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BY A. P. C.

F. DÜRR
METHOD AND DEVICE FOR THE ELECTROLYTIC OXIDATION OF THIN WIRES
Filed Sept. 15, 1938

Serial No.
230,090
3 Sheets-Sheet 1

Fig. 1

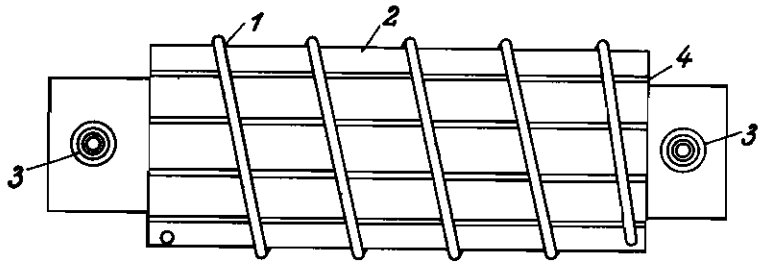

Fig. 2

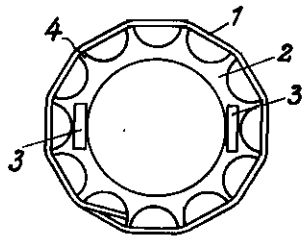

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Fig. 3

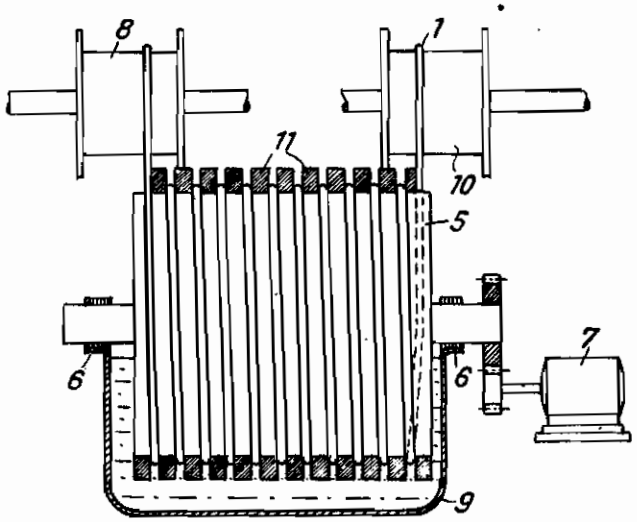
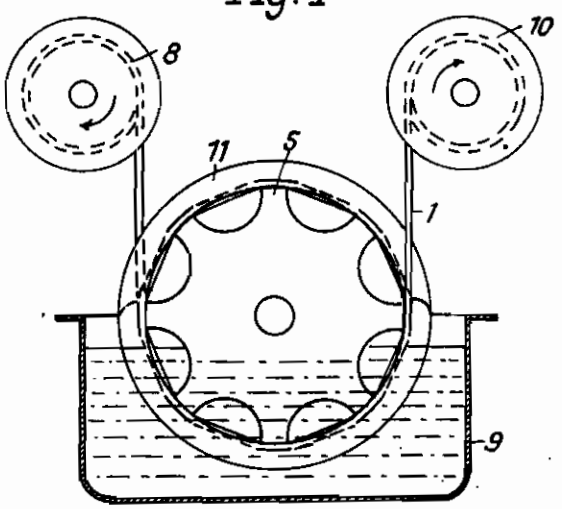


Fig. 4



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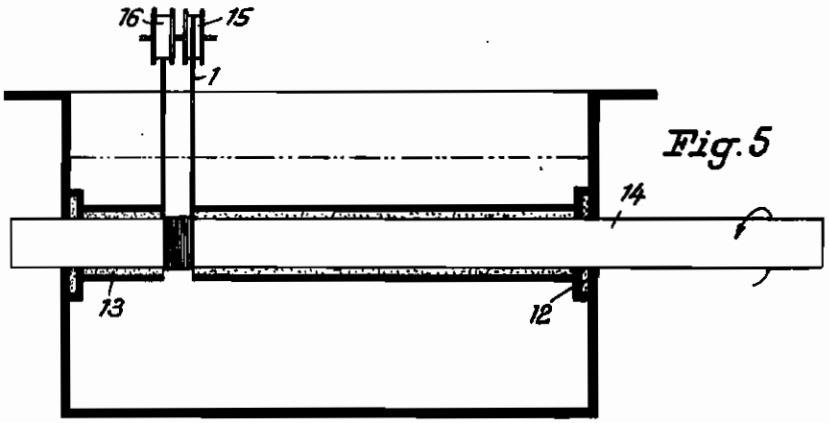


Fig. 5

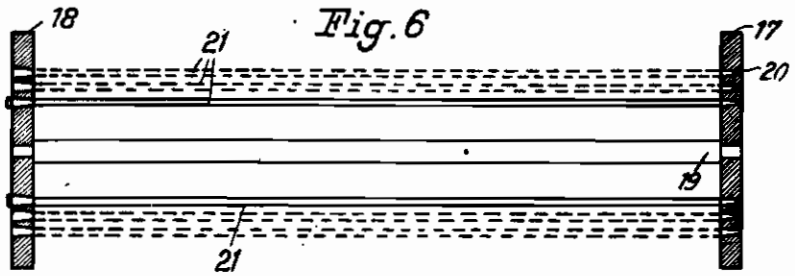


Fig. 6

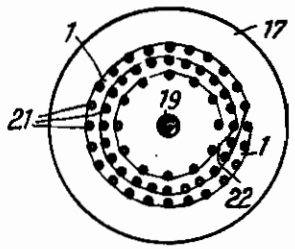
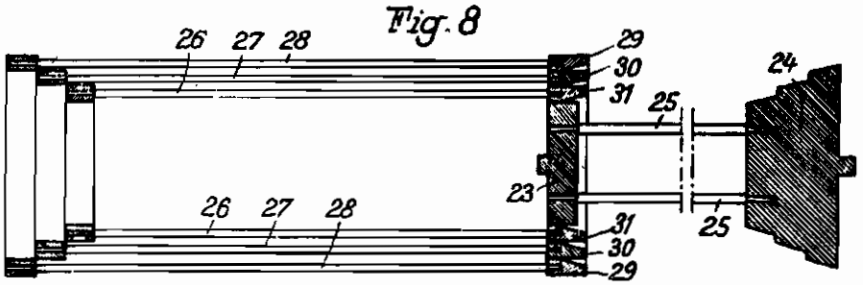


Fig. 7

Fig. 8



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ALIEN PROPERTY CUSTODIAN

METHOD AND DEVICE FOR THE ELECTROLYTIC OXIDATION OF THIN WIRES

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Application filed September 15, 1938

It is known to protect metals, especially light metals, such as aluminium and magnesium, from the influences of the weather by providing them with a covering of a layer of an oxide. It has repeatedly been tried to make use of the same means in connection with fine or thin wires, in that, in the case of success, an ideal means would have been found to maintain the original silver-bright color and to render thereby possible to use this material for laces, braids and the like. Also in the electric industry such electrolytically oxidised thin wires could be amply employed by reason of the insulating capacity of the layer of oxide.

Up to now, however, all said endeavors have failed as regards thin wires, the reason being, that on the one hand, the oxidation must be effected in the galvanic bath with a current of a certain appropriate density and, on the other hand, the wires are too thin to let pass the requisite number of amperes without being too strongly heated.

The present invention relates to a method, as well as to a device permitting to oxidise electrolytically also thin wires consisting of a light metal. The method consists in essence therein that the wire which serves as anode is wound upon a supporting device which is used also for the supply of the current, the wire being oxidised electrolytically upon that supporting device. It is possible to obtain in this way the requisite density of the current without overloading the wire by the current.

The supporting device for the wire may be formed by a reel provided with projecting edges, whereby the wire wound upon it is subdivided into a plurality of pieces which are connected up in parallel, the electrolytic oxidation being effected on the thus subdivided wire. The reel consists, as a rule, of aluminium or another suitable light metal and is connected up to the source of current. The current is supplied to the wire by the intermediary of the numerous places of contact between the wire and the edges of the reel, there being always only short pieces of the wire which are connected up in parallel subjected to the action of the current.

As the electrolytic oxidation is produced strongly also laterally at the supporting places to such a degree that colorations and the like do not permit to discover an interruption of the layer of oxide, although the supporting place has remained electrically conductive, it is in many cases not necessary to wind the wire upon a reel, but to employ instead of such a one a roller-like supporting member having a cylindrical surface, the wire being wound upon this surface in such a manner that it contacts therewith along its entire length.

Carrying out the present improved method may be effected in this way that, for instance, the supporting device, say, a reel or a roller, is wound with the wire on its entire length and the reel etc with the wire thereon is then placed into the bath, but this procedure cannot be carried out continually and necessitates a larger number of reels. A continual operation is, however, rendered possible by winding the wire off continually either in one turn or in a plurality of turns over the rotating supporting member there being provided, besides, one or several guide members which regulate the winding off, the winding on and progressive movement of the wire on the supporting member. But the method may be carried out also in this manner that the winding-off place and the winding-on place of the wire are located always at the same place in the bath, the reel or the roller performing then an axial movement which corresponds with the pitch of the wire on the reel etc, or with the progressive movement thereof on the same. This procedure presents the advantage that the electrolytic oxidation of the wire ean be carried out continually without the wire being subjected to mechanical strains by lateral shifting upon the supporting member or device.

In another modification of the method this latter is carried out in this manner that the wire to be treated is wound upon spools which consists of several layers and are composed while the winding takes place. When the reeling of one supporting member has been finished, another and still another, and so on, supporting member is arranged around the preceding one or ones, and each thereof is reeled like the first. It is possible to locate several layers of wire upon one spool and the receptacles containing the baths can be fully utilised as regards their space.

There are cases possible in which knotting the thin wire is no hindrance for the further working according to this invention, but also in such cases the use of supporting devices composed of several co-axial members is advantageous because the space occupied in the bath by the spool is only slight in spite of the longer wires. In this case the reels can be wound separately with the wire and can be composed to one structure only just before being dipped into the bath. The ends of the wire sections are knotted together after the individual concentric supporting mem-

bers have received the wire, and the wire sections are then in common subjected to the oxidation procedure.

When carrying out the method in accordance with this invention the places where the wires and the supporting member contact with one another remain without a layer of oxide in that the current passes through continually just at these places. This is without importance in many cases of use of the wire, because it is often times possible to manage in such a manner that the respective places which might, for instance, grow dark afterwards can be located on the rear side of the fabric. But there are also other cases in which that is not admissible. In such cases an artifice can be made use of whereby also the places in question can be oxidised as desired. As the said places are nearly always small like points, the surface portion still to be oxidised is correspondingly small in comparison to the main portion already oxidised, and owing thereto, also the intensity of the current with which the wire is supplied can be slight and will nevertheless produce the requisite density of the current in that the surface portions already oxidised are no more conductive. If, therefore, after the wire has been electrolytically oxidised upon the supporting member (reel, roller, or the like), an after-oxidation is effected at the still bright places in normal manner and with supply of the current to these places, all gaps are closed by this after-oxidation without any excessive loading of the wire with current. The improved method renders it, thus, possible to provide also thin wires with an actually complete covering by electrolytic oxidation.

In the accompanying drawings I have shown diagrammatically and by way of example several constructional forms of devices designed for carrying the present improved method into practice. In these drawings

Fig. 1 is an elevation of a wire and of a reel upon which it is wound,

Fig. 2 is a side-view of the reel,

Fig. 3 is a front-view of a device for carrying out a continual oxidation,

Fig. 4 is a side-view of the device shown in Fig. 3,

Fig. 5 is an elevation of a device likewise for continual treatment of the wire and having an axially movable supporting member.

Fig. 6 is a front-view of a supporting device in which the wire is wound-on in several layers,

Fig. 7 is a vertical section through the device shown in Fig. 6, and

Fig. 8 shows another constructional form of a winding-on device having several spools.

Referring to Fig. 1, 2 denotes the carrying or supporting member which is constituted in this example by a reel upon which the thin wire 1 is wound. This reel is so designed that the wire contacts with projecting edges 4 (Fig. 2). The current is supplied to the member 2, or the reel respectively, across the contacts 3. The wire is wound upon the reel in the manner of screw-threads; when this has been done, the reel with the wire thereon is placed into the bath, whereafter the electrolytic oxidising method is carried out. It is a matter of course that the method can be carried out also with another suitable supporting member instead of with a reel, for instance with a roller, a sieve drum or the like.

To carry out a continuous treatment the wire can be wound on and off continuously while the supporting member is rotated at the same time. The reel 5 is rotatory supported at 6 and is rotated by an electromotor 7 or the like. The wire 1 runs from the spool 8 over the reel 5 which dips into the vat 9 and is thereafter when having left the vat wound upon the spool 10. These phases and the progressive movement of the wire are regulated by a guide member which is stationary and carried round around the reel in the manner of a screw thread. This guide member can be made in the form of a wound spring of a metal-wire, for instance flat aluminium wire. The accurate distances between the windings of the thread are secured by distance pieces. The interior of the guide band is nicely turned hollow and oxidised so that the reel fits accurately in the guide member without any seizing. Instead of treating only one wire at the time being several thereof can be introduced side by side into the guide member, in which case the distance between the individual portions of the thread must be appropriately larger.

The guide member has the effect that the wire convolutions present upon the reel are shoved in the direction from the winding-on place to the winding-off place so that the wire is wound off and on always at the same places. At every revolution of the reel the wire dips again into the liquid whereby the total length of time requisite for the oxidation can be obtained. The reel is always covered with the material at all supporting places and cannot therefore ever loose its conductivity by oxidation. The current can be supplied through the reel, as well as through the guide member which consists of a conductive material.

The strain to which the wire is subjected by the lateral movement upon the supporting member during the winding-off can be obviated also by shifting the supporting member axially in correspondence with the progressive movement of the wire convolutions. For this purpose stuffing boxes 12 and 13 are mounted in the vat 9 and the roller-like supporting member is mounted in said boxes rotatory and axially shiftable. The wire 1 runs from a spool 15 to the supporting member 14 and is thereafter wound upon the spool 16 which is subjected to a slight pull. Corresponding to the progressive speed of the thread windings the supporting member is turned, as well as laterally shifted. When the roller 14 has covered its path it can be moved in the opposite direction with exchanged spools. In case the wire should tear and to render it possible to take hold of the ends at the place of tearing the roller can be so supported, or the level of the bath-liquid can be kept on such a height respectively, that a portion of the upper roller projects over the level of the liquid. It is, of course, possible that a plurality of supporting members is arranged side by side in one bath.

In the Figs. 6, 7 and 8 are illustrated supporting members rendering it possible to wind several layers over one another whereby it is furthermore rendered possible to obtain a particular utilisation of the capacity of the electrolytic baths. In the constructional form shown in the Figs. 6 and 7 a middle axle 19 is arranged between the disks 17 and 18 which are preferably provided with conical concentric bores 20 into which the reel bars 21 that bear correspondingly shaped counter-members are to be put. The operation proceeds in this way that first the first layer (shown in full lines) receives the wire 1 which is to be treated. Then another layer of bars is brought into place in the supporting member and the wire

is brought upon the next layer, as shown at **22** in Fig. 7 and is now wound in the same manner as before, but in the opposite direction. This procedure is repeated as often times as rows of bars can be housed upon the disks. As the distances between the individual layers or rows of bars can be small, it is possible to place an extraordinarily large amount of wire on a spool of low weight and necessitating only little room.

In the example shown in Fig. 8 there are two disks **23** and **24** rigidly connected with one another by bars **25**. The rows **26, 27, 28** which support the outer layers are supported in cage-rings **29, 30, 31** which are concentrically arranged. These rings are preferably conically enlarged at the inner side and fit upon correspondingly shaped counter-members of the disk **24** upon which members they can be shoved.

The operation in this case proceeds in this way that after the first layer has been wound either manually or by means of a coiling machine the ring **31** is shoved with the rods **26** upon the disk **24** to such an extent that the conical surfaces adhere closely to one another so that the cage can conduct a current and takes part in the rotatory motion. For the passage of the wire a suitably arranged slot is provided which presents the advantage that the ring **31** can laterally yield elastically. After the wire has been wound upon the cage **31, 26** also the other cages **30, 27** and **29, 26** receive the wire successively in the same manner, the cages being shoved upon one another, as already described. The thus finished supporting device is then inserted into the bath and the wire is treated as already described. With devices of this constructional form the procedure can be carried out also in this manner that the individual concentric spools receive the wire sections individually, whereafter the wire ends are knotted together and the spools are shoved upon another, the wire sections being then subjected in common to the electrolytic treatment.

It is a matter of course that the present improved method can be carried out also with the aid of other supporting members than those described and shown in this specification merely by way of example. Thus, for instance, also wire grates or sieve-like perforated supporting bodies may be used instead of the reels or cylindrical rollers.

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