Dec. 25, 1956 W. H. KIRKPATRICK 2,775,302

PROCESS AND DEVICE FOR INHIBITING CORROSION IN WELLS

Filed Aug. 4, 1954

FIG. 2

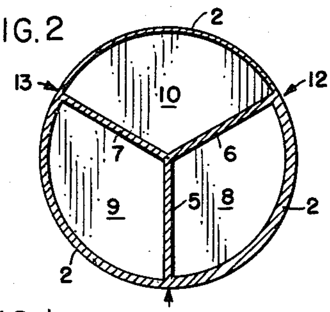



FIG. 4

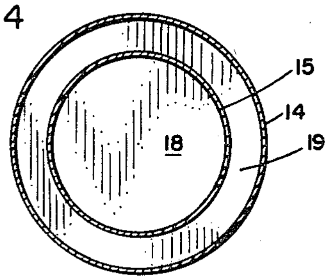



FIG. 1

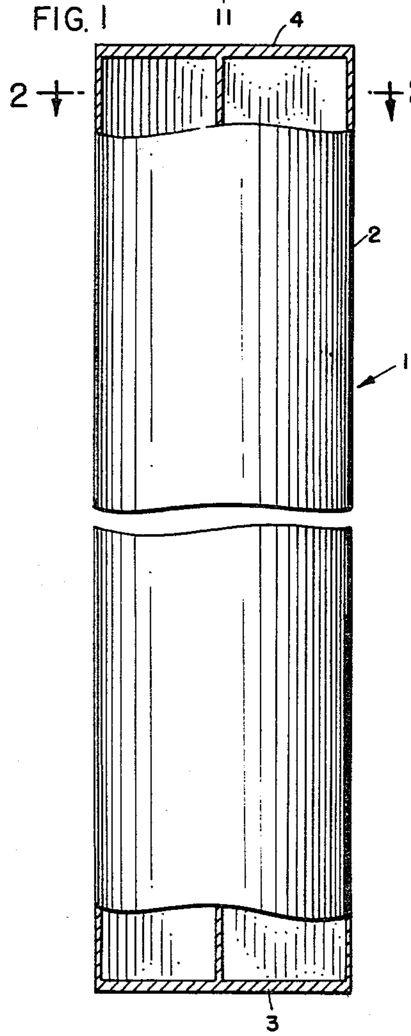
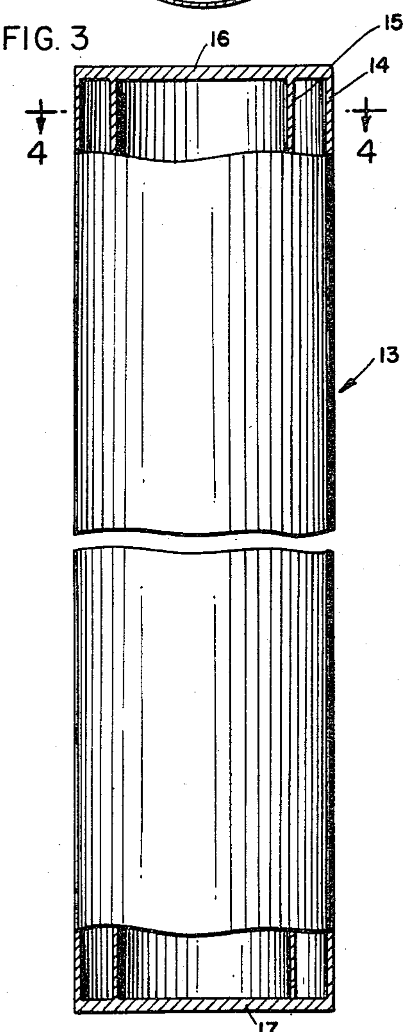



FIG. 3

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# PROCESS AND DEVICE FOR INHIBITING CORROSION IN WELLS

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2 Claims. (Cl. 166—1)

This invention relates to a process and a device for inhibiting the corrosion of metal tubing and piping in producing oil and gas wells.

It is known in the art to insert stick corrosion inhibitors into oil and gas wells. These stick corrosion inhibitors dissolve in the well fluids and assist in preventing the corrosion of ferrous metal tubing. Attempts have also been made to reduce or prevent corrosion of the ferrous metal tubing and piping of oil and gas wells by injecting corrosion inhibiting chemicals into the well. It has also been proposed to place the corrosion inhibitor in a metallic shell so that the corrosion inhibitor is liberated when the shell is corroded.

In the methods heretofore used where a chemical is injected directly into the well, the corrosion inhibiting materials rapidly dissolve and are carried upward with the production stream. The residence time and contact with the well tubing is relatively short and the method of application is highly inefficient. If a stick corrosion inhibitor is used, interruption of the production of the well may be necessary. The same is true where the corrosion inhibitor is carried in a metal shell which dissolves in the well fluids.

One of the objects of the present invention is to provide a new and improved process and a new and improved device for treating well fluids to inhibit or prevent corrosion of ferrous metal tubing and piping in producing wells.

Another object is to provide a new and improved process and a new and improved device for inhibiting corrosion in producing wells which is effective over a longer period of time and therefore requires renewal at less frequent intervals.

Other objects and advantages of the invention will be apparent by reference to the following description taken in conjunction with the accompanying drawings, in which:

Figure 1 is a side elevational view with parts broken away of a container for a corrosion inhibiting composition;

Figure 2 is a cross sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a modified form of a container for a corrosion inhibiting composition provided in accordance with the invention; and

Figure 4 is a cross sectional view taken along the line 4—4 of Figure 3.

Generally stated, the invention provides a compartmented container for corrosion inhibiting chemicals characterized by the fact that the walls of the container are dissolvable to liberate a corrosion inhibiting chemical from two or more compartments of the container successively and periodically, that is, with an intervening period of time. In this way a corrosion inhibiting chamical contained in one compartment of the container is liberated into the well fluids and at a predetermined interval of time, say, two or three days, or a week later, the same or a different corrosion inhibiting chemical is liberated from another compartment of the container into the well fluids.



In Figure 1, the compartmented container shown is a tubular or cylindrical element 1 having a tubular side wall 2 closed at the ends 3 and 4 and provided with internal partitions 5, 6 and 7, which extend lengthwise from one end of the container to the other.

As illustrated in Figure 2, the partitions 5 and 6 together with the outer wall 2 form a compartment 8. The partitions 5 and 7 together with the outer wall 2 form a compartment 9. The partitions 6 and 7 together with the outer wall 2 form a compartment 10. The wall thickness of the outer wall 2 between the points 11 and 12 is greater than the wall thickness of the outer wall 2 between points 11 and 13 and the wall thickness of the outer wall 2 between points 12 and 13 is thinner than the thickness of the wall 2 between the points 11 and 13.

In practice, corrosion inhibiting chemicals in any suitable form, preferably solid, semi-solid or liquid, are charged into the compartments 8, 9 and 10, and the ends 3 and 4 are sealed. The compartmented container is then inserted into the well and since the wall thickness is thinnest in compartment 10 along the outer wall 2 between points 12 and 13, the container will be dissolved at this point, either by erosion, corrosion or melting, and the contents of compartment 10 in due course will be discharged into the well fluids, thereby inhibiting corrosion of the ferrous metal tubing and piping with which the well fluids come into contact.

Dissolution and discharge of the contents of compartment 10 still leaves compartments 8 and 9 intact, because the wall thickness in each of these compartments is greater and more time is required for the walls to be dissolved by the well fluids. In due course compartment 9, which has a thinner wall than compartment 8, will dissolve, causing the contents thereof to be discharged into the well fluids, and finally the walls of compartment 8 will dissolve, discharging the contents of compartment 8 into the well fluids.

In Figure 3, the compartmented container, generally illustrated at 13, consists of two concentric shells 14 and 15 which are held in position and closed by the ends 16 and 17. In this type of container, the wall thickness of the shells 14 and 15 can be the same because the walls of the inner tubular shell 15 are not exposed to the well fluids until after the walls of the outer shell 14 have dissolved and discharged the contents of compartment 19 into the well. After a further period of time the walls 15 are dissolved and the contents of compartment 18 are discharged into the well.

While the invention is not limited with respect to the size and shape of the compartmented container, it is usually desirable to make the container smaller than 1½ inches in diameter and about 18 inches long. The wall thicknesses may vary depending upon a number of factors, such as the type of material used in constructing the container, and the time interval desired before the various compartments of the container discharge their contents into the well. In the device illustrated in Figures 1 and 2, the thinnest wall thickness can be, for example, about .005″, the thickest wall thickness can be, for example, .015″, and the intermediate wall thickness can be, for example, .010″. Thus, compartment 8 is bounded on all sides by a wall having a thickness of .015″. Compartment 9 is bounded on the side 5 by a wall having a thickness of .015″, and on the other two sides by a wall having a thickness of .010″. Compartment 10 is bounded on the side 6 by a wall having a thickness of .015″; on the side 7 by a wall having a thickness of .010″, and on the remaining side by a wall having a thickness of .005″. The ends 3 and 4 must have the same thickness as the maximum wall thickness of any compartment, otherwise the well fluids might dissolve the ends and cause the contents of the compartments to be discharged prematurely.

In a device of the type illustrated in Figures 3 and 4, the ends **16** and **17** should have a thickness equal to the combined thickness of the walls of the tubular shells **14** and **15**. Thus, if each of the shells **14** and **15** has a thickness of .010", the thickness of the ends **16** and **17** should preferably be at least .020".

The materials of construction employed in making a compartmented container for the purpose of the invention, can be any substances capable of being fabricated into the desired shape and adapted to dissolve in the well fluids either by erosion, corrosion, or in any other manner. The materials of construction used in making the compartmented container should have a melting point above the temperature of the bottom of the well in which the container is to be used. Suitable materials for the purpose of the invention are magnesium, aluminum, zinc and alloys of these metals, such as magnesium aluminum alloys, magnesium aluminum zinc alloys, and zinc aluminum alloys. The compartmented container can also be constructed of a high melting paraffin or other material which is sufficiently durable to withstand transportation and storage and yet will dissolve in the well fluids.

The invention is not limited to the employment of any particular corrosion inhibiting chemical. Examples of chemicals which may be employed are those described, for instance, in U. S. Patent 2,599,384 and in U. S. Reissue Patent 23,227. Many other types of chemicals can be employed without departing from the invention.

The invention provides a new and improved process of preventing corrosion of ferrous metal tubing and piping in producing oil and gas wells. The invention also provides a method of preventing corrosion in which corrosion inhibiting chemicals are made available in the well fluids periodically. The invention further provides a new and improved device for introducing corrosion inhibiting



chemicals into oil and gas wells. The diameter of the compartmented device provided in accordance with the invention can be sufficiently small to permit ready passage of the device downwardly through the well tubing to the bottom of the well, and the length can be varied depending upon the amount of corrosion inhibiting chemical which it is desired to discharge into the well at any one time. The process and the device provided in accordance with the invention make it possible to inhibit or prevent corrosion in oil and gas wells with a minimum interruption in well production.

The invention is hereby claimed as follows:

1. A process of inhibiting corrosion in a well containing corrosive fluids which comprises depositing in the well a compartmented container comprising a plurality of compartments, each containing a corrosion inhibiting chemical, and which are so constructed as to dissolve successively and periodically in the well fluids thereby to discharge said corrosion inhibiting chemicals from said compartment successively and periodically.

2. A compartmented container comprising a tubular outer shell closed at both ends and divided internally into compartments by partitions running lengthwise of said shell between said ends, and said compartments each being bounded by said outer shell, each compartment having an outer wall of varied thickness as compared with the outer wall of the adjacent compartment, and the ends having a thickness at least equal to the maximum thickness of the outer wall of the compartment having the thickest wall.

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