Jan. 22, 1957 G. E. TURPIN 2,778,616

MEANS FOR ATOMIZING LIQUIDS, PARTICULARLY FOR LUBRICATING SHEET METAL DURING ROLLING

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Fig. 1.

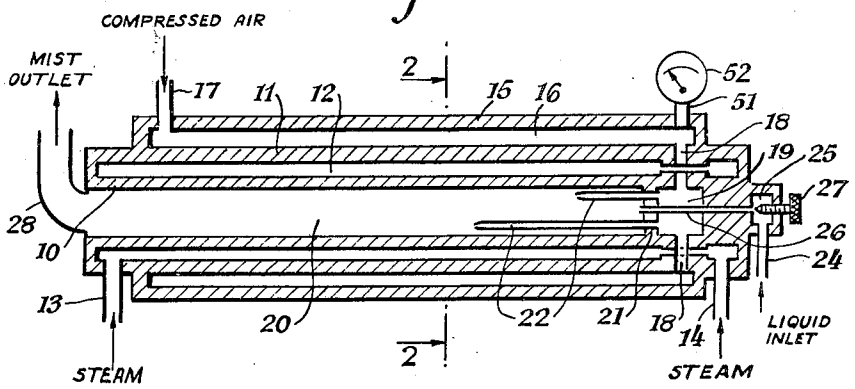
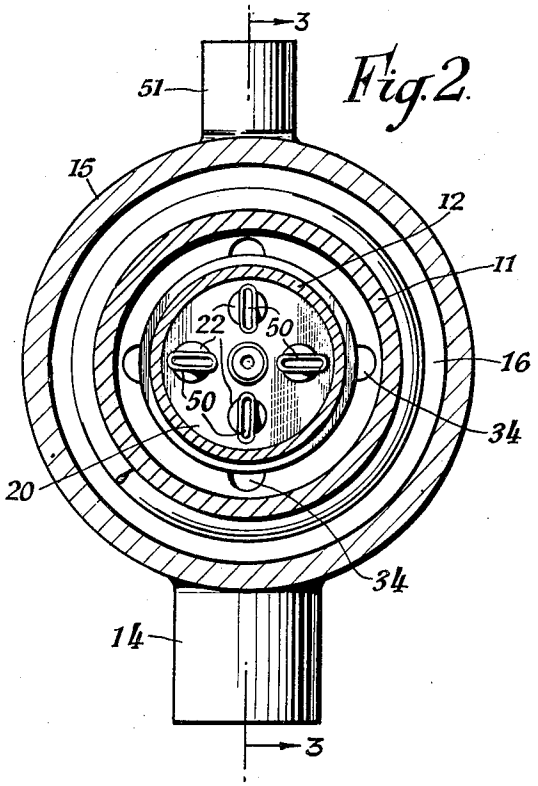


Fig. 2.



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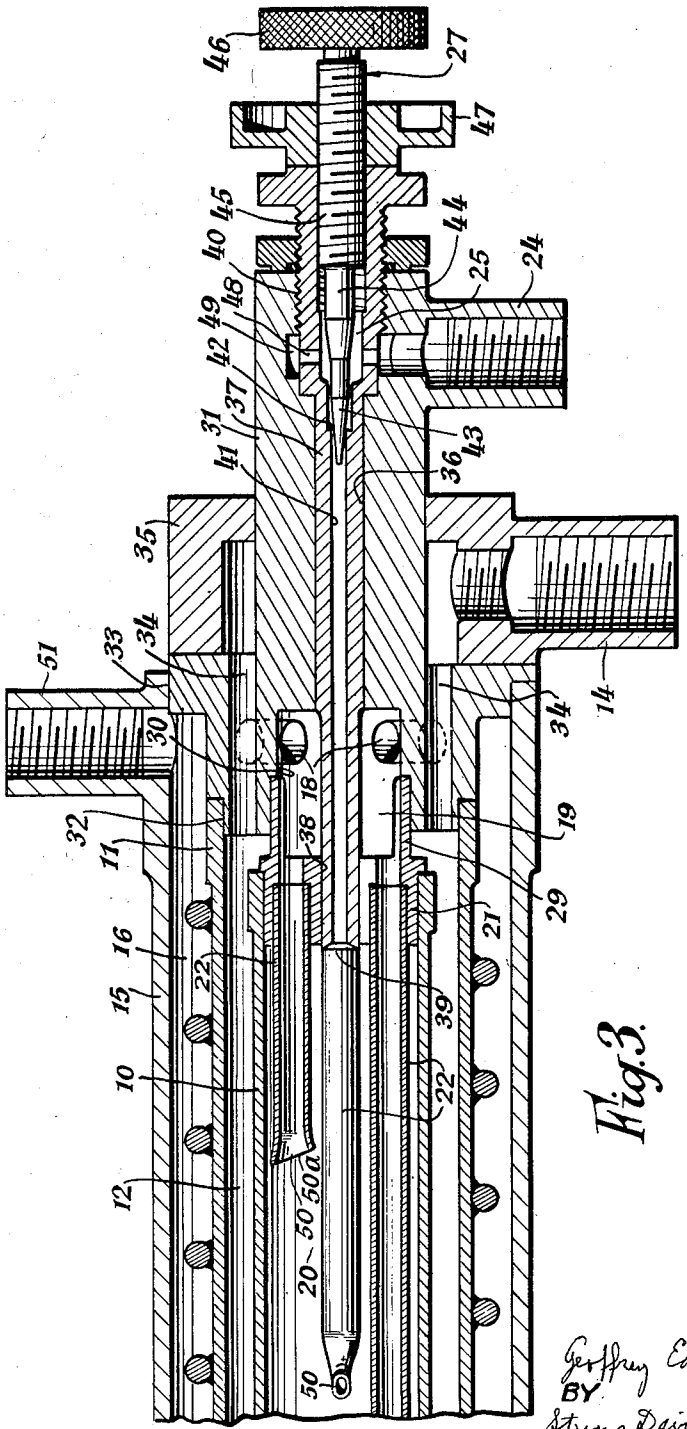


Fig. 3.

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MEANS FOR ATOMIZING LIQUIDS, PARTICULARLY FOR LUBRICATING SHEET METAL DURING ROLLING

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Claims priority, application Great Britain January 28, 1954

2 Claims. (Cl. 261—14)

This invention relates to means for atomising liquids, particularly for lubricating sheet metal during rolling.

In my patent specification No. 2,707,098, dated April 26, 1955, an atomising device is described comprising a hollow-walled tubular barrel, a casing disposed outside said tubular barrel forming an outer conduit surrounding said barrel, a compressed air inlet connection at one end of said outer conduit, transfer connection means at the other end of said outer conduit leading into the adjacent end of the bore of the tubular barrel, an injection device for delivering liquid into said bore longitudinally at a position adjacent the transfer connection means, so that heated air from the outer conduit is charged with liquid globules and then flows back along the bore of the tubular barrel to that end thereof adjacent the said one end of the outer conduit, and delivery means for the heated spray-laden air at that end of the bore, the hollow wall of the tubular barrel being provided with inlet and outlet connections for heating fluid. It is an object of the invention to provide an improvement in or modification of this form of device, whereby better atomisation of the liquid is achieved. The improved device, moreover, is capable of operating satisfactorily under higher delivery pressures than the previous construction.

In an atomising device comprising a hollow-walled tubular barrel through the wall of which a heating fluid is passed, a casing disposed outside said tubular barrel forming an outer conduit surrounding said barrel, a compressed air inlet connection at one end of said outer conduit, transfer connection means at the other end of said outer conduit leading into the adjacent end of the bore of the tubular barrel, an injection device for delivering liquid into said bore longitudinally at a position adjacent the transfer connection means, so that heated air from the outer conduit is charged with liquid globules as it flows back along the bore of the tubular barrel to a mixture outlet at the far end of said bore, the invention is characterised by the fact that injection and mixing means within the bore of the tubular barrel comprise a liquid injection nozzle directed along said bore and a plurality of air nozzles fed with heated air from the outer conduit and arranged to discharge said air at positions posterior to the liquid nozzle.

Preferably the delivery orifices of the air nozzles are disposed at a plurality of positions along the bore of the tubular barrel. The air nozzles may comprise tubular stems mounted in a partition extending across the bore of the tubular barrel. Thus the air nozzles can all extend parallel with the axis of the tubular barrel and are arranged as a circular array disposed around the liquid injection nozzle. Advantageously the air nozzles comprise tubes having their end portions partially flattened to form slot-like delivery orifices, these preferably being arranged radially. The liquid injection nozzle may comprise a jet tube having an axial duct along which the liquid flows, an axially adjustable needle valve member being arranged

to cooperate with an annular shoulder in said duct to regulate the flow of liquid therealong; the needle valve member may be fitted into the jet tube, said jet tube and valve member being removable as a unit from the tubular barrel.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a diagram in the form of a longitudinal section to show the general arrangement of the improved atomising device and the various fluid spaces and passages therein;

Figure 2 is a transverse sectional elevation of a practical embodiment, the section being taken to correspond with the line 2—2 of Figure 1 and being drawn to an enlarged scale; and

Figure 3 is a fragmentary longitudinal sectional elevation taken on the line 3—3 of Figure 2, and showing the air and liquid nozzles.

The atomising device shown in Figure 1 is used primarily for spraying palm oil on to sheet metal while it is being rolled. Palm oil is solid at ordinary temperatures but it can be melted and by using the appropriate form of atomiser it can be converted to a fine mist which is suitable for spraying on the sheet metal so as to produce a very thin uniform coating of palm oil thereon prior to rolling.

The device comprises a straight inner tube **10** which is surrounded by an intermediate tube **11**, the two being connected at their ends so as to form a hollow-walled barrel, the annular chamber thereof being indicated at **12**. The chamber forms a heating jacket which is fed with steam through an inlet **13**, said steam passing along the chamber **12** from left to right and being exhausted through a steam outlet **14**. An outer casing **15** is fitted around the tubular barrel **10**, **11** and is also closed at its ends to form an outer conduit **16** which is of annular shape in cross section. At its left-hand end it has an inlet **17** for compressed air, while at its right-hand end it leads into a number of radial passages forming transfer means, two of these passages being shown at **18** in Figure 1. They lead into a compartment **19** forming the right-hand end of the bore **20** of the inner tube **10**, said compartment **19** being bounded by a partition **21**. This partition **21** supports four air nozzles in the form of small diameter tubes which extend longitudinally of the bore **20**, only two of said tubes being shown at **22**. These tubes are fed with air from the compartment **19** and as they are of different lengths they serve to deliver said air at different positions along the bore of the inner tube **10**.

The liquid inlet is shown at **24** and leads into a chamber **25** from which a jet tube **26** extends axially through the compartment **19** and partition **21**, said jet tube terminating just beyond said partition. An adjustable needle valve **27** is provided in connection with the chamber **25** so as to enable the flow of liquid to be regulated closely to suit requirements. At its left-hand end the inner tube **10** leads to a delivery outlet **28** which is conveniently in the form of an elbow or other pipe.

In operation therefore the steam which is circulated continuously through the chamber **12** causes the tubes **10** and **11** to be maintained in a heated state. The compressed air as it travels along the outer conduit **16** becomes heated so that as it issues from the air nozzle **22** it readily breaks up the liquid spray which is being injected into the bore **20** from the jet tube **26**. As will be hereinafter described, the air nozzles are so constructed as to produce considerable turbulence within the bore **20** so that the mixture becomes further heated as it flows along the internal wall of the tube **10**, so that the product which is delivered through the outlet **28** is in a finely mixed and uniform state.

Details of the preferred practical embodiment are shown in Figures 2 and 3, the main parts being indicated by the

same reference numerals as are used in Figure 1. The partition **21** is fitted into the end of the tube **10** and is formed with a tubular extension **29**, which is in turn secured within a bore **30** formed in a body **31**, the bore **30** constituting the compartment **19**. At its left-hand end the body **31** is enlarged in diameter and is formed with two shoulders **32** and **33** which serve for locating the ends of the intermediate tube **11** and the outer casing **15**. It also has a number of longitudinal passages **34** which communicate with the annular chamber **12** inside the intermediate tube **11** and connects said chamber to the interior of an annular cap **35** having the steam outlet **14** formed on its lower part. The radial passages **18** are drilled at positions intermediate the longitudinal passages **34** and thus form the interconnecting means between the outer conduit **16** and the compartment **19**.

The body **31** has an axial bore **36** into which a liquid jet tube **37** fits snugly, said tube having its forward end extending axially through the compartment **19** and through a hole **38** formed centrally in the partition **21**, its delivery orifice **39** being substantially flush with the left-hand face of said partition. The jet tube **37** is enlarged in diameter at its right-hand end and is formed with a screw-thread **40** by which it is secured in the body **31**. The jet tube **37** has an axial duct **41** terminating in an annular shoulder **42**, which cooperates with the tapered end **43** of a needle valve member **44**, the latter having a stem portion **45** which is screw-threaded into the jet tube and is provided with an adjusting knob **46**; a lock-nut **47** serves to hold the desired adjustment. Adjacent the screw-threaded portion **40**, the jet tube **37** has a number of radial passageways **48** which communicate with an annular groove **49** in the body **39** and thus serve for feeding liquid from the liquid inlet **24** past the shoulder **42** to the axial duct **41** and delivery orifice **39**.

The air jet tubes **22** are set into the partition **21** and are of different lengths so that the air from the compartment **19** is delivered at high velocity to different points along the length of the bore **20**. Thus if the bore **20** is about 20 inches long, the four tubes **22** can advantageously be about 2, 4, 6 and 8 inches long respectively. As shown in Figure 2, each has its end partially flattened to form a slot-shaped delivery jet orifice **50**, the slots being arranged radially as seen in end view. Also the ends of the tubes are preferably cut off obliquely as indicated at **50***a* in Figure 3.

The unit is conveniently provided with a socket **51** into which a pressure gauge **52** (Figure 1) can be fitted to show the air pressure which is being fed to the air jet tubes **22**.

It should be mentioned that most of the parts of the atomising device described are welded together to form a robust, fluid-tight unit, and that the actual design of the various components can be modified to suit manufacturing requirements. Moreover it will be understood that the details which have been described are given by way of example only, and that various modifications may be made to suit requirements.

I claim:

1. An apparatus for producing a spray of atomised liquid, such as heated palm oil, comprising an inner tube, an oil injection nozzle disposed within one end of said inner tube, spray delivery means at the other end of said inner tube, an intermediate tube surrounding the inner tube but spaced therefrom to form an intermediate annular heating jacket, means for passing heating fluid along said heating jacket, an outer tube surrounding the intermediate tube but spaced therefrom to form an outer annular chamber which is of small radial thickness and is shorter in axial length than the heating jacket, said outer annular chamber being carried wholly upon the outside of the intermediate tube, means for feeding compressed air into the outer annular chamber at that end thereof adjacent the delivery end of the inner tube, transfer conduit means forming a connection for compressed air extending inwards from the outer annular chamber, a multiple nozzle device which is disposed in the bore of the inner tube adjacent the inlet end thereof, and which comprises a wall closing the bore of said tube, a plurality of air nozzle tubes mounted in the wall and directed towards the delivery end of said inner tube, the delivery ends of said air nozzle tubes being flattened to form narrow parallel-sided delivery nozzles, said nozzles being arranged in a circular series around the axis of the inner tube and having their parallel sides disposed substantially radially with respect to said axis, said air nozzle tubes being fed with heated air from the transfer conduit means, and fins anchored to the outside of the intermediate tube and extending outwards within the outer annular chamber to increase the transmission of heat to the compressed air before it reaches the transfer conduit means.

2. An apparatus for producing a spray of atomised liquid, such as heated palm oil, comprising an inner tube, an oil injection nozzle disposed within one end of said inner tube, spray delivery means at the other end of said inner tube, an intermediate tube surrounding the inner tube but spaced therefrom to form an intermediate annular heating jacket, means for passing heating fluid along said heating jacket, an outer tube surrounding the intermediate tube but spaced therefrom to form an outer annular chamber, which is of small radial thickness and is shorter in axial length than the heating jacket, said outer annular chamber being carried wholly upon the outside of the intermediate tube, means for feeding compressed air into the outer annular chamber at that end thereof adjacent the delivery end of the inner tube, transfer conduit means forming a connection for compressed air extending inwards from the outer annular chamber, a multiple nozzle device which is disposed in the bore of the inner tube adjacent the inlet end thereof, and which comprises a wall closing the bore of said tube, a plurality of air nozzle tubes mounted in the wall and directed towards the delivery end of said inner tube, said air nozzle tubes being of different lengths and having their delivery ends disposed at positions spaced along the length of the inner tube and being fed with heated air from the transfer conduit means and delivering it at spaced points along the length of the inner tube, and fins anchored to the outside of the intermediate tube and extending outwards within the outer annular chamber to increase the transmission of heat to the compressed air before it reaches the transfer conduit means.

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