

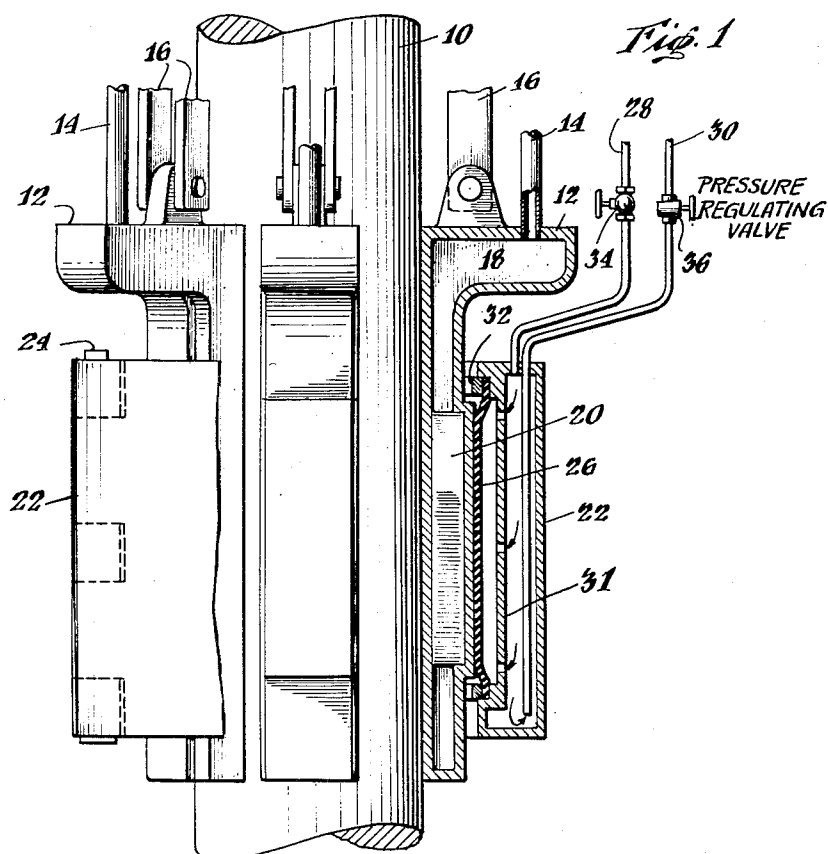
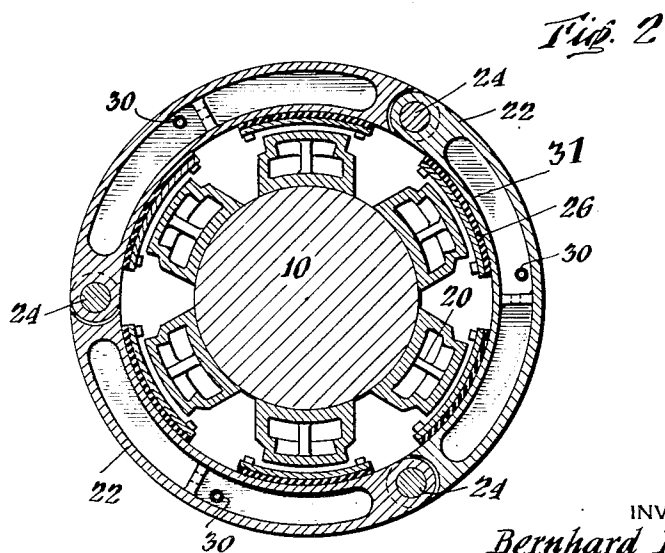
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B. BJERKAS

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HOLDER FOR ELECTRODES

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INVENTOR
Bernhard Bjerkås
BY
Eyre, Mann & Burns
ATTORNEYS

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HOLDER FOR ELECTRODES

Bernhard Bjerkaas, Fiskaa, Kristiansand, Norway, assignor to Elektrokemisk A/S, Oslo, Norway, a corporation of Norway

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This invention relates to an electrode holder of the general type shown in United States Patent No. 2,673,227. In that patent a flexible bag is interposed between the actual clamp members and the outside ring. Water is supplied to the flexible bag through a single pipe. With this construction, if by any mischance the cooling of the ring members is not efficient, the water in the flexible bag might be unduly heated and either develop an internal pressure that will rupture the bag or the temperature may go up high enough so that the bag is injured. According to the present invention the device is so designed that the actual cooling water is caused to circulate through a pressure chamber which has a flexible wall that operates against the clamps and it is the pressure of the cooling water itself that is exerted to hold the clamps pressed tightly against the electrode.

With a device of this kind it is important that cooling be carried out continuously while the device is in operation so that it is advisable that cooling water should be circulated through the device even when the pressure is being released for the purpose of moving the holder relative to the electrode. In order that I may have control of the pressure in the cooling chamber without stopping the circulation of water entirely, a reducing valve is provided on the outlet for the chamber and this is preferably operated in conjunction with a valve on the inlet side for the water going to the pressure chamber. So long as the reducing valve is set to the point where the outward flow is reduced below the inward potential flow, pressure will build up in the ring. On the other hand, if either the inlet flow is reduced or the outlet flow is increased, the pressure can be dropped to approximately zero while still maintaining a flow of water through the device.

In carrying out my invention, a flexible membrane is supplied on the inner face of each of the pressure ring members and the space behind this flexible membrane forms an inner wall of the water cooling space in the pressure ring members. The membrane may be of metal so arranged as to permit some flexibility but for ordinary purposes a membrane of rubber or the like is satisfactory.

By using a membrane which forms the inner face of the pressure ring, the electrode holder as an entirety may be made considerably slimmer than has heretofore been considered possible so that it is feasible to lower this type of holder directly through the roof of a closed furnace. This means that the length of the electrode below the holder will be reduced and the electrical conditions in the furnace will thereby be considerably improved.

My invention may be readily understood from the illustrative example shown in the accompanying drawings in which—

Fig. 1 is a side view partly in section showing a device embodying my invention, with the diaphragms expanded, and

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Fig. 2 is a sectional view of the structure shown in Fig. 1 but with the diaphragms unexpanded.

In these drawings, 10 is the electrode. The numeral 12 designates the clamp members which in this embodiment of the invention are six in number. These members 12 are provided with pipes 14 for the circulation of cooling water and these pipes also serve to conduct electric current to the clamps. Each clamp 12 also has a suspension member 16 adapted to suspend the electrode.

The clamps 12 are made hollow with an internal space 18 for the cooling water and in this instance are shown with a central rib 20 for strengthening the clamp.

Surrounding the clamps is a second series of members 22 which form a pressure ring. In this embodiment there are three parts to the ring which are hinged together as shown at 24. Pressure ring members 22 have on their inner faces flexible diaphragms 26, with one diaphragm being supplied for each clamp 12. Cooling water is passed into the members 22 through pipes 28 and is withdrawn through pipe 30 and provision is made so that the cooling water transmitted through these pipes has access directly to the rear of the diaphragms 26 through the perforated wall 31.

When the cooling water is under pressure within the ring members 22, the flexible diaphragms 26 will be expanded to press against the clamps 12 and hold these locked in place. This is clearly illustrated in Fig. 1, though in that figure the amount of flexing of the diaphragm necessary to hold the clamps in place has been somewhat exaggerated to make it clear that when the pressure is reduced the diaphragms will permit the clamps to relax their pressure on the electrode to permit relative movement of the electrode and the holder. The diaphragms in this case are made of rubber and are held attached to the ring members 22 by the gaskets 32.

Since it is desirable that control may be had over the pressure of the water in the ring members 22 without actually stopping the circulation of the water, the pipe 28 is supplied with an ordinary control valve 34 and the outlet pipe 30 is supplied with a reducing valve or other form of pressure-regulating valve 36.

It is understood that the water admitted by pipe 28 will be under a pressure-head which may be such as is usual in ordinary water supply lines. For example, this pressure may be upward from about 20 to 50 pounds per square inch. Due to the large area of the diaphragms 26 which substantially cover the outer surfaces of the central portions of the clamps 12, this relatively low unit pressure will be sufficient to grip and hold the electrodes.

In ordinary operation, valve 36 will be so set that with valve 34 open, the pressure within the ring members 22 will be at least about 20 pounds per square inch, though in some instances even lower pressures may be used. When it is desired to release the electrode, valve 34 can be partly closed which will still permit some water to circulate through the ring members but if the amount of water admitted through the valve 34 is less than that which can pass through valve 36, the pressure will drop and the electrode will be permitted to move relative to its holder. Of course, if preferred, the same effect can be had by changing the adjustment of the valve 36.

From this description it will be seen that remote control of the clamping of the electrode can be had through operation of the valves controlling the flow of water to the cooling ring members 22.

It is understood that this example is given only by way of illustration and is not intended as a limitation on the scope of my invention.

What I claim is:

1. In a holder for electrodes of the type described, the combination of a plurality of hollow water-cooled

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clamps adapted to contact the sides of an electrode, means connected with such clamps for transmitting electric current to them and means for supporting the electrode in a vertical position, a second series of interconnected members surrounding said clamps with internal spaces for the circulation of cooling water, flexible members forming the inner walls of the members of said second series positioned adjacent the outer surfaces of said clamps, said flexible members forming the inner walls of the aforesaid spaces for the circulation of cooling water, pipes for admitting and withdrawing cooling water under a pressure-head to and from said spaces in continuous flow in contact with the flexible members, and valve mechanism for controlling the flow whereby the water pressure in said spaces which is exerted against the flexible members may be controlled while water is being continuously circulated through and out of the said spaces adjacent said flexible members so that said flexible members may at will be pressed against said clamps to lock the clamps against the electrode, or relieved of such pressure so that the electrode may move

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relative to the clamps while being directly cooled by such water.

2. A structure as specified in claim 1 in which the flexible members are of rubber.

5 3. A structure as specified in claim 1 in which the flexible members form the major portion of the inner faces of the members from said second series so that a large area is available for pressure against said clamps whereby said clamps may be caused to exert sufficient pressure to hold the electrode while unit pressures in the order of as little as about 20 to 50 pounds per square inch are exerted by the cooling water.

References Cited in the file of this patent

UNITED STATES PATENTS

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