

⑫ **EUROPEAN PATENT APPLICATION**

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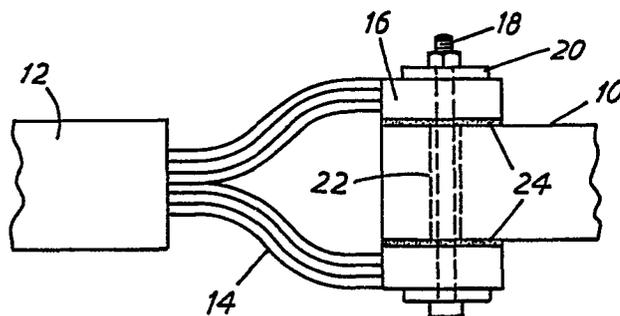
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㉖ **Aluminium reduction cells.**

㉗ In a line of aluminium electrolytic reduction cells connected in series, means are provided for connecting the cathode busbar of one cell to the cathode busbar of the next downstream cell so as to by-pass that downstream cell. The invention comprises making that connection by means of a flexible conductor (14) electrically joined to one busbar (12) and insulated from the other (10) by an easily removable insulator (24).



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Aluminium Reduction Cells

In a potline of aluminium electrolytic reduction cells, the cells are conventionally arranged in series with the electric current being passed from the cathode of an upstream cell to the anode of the next downstream cell. Each cell is provided with cathode busbars for collecting current from the cathode thereof and transferring it via anode risers to the anode beam of the next downstream cell. In modern cell design, high level access for routine maintenance and inspection is provided by walkways at approximately the height of the liquid contents of the cell. The cathode busbars run immediately below these walkways and are accessible from them. Low level access from below the bottoms of the cells, is also possible.

From time to time, one or more cells in the line has to be taken out of commission. This is done by shunting the cathode current from the live upstream cell through the cathode busbar of the dead cell, where it becomes the entry current for the next live downstream cell. Conventionally, this shunting is done by providing the cathode busbars with dead heads to which switch plates are bolted to provide the desired electrical current path. In order to carry the required current, the switch plates need to be of substantial size and weight. It is, therefore, necessary in practice to install them from below, that is to say, the maintenance crew needs to work from below the bottoms of the cells, and to hoist the switch plates into position and bolt them to the dead heads. This procedure has several disadvantages:-

a) For obvious safety reasons, the shunting operation cannot be done with current flowing in the conductors. So the line current is shut down for the time required to carry out the shunting operation. It is thus
5 economically important that the current be shut off for as short a time as possible. But the conventional procedure, which involves lifting switch plates and bolting them in position, takes a fair amount of time.

b) A common reason for taking a cell out of commission
10 is that there has been a break-out of the liquid contents of the cell. In the resulting emergency, a rapid simple procedure for by-passing the cell is required, and the conventional procedure is not rapid and simple. Moreover, following a break-out of
15 liquid, it may be dangerous or impossible to gain low level access to the cell - as is normally necessary in the conventional procedure for by-passing the cell.

It is an object of the present invention to overcome these problems.

20 The invention provides a line of aluminium electrolytic reduction cells connected in series, each cell having a cathode busbar for collecting current from the cathode thereof and transferring it to the anode of the next downstream cell, there being provided
25 means for making an electrical connection between a cathode busbar of one cell and a cathode busbar of the next downstream cell so as to by-pass the said next downstream cell.

characterized in that the means for making an
30 electrical connection between the two cathode busbars comprises a flexible conductor electrically joined to one busbar, and mechanically joined to the other busbar but electrically separated therefrom by an easily removable insulator.

35 Reference is drawn to the accompanying drawings in which:-

Figure 1 is a plan view of the electrical connection between the cathode busbars of two adjacent cells, and

Figure 2 is a front view of an insulator for use in the connector shown in Figure 1.

5 Figure 1 shows a cathode busbar 10 of one aluminium reduction cell and a cathode busbar 12 of an adjacent cell. It is not important which cell is downstream of the other. Mounted at the end of the cathode busbar 12 are two flexible aluminium conductors 14 whose ends
10 are joined to aluminium blocks 16. These two blocks are mounted on either side of the cathode busbar 10 and held in position by means of a bolt 18 extending through a hole in the busbar and washers 20. The blocks 16 are electrically insulated from the busbar 10 by a tube
15 22 of insulating material surrounding the bolt and within the hole through the busbar; and by plates 24 of insulating material.

The shape of the insulating plates 24 is shown in Figure 2. They include a slot 26 which fits over the
20 bolt 18. When in position, the top end of the plate stands proud of the busbar 10 and is provided with a hole 28 constituting a handle by which it may easily and quickly be lifted out of position.

In normal operation, the insulating plates 24 are
25 in position, and insulate the busbars 10 and 12 from one another so that both associated cells are in commission. In order to take the downstream cell out of commission: the current is switched off; the nut on the bolt 18 is loosened; the two insulating plates
30 24 are lifted out of position; the nut is re-tightened; and the current is switched on again.

The insulators can be made of any material that is capable of withstanding the required pressure and other conditions; potential difference up to 150 V;
35 temperatures up to 200-300°C. Suitable materials include 4 to 8 mm thick resin impregnated fibreglass

tubes and plates.

The invention provides the following advantages over the conventional shunting procedure:-

- 5 a) It facilitates a method of shunting which is extremely fast and thus reduces appreciably the line shut-down time.
- 10 b) It allows shunting from the working floor level above the busbars, rather than from floor level below the bottoms of the cells, which is highly desirable for the safety of the crew.
- c) All parts to complete the shunted connection are in place, which is most important in case of an emergency.
- 15 d) The flexible connectors allow for intimate contact between contact faces. Thus the connection can be designed for higher current densities. This in turn reduces the size of the shunting station and the size of the required hardware. The connection is also electrically stable.
- 20 e) The invention facilitates the design of complex busbar systems where the current distribution feeding the downstream cell needs to be maintained in a shunted condition.

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C L A I M S

1. A line of aluminium electrolytic reduction cells connected in series, each cell having a cathode busbar for collecting current from the cathode thereof and transferring it to the anode of the next downstream
5 cell, there being provided means for making an electrical connection between a cathode busbar of one cell and a cathode busbar of the next downstream cell so as to by-pass the said next downstream cell.

characterized in that the means for making an
10 electrical connection between the two cathode busbars comprises a flexible conductor electrically joined to one busbar, and mechanically joined to the other busbar but electrically separated therefrom by an easily removable insulator.

15 2. A line of cells as claimed in claim 1, wherein the easily removable insulator is a plate having a locating slot at its lower end and a handle at its upper end.

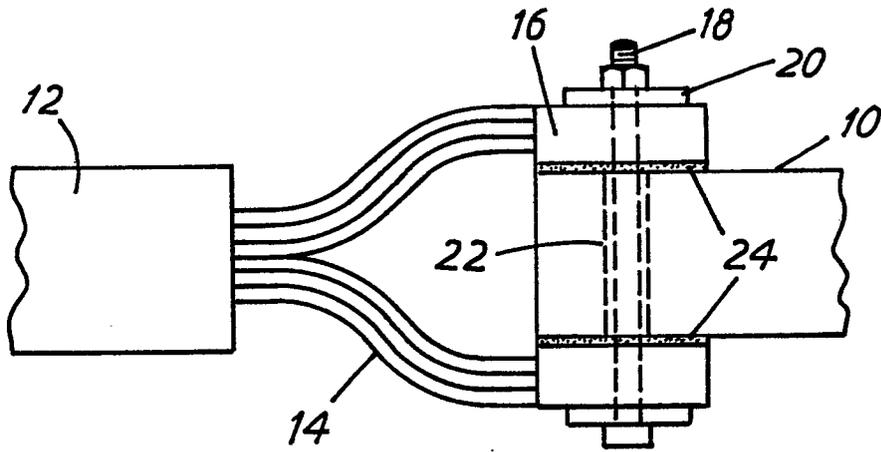


FIG. 1

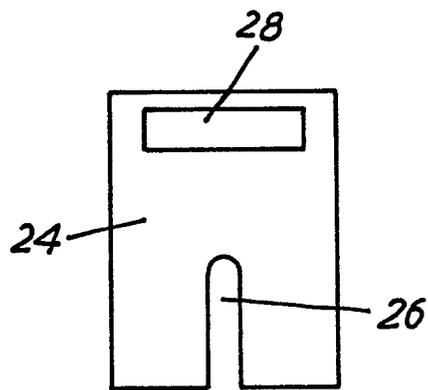


FIG. 2



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	SOVIET INVENTIONS ILLUSTRATED, Section Chemical, week D44, 9th December 1981, abstract no. 81367 M28 X25, Derwent Publications Ltd., London, GB; & SU - A - 802 403 (PETROV E.V.) 09-02-1981		C 25 C 3/16
A	--- CHEMICAL ABSTRACTS, vol. 97, no. 4, October 1982, page 501, no. 117490d, Columbus, Ohio, US; & SU - A - 933 809 (BRATSK ALUMINUM PLANT) 07-06-1982		
A	--- SOVIET INVENTIONS ILLUSTRATED, Section Chemical, week D18, 10th June 1981, abstract no. 32111 M28, Derwent Publications Ltd., London, GB; & SU - A - 757 606 (ALUM. MAGN. ELECTR. IND.) 23-08-1980		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	--- CHEMICAL ABSTRACTS, vol. 91, no. 22, November 1979, page 579, no. 184039c, Columbus, Ohio, US; & PL - A - 100 487 (HUTA ALUMINIUM) 15-02-1979		C 25 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23-09-1985	Examiner GROSEILLER PH.A.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
X	particularly relevant if taken alone		
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