

July 9, 1968

O. C. G. WENNBERG
 DEVICE FOR FEEDING CATHODE RODS INTO START
 SHEET-PRODUCING APPARATUSES

3,391,825

Filed Jan. 20, 1967

3 Sheets-Sheet 1

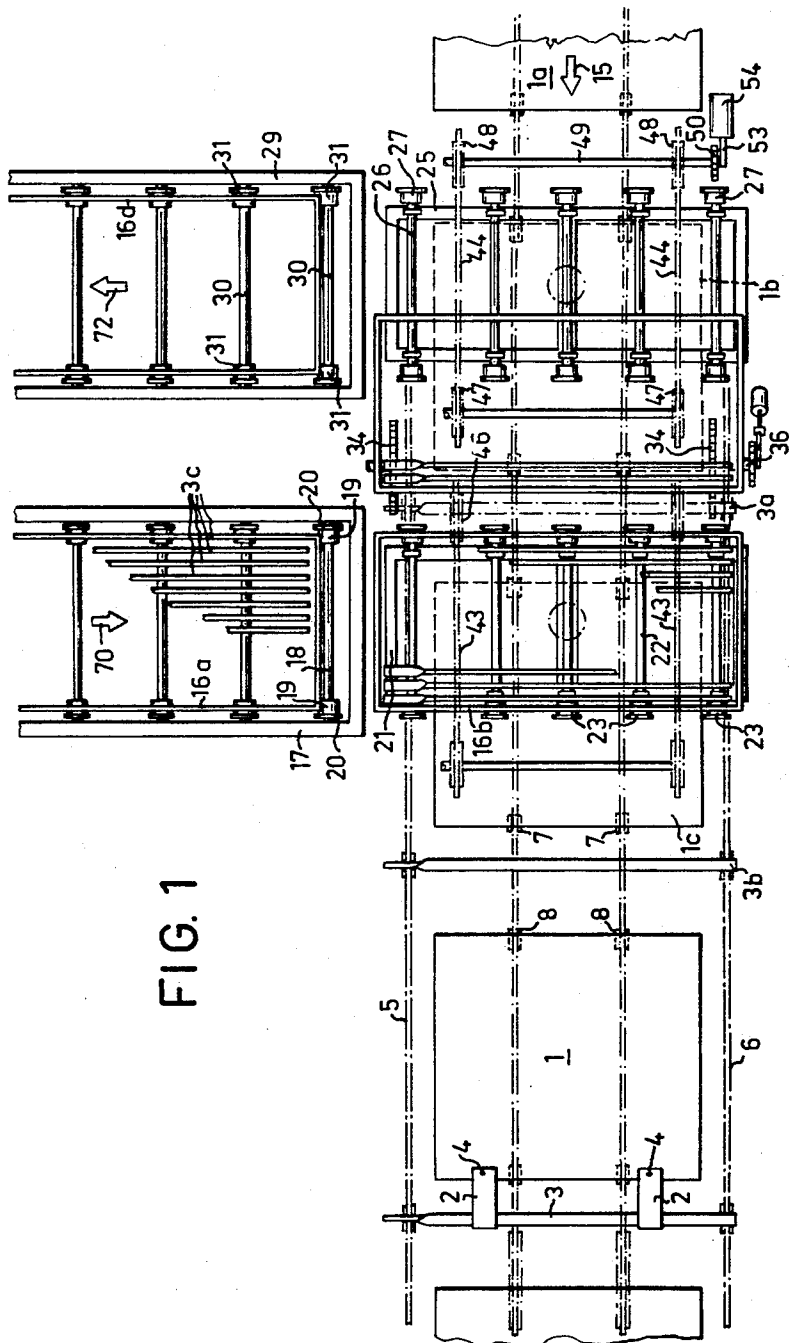


FIG. 1

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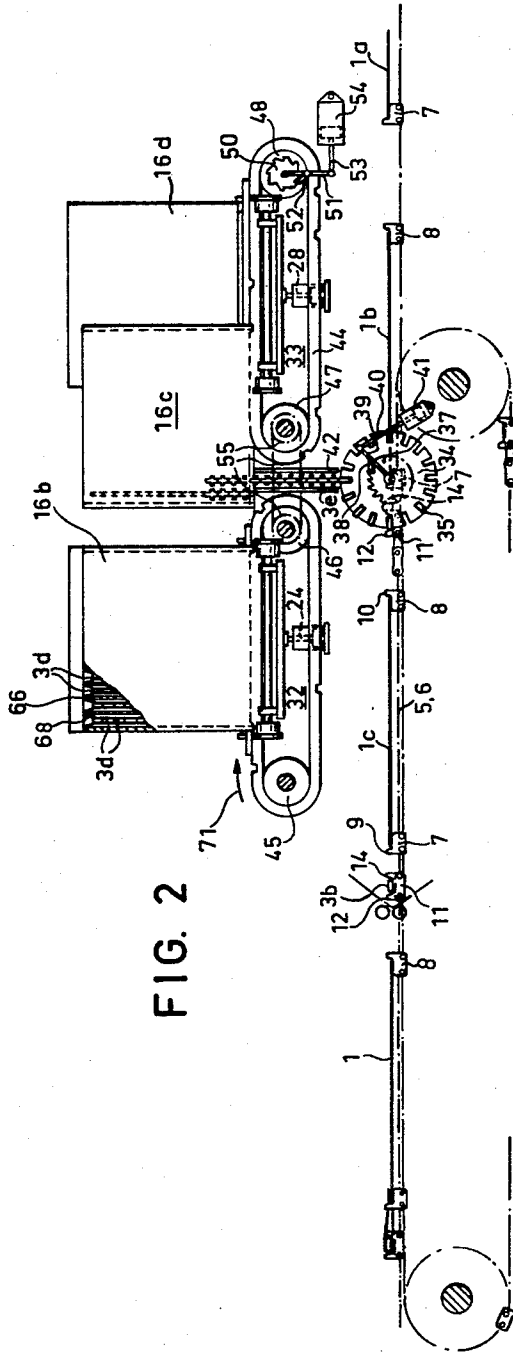
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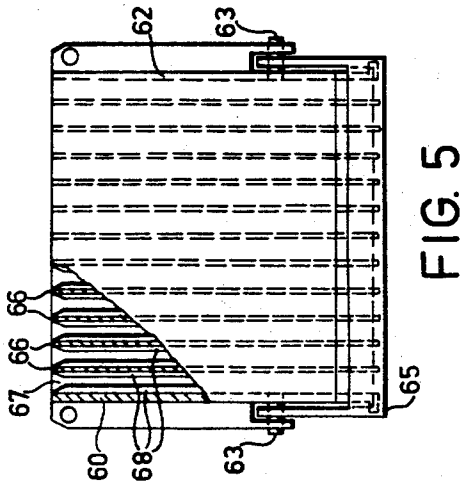


FIG. 5

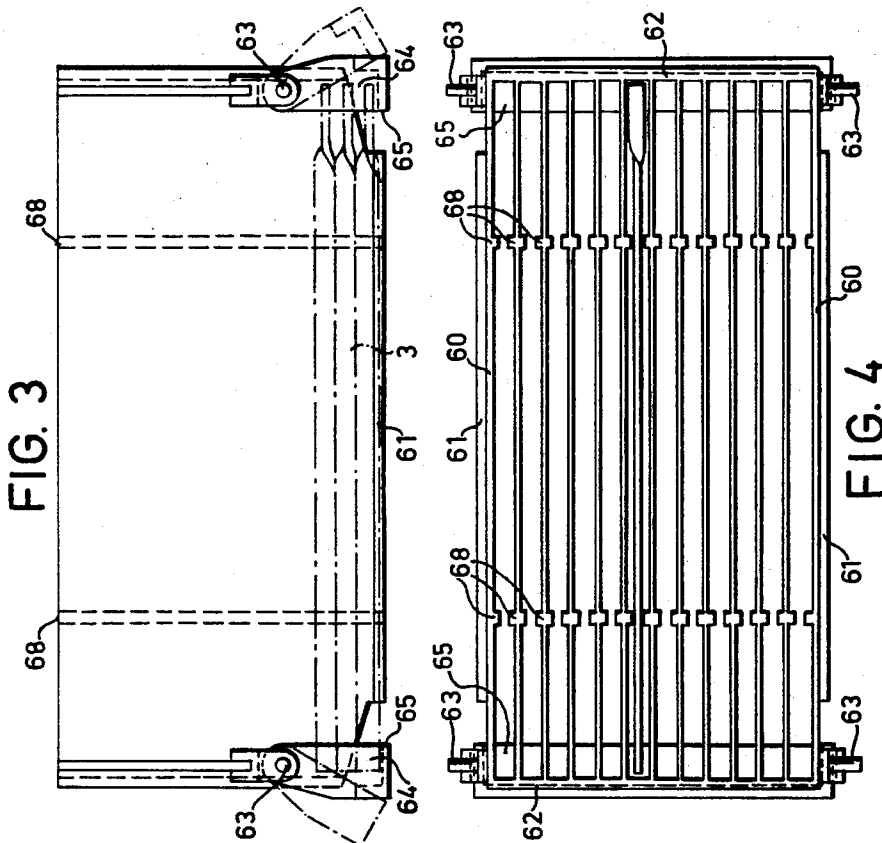


FIG. 3

FIG. 4

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DEVICE FOR FEEDING CATHODE RODS INTO START SHEET-PRODUCING APPARATUSES

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2,270/66

1 Claim. (Cl. 221—11)

ABSTRACT OF THE DISCLOSURE

Cathode rods adapted to be connected to start sheets for electrolytic refinement of copper are fed down onto a main conveyor progressing copper sheets, magazines being provided for storing a plurality of the cathode rods in rows above and laterally of each other. Rollways carrying charged and discharged magazines are located laterally of the main conveyor and have their feeding directions towards and away from the main conveyor at right angles to that of the latter. The cathode rods are discharged one at a time from each vertical row in a delivering position of the magazine above the main conveyor, recessed wheels being provided to receive each cathode rod to move it from the lower portion of the vertical row and deliver it to the main conveyor in a correct position relative to the start sheet advanced thereby.

This invention relates to apparatuses for the production of start sheets for electrolytic refinement copper. The start sheets consist of thin copper sheets provided with hangers usually in the form of lugs through which extend rods from which the sheets are suspended in the electrolytic tank while copper is precipitated onto the sheets. It is of importance that the sheets should be suspended in exactly parallel relation to each other and at suitable distances from each other because otherwise they may be infected by sludge and in addition the structure of the precipitated copper may become unsatisfactory because of irregular current density. In this connection the shape of the cathode rods is of considerable importance. This shape is also related to the devices by means of which the cathode rods are fed into the start sheet producing apparatus. It is of importance that the cathode rods both prior and after the supply to the start sheet producing apparatus should come into correct positions and be delivered in correct positions onto the main conveyor of the apparatus so that they can be assembled on the conveyor in the desired manner with start sheet blanks.

It is the object of this invention to provide a device for feeding the cathode rods into a start sheet producing apparatus so as to permit fully automatic operation. The feeding device according to the invention is constructed such that the cathode rods will be reliably placed in correct positions on the main conveyor.

In its broadest aspect the device according to the invention consists of a magazine comprising guide means for holding the cathode rods in rows above and laterally of each other, and of conveying means adapted to advance the magazine into a discharging position above the main conveyor of the start sheet producing apparatus such that the rods can be delivered to the main conveyor one at a time and in correct positions with respect to start sheet blanks carried by the main conveyor.

At one of their ends the cathode rods suitably have a cross section which differs from the cross section of the remaining length. By way of example, the major part of the length is rectangular in cross section whereas one end is flattened. The purpose of this inequality in cross sectional shape of different portions of the rods is to ensure that the

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rods will be held in predetermined positions in the magazine which is subdivided into compartments which are open at the top and at the bottom and have vertical guide ribs which in cooperation with the cathode rods hold said rods in predetermined positions, for instance with a rectangular portion placed up on end if a flattened end portion is horizontal.

As a result thereof the cathode rods are accurately guided in the magazine and can be discharged therefrom without being disordered or without assuming undesirable positions.

Additional aspects of the invention and advantages obtained thereby will appear from the following description of an embodiment illustrated in the annexed drawings. FIG. 1 is a plan view of part of the main conveyor of the start sheet producing apparatus together with means for feeding cathode rods to the conveyor. FIG. 2 is a lateral elevation corresponding to FIG. 1. Parts which are unessential to an understanding of the invention are omitted in FIGS. 1 and 2. FIGS. 3, 4 and 5 illustrate a side elevation, plan view and end view, respectively, of a magazine comprised in the device according to the invention.

The purpose of the start sheet producing apparatus is to provide the thin copper sheets or start sheet blanks with hangers in the form of lugs and with rods from which the sheets are then suspended during the subsequent treatment. To the left at the bottom of FIG. 1 there is illustrated a finished start sheet consisting of a thin copper sheet 1, two lugs 2, and a cathode rod 3 which extends through the lugs 2 which are attached to the copper sheet by means of rivets 4. The main conveyor consists of endless chains 5 and 6. In FIGS. 1 and 2 only the upper runs and individual links of the chains are shown. The chains comprises links 7, 8 having upwardly projecting dogs 9 and 10, respectively, for retaining a copper sheet 1 during forward movement. The chains also comprise links 11 each of which has two dogs 12, 14 between which the ends of the cathode rods 3 are located during transportation. The start sheet blanks 1 enter from the right in FIG. 1 and are advanced by the main conveyor in the direction indicated by the arrow 15 while they are resting on the links 7, 8 which are spaced in the conveyor chains such that the consecutive blanks are equally spaced apart. FIGS. 1 and 2 show part of a first start sheet blank 1a, a second blank 1b, a third blank 1c and a fourth blank 1 which forms part of a finished start sheet. The space between the start sheet blanks 1b and 1c is located opposite the place where cathode rods are fed downwards. A downwardly fed cathode rod 3a is indicated by chain-dotted lines in FIG. 1. Another cathode rod 3b is positioned between the start sheet blank 1c and the finished start sheet.

The cathode rods which are supplied to the main conveyor are housed in a magazine which is shown in FIGS. 3 to 5 and in which the rods are placed in vertical rows above each other and in rows located side by side. The magazine is placed on a roller conveyor or similar conveyor extending transversely and laterally of the main conveyor in a position indicated at 16a in FIG. 1. The roller conveyor consists of a frame 17 and rollers 19 mounted in the frame on shafts 18. The rollers have flanges 20 which guide the lower edges of the magazine. The horizontal rows of rods 3c are shown in FIG. 1 and the vertical rows 3d are shown in FIG. 2. Right above the main conveyor there is located a second roller way on which the magazine rests in the position 16b. This roller way consists of a frame 21 and rollers 23 mounted thereon on shafts 22. The first roller conveyor is stationary whereas the second conveyor can be lifted and lowered by means of a jack 24, FIG. 2. A third roller way which similarly to the previously named conveyor consists of a frame 25 and rollers 27 mounted on shafts 26 is located to the right of the second roller way and adapted to receive the magazine after the rods have been dis-

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charged therefrom. A magazine 16c is shown in a position on its way to the roller conveyor 25-27. This roller way is adapted to be lifted and lowered by means of a jack 28, FIG. 2. A fourth roller way consisting of a frame 29 and rollers 31 mounted on shafts 30 extends transversely of the main conveyor and in alignment with the third roller way. The frame 29 is stationary and the empty magazine can be pushed onto the fourth roller way from the third roller way after the third roller way has been lifted into its raised position. The empty magazine is shown in a position 16d in FIGS. 1 and 2.

Two discharge conveyors 32, 33 are provided one behind the other and at a distance from each other above the main conveyor of the start sheet producing apparatus. Below the space between the discharge conveyors feed wheels 34 are provided one on either side of the chains of the main conveyor. The feed wheels have peripheral recesses 35 for the cathode rods which recesses are devised such that each cathode rod is received and held in a predetermined position by the feed wheels and deposited thereby in a predetermined position on the main conveyor. The feed wheels 34 are secured on a rotatable shaft 36 which is rotated step by step by a mechanism comprising a ratchet wheel 37 keyed on the shaft 36, a pawl 38 and an arm 39 pivotally mounted on the shaft 36. The outer end of the arm is pivotally connected to the piston rod 40 of a piston movable in a hydraulic cylinder 41. For each reciprocating movement of the piston in the cylinder the ratchet wheel and the feed wheel 34 will be turned one step by means of the pawl 38. FIG. 2 shows a vertical row of cathode rods 3e in a position in which the row has dropped onto the feed wheels and the ends of the lowermost cathode rod have been received in the recesses in the feed wheels. Vertical guides 42 are provided for maintaining the row of cathode rods 3e in position above the feed wheels.

Each of the discharge conveyors 32, 33 comprises two endless chains or bells 43 and 44, respectively. The belts 43 pass over pulleys 45, 46 and the belts 44 pass over pulleys 47, 48. The pulleys 48 are secured on a shaft 49 which is actuated by a stepping mechanism comprising a ratchet wheel 50, an actuating arm 51 pivotally mounted on the shaft 49, and a pawl 52 mounted on the arm 51. This arm is pivotally connected to the piston rod 53 of a piston movable in a hydraulic cylinder 54. The conveyors 32, 33 are connected to each other by means of a chain transmission 55 provided between the pulleys 46, 47 so that the conveyors 32, 33 will be synchronously driven.

The magazine in which the cathode rods are stored is open at the top and bottom and has longitudinal walls 60 provided with bottom guide bars 61 and end walls 62 which terminate at some distance above the lower longitudinal edges of the magazine. Pins 63 are provided on the longitudinal walls at the lower edges of the end walls. At each end of the magazine these pins form pivots of bottom end parts 64 comprising bottom pieces 65 which in the illustrated inwardly turned positions of the parts 64 form a rest for the ends of the cathode rods 3. Upon outward turning into the positions shown in chain-dotted lines in FIG. 3 the bottom end parts 64 release the cathode rods which can fall through the bottom opening of the magazine. By means of longitudinal partitions 66 the magazine is subdivided into compartments 67 each of which is adapted to receive a vertical row or pile of cathode rods. The partitions 66 as well as the longitudinal side walls 60 are provided with vertical guide ribs 68 which maintain the cathode rods in position such that the cross section of the main part of each rod is placed up on end in the magazine. As shown in FIG. 3, there are provided two rows of guide ribs 68 in the magazine with the guide ribs of each row in opposite relations. In certain cases a single row will be sufficient.

The mode of operation of the device described is substantially as follows. A magazine which is filled with cathode rods stored in the compartments 67 in vertical rows 3d and horizontally side by side as shown at 3c is

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in the position 16a in FIG. 1 where the longitudinal edges of the magazine rest on the rollers 19 of the first roller conveyor. As indicated by the arrow 70 the full magazine is automatically or manually moved in a direction at right angles to the main conveyor 5, 6 into a position 16b above the main conveyor. During this movement the magazine is received by the rollers 23 of the second roller way which by means of the jack 24 is maintained in an upper position. Thereupon the second roller way is lowered by means of the jack 24 into a position in which the bottom edges of the magazine rest upon the upper runs of the belts 43 of the conveyor 32. As indicated by an arrow 71 the belts 43 are moved step by step such that the magazine passes toward the right as viewed in FIG. 2 in a direction opposite to the direction of movement of the main conveyor. After the leading wall of the magazine has arrived near the front end of the conveyor 32 the bottom end parts 64 of the magazine are turned outwardly with the result that the piles of cathode rods will be supported by the belt of the conveyor 32. The foremost piles of cathode rods are pushed onto a horizontal part of the guide 42 until the foremost pile arrives right above the vertical part of the guide and falls through the guide until the lowermost cathode rod is stopped by the feed wheels 34. Accordingly as the feed wheels are rotated by the stepping mechanism 37, 38, 39, 40, 41 the ends of the cathode rod which for the time being is lowermost in the row are received in the recesses 35 of the feed wheels by means of which the cathode rods are held in predetermined positions. After the feed wheels have been turned through about a quarter of a revolution and the cathode rod has arrived at the chains of the main conveyor two links 11 are located right below the cathode rod which consequently will be caught by the chains 5, 6 of the main conveyor and advanced while lying in a predetermined position between the dogs 12, 14. The cathode rod is then advanced step by step by the main conveyor in the direction of the arrow 15. At the same time copper sheets resting between the links 7, 8 are advanced in the same direction. Since the links 7 and 11 are positioned in the chains 5 and 6 at predetermined distances from each other, the cathode rod will be in an adequate position ahead of the leading edge of the copper sheet. This will be clearly seen from FIG. 1 in which a cathode rod 3b is located ahead of the leading edge of a copper sheet 1c. While the cathode rods of a vertical pile are fed downwards toward the main conveyor by the feed wheels 34 the magazine 16 remains in a predetermined position, but after all of the rods of the pile have been fed downwards the discharge conveyors 32, 33 will be advanced one step by the stepping mechanism 50-54 so as to move the next following vertical pile in line with the guide 42 thus permitting the rods of this pile to drop toward the feed wheels 34. The sequence of events is repeated until all of the rods have been discharged from the magazine. The empty magazine is moved by the discharge conveyor 33 into a position right above the third roller way which is lifted by means of the jack 28 so that the rollers 27 will come into contact with the longitudinal bottom edges of the magazine and lift the magazine. When said bottom edges are on a level with the upper side of the rollers 31 of the fourth roller way the magazine is moved transversely of the main conveyor onto the fourth roller way as indicated by the arrow 72 in FIG. 1. Then the empty magazine can be transported to suitable means for refilling.

I claim:

1. A device for feeding cathode rods to a main conveyor advancing start sheets for electrolytic refinement of copper comprising a magazine including lateral walls, end walls, and bottom end parts and provided with guide means for holding the cathode rods in rows above and laterally of each other, and conveying means to advance the magazine into a discharging position above the main conveyor, said bottom end parts being pivoted to opposite

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walls and adapted to be turned outwardly from a rest position for the ends of the lowermost cathode rods to release a row of rods, said device including means to deliver the rods one at a time to said main conveyor in correct position with respect to the start sheets carried thereby.

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