July 25, 1967 A. C. VIALARON 3,332,865

METHOD FOR THE PRODUCTION OF GASEOUS MIXTURES CONTAINING ACETYLENE AND ETHYLENE

Filed Oct. 23, 1964

Fig. 1

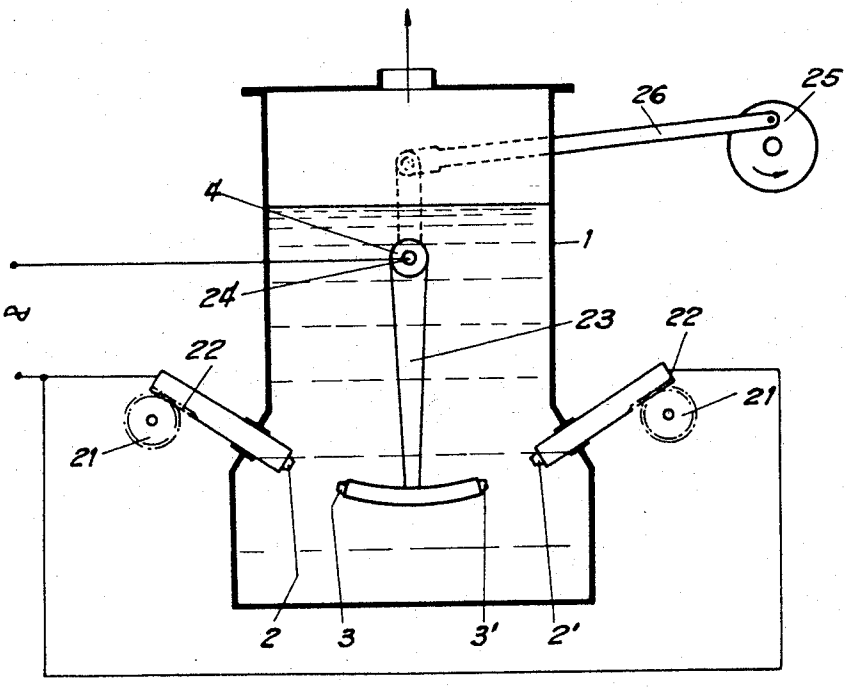
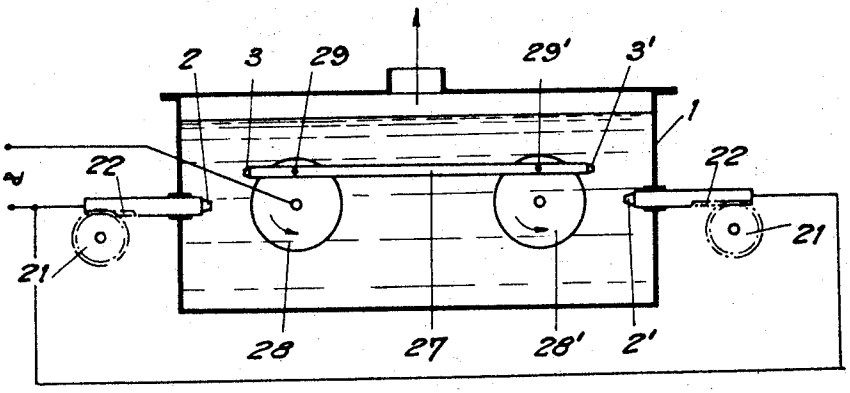


Fig. 2



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United States Patent Office 3,332,865 Patented July 25, 1967

3,332,865

METHOD FOR THE PRODUCTION OF GASEOUS MIXTURES CONTAINING ACETYLENE AND ETHYLENE

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Filed Oct. 23, 1964, Ser. No. 406,054
Claims priority, application France, Nov. 4, 1963, 952,615
6 Claims. (Cl. 204—171)

In my prior patent application Ser. No. 189,740 filed on April 24th, 1962, now patent No. 3,224,952 issued December 21, 1965, I have described a method for the production of gaseous mixtures containing acetylene and ethylene starting from a liquid hydrocarbon in the midst of which an electric arc is produced between two electrodes, the said electric arc being interrupted then restored in accordance with a predetermined frequency by imparting to at least one of the electrodes an alternating movement which brings the electrodes into contact for the purpose of striking the arc and draws them apart for the purpose of interrupting the arc.

As will be recalled, this method is especially characterized in that the cycle comprising the interruption followed by the passage of the arc has a maximum time-duration of one second and that the electrodes are placed in such a position that an impact which effects the cleaning of these latter takes place at the moment of making the contact which is intended to initiate the arc. Moreover, in the case in which alternating current is utilized as a supply source for the electric arc, the frequency of reciprocating motion of the movable electrode is preferably synchronized with the frequency of the current in such a manner as to ensure that the arcing contact is made at the moment when the voltage is in the vicinity of zero value.

In the different forms of embodiment of the method which are described in the above-mentioned patent application, each pair of electrodes consists of a stationary electrode and a movable electrode which are disposed coaxially in oppositely facing relation and the movable electrode is endowed with a rectilineal alternating motion which is directed along the longitudinal axis thereof and which is controlled, for example, by means of a crank and connecting-rod mechanism or the like.

In point of fact, the industrial development of the method which has just been summarized has led to the discovery that, if the rectilineal alternating motion as initially contemplated is replaced by a curvilineal alternating motion of each movable electrode, it is thereby made possible, not only to achieve the optimum operating conditions which are a distinctive feature of the patent application herein referred-to, but also to improve the practical application of this method to a marked extent. The utilization of the above-mentioned curvilineal alternating motion has in fact proved to be particularly advantageous, especially for the following reasons:

(a) In the case in which alternating current is employed, the alternate utilization of the two current polarities is more readily permitted by a curvilineal alternating motion than by a rectilineal alternating motion;

(b) Curvilineal alternating motion offers a particularly easy solution to the problem of fluid-tightness of the reaction tank at the level of the mechanism which controls the travel of the movable electrodes.

The present invention therefore has for its object an

improvement which is made in the method described in the above-mentioned patent application and which essentially consists in imparting to the movable electrodes a curvilineal alternating motion such as to ensure that said movable electrodes are brought into contact with and moved away from the stationary electrodes under the conditions which are contemplated in the patent application hereinabove referred-to.

In the practical application of the aforesaid improvement, the curvilineal alternating motion of the system which carries the movable electrodes can be produced especially by means of a pendulum arrangement or by means of an eccentric mechanism.

Forms of execution of each of these two types of drive systems have been illustrated in the accompanying drawings by way of example only and not in any limiting sense. In these drawings:

FIG. 1 is a diagrammatic cross-section of an apparatus in which the curvilineal alternating motion of the movable electrodes is produced by means of a pendulum;

FIG. 2 is a similar view of an apparatus in which the curvilineal alternating motion of the electrodes is produced by means of an eccentric mechanism.

In the form of embodiment of FIG. 1, the apparatus comprises a reaction tank **1** which is filled with the liquid hydrocarbon to be processed. There are shown at **2** and **2'** two stationary electrodes which are disposed in symmetrical relation and penetrate at an oblique angle into the tank **1** through suitable fluid-tight packings fitted in the opposite lateral walls of said tank; the positions of said electrodes can be adjusted longitudinally, for example by means of a rack and pinion mechanism **21–22**. Between the stationary electrodes **2, 2'** is disposed a moving system consisting of two movable electrodes **3, 3'** and suspended from the lower extremity of a pendulum **23**, the spindle **24** of which is immersed in the hydrocarbon and traverses the wall of the tank **1** through a packing gland **4**. An externally mounted eccentric mechanism **25** which is coupled to the upper extremity of the pendulum **23** by means of a connecting-rod **26** produces and maintains the oscillation of the pendulum with a well-defined and constant amplitude which brings the movable electrodes **3, 3'** periodically and alternately into contact with the corresponding stationary electrode **2** or **2'**.

The operation of the apparatus as thus constituted can easily be regulated so that the essential conditions laid down in the aforesaid patent application Ser. No. 189,740 are complied with. When the apparatus is supplied with alternating current, the frequency of oscillations of the pendulum is synchronized with the frequency of the current employed. When the apparatus is supplied with direct current, the oscillation frequency is established as a function of the desired arcing time. In both cases, the amplitude of the oscillations is so regulated as to obtain the maximum length of arc which is compatible with the terminal voltage and to produce at the moment of contact of the electrodes a force of impart which is sufficient to effect the cleaning of said electrodes.

As has been stated earlier, the pendular motion as thus carried into effect has an advantage over the rectilineal motion described in the above-mentioned patent application in that it permits of substantial simplification of the apparatus when utilizing two polarities of alternating current, this utilization being obtained in accordance with the form of embodiment which is illustrated in FIG. 1 by equipping the pendulum with symmetrical electrodes designed to cooperate with stationary electrodes which

are also symmetrical. In order to obtain the same result, the rectilineal displacement of the movable electrodes as effected by means of a conventional crank and connecting-rod mechanism would call for the use of a crankshaft fitted with two oppositely-acting connecting-rods.

Furthermore, the pendular motion referred-to ensures a simplification of the packing glands at the point at which the mechanism for controlling the movement of the movable electrodes traverses the tank **1**. In fact, in the case of a rectilineal movement, the travel of the electrode-carrier rod is equal to the travel of said electrodes and the packing gland must ensure leak-tightness during said travel. On the contrary, in the case of pendular motion, the packing glands **4** are subjected only to a rotary motion, the amplitude of which can be reduced to a minimum by lengthening to a sufficient extent the arm of the pendulum which carries the movable electrodes.

In the form of embodiment which is illustrated in FIG. 2, the same reference numerals designate the same elements as in FIG. 1 and the stationary electrodes **2** and **2'**, the position of which can be adjusted as in the previous example by means of a mechanism such as rack-and-pinion mechanism **21–22**, are located symmetrically and coaxially on each side of the reaction tank **1** and traverse the opposite lateral walls thereof. There is disposed between said stationary electrodes and in the interior of the tank a moving system which consists in this case of a horizontal rod **27** which carries at its extremities the movable electrodes **3** and **3'**. The said moving system is controlled in dependence on two eccentrics **28, 28'** by means of spindles **29, 29'**. One of the two eccentrics is driven in rotation from a motor (not shown in the drawings) which is located outside the tank **1** and which drives the shaft of said eccentric whilst the other eccentric is mounted to rotate freely and designed to maintain the moving system **27** in a position which is always parallel with the common axis of the stationary electrodes **2** and **2'**.

In this form of embodiment also, the operation of the apparatus can easily be regulated so that the essential conditions indicated in the above-mentioned patent application should be satisfied. When the apparatus is supplied with alternating current, the speed of rotation of the driving eccentric is synchronized with the current frequency; if the apparatus is supplied with direct current, the speed of rotation is established as a function of the desired arcing time. In both cases, the length of the arc is predetermined by the distance off-center of the spindles **29** and **29'**. The advantageous feature which is additionally provided by this second form of embodiment consists in the fact that, since the arc describes a semicircle, the length of the arc increases to a greater extent than the distance off-center. Finally, the intensity of impact which is necessary for the purpose of cleaning the electrodes and which takes place at the moment when each movable electrode comes into contact with the corresponding stationary electrode can easily be regulated by means of the mechanisms **21–22** which serve to position the stationary electrodes.

The advantages of the eccentric device which has been described in the foregoing are the same as those of the pendulum system described earlier, namely: simplification of the apparatus when utilizing the two polarities of alternating current and simplification of the solution to the problem of fluid-tightness at the level of the mechanism which controls the movement of the movable electrodes.

What I claim is:

1. Method of production of gaseous mixtures containing acetylene and ethylene starting from a liquid hydrocarbon, which consists in producing an electric arc between two electrodes in the midst of said liquid hydrocarbon, interrupting said arc and then restoring said electric arc at a predetermined cycle frequency by imparting to at least one of said electrodes a positive periodic curvilineal alternating motion which brings said electrodes into contact for the purpose of striking said electric arc and draws said electrodes apart for the purpose of interrupting said electric arc, each of said cycles comprising a positive periodic interruption and a passage of said electric arc having a maximum time-duration of one second, and the relative movement of said electrodes being determined so that an impact takes place between the electrodes during each cycle at the moment when an electric arc is struck between said electrodes, said impact having the effect of cleaning said electrodes.

2. Device for the production of gaseous mixtures containing acetylene and ethylene starting from a liquid hydrocarbon, said device comprising in combination a tank designed to contain said liquid hydrocarbon, at least one stationary electrode and at least one movable electrode disposed in oppositely facing relation inside said tank, means for supplying said electrodes with electric current, means for imparting to each movable electrode a positive periodic curvilineal alternating motion for the purpose of drawing said movable electrode into contact with and then away from the corresponding stationary electrode in such manner as to produce then to interrupt an electric arc between said electrodes, and means for regulating the relative movement of said electrodes in such manner that each movable electrode strikes against the corresponding stationary electrode to produce an impact when said electrodes are in their position of maximum proximity.

3. Device as defined in claim **2**, wherein said means for imparting a curvilineal alternating motion to each movable electrode comprise a pendular arm which carries said movable electrode, a horizontal spindle which is fixed within said tank and on which said pendular arm is pivotally mounted, and means for imparting to said pendular arm a movement of oscillation having a predetermined and constant amplitude whereby said movable electrode carried by said arm is brought periodically into contact with the corresponding stationary electrode and said movable electrode is drawn periodically away from said stationary electrode.

4. Device as defined in claim **2**, wherein said stationary electrodes are disposed symmetrically in pairs on the two opposite sides of said tank, and said means for imparting a curvilineal alternating motion to said stationary electrodes comprise a pendulum arm which is disposed between each pair of stationary electrodes and adapted to carry a pair of movable electrodes located respectively in oppositely facing relation to said stationary electrodes, a horizontal spindle which is fixed within said tank and on which said pendular arm is pivotally mounted, and means for imparting to said pendular arm a movement of oscillation having a well-defined and constant amplitude whereby each of said movable electrodes carried by said pendular arm is brought periodically and in alternate sequence into contact with the corresponding stationary electrode.

5. Device as defined in claim **2**, wherein said means for imparting a curvilineal alternating motion to each movable electrode comprise a movable support which carries said movable electrode, an eccentric mechanism operatively connected with said movable support, and means for driving said eccentric mechanism in rotation at a predetermined and constant speed in such manner as to impart to said movable support a circular alternating motion whereby said movable electrode carried by said movable support is brought periodically into contact with the corresponding stationary electrode and said movable electrode is drawn periodically away from said stationary electrode.

6. Device as defined in claim **2**, wherein said stationary electrodes are disposed symmetrically and coaxially in pairs on two opposite sides of said tank and said means for imparting a curvilineal alternating motion to said

movable electrodes comprise a movable rectilineal support which is disposed between each pair of stationary electrodes coaxially with said stationary electrodes and which carries at its extremities a pair of movable electrodes, a pair of eccentrics operatively connected with said movable support, and means for driving one of said eccentrics in rotation at a predetermined and constant speed in such manner as to impart to said movable support a circular alternating motion whereby each of said movable electrodes carried by said movable support is brought periodically and in alternate sequence into contact with the corresponding stationary electrode.

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