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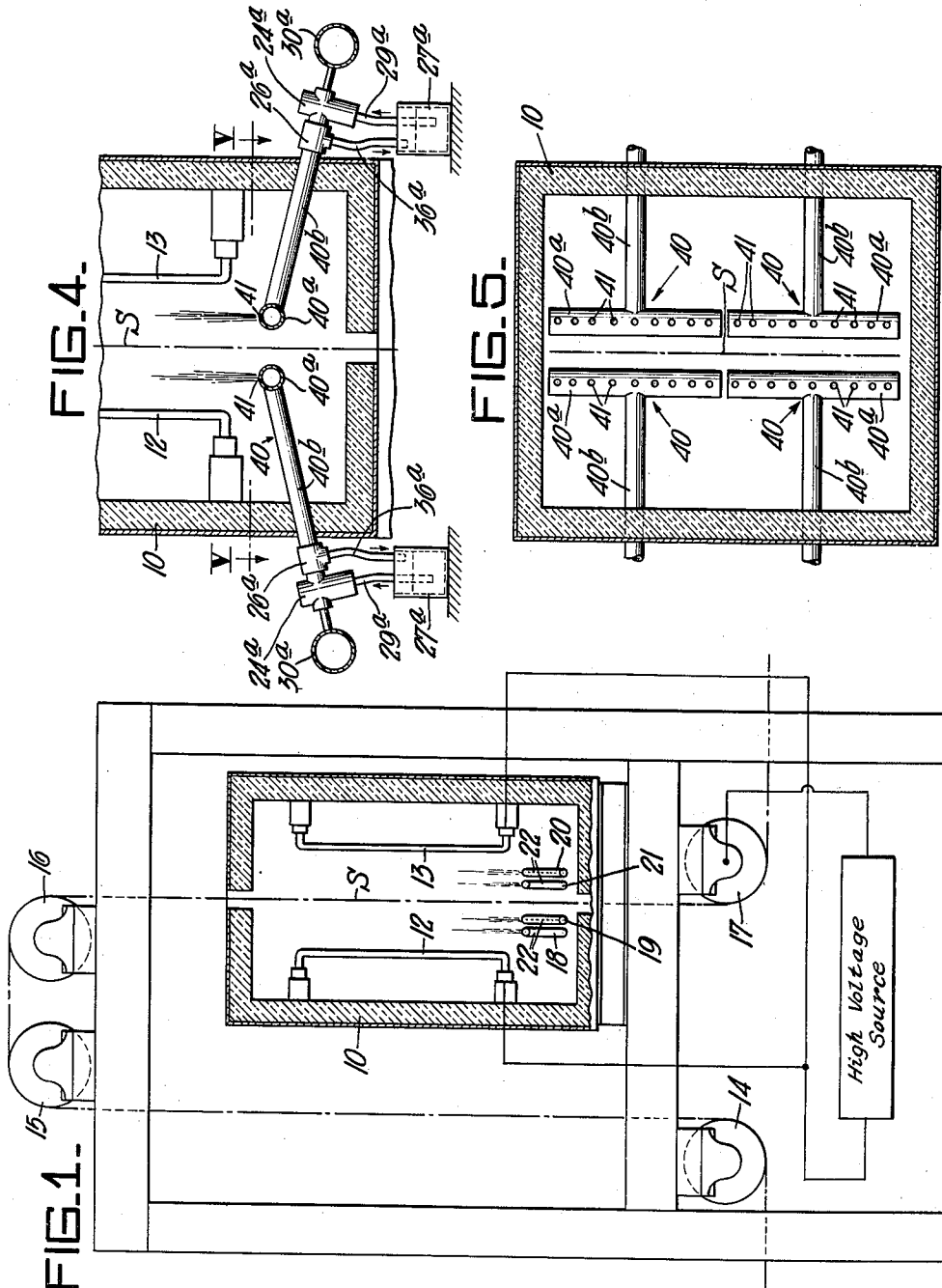
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2,762,331

OIL SPRAY DEVICES FOR ELECTROSTATIC OILING MACHINES

Filed June 18, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2.

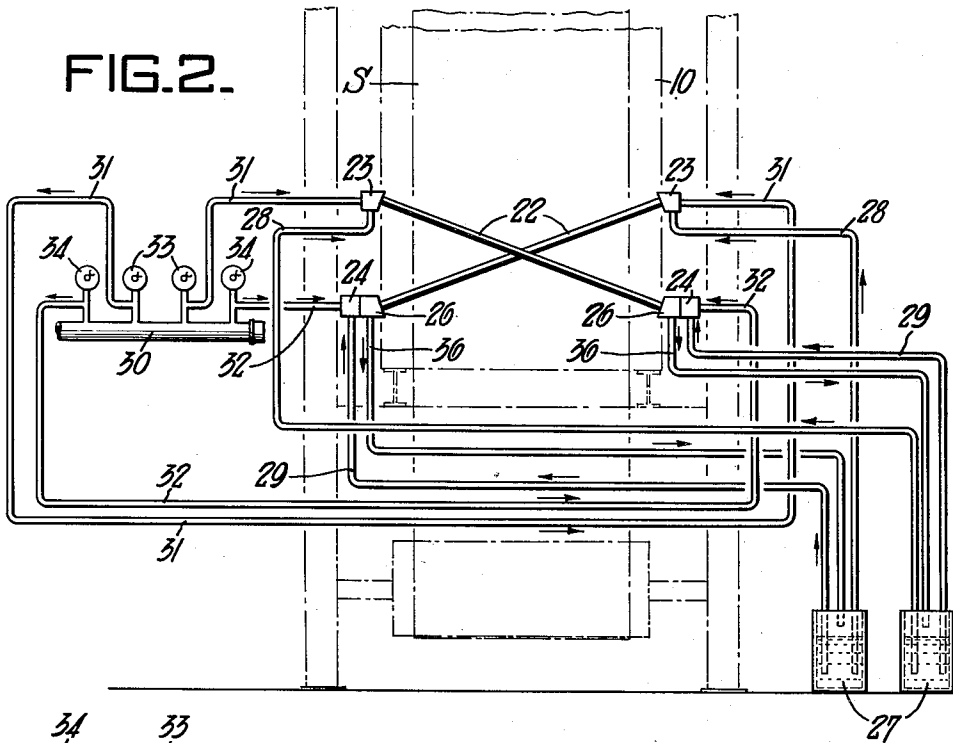
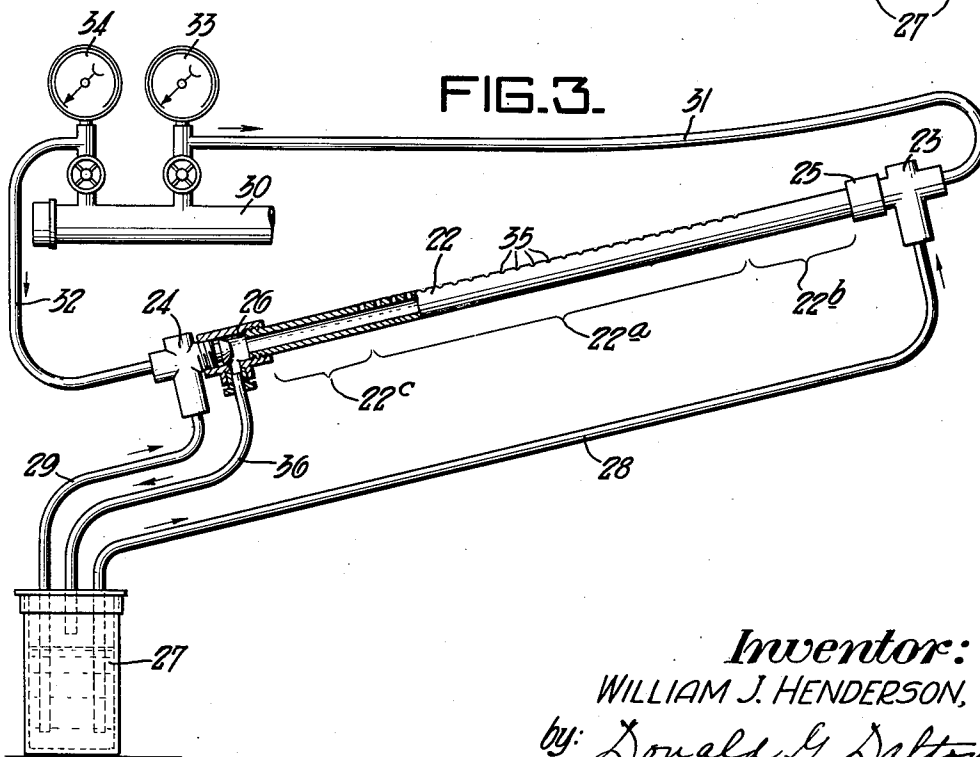


FIG. 3.



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OIL SPRAY DEVICES FOR ELECTROSTATIC OILING MACHINES

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This invention relates to improved oil spray devices especially for electrostatic oiling machines.

A common practice in the manufacture of electrolytic tin plate is to apply a surface film of a nondrying oil over the tin coating. This film facilitates handling tin plate during its subsequent processing, such as lacquering. One form of equipment used for applying the film is an electrostatic oiling machine, which comprises essentially a chamber, a pair of spaced apart high voltage grids of like polarity within the chamber, and devices for introducing atomized oil sprays. Tin plate in continuous strip form passes between the grids and is connected to a high voltage source of opposite polarity. Electrostatic attraction of the strip for the oil particles causes them to adhere to its surfaces and produce the desired film thereon.

An object of the present invention is to provide, in combination with such machines, improved oil spray devices which are more efficient, more economical in consumption of oil, and afford better control of the spray than previous spray devices with which I am familiar.

A further object is to provide improved oil spray devices which have a gravity return for larger oil droplets that fail altogether to atomize or else do not atomize to a sufficiently fine particle size, and thus both economize in the use of oil and eliminate oversize oil droplets from the spray.

A further object is to provide improved oil spray devices in which the only compressed air needed is that introduced to the atomizers.

In accomplishing these and other objects of the invention, I have provided improved details of structure, preferred forms of which are shown in the accompanying drawings, in which:

Figure 1 is a vertical sectional view of an electrostatic oiling machine equipped with improved spray devices embodying features of the present invention;

Figure 2 is a schematic end elevation of the machine and illustrates the spray arrangement;

Figure 3 is an elevational view of one of the spray devices; and

Figures 4 and 5 are vertical and horizontal sectional views of an oiling machine equipped with a modified spray device in accordance with the invention, Figure 5 being taken on line V—V of Figure 4.

Figure 1 shows an electrostatic oiling machine which comprises a chamber 10, a pair of spaced apart high voltage grids 12 and 13, and a series of rolls 14, 15, 16 and 17 for guiding a continuous strip S of tin plate or other metal in a vertical path (either up or down) through the chamber and between the grids. A pair of spray devices 18 and 19 embodying one form of the present invention are supported by the walls of chamber 10 and are situated under the space between grid 12 and the strip path, and a similar pair of spray devices 20 and 21 are situated under the space between grid 13 and the strip path. In each instance the spray devices preferably are closer to the strip than to the downward projection of the grids.

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The machine, apart from the spray devices, is not shown nor described in detail since it can be of any standard or desired construction and operates according to well known principles.

Figure 3 shows details of a preferred spray device 18, 19, 20, or 21, all of which preferably are of similar construction. The device includes a sloping manifold 22, shown as having atomizers 23 and 24 at opposite ends thereof, and fittings 25 and 26 securing said atomizers thereto. For a smaller oil delivery the upper atomizer 23 and fitting 25 can be omitted. An oil container 27, preferably transparent, is connected to atomizers 23 and 24 via tubes 28 and 29. A compressed air header 30, or equivalent air source, is connected to said atomizers via lines 31 and 32, which preferably contain pressure gauges 33 and 34. The manifold has a discharge section 22a and entry sections 22b and 22c of substantial length at each end of said discharge section. The upper face of the discharge section has a series of openings 35 for emitting sprays of atomized oil which the atomizers 23 produce in the manifold. An oil return line 36 connects the fitting 26 and the container 27. Any larger oil droplets which fail to atomize sufficiently drop from spray in the entry sections of the manifold and flow by gravity down the manifold and the line 36 back into the container 27.

Figure 2 shows schematically the preferred positioning arrangement of the spray devices 18 and 19. The spray devices 20 and 21 on the opposite side of the strip are positioned similarly. Preferably there are two spray devices on each side of the strip to increase the amount of oil delivered over that possible with one such device. The spray devices 18 and 19 are arranged so that their manifolds 22 are within chamber 10 and form a shallow X when the chamber is viewed in end elevation to deliver oil uniformly across the strip width. The openings 35 face upwardly so that the sprays are emitted parallel to the strip surface. The atomizers 23 and 24 and the containers 27 are outside the chamber walls, where they are easily accessible. Preferably no air is introduced to the system other than that introduced to the atomizers 23 and 24. This arrangement furnishes a supply of atomized oil which is of substantially uniform particle size and substantially uniform volume across the full width of the strip and in close proximity thereto, whereby the electrostatic attraction of the strip causes the oil particles to form the desired uniform film on the strip surface. The gravity return assures that oil which passes through the atomizer and fails to atomize is neither wasted, nor deposited on the strip as nonuniform droplets, but returns to the containers 27.

Figures 4 and 5 show a portion of an electrostatic oiling machine which is equipped with modified spray devices 40, of which there preferably are a plurality on each side of the strip S located below the spaces between the strip path and the grids. Each spray device 40 is formed of a manifold which is of T-shape in plan and includes a discharge section 40a and an entry section 40b connected to the midportion of said discharge section. The entry section 40b slopes downwardly from the discharge section 40a and at its lower end is connected to a fitting 26a, an atomizer 24a, and oil line 29a, an oil container 27a, an oil return line 36a, and an air header 30a, all preferably located outside the chamber 10 and being of similar construction and operation to the corresponding parts of the spray device shown in Figure 3 and already described. The upper face of the discharge section 40a has a plurality of upwardly directed spray openings 41. The sloping entry section 40b of the manifold provides a space in which unatomized oil droplets can collect and return by gravity to the oil container 27a in the same way as the sloping manifold of Figure 3.

The oils suitable for forming the desired film on tin plate are known in the art and include most of the non-drying oils, with the further qualification for tin plate used in food containers that they be nonpoisonous. Specific examples are cottonseed oil, palm oil, corn oil, olive oil, coconut oil, lard oil, tallow, and plasticizers such as dibutyl phthalate or sebacate. When the oil is of a type that is solid at room temperature, such as palm oil or tallow, the containers 27 or 27a can be heated sufficiently to liquify the oil. External infra red lamps, not shown, can be used satisfactorily for such heating. The transparency of the containers 27 or 27a furnishes a ready visual indication of the actual oil supply. The atomizers 23, 24 and 24a are all located externally of the spray chamber so that they can be readily cleaned and adjusted. In actual practice I have observed an oil consumption of 8 gallons per week of steady operation with the spray devices of the present invention, contrasted with 50 gallons with conventional spray devices.

While two embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. In an electrostatic oiling machine which comprises a chamber, a pair of spaced apart high voltage grids within said chamber, and means for guiding metal strip in a vertical path between said grids, the combination with said chamber of oil spray devices supported by the walls thereof on opposite sides of the strip path and each including a manifold situated within said chamber under the spaces between the strip path and the grids and having a plurality of openings directed upwardly parallel to the strip path, an atomizer having a connection with said manifold and discharging therein, an oil container connected with said atomizer, means for introducing compressed air to said atomizer, and means connected with said manifold on the discharge side of said atomizer furnishing a gravity return to said container for oil which passes through said atomizer and fails to atomize.

2. A combination as defined in claim 1 in which there are two sloping manifolds on each side of the strip path arranged to form a shallow X when the chamber is viewed in end elevation.

3. A combination as defined in claim 1 in which each of said manifolds is of T-shape in plan.

4. In an electrostatic oiling machine which comprises a chamber, a pair of spaced apart high voltage grids within said chamber, means for guiding metal strips in a vertical path through said chamber and between said grids, the combination with said chamber of oil spray devices supported by the walls thereof on each side of the strip path for applying sprays of atomized oil to the strip surface, each of said spray devices including a manifold situated within said chamber and having a plurality of openings, an atomizer situated outside said chamber and having a connection with said manifold and discharging therein, an oil container and a compressed air source situated outside said chamber and connected to said atomizer, and means connected with said manifold on the discharge side of said atomizer furnishing a gravity return to said container for oil that passes through said atomizer and fails to atomize.

5. An electrostatic oiling machine comprising a chamber, a pair of spaced apart high voltage grids within said chamber, means for guiding metal strips in a vertical path

through said chamber and between said grids, and a pair of oil spray devices supported by the walls of said chamber on each side of the strip path, each of said devices including an elongated manifold situated within said chamber under the space between a grid and the strip path and having upwardly directed spray openings, atomizers situated outside said chamber and connected to both ends of said manifold and discharging therein, an oil container situated outside said chamber, connections for admitting oil from said container and compressed air to said atomizers, and an oil return line connected to a low point of said manifold on the discharge side of said atomizers and to said container to furnish a gravity return for oil which passes through one of said atomizers and fails to atomize, the two manifolds on each side of the strip path forming a shallow X when the chamber is viewed in end elevation.

6. An oil spray device comprising a sloping manifold having upwardly directed spray openings, atomizers connected to opposite ends of said manifold and discharging therein, a container for oil and a compressed air source connected to said atomizers, and a gravity return line connected to a low point in said manifold on the discharge side of said atomizers and to said container for returning larger oil droplets.

7. An oil spray device comprising a manifold of T-shape in plan and having a discharge section and an entry section connected to the mid-portion of said discharge section and sloping downwardly therefrom, said discharge section having a plurality of spray openings, an atomizer connected to the lower end of said entry section and discharging therein, an oil container and an air source connected to said atomizer, and an oil return line connected to a low point of said entry section on the discharge side of said atomizer and to said container for returning larger oil droplets.

8. An oil spray device comprising a manifold having an entry section and a discharge section, an oil supply reservoir, atomizing means connected to said reservoir and to said entry section and discharging into the latter, an air source connected to said atomizing means, said entry section being positioned with respect to said atomizing means and said discharge section to slope toward the atomizing means and being of sufficient length for oversize oil particles in the oil spray issuing from said atomizing means to drop from this spray, and a gravity return pipe connecting the lower end of said entry section on the discharge side of said atomizing means to said reservoir.

9. A spray device as defined in claim 8 in which said entry section and said discharge section are aligned and connected end to end.

10. A spray device as defined in claim 8 in which said entry section is substantially perpendicular to said discharge section and connected to the mid-portion thereof.

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