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R. R. JONES

2,179,153

ELECTRODE CLAMP

Filed Oct. 8, 1938

2 Sheets-Sheet 1

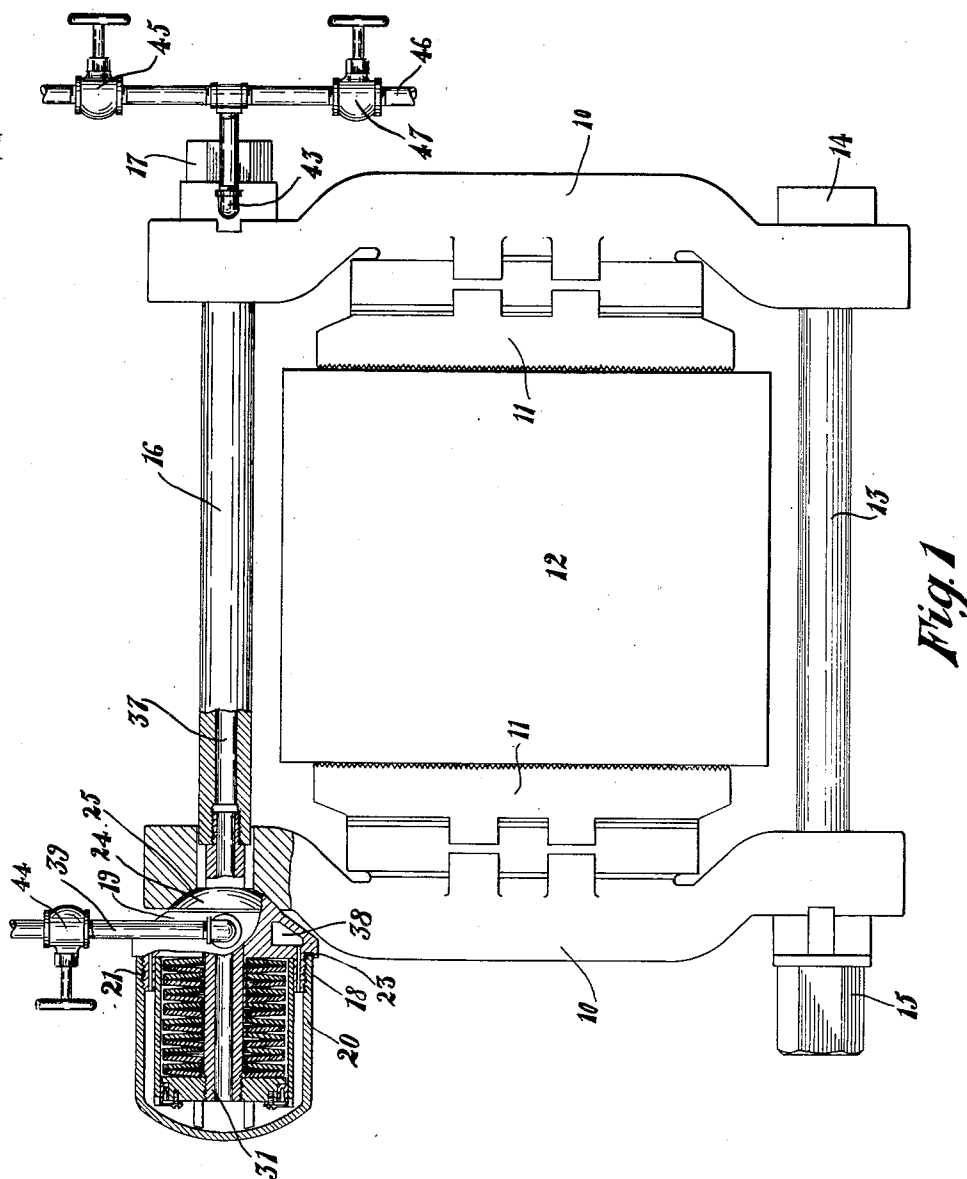


Fig. 1

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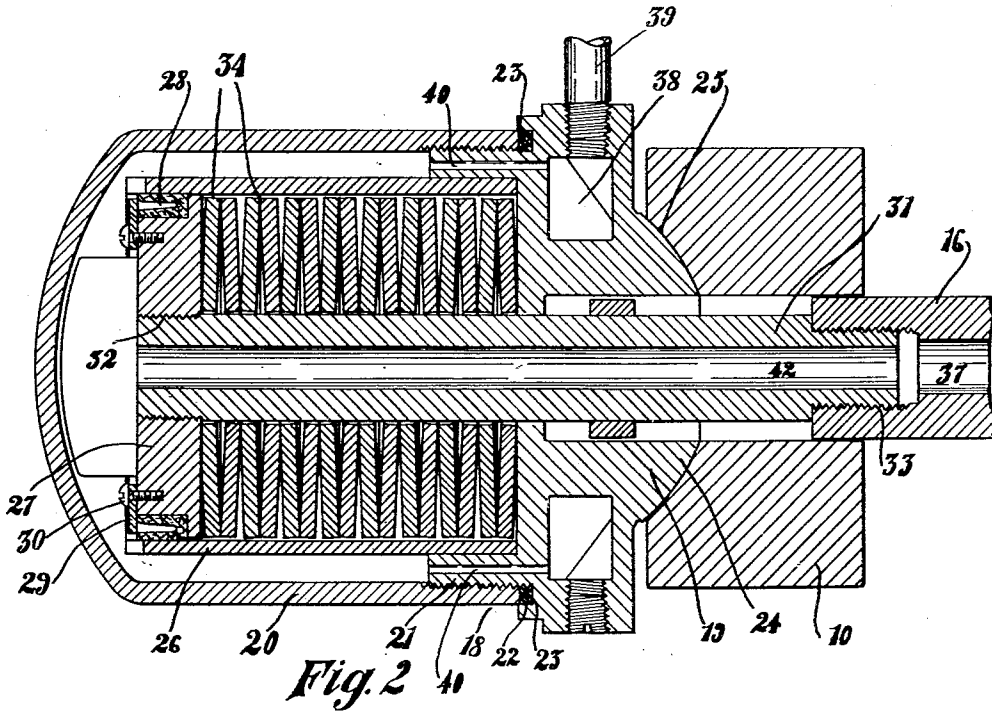


Fig. 2

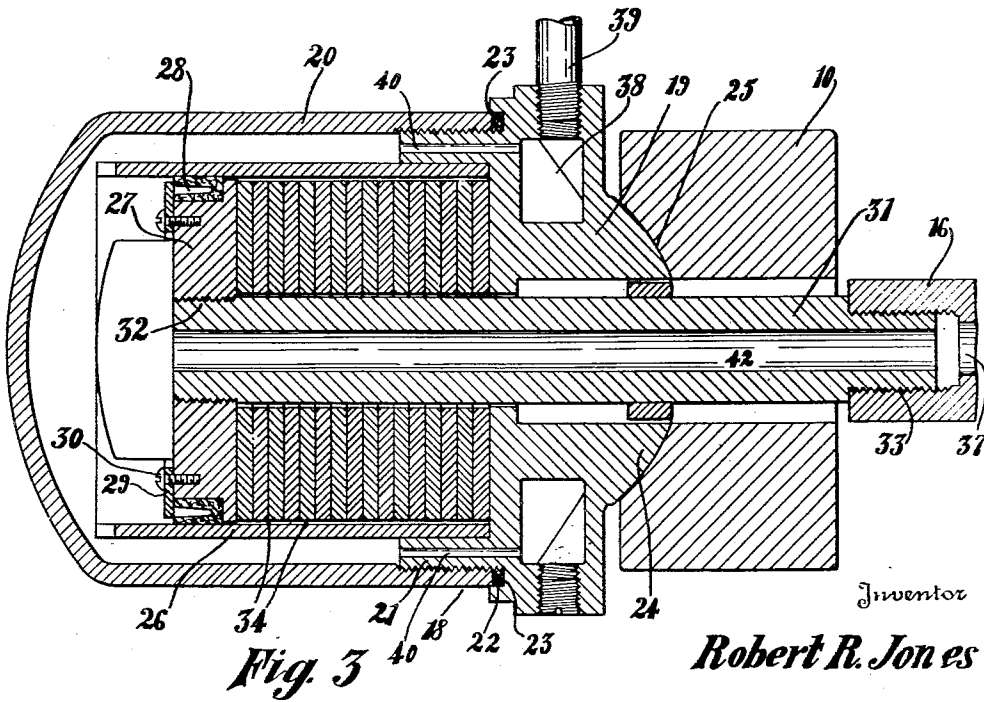


Fig. 3

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UNITED STATES PATENT OFFICE

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ELECTRODE CLAMP

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5 Claims. (Cl. 13-16)

The invention relates to clamps or holders such as are used for supporting an upright electrode in an electric furnace and more particularly to a hydraulic release for the tension bolt of such a clamp or holder.

The electrodes of an electric arc furnace are carbon or graphite bars and may be of any desired shape of cross section, such as round, square or rectangular; each composed of one or more pieces clamped or cemented together or of carbon paste compacted into a metal form. Usually the electrodes of round cross section are capable of being joined end to end by methods common to the art. A furnace may contain one or more electrodes and the following description is applied to but one of these usually identical assemblies.

To support this electrode in upright position over a furnace, a common method is to use some sort of a circumferential clamping device, to which is attached the means for supporting it and the electrode from a winch or other adjusting means which is in turn supported by a stationary part of the furnace assembly.

The mechanical and electrical contact with the electrode is generally made by means of conducting pads, usually water cooled, which are pressed against the electrode on one or more sides, if the electrode is square or rectangular, or segmentally, if the electrode is of circular cross section, by the pressure exerted by the clamping device; the pressure being sufficient to ensure a good electrical contact and to prevent the electrode from moving under the influence of gravity.

As the electrode is consumed it is necessary that the relative position of the clamping device and the electrode be changed in order that the conducting pads be maintained in the most efficient position, which is near the furnace roof or the top of the charge.

To cause the clamping pressure to be exerted and released at will and to allow for unavoidable variations in the size of the electrode, a common practice is to use a bolt and nut as part of the assembly, the bolt being in tension. The adjustment of this tension bolt by hand, located as it is, adjacent to the furnace, is a hot, laborious and dangerous operation.

The object of this invention is to provide a bolt that may be substituted for the bolt-nut-manually operated type, retaining all the advantages of this type and in addition, affording means for operating it and slipping the electrode from a distance, by means of hydraulic or air pressure,

to simulate hand operation. Springs in the head of the bolt serve to maintain the parts in a normally clamped position, readily released by pressure.

The above object together with others which will be apparent from the drawings and following description, or which may be later referred to may be attained by constructing the improved clamp in the manner illustrated in the accompanying drawings. The arrangement of tension bolt, clamps, pads and electrode shown in the drawings and referred to in the description, is but one of the many arrangements that may be used. My invention covers all arrangements wherever tension bolts are used in the assembly.

In the accompanying drawings:

Figure 1 is a plan view of an electrode clamp embodying the invention, parts being broken away for the purpose of illustration;

Fig. 2, an enlarged longitudinal sectional view through the improved clamping head with hydraulic release, showing the same in the clamped position; and

Fig. 3, a view similar to Fig. 2 showing the head in the released position of the clamp.

Similar numerals refer to similar parts throughout the drawings.

The holder or clamp comprises the two spaced clamp members indicated at 10 which are preferably water cooled by any suitable method, and each of which carries a pad 11 adapted to contact with opposite sides of an electrode 12.

The particular construction of these clamp members does not enter into the present invention and for that reason these clamp members are not illustrated in detail and the means for water cooling the same is not shown.

The tension bolt 13 is located through the corresponding ends of the clamp members 10, the head 14 of the bolt abutting one clamp member and the nut 15 being located upon the other end of the bolt for drawing these ends of the clamp members toward each other, or this tension bolt 13 may be a hinged joint or suitable arrangement, or may be replaced in this construction by a duplicate of tension bolt 16 and its assembly.

The opposite ends of the clamp members 10 are arranged to be drawn toward each other by a tension bolt 16 having a nut 17 at one end, and to the other end is connected the improved clamping head with hydraulic release to which the invention pertains which is indicated generally at 18.

This clamping head may comprise the base indicated generally at 19 and the housing 20 which

is connected thereto by a water tight joint preferably formed by internally threading the inner open end portion of the housing so as to fit upon the threaded reduced portion 21 of the base, the end of the housing fitting into an annular groove 22 within the base, within which is preferably located a gasket 23. If desired, this joint may be made to provide a water tight joint which will withstand high pressure by other mechanical means. The base 19 has the ball or rolled end 24 adapted to be seated within a concave socket 25 in the adjacent clamp member 10.

Within the extension 21 of the base is located one end of a hollow cylinder 26 which may be connected thereto in any suitable manner. The piston 27 is mounted for movement within said cylinder and has located around its periphery the packing ring 23 which provides a water tight sliding fit within the cylinder and which is held in place as by the retaining ring 29, which may be connected to the piston as by screws 30.

The piston rod 31 may be threaded upon its outer end as at 32 for connection to the piston 27 and its inner end may be reduced and threaded as at 33 for connection to the tension bolt 16, or tension rod 31 can be extended or lengthened to form the tension bolt, 16.

A spring mechanism is located within the cylinder 26 between the base 19 and the piston 27 and surrounding the piston rod 31. This spring may be in the form of a plurality of saucer-shaped spring disks 34 arranged in opposed pairs as best shown in Fig. 2, but other types of spring may be used.

It is common practice to water cool these clamps or holders and in carrying out the present invention the tension bolt 16 has a central bore 37 through which may be passed cooling fluid as well as fluid under pressure for providing a hydraulic release as will be later described.

The base 19 has an annular chamber 38 communicating with a cold water inlet 39 and communicating through the passages 40 with the interior of the housing 20.

The piston rod 31 has the central bore 42 which communicates with the interior of the housing 20 and with the bore 37 in the tension bolt 16 so that cooling water entering the chamber 38 will pass around the same and through the passages 40 to the interior of the housing 20 and will then pass through the piston rod 31 and tension bolt 16 to the outlet pipe 43.

A valve 44 controls the inlet pipe 39, and a valve 45 controls the outlet. A branch pipe 46 communicates with the pipe 43 and leads to a high pressure hydraulic pump or the like, the valve 47 being interposed between said pump and the pipe 43.

When the head is assembled it is so adjusted that the spring disks 34 will draw the tension bolt 16 to the left as viewed in the drawings, tightly clamping the pads 11 of the clamp members 10 upon opposite sides of the electrode 12 so as to support the electrode by the holder.

In the normal operation of the holder the valve 47 is closed while the valves 44 and 45 are open permitting a continuous circulation of the cooling water around the head and through the tension bolt 16 to the outlet.

When it is desired to open the clamp so as to permit the electrode to be lowered relative thereto, the inlet valve 44 and outlet valve 45 are both closed and the high pressure valve 47 is opened permitting the high pressure fluid to pass

through the tension bolt 16 and piston rod 31 into the housing 20 of the clamping head, and as the pressure builds up, the piston 27 will be forced to the right (Fig. 3) collapsing the spring disk 34, and moving the nut 17 of the tension bolt 16 to the right so as to permit the corresponding ends of the clamping members 10 to move out from each other releasing the electrode 12 from the clamping action of the pad 11 and permitting the electrode to be adjusted relative to the holder.

When the desired adjustment is obtained the high pressure valve 47 is closed and the outlet valve 45 is opened permitting the high pressure fluid to exhaust from the clamping head so that the springs 34 may pull the piston back to the clamping position as shown in Fig. 2, and the inlet valve 44 is opened permitting, cooling water to again circulate in the clamping head and tension bolt.

I claim:

1. In combination with an electrode holder including clamp members and a tension bolt located through said clamp members, a nut upon one end of the tension bolt engaging the outer side of one clamp member, a clamping head slidable upon the other end of the bolt engaging the outer side of the other clamp member, a piston within said clamping head, a piston rod connected at opposite ends to the piston and to the tension bolt, spring means co-operating with the piston for normally urging the clamping head against the adjacent clamp member for clamping the clamp members upon an interposed electrode, and means for circulating fluid through the clamping head and means for building up the pressure of the fluid to act against the piston for releasing the spring means.

2. In combination with an electrode holder including clamp members and a hollow tension bolt located through said clamp members, a nut upon one end of the tension bolt engaging the outer side of one clamp member, a clamping head slidable upon the other end of the bolt engaging the outer side of the other clamp member, a piston within said clamping head, a hollow piston rod connected at opposite ends to the piston and to the tension bolt, spring means co-operating with the piston for normally urging the clamping head against the adjacent clamp member for clamping the clamp members upon an interposed electrode, means for circulating cooling fluid through the clamping head, and means for admitting high pressure fluid to the clamping head to act against the piston for releasing the spring means.

3. In combination with an electrode holder including clamp members and a hollow tension bolt located through said clamp members, a nut upon one end of the tension bolt engaging the outer side of one clamp member, a clamping head slidable upon the other end of the bolt engaging the outlet side of the other clamp member, a piston within said head, a hollow piston rod connected at opposite ends to the piston and the bolt, spring means co-operating with the piston for normally urging the clamping head against the adjacent clamp member for clamping the clamp members upon an interposed electrode, means for admitting cooling fluid to the bolt and clamping head, and means for admitting hydraulic pressure fluid through said hollow bolt to the clamping head and against the piston to release the spring means.

4. In combination with an electrode holder in-

cluding clamp members and a tension bolt located through said clamp members, a nut upon one end of the tension bolt engaging the outer side of one clamp member, a hollow clamping head slidable upon the other end of the tension bolt engaging the outer side of the other clamp member, a cylinder within said hollow clamping head and spaced from the walls thereof, a piston within said cylinder, a piston rod connected at opposite ends to the piston and the tension bolt, spring means cooperating with the piston for normally urging the clamping head against the adjacent clamp member for clamping the clamp members upon an interposed electrode, means for admitting cooling fluid to the head and around said cylinder, and means for admitting hydraulic pressure fluid to the head and against the outer side of the piston to release the spring means.

5. In combination with an electrode holder including clamp members and a hollow tension

bolt located through said clamp members, a nut upon one end of the tension bolt engaging the outer side of one clamp member, a hollow clamping head slidable upon the other end of the tension bolt engaging the outer side of the other clamp member, a cylinder within said hollow clamping head and spaced from the walls thereof, a piston within said cylinder, a hollow piston rod connected at opposite ends to the piston and the tension bolt, spring means cooperating with the piston for normally urging the clamping head against the adjacent clamp member for clamping the clamp members upon an interposed electrode, means for admitting cooling fluid to the bolt and clamping head, and means for admitting hydraulic pressure fluid through said hollow bolt to the clamping head and against the piston to release the spring means.

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