

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTELLIGENT WELLHEAD SYSTEMS, INC.,
Petitioner,

v.

DOWNING WELLHEAD EQUIPMENT, LLC,
Patent Owner.

IPR2024-00300
U.S. Patent No. 11,560,770

**DECLARATION OF JOHN HUGHETT
SUPPORT OF PATENT OWNER'S PRELIMINARY RESPONSE**



Figure 15 A "frac stack" atop BP's D-1 well in Oklahoma's Woodford shale while the well was being refractured in early 2013. BP doubled production from horizontal shale gas wells last year in a program meant to determine if refracturing

could be done economically [Renewing Mature Shale Wells Through Refracturing \(spe.org\)](https://www.spe.org)

1. Fracturing trees are conventional structures that have long been known and used in the industry.

98. Once the frac valve was developed, the frac tree became the standard. The frac valve was developed in East Texas during the Cotton Valley boom of the 1980s. The first frac valves were operated manually. By the 1990s the standard had become one manual frac valve (lower master) below a hydraulic operated frac valve (upper master). This is the same valve sequence utilized on frac trees today. On top of these two valves there is typically a cross with two valves on each wing and a goat's head on top of the cross. On top of the goat's head is a swab valve. The goats head was developed in the early stages of the Barnett Shale boom, approximately late 2005. This assembly, which is referred to as a frac tree, is typically utilized while performing hydraulic fracture treatments on wells. Generally, once the hydraulic fracture treatments are completed, the frac tree is removed and a production christmas tree is placed on the well. Virtually every well that I have been involved with since the development of the frac tree has utilized this device.

2. Using lengths of pipe and various connectors to assemble pathways between a manifold and a well has long been a common practice.

99. Once the missile manifold became prevalent in hydraulic fracture stimulation operations in the 2005 timeframe, piping was utilized to go from the

manifold to the well, i.e., frac tree. The industry has always used piping (lengths of pipe) to go from the missile manifold to the well. After 2010 this changed slightly in that the discharge of the missile manifold goes to an intermediate manifold, referred to as a zipper stack, and from there to the individual well frac trees. These pathways are made up of individual lengths of pipe coupled together utilizing connection blocks, hammer unions and flanges. Which connectors and couplings are used is often determined by the particular geography of the operation. Whether it be for single- or multi-conduit connections between a manifold and a fracturing tree, spacing and alignment is always a concern. To address this concern, practitioners have long relied on the ability to use various connectors (tees, crosses, or other connection blocks) and pipes to redirect fluid flow between a manifold and a frac tree to accommodate the space available at a given site. Because well locations vary greatly in size, sometimes due to terrain, the rig up of frac iron may vary location to location even in the same field. This has been a constant battle over the last 50+ years.

100. Over the last 45 years, efforts have been made to streamline the assembly of these connections. There has been and is a continuing effort to reduce the assembly time and to render the location safer. The faster that these systems can be assembled and maintain high reliability, less money is expended by the operator.

3. Valves are commonly used to control the flow of fluid during fracturing operations, and using two valves in series is a similarly common practice.

101. A tenet of engineering design principles for the flow of high-pressure fluids dictates that there be two valves in series. This can easily be seen in the christmas tree utilized while producing a well. For a high-pressure well there is universally a lower master valve and an upper master valve. On the wing of this same christmas tree, there is an inner wing valve and an outer wing valve. The same principles and safety precautions are commonplace in hydraulic fracture treatment plumbing. To put it another way, it is common practice to utilize two valves in series for any application that calls for a valve to be exposed to high-pressure fluids. The reasoning behind two valves in series is one valve is the one commonly used and the other is the backup in the event of damage to the primary valve.

102. This principle is very well understood in the industry. This is a primary tenet of good engineering design.

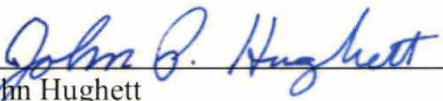
4. The use of flanged connections is common in fracturing systems.

103. The use of flanged connections has been prevalent at the well site since long before 2011. This is true during all phases of a well's lifecycle. During the drilling phase of the well's lifecycle, while drilling the well we utilize a choke and kill manifold to allow for well control operations in the event that well control

X. CONCLUSION

207. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: March 8, 2024



John Hughett