

PROSPECTIVE LINES OF RAM-TYPE BLOWOUT PREVENTERS DEVELOPMENT**ShcherbanuykA.A.****Scientific supervisor: senior lecturer PushchaevS.N.****Language supervisor: TsigankovaE.V.***Siberian Federal University*

Blowout preventers are installed on the wellhead in the process of drilling or work over. The main task of blowout preventers – wellhead sealing with or without tubes in it to prevent inadvertent discharge from oil or gas wells, otherwise called overshoot [1; p. 212].

Ram is main sealing preventer element. The functions performed by specific preventer, depend on what type of plate installed in it at the moment. Pipe rams are designed to seal the well in the presence of her pipes, blind rams overlap well, in which there are no pipes. There are also shear rams, which can cut the pipe and block well. They are a kind of blind rams. Preventer with blind rams is mounted on the wellhead below preventer with pipe rams. In dual preventers blind rams are mounted below pipe rams [2; p. 321].

Blowout preventers main characteristics are bore diameter, operating pressure, the diameter of the sealing pipes, dimensions, weight [3; p. 65].

In today's oil and gas industry, the most common blowout preventers are made in Russia, USA, China, Canada and France.

This report reviews the Russian inventors' patents concerning blowout preventers, published within the last ten years in order to identify the most promising areas of this type of equipment in the near future. For clarity and ease of analysis all of the patents are listed in the table. Six technical problems have been chosen as the criteria for studying of inventions often found in the Russian patents concerning blowout preventers for the last decade.

Table 1 - Comparative analysis of blowout preventers' patents

Patent number	Reliability	Dimensions	Design	Functionality	Operational complexity	Control
Patent RU №2445444	Increases	Reduced	Simplified	Expands	Reduced	Simplified
Patent RU №2411345	Increases	Do not change	Simplified	Expands	Do not change	Do not change
Patent RU №2382169	Increases	Do not change	Complicated	Do not change	Reduced	Simplified
Patent RU №2264528	Increases	Do not change	Complicated	Do not change	Reduced	Do not change

Table 1 - Comparative analysis of blowout preventers' patents (continuation)

Patent RU №2261 980	Increases	Do not change	Complicated	Expands	Reduced	Simp- lified
Patent RU №2243 356	Increases	Do not change	Simplified	Expands	Reduced	Simp- lified
Patent RU №2241 113	Increases	Increase	Simplified	Expands	Reduced	Comp- lica- ted
Patent RU №2239 694	Increases	Reduced	Simplified	Expands	Reduced	Simp- lified
Patent RU №2237 795	Increases	Reduced	Simplified	Expands	Reduced	Do notch an-ge
Patent RU №2203 387	Reduced	Reduced	Complicated	Expands	Increases	Simp- lified

Comparative analysis of the patents shows the fact that in nine out of ten of the present inventions reliability improves in comparison with the prototype. Also, reduction in the complexity of the operation and expansion of preventers' functionality are noticed. These problems are solved in eight out of ten patents. Simplification of design and management of preventer occur more rarely above stated objectives, however in more than half of the submitted patents such problems are solved. The main or one of the main technical results of the invention is a reduction of preventers' dimensions.

Let us consider the patent RU2445444, which is today one of the newly published patents of blowout preventers. The invention on which the patent has been obtained, is a modernization of the BOP, patent RU2239694 which is also presented in this report. Modernization of control concerns rams 9 of preventer and its locking element 6, which covers the vertical through-hole 4 in the absence of down hole equipment in it, and also the design of the locking element and are generally aimed at improving the safety and reliability of the BOP. The essence of the modernization is to equip prototype having only manual control with hydraulic rams and the locking element, which can significantly increase the speed of the BOP, which in its turn has a positive effect on the safety of repair work on the well. It should be noted that modernization gives the possibility, if necessary, to use manual control of the locking element 10 and rams 27. Also, as mentioned above, the locking element itself is subjected to upgrading: it is not cylindrical, as a prototype, it has a spherical shape, and its seal 12 is positioned in the bore 13 of the housing, whereby it is not subject to destruction, the probability of which is large enough for the seal 8 prototype placed in grooves of the cylindrical surface 7 of the closing element and, accordingly, along with it intersecting the vertical bore zone 4 where edges cut is possible at the intersection of sealing surfaces. Consequently, the streamlined design of the locking element increases the reliability

of the BOP. Also it should be stressed that the prototype and accordingly modernization are aimed at downsizing of preventers, it is achieved with the introduction of the above mentioned locking element, which allows not using dual preventers or BOPs with a set of additional blind rams.

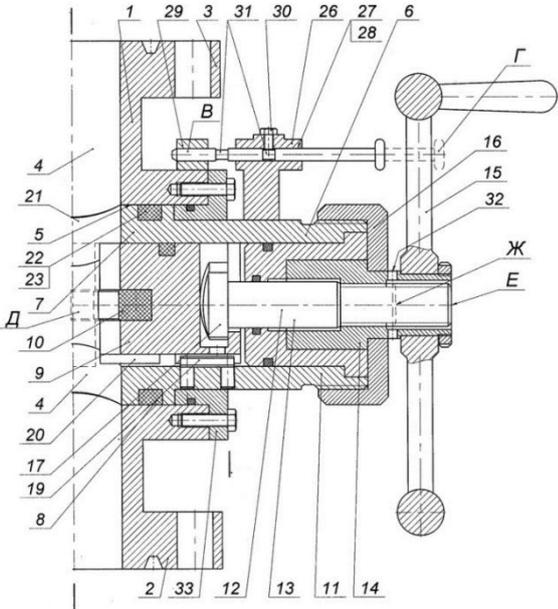


Figure 1 - Patent RU2239694. Overall sectional view

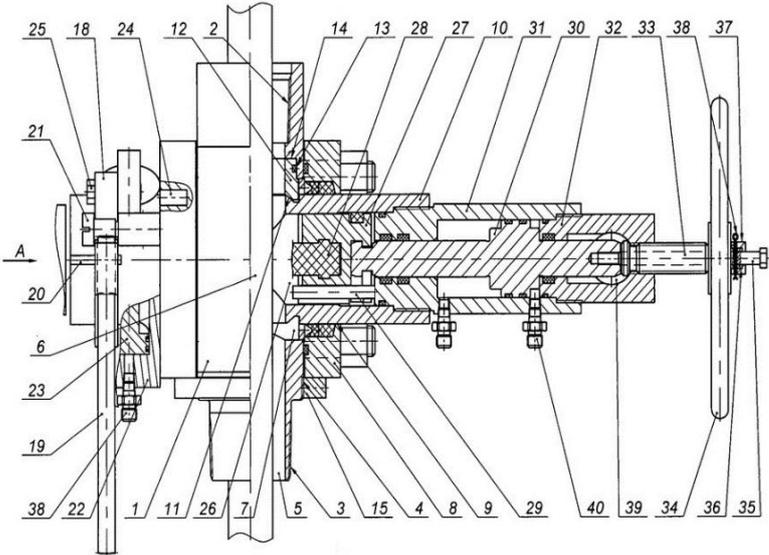


Figure 2 - Patent RU2445444. Overall sectional view

Having analyzed the Russian patents of blowout preventers, having studied the design of proposed inventions and technical tasks that should be solved by these inventions; we have determined that the main promising development direction of ram-type preventers' structures is to increase their reliability, which directly influences on preventers' safety. It should be noticed that the problem of operation complexity reducing and extension of BOP functionality

as well as improving reliability focus on safe well construction and repair, which are provided by preventers.

References:

1. Abubakirov V.F. "Drilling equipment": 2 vols. Nedra, 2000. 762 pages.
2. Lesetsky V.A, Illsky A.L. "Drilling machines and mechanisms": Moscow, "Nedra", 1980. 391 pages.
3. Muravenko V.A, Muravenko A.D. "Equipment blowout": review of technical information/Izhevsk.:IzhGTU,2005. 168 pages.