the nipple air channels **53** and then through the annular passage **59**, from which it is delivered to the mixing chamber **58** in the form of a converging conical jet. When mold wash is delivered under pressure to the mixing chamber **58**, it is blown by the air jet through the nozzle orifice **58** in the form of a conical spray.

A protective sleeve **60** is fitted over the lower end portion of the nozzle assembly. The protective sleeve is provided with radial spacing fins **61** which serve to center the nozzle assembly as it is lowered into the interior of a mold, and thus help to produce a uniform coating of mold wash on the interior of a mold.

In the operation of the above-described spraying apparatus, the circulation pump **12** is started while the counterweight **20** is resting upon the lever operating rod **21**, whereby mold wash is continuously withdrawn from the supply tank **5** and circulated through the inlet pipe **10** and the open valve **16** back into the supply tank. The apparatus thus is in condition ready for a spraying operation. When it is desired to spray the interior of a pair of molds M, the operator lowers the spray nozzles **27** into such molds, whereby the counterweight **20** is raised from the lever operating rod **21**, releasing the valve lever **19** and causing the valve **16** to close under the urging of the spring **24**. Thereupon mold wash is diverted through the feed pipe **25** and into the pneumatic nozzles. It has been found advantageous to maintain a mold wash pressure of between 20 and 40 pounds per square inch in the inlet pipe **10** and the feed pipe **25** when the valve **16** is closed. Regulation of mold wash pressure may be achieved by having a variable speed drive on circulation pump **12**.

Air is supplied to the pneumatic nozzles through the air line **35** and in normal operations flows constantly out of the nozzles, whether the apparatus is in spraying operation or not. An air pressure of about 6 to 8 pounds per square inch in the air line **35** has been found adequate.

Since the spray of mold wash begins as soon as the spray nozzle begins to move down through the mold, and stops as soon as the nozzle is raised out of the mold, the apparatus of this invention has been found to deposit an ample coating of mold wash on copper billet molds, and yet to effect a substantial saving of mold wash in comparison with the amount required using other application procedures. A minimum of physical effort is required, with the result that a single operator can perform all the spraying of molds that required the efforts of several men when using the heretofore conventional manual methods for applying mold wash to billet molds.

I claim:

1. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said inlet and said outlet pipes, whereby mold wash is circulated from the tank through the outlet pipe and through the inlet pipe back to the tank, a normally open circula-

tion control valve connected in said inlet pipe, a valve operating lever, spring means urging said valve closed, a spray nozzle communicating with said inlet pipe through a flexible hose connection and movable in a vertical path into and out of said mold, and a counterweight normally holding said nozzle in an elevated position out of said mold and holding said valve operating lever in position to hold said valve open in opposition to the urging of said spring means, said counterweight releasing said lever when the nozzle is lowered into the mold, thereby enabling said valve to be closed for so long as said nozzle is lowered into the mold.

2. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said inlet and said outlet pipes and serving to circulate mold wash from the tank through the outlet pipe and through the inlet pipe back to the tank, a normally open circulation control valve connected in said inlet pipe, a spring-biased valve operating lever through which said valve is urged closed, a spray nozzle connected through a flexible hose connection to said inlet pipe, said nozzle being suspended for movement in a vertical path into and out of said mold, and a counterweight normally holding said nozzle in its elevated position out of said mold and actuating the operating lever of said valve so as to hold said valve open against the urging of said spring bias, said counterweight releasing said lever whenever said nozzle is lowered into the mold, thereby allowing said valve to close and remain closed until said nozzle is raised again to the upper limit of its path of travel.

3. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said inlet and said outlet pipes, a circulation control valve connected in said inlet pipe, lever means normally holding said valve open, whereby said pump normally continuously withdraws mold wash from said tank through said outlet pipe and introduces it back into said tank through said inlet pipe and valve, a mold wash feed pipe communicating with said inlet pipe between said valve and said pump, a pneumatic spray nozzle communicating with said feed pipe through a flexible hose connection, said nozzle being movable in a vertical path into and out of said mold, and counterweight means normally holding said nozzle out of the mold and normally actuating said lever means to hold said valve open, said counterweight means releasing said lever to cause said valve to close and thus to direct mold wash to the said nozzle whenever said nozzle is moved into said mold.

4. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said inlet and said outlet pipes, said pump normally circulating mold wash continuously from the tank through said outlet pipe and through said inlet pipe back into said tank, a normally open circulation control valve connected in said inlet pipe, a mold wash feed pipe communicating with said inlet pipe between said control valve and said pump, a pneumatic spray nozzle, a flexible hose connection between said feed pipe and said nozzle, said nozzle being movable in a vertical path into and out of said mold, spring means urging said control valve closed, and means actuated by movement of said nozzle out of said mold to overcome the force of said spring means and open said control valve.

5. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said

inlet and said outlet pipes, said pump normally circulating mold wash continuously from the tank through said outlet pipe and through said inlet pipe back into said tank, a normally open circulation control valve connected in said inlet pipe, a mold wash feed pipe communicating with said inlet pipe between said control valve and said pump, a check valve connected in said feed pipe, said check valve preventing flow through said feed pipe toward said tank and creating appreciable resistance to the flow of mold wash therethrough from sand tank, a pneumatic spray nozzle, a flexible hose connection between said feed pipe and said nozzle, said nozzle being movable in a vertical path into and out of said mold, spring means urging said control valve closed, and means actuated by movement of said nozzle out of said mold to overcome the force of said spring means and open said control valve.

6. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said inlet and said outlet pipes, said pump normally circulating mold wash continuously from the tank through said outlet pipe and through said inlet pipe back into said tank, a circulation control valve connected in said inlet pipe, a mold wash feed pipe communicating with said inlet pipe between said control valve and said pump, a pneumatic spray nozzle, a flexible hose connection between said feed pipe and said nozzle, said nozzle being movable in a vertical path into and out of said mold, lever means for opening said control valve, spring means operably connected to said lever means for closing said control valve, and means actuated by movement of said nozzle out of said mold operating said lever means to overcome the force of said spring means and thereby open said control valve.

7. Apparatus for applying mold wash to the interior of a mold comprising a tank containing mold wash, an inlet pipe and an outlet pipe each communicating with said tank, a circulation pump connected between said inlet and said outlet pipes, said pump normally circulating mold wash continuously from the tank through said outlet pipe and through said inlet pipe back into said tank, a circulation control valve connected in said inlet pipe, a mold wash feed pipe communicating with said inlet pipe between said control valve and said pump, a check valve connected in said feed pipe, said check valve preventing flow through said feed pipe toward said tank and creating appreciable resistance to the flow of mold wash therethrough from said tank, a pneumatic spray nozzle, a flexible hose connection between said feed pipe and said nozzle, said nozzle being movable in a vertical path into and out of said mold, lever means for opening said control valve, spring means operably connected to said lever means for closing said control valve, and means actuated by movement of said nozzle out of said mold operating said lever means to overcome the force of said spring means and thereby open said control valve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,258,071	Winter	Mar. 5, 1918
1,638,758	Boyett	Aug. 9, 1927
2,141,630	Westin	Dec. 27, 1938
2,381,649	Dalton	Aug. 7, 1945
2,508,709	Goetchius	May 23, 1950
2,509,448	Ransburg et al.	May 30, 1950
2,518,038	Malhiot	Aug. 8, 1950

FOREIGN PATENTS

581,777	Great Britain	Oct. 24, 1946