Dec. 29, 1931. H. F. FISHER ET AL 1,838,933

ELECTRICAL TREATER HAVING DRY OIL BARRIER SUPPLY

Original Filed Nov. 28, 1927

Fig. 1.

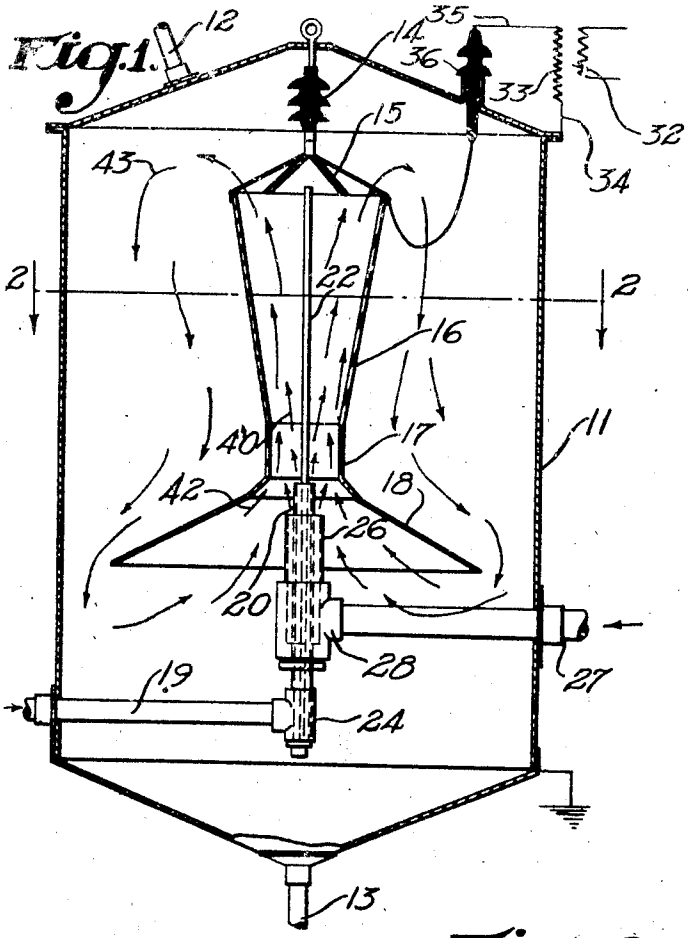


Fig. 2.

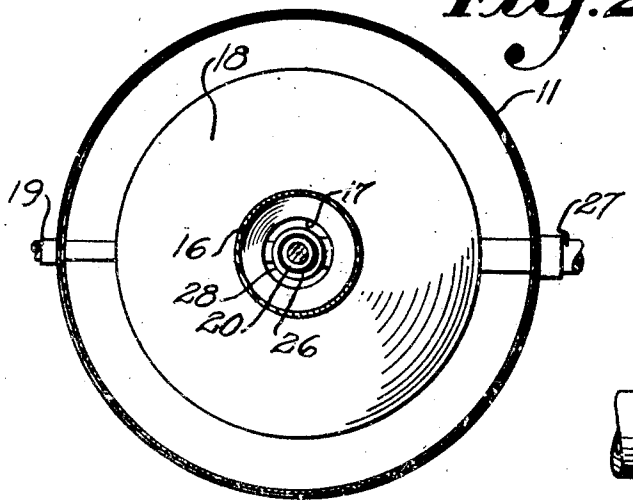
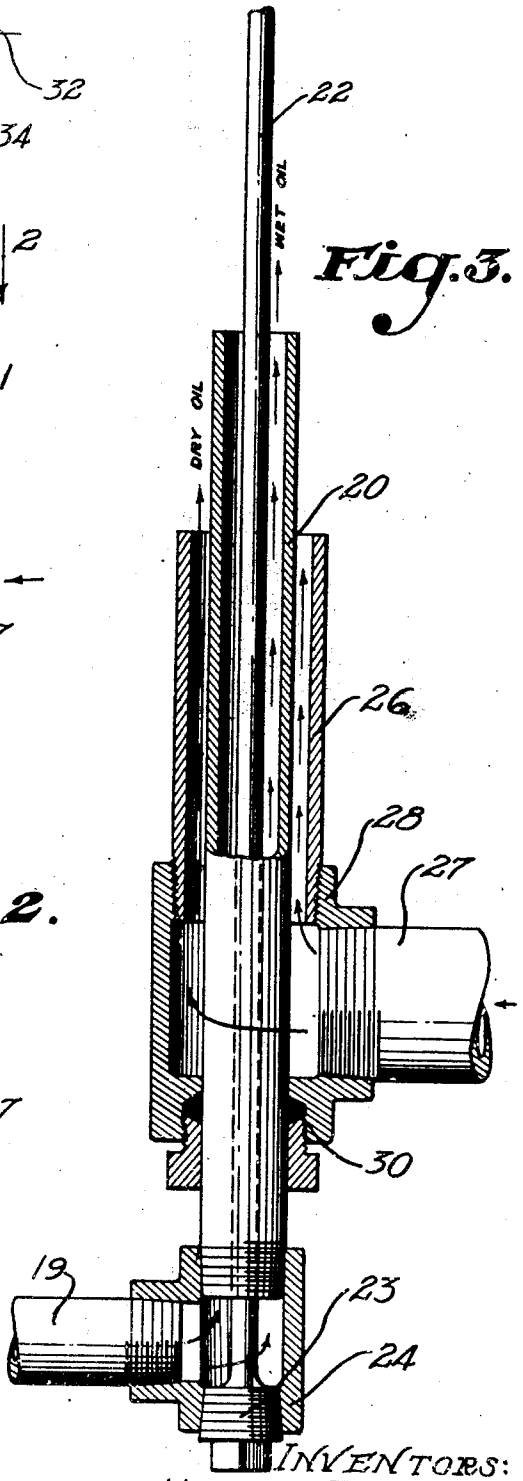


Fig. 3.



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Patented Dec. 29, 1931

1,838,933

UNITED STATES PATENT OFFICE

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ELECTRICAL TREATER HAVING DRY OIL BARRIER SUPPLY

Application filed November 28, 1927, Serial No. 236,090. Renewed September 4, 1931.

This invention relates to electrical treaters of the characters designed for separating liquids or a solid and a liquid, and it relates particularly to a treater for efficiently separating water and oil from emulsion. In the co-pending application entitled Dehydrator with means for directing emulsion through a high intensity field, Serial No. 203,253, filed July 2, 1927, of Harmon F. Fisher, there is described a treater which provides a central high intensity electrode and an outer low intensity electrode. The wet oil or the fluid to be treated is passed through the treating space immediately around the central electrode and treated oil or dry oil is passed through the treating oil around the wet oil to form a dielectric barrier which prevents short-circuit in the treating space. The treated oil makes a complete circuit around the outer electrode, being caused to flow by the injector effect of the wet oil.

We find that the treating capacity of a given size, high field intensity electrode is greatly increased and also the commercial quality of the treated oil is improved when the circulation of oil through the shield is aided, augmented or entirely provided by some auxiliary means other than the high velocity of the wet oil jet. One method of securing this auxiliary aid to the circulation of wet oil is to provide a second larger stream or jet of treated oil, surrounding the first or inside jet of wet oil. This may be accomplished by placing a second larger diameter nozzle concentric with the smaller wet oil nozzle and pointing directly into the throat of the surrounding electrode so that the outer enveloping jet of circulating oil is moving parallel with and in the same direction as the inner jet of wet oil. This second outer nozzle is connected with a suitable dry oil or dielectric barrier supply source. We have found that by this means the treating capacity of a given treater of this character can be increased from two to ten-fold the capacity of the simple treater not having the auxiliary aid to circulate the wet oil.

One of the objects of this invention is to provide an electrical treater of this character in which the fluid to be treated is carried through the treating space by a dielectric medium.

A further object of the invention is to provide an electrical treater in which the dielectric medium keeps the fluid to be treated in the proper part of the treating space.

Further objects of the invention lie in our novel method of electrically treating a fluid by passing this fluid through a treating space in contact with a dielectric medium.

A still further object of the invention is to provide a treater in which the dielectric medium envelops the fluid to be treated.

Other objects and advantages of the invention will be pointed out in the following description.

In the following description reference will be had to the accompanying drawings in which the invention is diagrammatically illustrated. In the drawings:

Fig. 1 represents a vertical cross-section through a preferred embodiment of the invention.

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

Fig. 3 is an enlarged section showing the nozzle of the invention.

Referring to the drawings in detail, the numeral 11 represents a tank having a dry oil outlet 12 and a precipitate outlet 13. Supported from the top of the tank 11 is an insulator 14 which carries a spider 15, this spider 15 supporting a live or surrounding electrode 16 of the invention. This surrounding electrode 16 is of annular cross-section and near the lower end thereof is provided with a throat 17. The portion of the electrode 16 below the throat 17 is provided in the form of an apron 18.

Adapted to supply emulsion or other fluid to be treated to the interior of the surrounding electrode 16 is a fluid inlet pipe 19 having a vertical leg 20 forming an inner nozzle which projects into the throat 17. Extending through the surrounding electrode 16 is a central electrode 22. This central electrode 22 extends through the vertical leg 20 of the fluid inlet pipe 19, as clearly illustrated in Fig. 3, being supported by a plug 23 which screws into a fitting 24 of the fluid inlet 19.

Surrounding the vertical leg or nozzle 20 is an outer nozzle 26 which is in communication with a barrier medium supply 27. The barrier medium supply 27 is provided with a fitting 28 which surrounds the vertical leg 20 and which supports the nozzle 26. The lower part of the fitting 28 is provided with a packing 30 which surrounds the vertical leg 20.

An electric field is established between the surrounding and central electrodes 16 and 22 by means of a transformer or other current source indicated by the numeral 32. The transformer 32 has a secondary 33, one side of which is connected by a conductor 34 to the tank 11, in this manner being connected to the central electrode 22, and the other side of the secondary 33 is connected by a conductor 35 to the surrounding electrode 16, this conductor 35 passing through an insulation bushing 36.

In the operation of the invention the tank 11 is first filled with a dielectric barrier which may be dry or treated oil. Fluid to be treated, which is in this case emulsion, is directed into the space between the electrodes 16 and 22 by means of the vertical leg or nozzle 20. Previous to this time, an electric field is established in this space. Simultaneously with the supplying of emulsion to the treating space, a dielectric medium or barrier, which is preferably a dry or treated oil, is supplied to the nozzle 26 and passes upward into the treating space around the wet oil. The dielectric medium is preferably under a high pressure and issues from the nozzle 26 under considerable velocity, issuing therefrom, as indicated by arrows 40 in Fig. 1. The wet oil need not be under any considerable pressure, since the action of the dielectric medium is to carry the wet oil through the treating space at the same time confining it to that area around the central electrode 22 which is the portion of the field of highest potential gradient. The dielectric medium, in addition to carrying the wet oil through the field at a proper rate of speed, envelops it and confines it, as previously explained, to the proper treating field. The injection of the dielectric medium into the throat 17 causes the dielectric barrier, which is in the tank 11, to circulate into the throat 17, as indicated by arrows 42. The dielectric medium and the dielectric barrier prevent short-circuiting between the electrodes 16 and 22, and thus maintain the efficiency of the treater. The entire mass of treated emulsion or treated wet oil, together with the dielectric medium and dielectric barrier, pass from the upper end of the treating space, as indicated by arrows 43, and pass downward around the apron 18 and pass into the throat 17 in the form of a dielectric barrier. The elongated path provided by passing around the apron 18 assists materially in promoting the separation of suspended matter from the oil as shown and claimed in a copending application filed by Harmon F. Fisher, Serial No. 233,291. The water particles, of course, gravitate to the bottom of the shell 11 and are withdrawn through the pipe 13, the very dry oil passing to the top of the shell 11 and being withdrawn through the pipe 12.

In this invention the rate of treatment is much greater than in a similar treater not having the dielectric medium supply means which supplies a dielectric medium for enveloping the wet oil and carrying it through the treating space.

We claim as our invention:

1. An electrical treater comprising: an inner nozzle; a central electrode extending into said innner nozzle; means for supplying a fluid to be treated to said inner nozzle, said fluid being discharged therefrom immediately around said central elctrode; an outer nozzle adapted to discharge an envelope of dielectric medium, said envelope surrounding said fluid discharged from said inner nozzle; a surrounding electrode around said central electrode and around the streams of fluid and dielectric medium discharged from said nozzles; and means for impressing a potential difference between said central and said surrounding electrodes.

2. An electrical treater comprising: a central electrode; an inner nozzle electrically connected to said central electrode and adapted to discharge an envelope of fluid to be treated therearound; an outer nozzle adapted to discharge an envelope of dielectric medium, said envelope of dielectric medium surrounding said fluid discharged from said inner nozzle; a surrounding electrode around said central electrode and around the streams of fluid and dielectric medium discharged from said nozzles; and means for impressing a potential difference between said central and said surrounding electrodes.

3. A method of treating a fluid in an electric field formed between a central electrode and a surrounding electrode, which method includes the steps of: introducing an envelope of a dielectric medium into said field in spaced relationship with said surrounding electrode, said envelope being concentric with said central electrode; and introducing into said field between said envelope of dielectric medium and said central electrode a fluid to be treated.

4. A method of treating a fluid in an electric field formed between a central electrode and a surrounding electrode, which method includes the steps of: introducing an envelove of a dielectric medium into said field at a relatively high velocity, said envelope being concentric with said central electrode; and introducing into said field between said envelope of dielectric medium and said central electrode a fluid to be treated, said fluid to be

treated being introduced at a relatively lower velocity than said dielectric medium.

5. A method of treating an emulsion, which includes the step of introducing concentric streams of emulsion and a dielectric medium into an electric field at differential pressures, the pressure on said dielectric medium being greater than the pressure on said emulsion.

6. A method of treating a fluid in an electric field formed in a treating space between a central electrode and a surrounding electrode open at its ends whereby said treating space is in communication with a surrounding liquid, which method includes the steps of: introducing into said field in spaced relationship with said electrodes an envelope of a dielectric in a manner to draw a portion of said surrounding liquid into the outer portion of said treating space; and simultaneously introducing an envelope of said fluid immediately around said central electrode and between said central electrode and said envelope of dielectric.

7. A method of treating a fluid in an electric field formed between a central electrode and a surrounding electrode, which method includes the steps of: introducing an envelope of the fluid to be treated immediately around said central electrode; and injecting into said field around and in confining contact with said envelope and in spaced relationship with said surrounding electrode another envelope of another material, said other envelope of the other material being injected in such a direction and with such velocity that said envelope of said fluid to be treated is maintained in contact with said central electrode by the confining action of said envelope of other material during a material length of the time in which it is influenced by said electric field.

8. A method of treating a fluid in an electric field between a central electrode and a surrounding electrode which provides walls converging in a given direction, which method includes the steps of: introducing into said field the fluid to be treated in the form of a fluid envelope around said central electrode; and introducing into said field in said given direction an envelope of another material surrounding said envelope of said fluid to be treated, said envelope of said other material being introduced at such a point that said converging walls force it into confining relationship with said envelope of said fluid to be treated.

9. In an electrode structure, the combination of: a central electrode; an inner nozzle electrically connected to and surrounding said central electrode in a manner to form an inner annular passage therebetween, said central electrode extending a material distance from the end of said inner nozzle; fluid-supply means communicating with said inner annular passage; an outer nozzle electrically connected to and surrounding said inner nozzle and cooperating therewith in defining an outer annular space, said outer nozzle terminating short of said end of said inner nozzle; and fluid-supply means communicating with said outer annular space.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 10th day of November, 1927.

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WILLIAM WOELFLIN.