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J. A. RAMSEY

3,179,736

ALUMINUM REDUCTION POT

Filed May 29, 1962

FIG. 1

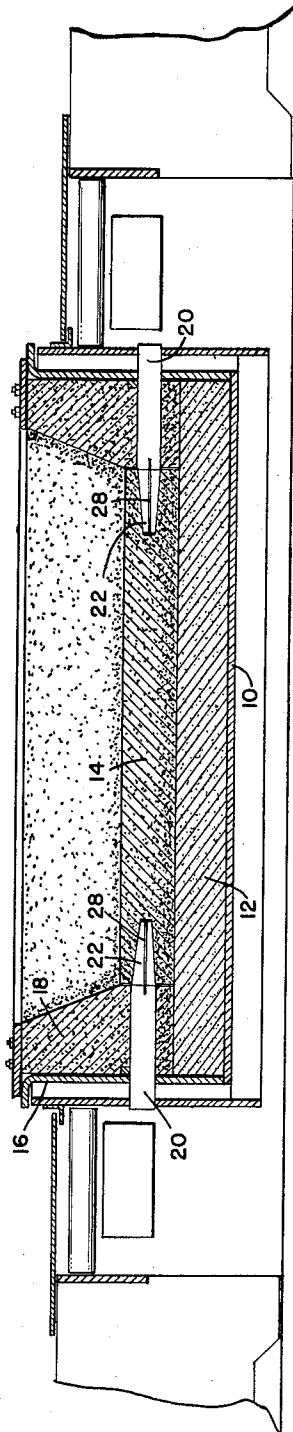


FIG. 4

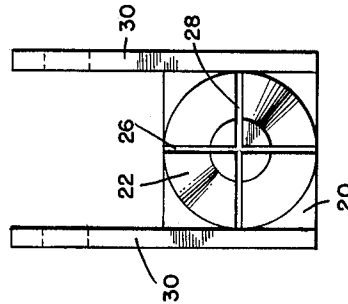


FIG. 3

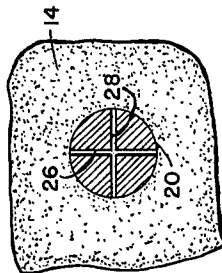


FIG. 2

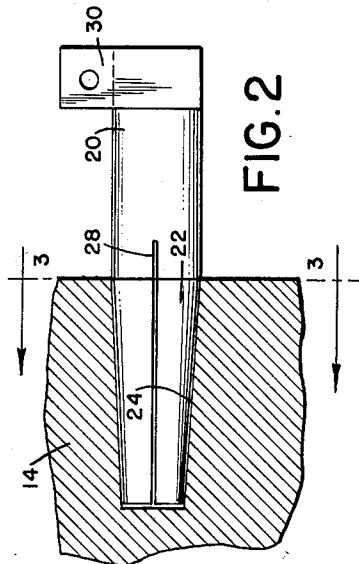
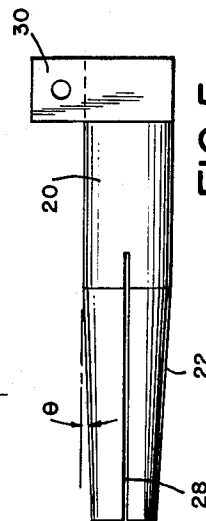


FIG. 5



INVENTOR.

JAMES A. RAMSEY

BY

Stumm, Palmer & Matthews

ATTORNEY

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ALUMINUM REDUCTION POT

James A. Ramsey, Portland, Tex., assignor to Reynolds Metals Company, Richmond, Va., a corporation of Delaware

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5 Claims. (Cl. 13—25)

This invention relates to an aluminum reduction pot.

For sixty years following the introduction of the Hall process for the extraction of metallic aluminum, the replacement of the monolithic carbon linings employed in small reduction cells constituted a major and expensive maintenance problem. Relatively recently the use of pre-baked carbon cathode blocks has been adopted providing to the equipment a longer life and a higher operating strength, the blocks themselves being characterized by a higher density, a low porosity, and a lower resistance than the materials previously employed. Even more recently, it has been found that the use of graphite rather than carbon for the cathode blocks provides further advantages, but because of the brittle nature of graphite and the differences in the thermal expansion of the graphite and the metal collector bars connecting them to a current source, serious difficulties have been encountered at the temperatures to which the equipment is subjected.

Inasmuch as the joints between the graphite cathode blocks and the collector bars are not accessible after the reduction cell has been placed in operation, it is necessary that the joints retain high conductivity and yet avoid all danger of fracture of the graphite blocks. These results have been achieved in accordance with the present invention by providing a relatively long tapered end on each collector bar for reception within a complementary socket formed in the large graphite block. Inasmuch as the collector bars which are customarily composed of mild steel, will expand at a far greater rate than the graphite with increases of temperature, the tapered ends of the collector bars are slotted so as to relieve excessive forces that would otherwise fracture the blocks at the elevated temperatures employed, ranging up to 900° C. Upon establishing a joint of the type contemplated by the present invention, adequate pressure and conductivity will be maintained between the graphite block and the collector bars for the life of the cathode.

It is among the objects of the present invention to provide an aluminum reduction pot comprising a shell, a graphite cathode block supported in the shell, and a metal collector bar extending through the shell and electrically connected with the block, the block containing a socket converging inwardly from a surface thereof, the collector bar having a convergent end complementing the socket and received therein, the convergent end containing a slot extending throughout the length thereof. The convergent end preferably has a taper of the order of 3° and preferably contains a plurality of such slots disposed perpendicularly. Such slots preferably exceed the length of the convergent end of the collector bar.

The present invention also contemplates the provision of an aluminum reduction pot electrical connection between a graphite block and a steel collector bar wherein the block contains a tapered socket and the bar has a tapered end complementing and received in the socket, the end of the bar being symmetrically slotted throughout the length of its taper.

A more complete understanding of the invention will follow from a description of the accompanying drawings wherein:

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FIG. 1 is a sectional elevation of an aluminum reduction pot incorporating the present invention;

FIG. 2 is a fragmentary sectional elevation on an enlarged scale depicting a graphite cathode block receiving a tapered end of a collector bar;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 is an end elevation, on an enlarged scale of a collector bar the type depicted in FIG. 2; and

FIG. 5 is an elevation of a collector bar of the type depicted in FIG. 2.

The aluminum reduction pot depicted in FIG. 1 includes a steel retained shell 10 whose bottom wall is covered by insulation material 12 such as alumina which in turn supports graphite cathode blocks 14, the side walls 16 of the shell being covered with rammed carbon 18.

Collector bars 20 extend through the side walls 16 of the shell 10, and have tapered ends 22 received in complementary tapered sockets 24 provided in the graphite cathode blocks. The angle of taper θ depicted in FIG. 5 is preferably of the order of 3°. The tapered end of each collector bar is slotted throughout the length of the taper and preferably for a distance exceeding the length of the taper. The slotting is preferably in the form of slots 26 and 28 disposed at right angles extending throughout the length of the tapered ends 22 and into the portions of the collector bars of uniform cross section. After the graphite cathode blocks have been assembled in the reduction pot, the collector bars are driven into position so that their tapered ends enter into a snug fit with the sockets provided in the blocks so as to provide the required conductivity. The collector bars can be anchored in these positions in any suitable manner and suitable straps 30 can be welded thereto for the attachment of suitable electric conductors.

Highly satisfactory results have been achieved in accordance with the present invention where the collector bars have tapered ends of the order of twelve inches in length and where the slots are of the order of 0.042 inch wide and extend for a length of approximately fourteen inches. Such bars have a maximum cross sectional dimension of the order of four and one-half inches from which the taper begins.

Whereas only one form of the invention has been described with reference to the accompanying drawings, variations will occur to those skilled in the art which fall within the scope of the appended claims.

I claim:

1. An aluminum reduction pot comprising a shell, a graphite cathode block supported in said shell, and a resilient metal collector bar extending through said shell and electrically connected with said block, said block containing a socket converging inwardly from a surface thereof, said collector bar having a convergent end complementing said socket and received therein, said convergent end containing a slot extending through the length thereof.

2. An aluminum reduction pot according to claim 1 wherein said convergent end has substantially a 3° taper.

3. An aluminum reduction pot according to claim 1 wherein said convergent end contains a plurality of intersecting slots extending through the length thereof.

4. An aluminum reduction pot according to claim 1 wherein said convergent end contains perpendicular slots extending throughout the length thereof.

5. An aluminum reduction pot according to claim 1 wherein said slot has a length exceeding that of said convergent end.

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10 RICHARD M. WOOD, *Primary Examiner.*