June 25, 1957 W. DÄMGEN ET AL 2,797,251

DEVICE FOR HOLDING AND MOVING FORWARD ELECTRODES

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Fig. 1.

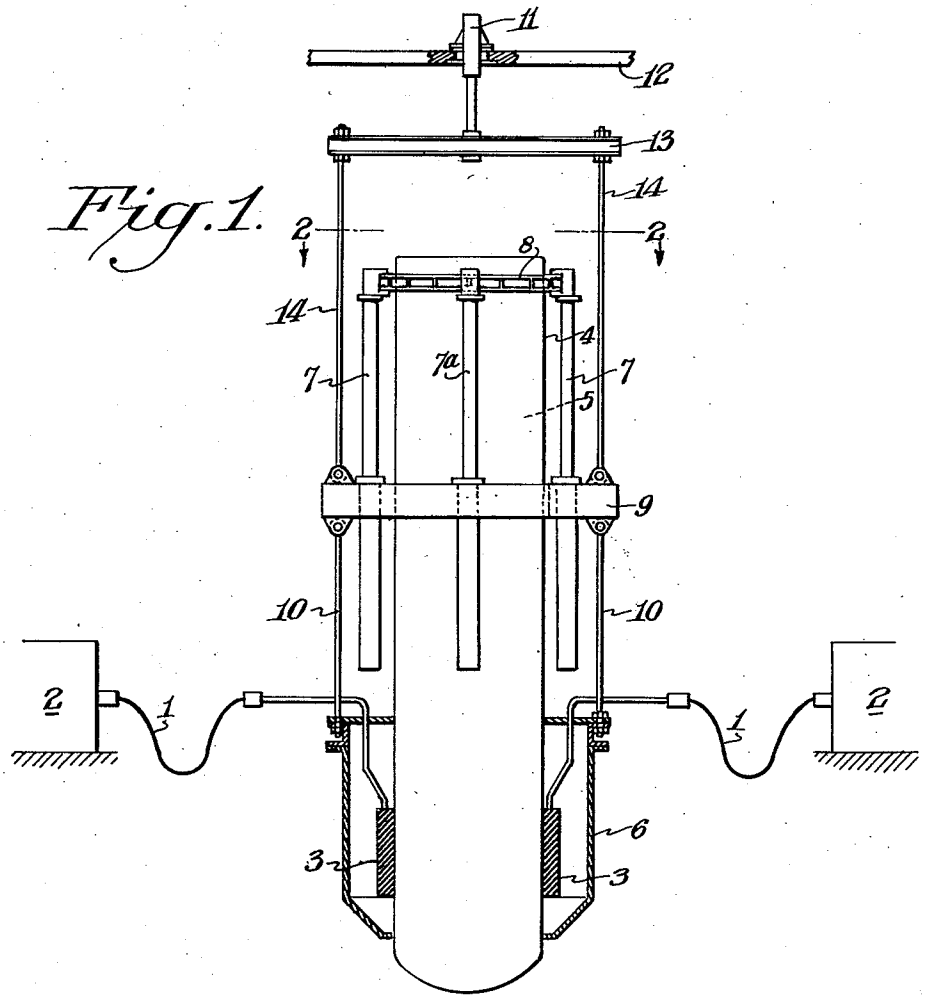
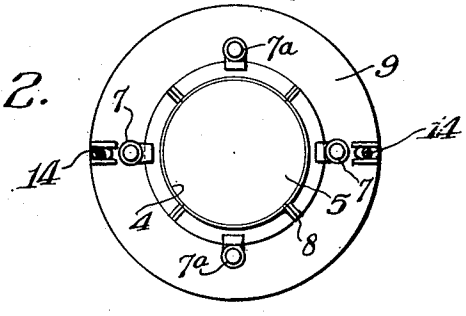


Fig. 2.



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Fig. 3.

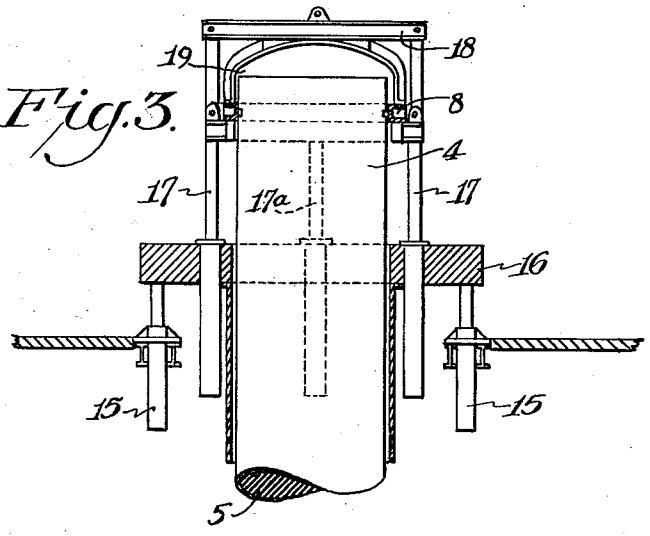


Fig. 4.

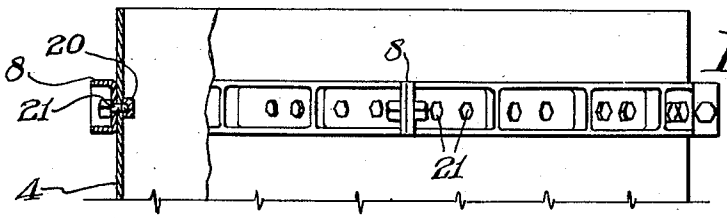


Fig. 5.

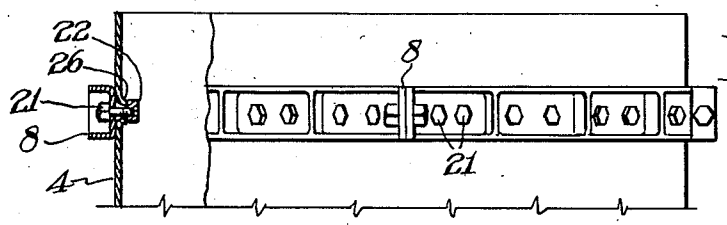
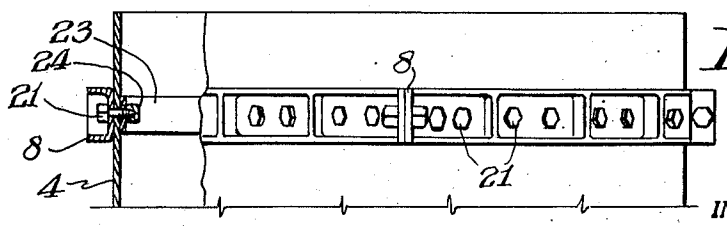


Fig. 6.



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Fig. 7

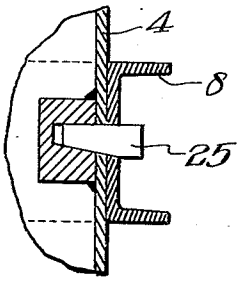


Fig. 8.

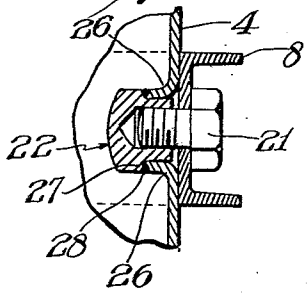
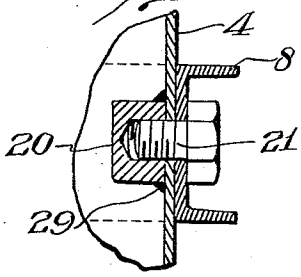


Fig. 9.



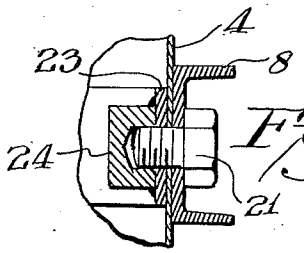


Fig. 10

Fig. 11.

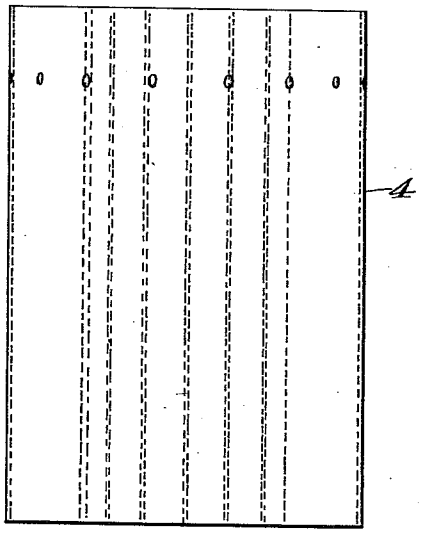
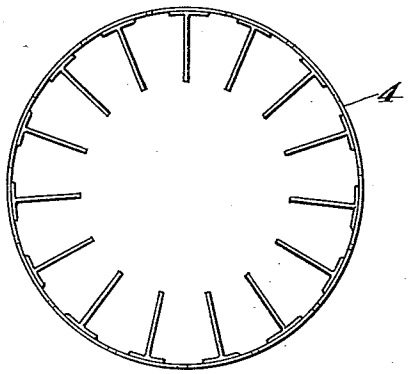


Fig. 12.



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DEVICE FOR HOLDING AND MOVING FORWARD ELECTRODES

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Application June 1, 1955, Serial No. 512,468

7 Claims. (Cl. 13—14)

The present invention relates to a device for holding and moving forward continuous electrodes in electric furnaces.

For the purposes of this invention, the term "lifting device" means a device by which the electrodes are lifted and lowered. As lifting devices of this kind there may be used mechanical, electric or pneumatic and, more especially, hydraulic devices.

Instead of a lifting device there may be used a supporting device. As used herein, the term "supporting device" means a device by which the electrodes are kept at a certain height.

It is also possible to use a lifting device together with a bearing device.

We have found a device for holding and moving forward continuous electrodes, for example, Söderberg electrodes, in electro-thermal furnaces. This device comprises at least two groups of the lifting and supporting devices. Either of these groups is capable of bearing the whole electrode and both are arranged independently of the current supply facilities. The lifting and supporting devices are arranged at a yoke-like mechanism which itself is operated by another lifting device that controls the position of the electrode for regulating the furnace resistance.

The lifting devices may be connected with the electrode by means of a detachable bolt construction, the nuts for the screws or a flat steel ring provided with female threads being fixed at the inner side of the electrode shell, for example, by welding; the lifting device may also be connected with the electrode by means of a profiled ring, for example a U-shaped steel ring, provided with nuts and fixed at the inner side of the electrode shell, for instance, by welding.

It has proved advantageous to use nuts the holes of which are blind towards the inside of the electrode shell. In practice, the device of this invention is operated in a manner such that the electrodes are moved forward pari passu with their consumption, the forward movement of the electrodes being controlled either from a suitable central point, for example, a switchgear, or they may be moved forward continuously by means of the lifting devices according to their consumption.

In the drawings:

Fig. 1 is a side elevational view partly in section of an embodiment of the present invention.

Fig. 2 is a cross-sectional view taken on the line 2—2 of the Fig. 1.

Fig. 3 is a sectional elevation of a modified form of lifting mechanism.

Figs. 4, 5 and 6 are fragmentary elevations, partly in section, of encircling rings joined to the electrode shell.

Figs. 7, 8, 9 and 10 are enlarged sections of details of several parts shown in Figs. 4, 5 and 6 including one variation.

Fig. 11 is a side elevation of the outer casing which surrounds a section of electrode.

Fig. 12 is a top plan view of Fig. 11.

In Figures 1 and 2 the numerals designate the following parts:

Current supply line **1** is arranged in flexible manner between the source of current **2** and current supply plates **3** enabling the latter to follow the movement of electrode shell **4** and electrode **5**. Protective shell **6** surrounds current supply plates **3**. **7** represents one lifting device group. The second lifting device group is *7a*. Lifting devices **7** and *7a* carry a ring **8** which encircles electrode **5** and is connected with electrode shell **4** in detachable manner, for example, by means of screws **21**, in Figures 4, 5, 6, 8, 9 and 10. Lifting devices **7** and *7a* thus carry electrode shell **4** by means of ring **8** and, consequently, electrode **5**. Lifting devices **7** and *7a* are connected with yoke **9** carrying by means of draw rods **10**, if desired replaced by a sheet metal cylinder **15**, Figure 3, current supply plates **3** with protective shell **6**. Yoke **9** is lifted and lowered by a further lifting device **11** mounted at supporting beam **12**. Lifting device **11** carries a second yoke **13** connected with yoke **9** by rods **14**. Another construction of the lifting device is shown in Figure 3. It consists of two lifting cylinders **15** mounted on supporting beam **12** and carrying yoke **16**. Lifting devices **17** and *17a*, which correspond to lifting devices **7** and *7a* of Figures 1 and 2, are arranged in a manner such that they can also be used for pressing the electrode downward by means of yoke **18** and cover **19** which engages ring **8**, if the electrode sticks to the current supply plates.

In Figures 4 and 9 part **20** is a nut provided with a base plate, the nut being welded, **29** to electrode shell **4**. Screw **21** provides the detachable connection of ring **8** with electrode shell **4**.

Figures 5 and 8 illustrate another method for fixing the nut at the electrode shell **4**. In this embodiment the sheet metal of the electrode shell is bent towards the inside in a nozzle-like manner **26**. Nut **22** provided with a flange, **27** engages the edge of the sheet metal and is welded thereto, **28**.

Under certain circumstances, for instance, when an electrode shell of minor wall thickness is used, it is advisable to weld the nuts **24** to a flat steel ring **23** and to connect this ring with the shell by welding (as shown in Figures 6 and 10).

In all cases, the holes in the nuts (**20**, **22** or **24**) are blind towards the inside of the electrode so that no electrode mass penetrates through the holes when the screws **21** are removed.

When using the device of this invention, it has proved advantageous to control the feed of the electrodes pari passu with their consumption from a suitable central point, for example, a switchgear, or to move the electrodes continuously forward in accordance with their consumption by means of the lifting devices. As compared with the known devices, the device according to this invention offers the advantage that the expenditure of energy spent on the lowering operation of the electrodes is saved. The electrode must, however, be moved forward not only according to its consumption but it must also be adjusted to comply with the electric conditions desired in the electric furnace.

When a new electrode shell section has been introduced into the furnace, the load is transferred in each particular case from the one lifting device group to the other. It is also possible to operate in such a manner that, generally, both lifting device groups are in operation, one group of which, after introduction of a new electrode shell section, serves to shift the load to the latter. Figure 11 illustrates an embodiment of electrode shell **4** which surrounds a section of electrode **5**.

Finally, it is also possible to use the device according to this invention in such a manner that, generally, one of the two lifting device groups is in operation, whilst the other group serves to shift the load to the electrode shell section which has been introduced. With the device of this invention, the force applied acts on the upper end of the electrode shell. In view of the fact that the electrode shell consists of various sections welded together, the joints must be welded so that they can carry the total weight of the electrode. This is achieved either by using an electrode shell of sufficient sheet thickness so that the cross section of the sheet metal carries the weight of the electrode, or the electrode shell must correspondingly be reinforced, as illustrated in Figure 12.

Instead of the screws **21** used for connecting the lifting devices with the electrode shell **4**, there may also be used other reliable but readily detachable connections, for example, wedges **25**, Figure 7.

A hydraulic lifting gear is advantageously used.

We claim:

1. Apparatus for holding and moving forward a continuous electrode in an electro-thermal furnace, said apparatus comprising a plurality of groups of electrode lifting and supporting means, at least two groups of the electrode lifting and supporting means being each capable of independently lifting and supporting an electrode and each of said two groups being arranged independently of current supply means for said electrode, said two electrode lifting and supporting means being arranged and supported by a yoke means, another group of electrode lifting and supporting means connected to said yoke means, and means associated with another group of electrode and supporting means for controlling the position of the said current supply means with reference to said electrode.

2. Apparatus as set forth in claim 1, including an electrode shell supporting said electrode and means detachably connecting said at least two groups of electrode lifting and supporting means to said electrode shell.

3. Apparatus as set forth in claim 2 wherein the electrode shell is of sheet metal, the sheet metal being pierced to provide inwardly extending excess metal portions defining a nozzle-like arrangement and encompassing means forming part of the means for detachably connecting the at least two groups of lifting and supporting means.

4. Apparatus as set forth in claim 3 wherein the means forming part of the means for detachably connecting the at least two groups of lifting and supporting means is a female threaded member.

5. Apparatus as set forth in claim 2 including a ring member fixed to said electrode shell and arranged for detachable connection with each of said at least two groups of electrode lifting and supporting means.

6. Apparatus as set forth in claim 2 wherein said electrode shell and said detachable connecting means form an electrode impervious side wall casing for said electrode.

7. A process for continuously holding and advancing a continuous electrode in an electro-thermal furnace which comprises the steps of supporting an electrode in a vertical position and continuously advancing said electrode downwardly as it is consumed by at least one means capable of lifting and supporting said electrode, supporting a supply segment of additional electrode by another separate means capable of independently lifting and supporting said electrode, adjusting the vertical position of the two lifting and supporting means relative to the other to engage the bottom of the electrode segment and the top of the non-consumed portion of the electrode, joining the segment of electrode to the unconsumed portion of the electrode, and adjusting current resistance in the electro-thermal furnace by means of raising and lowering the electrode independently of the other two means for lifting and supporting the electrode.

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