

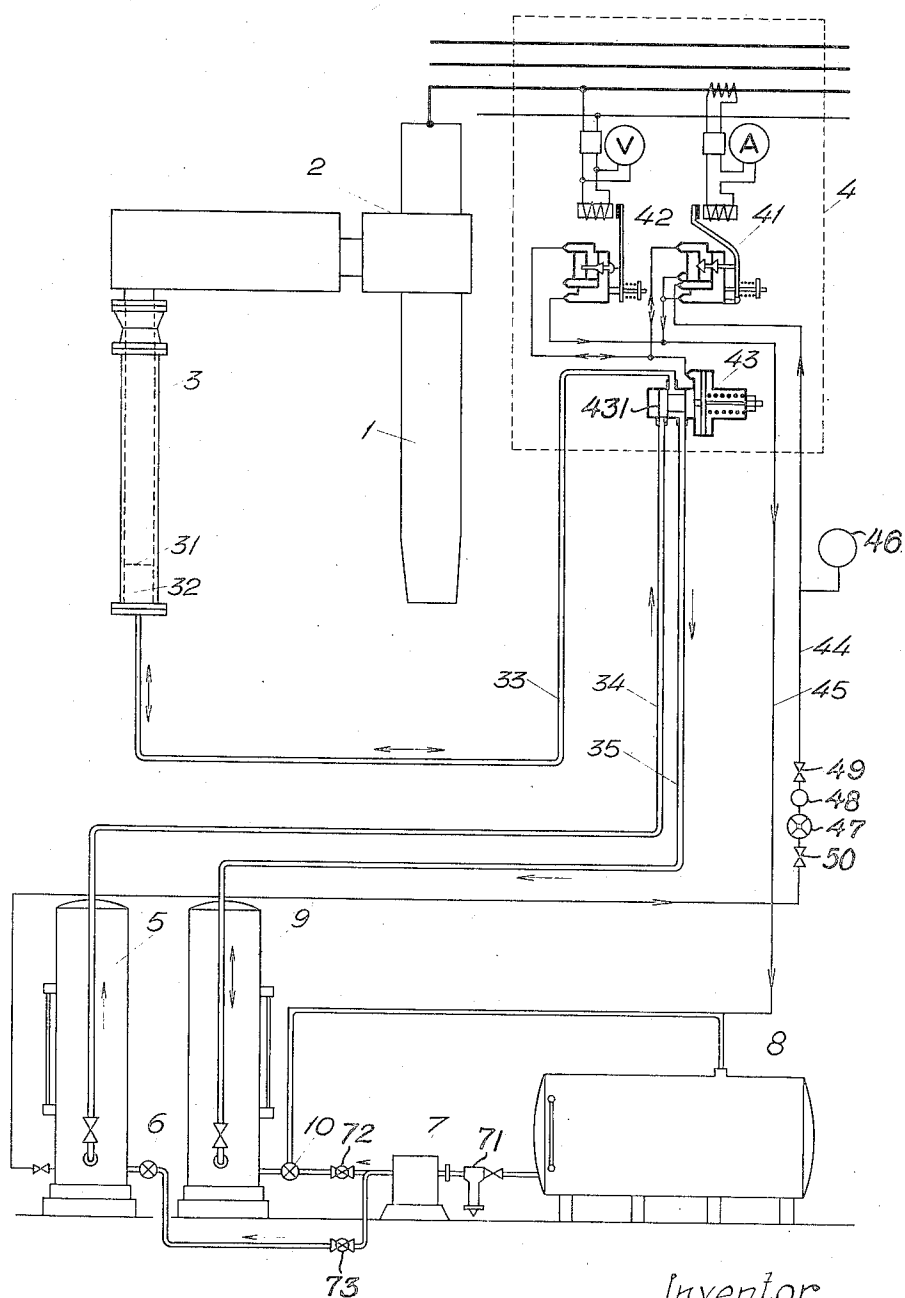
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ARRANGEMENT FOR THE BALANCING OF ELECTRODES OF ELECTRICAL ARC FURNACES

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ARRANGEMENT FOR THE BALANCING OF
ELECTRODES OF ELECTRICAL ARC FURNACES

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The present invention relates to electrical arc furnaces, the electrodes of which are automatically controlled by means of hydraulic regulators for the purpose of maintaining the electrical current and power of the furnace at a constant value. The variations of the electrical current are transferred through the feeling member of the regulator into hydraulic power which by means of a hydraulic motor for each electrode brings such electrodes closer to or farther from each other or closer to or farther from the melting metal. The hydraulic motor consists of a cylinder with piston, the movement of which in one or the other direction due to the hydraulic power is transmitted to the electrode. In the known apparatus of this type, in order to facilitate the movement when the electrodes are moving upwards and downwards, the weight of the electrode and the holder of the same is ordinarily entirely or partly balanced by means of counterweights. For large furnaces, hydraulic balancing is also obtained by means of a special equalizing cylinder to the piston of which a substantially constant pressure is applied. This pressure is adjusted so that the pressure in the cylinder is such that the force on the piston is exceeded by the weight of the electrode and the holder to the extent required to move the electrode downwards. This arrangement is, however, rather complicated, as it requires two cylinders and two pressure hoses for connection of the pressure fluid to each electrode.

The present invention has for its object to avoid this drawback by effecting the hydraulic balancing by means of the operating cylinder normally belonging to the regulating arrangement. For this purpose the chamber on that side of the piston in the regulating cylinder, which is affected by the pressure fluid, stands normally in connection with a pressure equalizing tank, the pressure of which is maintained approximately constant at the value required for the balancing.

The invention is illustrated on the attached drawing which shows a form of arrangement of the same for one electrode with single acting operating cylinder.

The electrode is marked 1, its holder 2 and the operating cylinder 3. The plunger 31 is subjected to a pressure regulated by the regulator 4, and supplied by a hydraulic plant consisting of the pressure tank 5 with the level regulator 6, the pump 7 with strainer 71 and valves 72, 73 and the fluid tank 8. The pressure tank 5 is only partially filled so that an air cushion is provided. The regulator 4 consists of current and pressure

indicators 41 and 42 respectively which hydraulically operate a slide valve 43. The pressure required for this operation is also taken from the pressure tank 5 through the pipes 44, 45. The pipe 44 is provided with a manometer 46, a reducing valve 47, a strainer 48 and ordinary valves 49, 50. The manner of operation of the regulator and including the slide valve 43 is well known, a similar arrangement being shown, for example, in U. S. Patent No. 1,562,204, therefore it is only mentioned here, that if the electrode comes too near the metal bath and the current in the furnace will thus be too high, and the slide 431 in the valve 43 is moved to the left. The pressure chamber 32 in the regulating cylinder of the electrode is connected, by means of the tubes 33, 34, to the pressure tank 5, the pressure of which causes the plunger 31 and by this the electrode 1 to move upwardly. The current will then sink, the slide in the valve 43 is moved to the right and the tube 34 from the pressure tank 5 is shut.

According to the present invention, and in the arrangement shown on the drawing, the pressure chamber 32 is connected to the pressure equalizing tank 9, by means of the slide valve 43 and the tubes 33, 35. By means of the level regulator 10 the pressure in the tank 9 is maintained at about constant pressure so adjusted that suitable balancing of the electrode is obtained. As the tank 9 is only partially filled an air cushion is provided therein. In the form of arrangement shown on the drawing, the pressure is less than the weight of the electrode and the holder and other members connected to the same and taking part in the movement of the electrode. Therefore when the pressure chamber 32 is connected to the equalizing tank 9, the electrode will slowly sink downwards and the regulating operation will thereafter start again.

It is in the nature of the case that the invention is not limited to the form of arrangement shown on the drawing. The invention may for instance also be suitable for double acting regulating cylinders. In any case it is very easy to adjust the pressure in the tank 9 so that a balancing of the electrode is obtained suitable for the even running of the furnace.

I claim as my invention:

1. Apparatus for the hydraulic control of an electric arc furnace electrode, comprising means for the vertical suspension of the electrode, a fluid pressure cylinder containing a piston for actuating the electrode, an actuating pressure tank and a balancing pressure tank both adapted

to supply fluid pressure to said cylinder, and an automatic control mechanism responsive to current variations in the electrode circuit whereby the pressure in the actuating tank is applied to the piston to raise the electrode and whereby the pressure in the balancing tank is at other times applied to the piston to substantially counterbalance the raised electrode and to prevent sudden movement of the electrode and ensure even running of the furnace.

2. Apparatus for the hydraulic control of an electric arc furnace electrode, comprising means whereby the electrode is advanced by gravity, a hydraulic cylinder, a piston therein for actuating the electrode, a source of hydraulic pressure, a source of relatively low hydraulic pressure, and an automatically actuated control responsive to current variations in the electrode circuit for admitting the higher pressure to the said cylinder to retract the electrode and for admitting the lower pressure to the same cylinder at other times to prevent sudden movement of the electrode and to ensure even running of the furnace by retarding the advancement of the electrode under gravity.

3. Apparatus for the hydraulic control of an electric arc furnace electrode, comprising means for the vertical support of the electrode, a hydraulic cylinder, a piston therein for actuating the electrode, a high pressure tank and a low pres-

sure tank both adapted to supply hydraulic pressure to the said cylinder, and an automatically actuated control mechanism responsive to current variations in the electrode circuit for admitting pressure to the cylinder from the high pressure tank to raise the electrode against the force of gravity and for admitting pressure to the cylinder from the low pressure tank at other times to retard the downward movement of the electrode when the latter is in a raised position, and to ensure even running of the furnace.

4. Apparatus for the hydraulic control of an electric arc furnace electrode, comprising means for vertically suspending the electrode, a hydraulic cylinder, a piston therein for actuating the electrode, a high pressure tank and a low pressure tank both adapted to supply hydraulic pressure to the said cylinder, an automatically actuated control mechanism responsive to current variations in the electrode circuit for admitting pressure to the cylinder from the high pressure tank to raise the electrode and for admitting pressure to the cylinder from the low pressure tank at other times to retard the downward movement of the electrode and to prevent sudden movement of the electrode and to ensure even running of the furnace, and means for regulating the pressure in the low pressure tank to vary the retarding action on the electrode.

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