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SPIRAL GUIDE AND TUBING HOLDER

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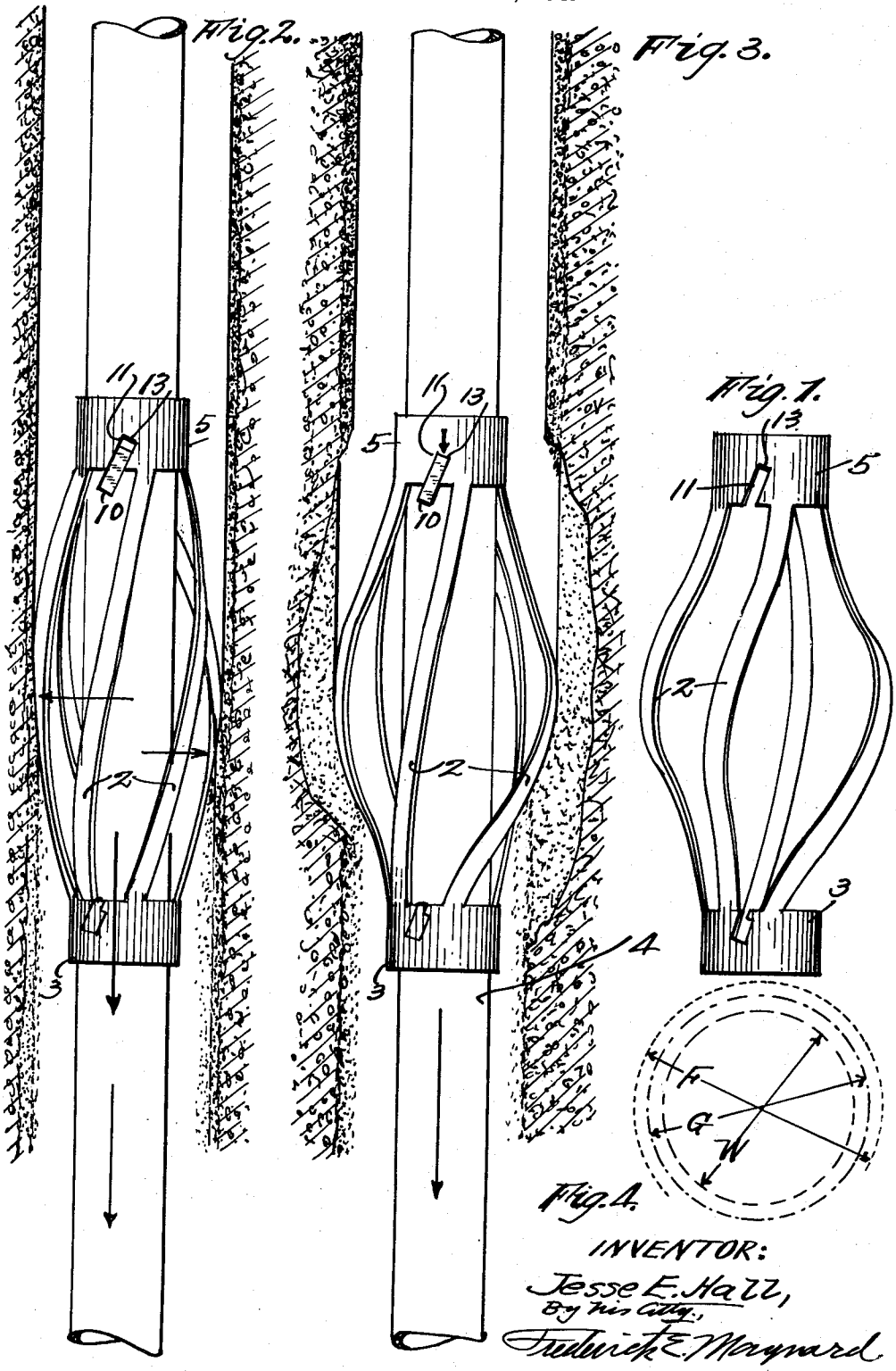

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SPIRAL GUIDE AND TUBING HOLDER

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5 Claims. (Cl. 166—18)

This invention is a pipe guide and well bore cleaner.

It has long been the practice in the deep well industry to centralize a pipe or tubing in a well hole and a device is shown in Arnold Patent No. 111,418, comprising hollow cylindrical end portions A'—A' and outwardly bowed springs or metal strips A connecting the same. In the year 1922 it was known to be old to force cement by pressure in a pipe in a well where it was desired to plug a centered pipe. In thus cementing the tubing the guide or guides at the zone of cementing would be enveloped and of course reinforce the cement about the pipe.

An object of this invention is to provide an improvement wherein a pipe centering holder or guide incorporates means to limit its degree of expansion when in situ on a given pipe or tubing so that if the guide, which also functions as a mud bore hole trowel, should run into a bore wall enlargement (plastered with mud) the bowed spring blades will automatically be limited in expanding action as the guide descends or rises at the said bore hole enlargement.

A further object is to provide a guide including helical blades attached rigidly at upper and lower ends to and between suitable body bands which are relatively movable axially freely in a separating direction, but when mounted on a pipe or other carrier, can move toward each other only to a limited degree to an arbitrary expansion degree of the bowed blades to protect the wall mud layer from undue bore reaming beyond a desired or normal mud bore hole diameter.

An additional object is to provide a bore cleaner and pipe guide comprising hollow cylindrical end portions and outwardly bowed springs but which has one of the end portions or bands rigidly fixed on the pipe or tubing and has means for limiting the expanding action of the bowed devices or blades as the pipe and its guides may be moved upwardly as one unit and in which the upper bands of the guides is yieldably slidable toward its respective limiting means. In this invention each guide is pushed upwardly in the well bore by its bottom band and the guide is also pulled downwardly by its bottom band, and means are provided to prevent the squashing of the bowed blades as the pipe moves upwardly, and conversely to prevent over-expansion of the blades as the guides may move into a bore enlargement along the hole. The present invention aims to put the blades under tension when the pipe is moving downwardly and to put them under pressure when moving upwardly in a well hole, and includes means acting on either stroke to limit opening of the bowed blades to a given gage, or spreading capacity about the carrier.

The purpose of the helicity of the bowed spring blades is to effect a full circle bore surface contact while the tool is moving upwardly, or moving downwardly.

The invention consists in certain advancements in this art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose construction, combinations and details of means, and the manner of operation will be made manifest in the description of the herewith illustrative embodiment; it being understood that modifications, variations and adaptations may be resorted to within the scope, principle and spirit of the invention as it is more particularly claimed hereinbelow.

Figure 1 is a side elevation of the fully expanded or free and unmounted cleaner and guide. Figure 2 is a side elevation of one of the guides mounted on a pipe and as in normal, wall engaging position. Figure 3 is a side elevation of the mounted guide and expanded in a hole enlargement to a gaged or stopped limit (and indicates the squashing limit of the guide in event of its being pushed up in the well bore). Figure 4 is a diagram of diameter variations of the spring system of the guide.

A suitable number of like, bowed and helically shaped spring blades 2 are equally arranged in a circle on a common axis and have their lower ends all rigidly and suitably fixed in or on the upper end of a lower cylindrical body in the form of a band 3 which can be passed onto a given pipe or tubing 4 which will serve to carry the device into or from a given size well hole. The lower band 3 is rigidly fixed in any suitable manner, preferably by welding, to the pipe 4 so that the set of blades 2 is either pulled down with the pipe or is pushed by the pipe as this is pulled.

The blades 2 converge toward each other at their upper ends and are rigidly fixed in any suitable manner to the lower end of a hollow cylindrical body or band 5 which slidably fits the given pipe. The springs or blades 2 have the normal tendency to expand to their full capacity as shown in Fig. 1 and draw the upper band 5 downwardly on the pipe. Furthermore if the guide is pushed upwardly by the lower band 3 there is an additionnal spreading effort on the blades especially if there is much resistance on the upper side of the blades; a squashing of the

blades which bulges them to an undesired degree.

Therefore, the notable feature of this invention is the incorporation of means, first, to limit the expansion of the blades 2 when mounted on the pipe 4, to a predetermined gage limit, clearly indicated in Fig. 3, and, second, to prevent the squashing of the blades laterally when being pushed up by the carrying pipe, and, further, to provide for a screwing moment on the upper band 5 as it may shift axially on the pipe.

To achieve these aims, a gage stop and helically directed key device 10 is rigidly fixed on the pipe 4 at any position desired with respect to the fixed band 3 and extending slidably and complementally in a helical slot 11 in the band, complementary to the pitch of the blades 2; the key being so fixed as to be engaged by the end wall 13 of the slot 11 in the given gage position of the upper band 5, Fig. 3, to stop expansion of the bowed blades 2. The band 5 slides upwardly on the fixed key 10 and on the pipe when the guide blades are forced into a given size bore hole and the blades are inwardly flexed and their diameter contracted to position W, Fig. 4, and as in Fig. 2; this condition arising when the guide blade ride on a firm layer of circulation mud pumped down the hole; Fig. 2 showing the contracted blades, and the upper band 5 being pushed upwardly relative to the top end of the key 10 which still rides in the slot 11. It will be seen that on pulling the pipe 4, if the upper band 5 moves down and engages the stopping key 10 then both bands are in effect rigid and the blades cannot be over bulged in the hole. When the band 5 stops on the upper end of the key 10, Fig. 3, the springs cannot expand beyond the degree determined by gaging key 10; shown at G, Fig. 4, but when the springs engage a wall they are squeezed in more and the band 5 is pushed up from the stop 10, Fig. 2.

In normal operation, in a given size well hole, the mud plaster on the formation face will set up enough resistance to compress the blades 2 and move the shoulder 13 of the upper band 5 up from the stop end of the key 10, Fig. 2.

Fig. 4 is a diagram showing by outer circle F the full expansion capacity of the free and unmounted guide, circle G shows the set gage expansion size, and circle W, the smallest, the average working circle mean of the blades at the girth, or mid length.

What is claimed is:

1. A cleaner, guide and reinforcing holder for a well tube or pipe element, having, in combination, upper and lower bands one of which is rigidly fixed to the said element, limited expansion bowed spring blades all with upper and lower ends rigidly attached to and spacing the bands for holding the element in centered position in a well bore, and one of the bands movable axially on the element as to the fixed band, and means engaging the movable band to limit the expansion of the mounted blades.

2. The holder of claim 1, and said means including a stop spline fixed on the element and engaging, and limiting the squashing motion of, the movable band.

3. In a holder of the class described, a pair of coaxial, spaced bands connected by bowed spring blades which permit relative axial movement of the bands, a carrier on which one of the blades is rigidly fixed at an arbitrary point for both raising and lowering the applied holder, the other band being loosely mounted on the carrier, and means fixed at an arbitrary point on the carrier and engaging the loose band to limit expansion of the mounted blades and to positively stop undue rotation of the loose band on the carrier.

4. The holder of claim 3, and said means including a stop key one end of which engages the movable band to limit blade expansion.

5. In a holder of the class described, a pair of coaxial, spaced bands connected by helical, bowed spring blades which permit relative axial movement of the bands, a carrier element on which one of the bands is rigidly fixed for both raising and lowering of the applied holder and the other band being loosely mounted on the carrier, and means fixed at an arbitrary point on the carrier and engaging the loose band to limit expansion of the said blades as to the element and to positively guide the slidable band in a helical motion and stop undue rotation thereof; said stop means including a helical key fixed on the carrier and the movable band having a slot complementary to the key.

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