March 25, 1958 E. GEMPE 2,828,256

APPARATUS FOR PRODUCING GALVANIC COATINGS

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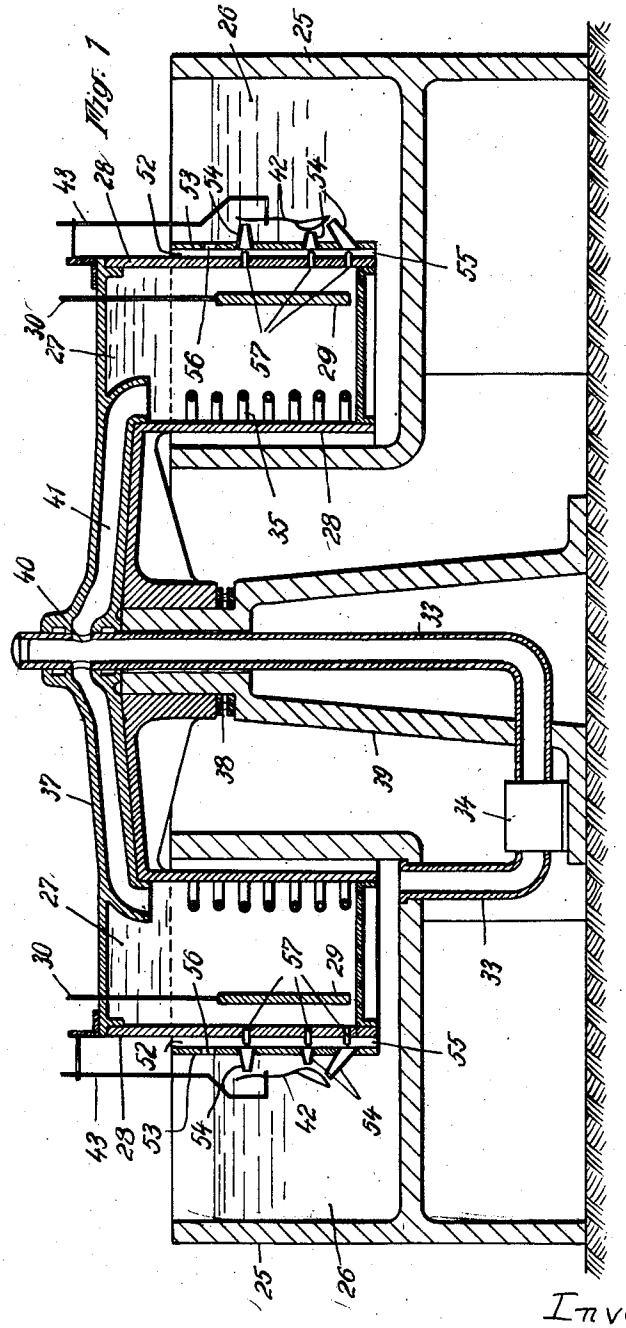
Fig. 1



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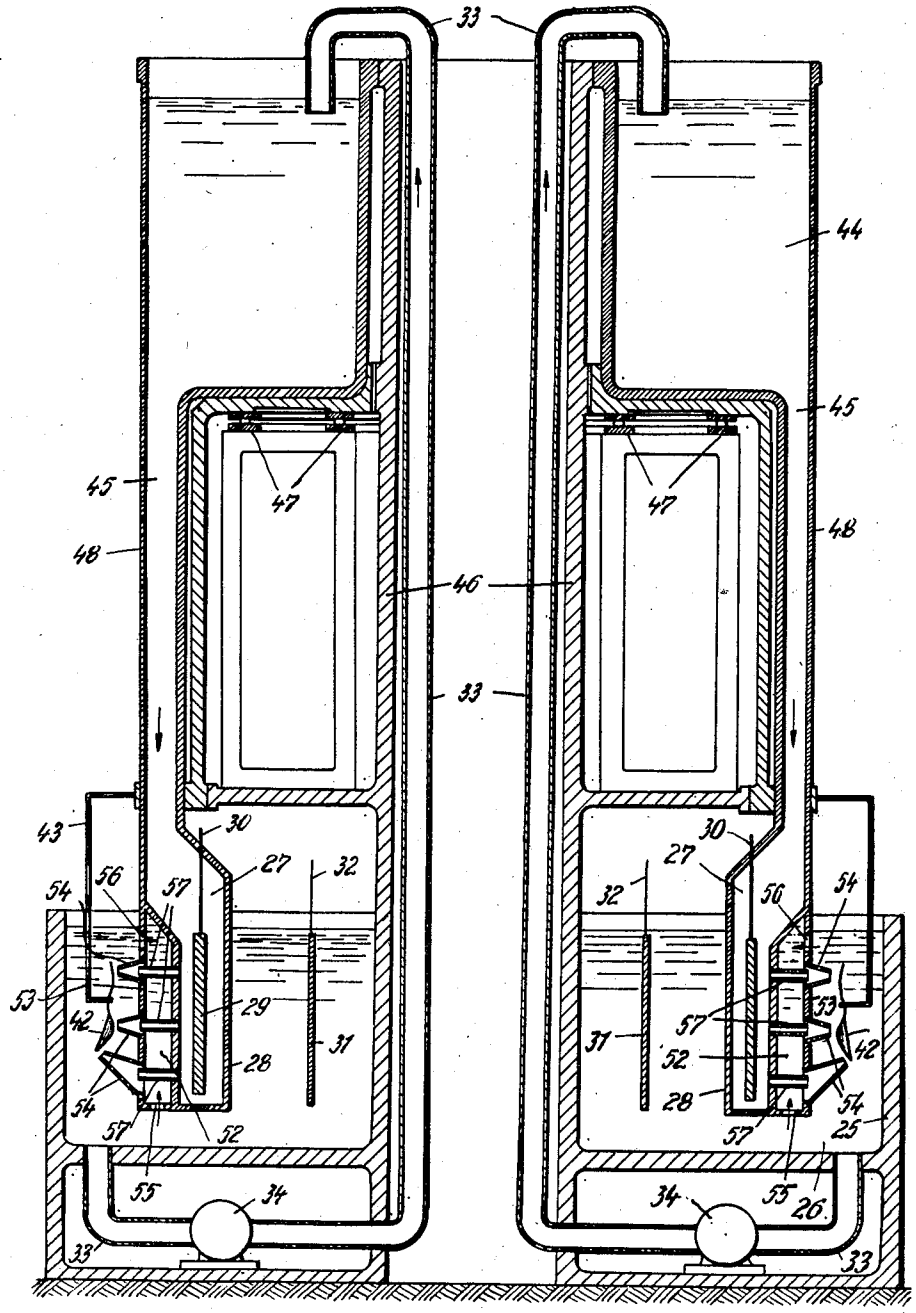

Fig. 2

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APPARATUS FOR PRODUCING GALVANIC COATINGS

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Claims priority, application Germany February 12, 1953

1 Claim. (Cl. 204—199)

This invention relates to an apparatus for the production of galvanic coatings on objects of all kinds which are subjected at different points to relatively heavy wear or which for other reasons have to be provided with a thicker layer of deposited metal over local zones than at other points. The invention relates particularly to the production of cutlery such as forks, spoons and the like which require locally thickened silver layers.

In the apparatus of this kind, there is established between an anode chamber which contains at least one anode, and a cathode chamber which contains the workpieces as cathodes, a flow gradient by which the electrolyte is driven at an increased speed through openings or tubes provided in an insulated screen opposite the parts of the cathode which are to be thickened, in order to concentrate the stream lines on such places. The necessary flow gradient can be created by increasing the hydrostatic pressure between the anode chamber and the cathode chamber, for example by arranging these chambers at different levels, and/or by means of a pump.

The apparatus of this kind is improved, according to the present invention, by increasing the velocity of the electrolyte which flows to the parts of the cathodes which are to be thickened, by means of injectors which preferably take the form of tubes or nozzles, thus reducing the scattering of the stream lines emanating from the openings or the like in the screen, and achieving concentration of the ion exchange and increase of the specific current density on those parts on the workpieces which have to be thickened. The desired local thickening of the galvanic deposit thus takes place more rapidly, more intensively and more precisely than hitherto, this being of particular technological and economical import for the continuous mass processing of such workpieces.

Two devices according to the present invention are illustrated by way of example in the accompanying drawings, in which:

Fig. 1 shows diagrammatically, in vertical longitudinal section, an apparatus with a rotatable anode chamber in the form of a pressure chamber, with which the cathodes are movable.

Fig. 2 shows diagrammatically, in vertical longitudinal section, an apparatus with a pressure-free but rotatable anode chamber disposed above the cathode chamber connected to a space and exerting hydrostatic pressure, the cathodes moving with the anode chamber.

The devices according to Figures 1 and 2 are intended to be used for continuous operation. The cathode chamber **26**, which is filled with the electrolyte fluid, is surrounded by an annular tub **25**, and surrounds in its turn concentrically an annular container **28** which forms the anode chamber **27** and in which one or several anodes **29** are connected to current leads **30**. The cathode chamber **26**, in which, if desired, auxiliary anodes **31** with current leads **32** (Fig. 2) can be placed, is connected with the anode chamber **27** by means of a pipe **33** in which can be included a pump **34** in order to keep the electrolyte circulating and, if desired, a filter (not shown in the drawing). In order to create an additional temperature gradient, a heating coil **35** can be installed in the anode chamber **27**.

In the embodiment according to Fig. 1, the anode chamber **27** is covered by a pressure-tight lid **37** on a standard **39** and is mounted by means of ball bearings **38**, so as to be rotatable around the vertical middle part of the pipe **33** which serves as a pivot. The pipe **33** is connected, within the hollow lid **37** and by means of apertures **40**, with a duct chamber **41**. The cathodes, e. g. the spoons **42**, are fastened to the anode container **28** and/or to its lid **37** by means of cathode holders **43**, and therefore rotate along with the anode chamber round the central axis of the device, and can be easily put in and taken out at any point on the periphery of the annular tub **25**.

In the embodiment according to Figure 2, an electrolyte chamber **44** is disposed above the cathode space **26** and is connected with the anode chamber **27** by means of an annular duct **45**. The pipes **33** open into the electrolyte container **44** at its top. The electrolyte which is being circulated by the pump **34**, is thus subjected in the anode chamber **27** to a hydrostatic pressure which corresponds to the difference of level of the respective spaces.

According to Fig. 2, the anode chamber **27**, with the annular duct **45** and the upper electrolyte chamber **44**, are rotatably journalled on a central support **46** by means of the ball bearings **47**. In a similar manner to the arrangement of Fig. 1, the cathodes **42** are fastened by means of the cathode holders **43**, to the wall **48** of the rotatable chambers **27**, **45** and **44**, and rotate along with the latter.

A diaphragm chamber **52**, preferably having an annular shape, is provided between the outer wall of the anode container **28** and the zone of the cathode chamber **26** which contains the cathodes **42**. The diaphragm chamber **52** is separated from the cathodes by an insulated diaphragm **53**; the latter is provided with apertures, e. g. with nozzles **54**, which open in front of the places on the workpieces **42** which are to be thickened. The diaphragm chamber **52** is connected with the cathode chamber by apertures **55** and **56** provided at the bottom and/or in the diaphragm wall so that the electrolyte can enter the chamber **52** in the direction indicated by arrows in Figure 2, with the result that essentially the same fluid pressure prevails in the chamber **52** and in the cathode chamber **26**.

Apertures with inserted injector nozzles or tubes **57** are provided in the outer wall of the anode container **28** which is contiguous with the diaphragm chamber **52**, the said apertures facing the screen apertures or nozzles **54**. The injector tubes **57** open a short distance ahead of the inlet ports of the nozzles **54**, or else extend to a varying degree into the latter.

I claim:

Apparatus for producing locally thickened galvanic deposits on at least one predetermined surface part of articles inserted in said apparatus as cathodes, said apparatus comprising an anode chamber enclosing at least one anode, a cathode chamber, means for supporting the said articles suspended as cathodes in said cathode chamber, electrical connections serving for connection of said anode and said cathode-supporting means to a source of electric current, an insulated diaphragm arranged between said anode chamber and said cathode chamber and adjacent said articles serving as cathodes in the cathode chamber, said diaphragm having apertures situated opposite the parts of the surface of the articles which are to be provided with a thicker coating concentrating the flux of electrolytic current more strongly on said predetermined surface parts of the articles than on other parts

thereof, means adapted to create a pressure drop between the anode chamber and the cathode chamber driving an electrolyte from said anode chamber into said cathode chamber at increased rate of flow through said apertures in said diaphragm in a direction to impinge against said predetermined surface parts of the articles, means adapted for returning the electrolyte from said cathode chamber to said anode chamber, said anode chamber being enclosed in a container provided with said diaphragm having said apertures, a diaphragm chamber disposed between said insulated diaphragm having said apertures and said anode chamber, said diaphragm chamber communicating with said cathode chamber, said container enclosing said anode chamber dipping into said cathode chamber and being journalled on a support for rotation about a central axis in relation to said cathode chamber, the electrolyte being circulated from said cathode chamber by a pump into said container, and injector jets connected to said anode chamber, the orifices of said injector jets being directed into said apertures provided with nozzles, the

orifices of said nozzles opening in front of the parts of the surface of said articles which are to be provided with thicker coatings, said diaphragm having said apertures and said nozzles, said diaphragm chamber, said injector jets, and said articles to be treated being arranged to rotate along with said container enclosing said anode chamber.

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