

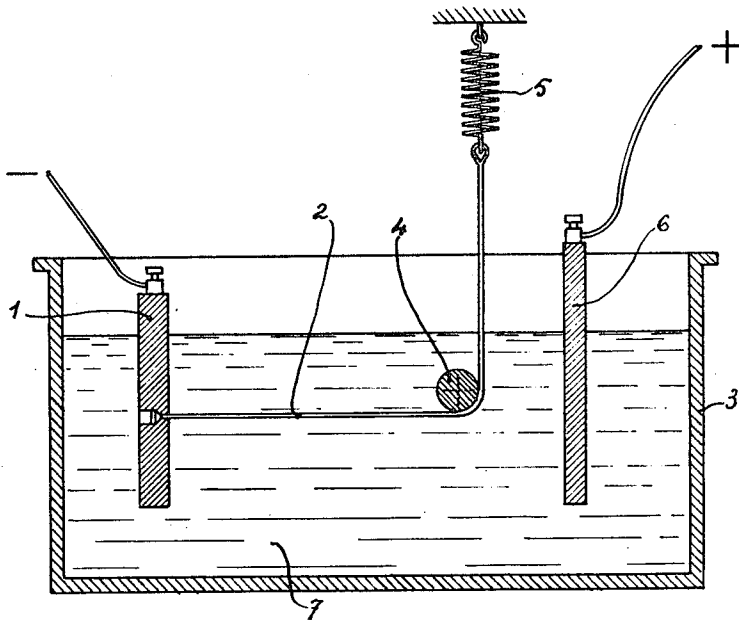
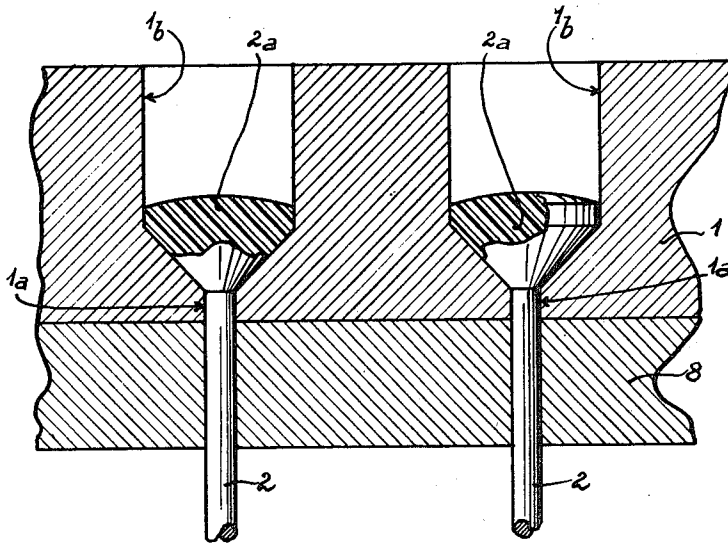
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MANUFACTURE OF FINELY PERFORATED PLATES

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MANUFACTURE OF FINELY PERFORATED PLATES

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This invention refers generally to perforated plates and it is more particularly concerned with a method for establishing metallic plates having fine calibrated holes, as for instance for the spinning of rayon and the like.

The spinning industry has for years been confronted with the problem of realizing fine calibrated holes in the manufacture of spinnerets. The drills required for this operation are expensive and wear off rapidly; further in actual practice owing to their quite reduced diameter they can only drill a hole of relatively short length and therefore in order to obtain a perforated plate of the sufficient thickness it is generally necessary to provide blind holes of relatively large diameter on one side of the plate and to drill the fine holes in the portion of reduced thickness left between the bottom of the blind holes and the other side of the plate. Such an operation is of course delicate and expensive, and further the useful life of the plate obtained is relatively short since as soon as its thickness is noticeably reduced by chemical attack or by wear, the fine holes disappear wholly or in part.

It is an object of the present invention to provide new or improved means for the manufacture of perforated plates of any desired thickness having any pre-determined number of fine calibrated holes extending from one side of the plate to the other.

A further object of this invention is to obtain perforated plates with fine calibrated holes without having to use any kind of drilling tool.

With these objects in view the present invention concerns a method for the manufacture of a perforated plate, wherein the plate is formed by electrolytic deposition of a metal on an electrically-conducting support carrying filaments the diameter of which corresponds to the diameter of the holes in the desired plate. These filaments are thus embedded in the electrolytic layer progressively formed on the support, and by separating the layer from the support and by withdrawing the filaments from the layer there is obtained a metallic plate having fine calibrated holes of the exact diameter desired.

The support may be removed from the electrolytic layer by a machining operation, as for instance by milling the support which is thus destroyed, but in a preferred embodiment of the present invention the support is such that the electrolytic layer will not adhere thereon. This may be obtained by covering the surface of an appropriate member, such as a metallic plate, with an electrically conducting varnish or powder such as graphite for instance, or by directly forming the support of a metal on which the electrolytic layer will not readily adhere, as for instance slightly oxidized aluminium.

The filaments adapted to form the holes in the electrolytic layer may be made of any insulating substance which will not be attacked by the electrolytic bath and which will lend itself to the final withdrawing operation. It may be of advantage to use a highly elastic plastic in such a manner that under the action of a sufficiently high tractive force the filaments may contract in diameter and thus become disengaged from the walls of the holes formed in the metallic layer. In another embodiment the filaments are made of a substance which may be quite easily dissolved in an appropriate solvent, in which case the per-

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forated plate obtained may for instance be immersed in this solvent for a sufficient time. It is further possible to select a substance which may be transformed by heat into a substantially non-viscous liquid, or into a gas or vapour, without reaching a temperature liable to damage the metallic perforated plate.

In another embodiment the filaments may be in the form of fine wires covered with an insulating varnish, or made of a metal on which the electrolytic layer will not adhere, or which may be destroyed by chemical attack or melted by heat without damaging the perforated plate.

The filaments used may be coated with wear resistant particles, as for instance diamond, metal carbides, etc., which become embedded in the metallic layer. In the plate finally obtained the walls of the fine holes are coated with hard particles which highly increase the useful life of the plate, as for instance in the case of a spinneret.

The support may be itself in the form of a perforated plate with the filaments engaged through the perforations, it being noted that such a support may be used for making a large number of electrolytic perforated plates and that therefore the costs and disadvantages of its manufacture are not significant. It is also possible to use a non-metallic support, as for instance made of a plastic substance, covered with an appropriate electrically conducting layer, as for instance graphite.

In the annexed drawings:

FIG. 1 is a large scale diagrammatic section showing a supporting plate on which a perforated plate has been electrolytically formed in accordance with the present invention.

FIG. 2 diagrammatically illustrates an electrolytic apparatus for the production of such a perforated plate.

With reference to FIG. 1, reference numeral 1 designates a supporting plate made of an appropriate metal and adapted to serve as a cathode for the formation of an electrolytic layer in accordance with the present invention. Plate 1 has a number of fine holes 1a in which are passed filaments 2 of an appropriate plastic substance, as for instance a polyamide such as nylon. Plate 1 may be obtained by any appropriate method. In the example illustrated the said plate has been perforated by the known process, i.e. by first forming therein a number of blind holes 1b and by then perforating at a much smaller diameter the thin wall left between the bottom of each blind hole 1b and the opposite side of plate 1. It has further been supposed that filaments 2 were retained in holes 1b by being pressed therein at such a temperature as to form an enlarged head 2a of melted plastic substance. Of course the diameter of filaments 2 and their pattern on the supporting plate 1 should correspond to the diameter and to the arrangement of the holes in the perforated plate to be obtained.

Plate 1 with filaments 2 attached thereto is then disposed in an electrolytic cell 3 (FIG. 2) and it is connected to the negative terminal of an appropriate D.C. source (not shown) to act as a cathode. Filaments 2 are maintained under tension by any appropriate means, as for instance by being passed around rods such as 4 and attached to tensioning springs 5 or alternatively to counterweights or the like. Cell 3 further comprises an anode 6 connected to the positive terminal of the D.C. source. Anode 6 is of course made of the metal desired for the perforated plate to be obtained and the electrolytic bath 7 of cell 3 is formed of an appropriately selected salt of this metal.

It will be appreciated that under such conditions an electrolytic layer 8 (FIG. 1) is progressively formed on support 1. Owing to the presence of filaments 2 this layer is in the form of a perforated plate having fine

calibrated holes extending from one side to the other side thereof, whatever may be the thickness of this plate.

The plate thus obtained is then separated from its support 1, the filaments attached to the said support being at the same time withdrawn from the holes of the plate. Support 1 may have been coated with a conducting varnish or with graphite powder to prevent adhesion between support 1 and plate 8. As to filaments 2, owing to the high elasticity of nylon, they are easily withdrawn by pulling the plate apart from its support, since their elastic longitudinal extension under the action of the pulling force determines a corresponding transverse contraction, i.e. a reduction in diameter of the filaments.

It will be noted that filaments 2 are not necessarily of circular cross-section. The invention therefore permits of manufacturing plates provided with fine perforations of square, rectangular or any other non-circular cross-section. Further filaments 2 could be maintained at any angle with respect to the support during the electrolytic operation, which means that in the perforated plate obtained the holes could be obliquely disposed, if required.

I claim:

1. A method for the production of perforated metallic plates having fine calibrated holes, which consists in forming a supporting plate having an electrically conducting side; in perforating in said supporting plate fine holes in accordance with the pattern of the calibrated holes to be obtained; in passing through the holes of said supporting plate filaments made of an elastically deformable plastic substance; in disposing said supporting plate as a cathode in an electrolytic cell with said filaments extending substantially perpendicularly from said conducting side; in forming on said conducting side a metallic layer with said filaments embedded in said layer; and in separating said metallic layer from said supporting plate while stretching said filaments to cause same to contract and to become disengaged from said layer.

2. In a method as claimed in claim 1, the step of applying onto said electrically conducting side an intermediate conducting layer easily separable from said side.

3. In a method as claimed in claim 1, forming said support of aluminum at least on the electrically conducting side thereof.

4. A method for the production of perforated metallic plates having fine calibrated holes which consists in forming a support having a substantially flat electrically conducting side; in securing to said support a number of filaments of an elastically deformable plastic substance, said filaments extending from said conducting side substantially perpendicularly thereto; in coating said filaments with wear resistant particles; in disposing said support in an electrolytic cell; in forming a metallic layer on said conducting side of said support, with said filaments embedded in said layer; and in separating said metallic layer from said support while stretching said filaments to cause same to contract and to become disengaged from said layer while leaving said particles embedded therein.

5. A cathode for the production of perforated plates having fine calibrated holes by electrolytic deposition of a metallic layer, comprising a supporting plate having fine holes therethrough, said supporting plate having an electrically conducting side on which said metallic layer is to be formed; and filaments passed through said holes and projecting from said conducting side, said filaments being made of an elastically deformable plastic substance and being coated with wear resistant particles.

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