UDC 621.371:550.837.6

ELECTRONIC SYSTEM FOR IDENTIFICATION OF HYDROCARBON DEPOSITS

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The analysis of the structural design of radio engineering systems for the identification of hydrocarbon deposits on the basis of two-frequency, pulse and modulated signals is carried out. The characteristic of methods of exploration based on the use of these systems is done.

The relevance to the present work task is to improve the existing electromagnetic methods of exploration and development of new methods of searching, identification of oil and gas (hydrocarbons) [1 – 6].

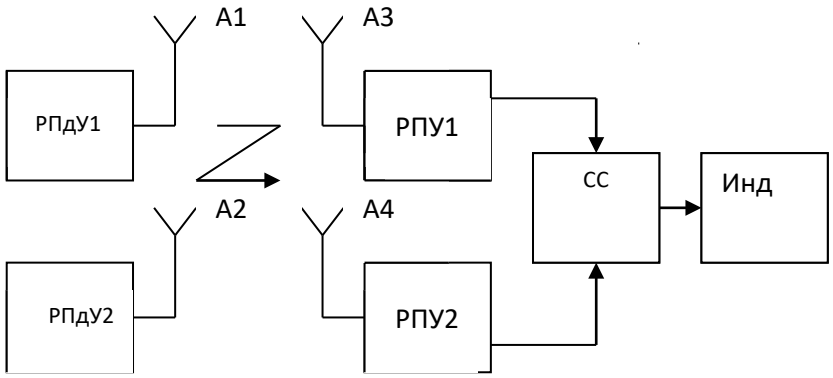

Fig. 1. Two channel RTS with the spacing in frequency

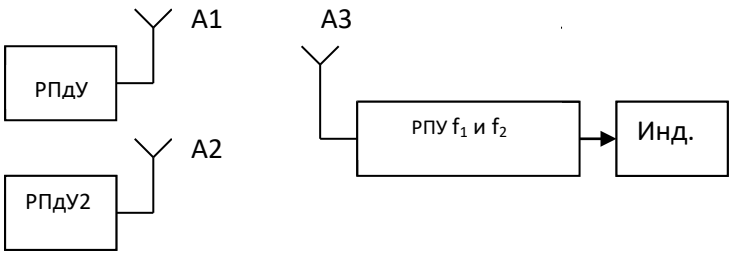

Fig. 2. RES using the illumination source

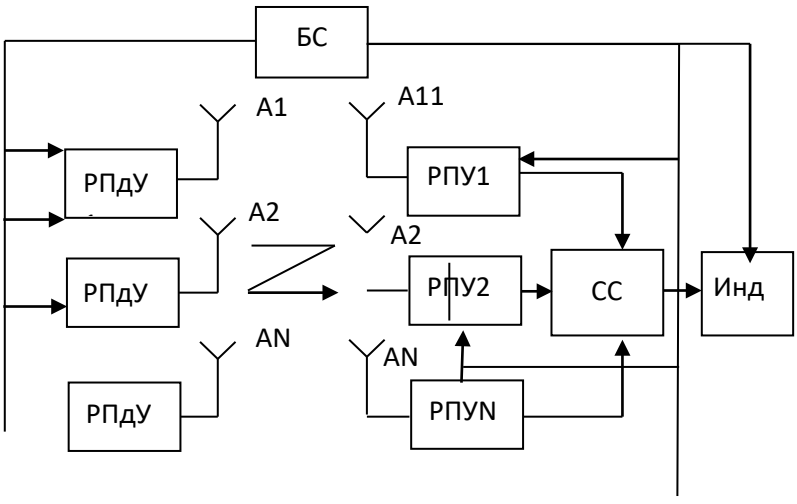

Fig. 3. Multi-channel RES

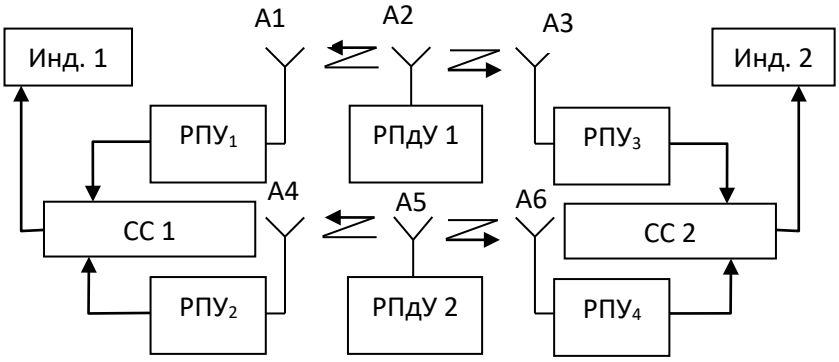

Fig. 4. Two-frequency RES for the implementation of equidistant receivers

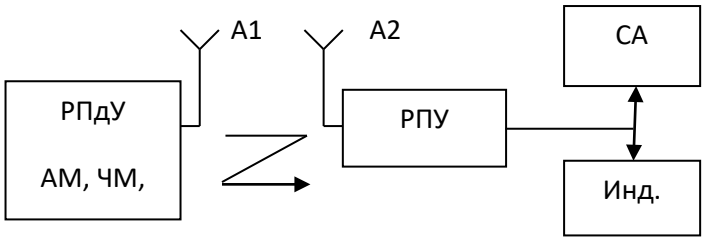

Fig. 5. RES on the basis of the modulated signals

The scheme presented in Fig.1 consists of two transmitters and РпдУ1 РпдУ2 operating at frequencies f1 and f2, two receivers РПУ1 and РПУ2 configured to frequency transmitters and four antennas A1 to A4. It is designed to transmit and receive electromagnetic effect frequencies f1 and f2.

Signals from the outputs of receivers are sent to the comparison circuit (SS) and then to the indicator (ind.). This scheme RTS provides an implementation of the methods of natural radiation UVZ and acoustic impact.

RTS realized according to the scheme given in Fig.2, allows the registration of UVZ boundaries and deep faults.

The scheme shown in Fig. 3, is a multi-channel device consisting of n Transceivers and N receivers. On the receiving side, spectral analysis of the received signals is possible. It provides a reliable definition of the boundaries of UVZ. Thus the avoidance of the superposition of the radiated fields electromagnetic effects in the structure of the RTS is provided by block synchronization of BS.

The scheme shown in Fig. 4 is built on the basis of equidistant receivers method. It differs from the scheme shown in Fig. 1 (two receivers tuned respectively to the frequencies f1 and f2). The technique consists in recording the electric field strength in two directions at the same distance from the stationary transmitters operating at frequencies f1 and f2.

The transmitter is installed at the point l=0. It produces a measurement of the ratio of the intensities of electric fields straight l_{st} and reverse l_{rev}, and $l_{st} = - l_{\text{rev}}$.

$$k_E = \frac{E_{np}(l_{np})}{E_{обр}(l_{обр})}$$

The scheme shown in Fig. 5, consists of a transmitter modulated signals (AM, FM, or AMM). The receiving side requires the use of RTS, comprising the spectrum analyzer.

In the implementation of RTS for exploration UVZ much attention was paid to the development of antennas.

Informative methods of searching and contouring hydrocarbon deposits can significantly improve the use of radio-complex methods. Group UH with known as radioprotector UVZ contributes to the improving efficiency of exploration, especially in complex interference conditions.

REFERENCES

1. Иванова, К.И. Способ геоэлектроразведки углеводородной залежи с использованием радиоимпульсных сигналов / К.И. Иванова, В.Ф. Янушкевич // Фундаментальные и прикладные исследования в со-

временном мире : материалы XV Междунар. НТК, Санкт – Петербург, 4 октября 2016 г. – СПб. – Т. 1. – С. 107–111.

2. Взаимодействие радиоимпульса с анизотропной средой / Д.Л. Василенко [и др.] // Проблемы проектирования и производства радиоэлектронных средств : сборник материалов IV Международной НТК, Новополоцк, 25–26 мая 2006 г. – Новополоцк, 2006. – Т.2. – С. 77–80.
3. Янушкевич, В.Ф. Моделирование двухчастотного зондировани яуглеводородных залежей / В.Ф. Янушкевич // Современные проблемы проектирования и производства радиоэлектронных средств : сборник материалов международного научно-технического семинара, Новополоцк, 29 – 31 мая 2000 г. / Полоцкий гос. ун-т. – Новополоцк, 2000. – С. 205–208.
4. Янушкевич, В.Ф. Приборы для обнаружения углеводородных залежей на основе применения импульсных сигналов / В.Ф. Янушкевич // Приборы. – 2017. – №8 (206). – С. 12–18.
5. Янушкевич, В.Ф. Поверхностный импеданс анизотропной среды над углеводородными залежами в режиме радиоимпульсных сигналов [Электронный ресурс] / В.Ф. Янушкевич // Журнал радиоэлектроники : электронный журнал. – 2017. – № 10. – Режим доступа: http://jre.cplire.ru/jre/oct17/2/text.pdf.
6. Янушкевич, В.Ф. Взаимодействие радиоимпульсных сигналов с анизотропной средой над углеводородными залежами / В. Ф. Янушкевич // Труды МАИ. – 2017. – № 96. – С. 1–16.