UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FRANCIS ALEXANDER CUMMING, SIMON LAWRENCE FISHER, and ROBERT BRUCE STEWART

Appeal 2008-0246
Application 10/164,329[1]
Patent 6,070,671[2]
Technology Center 3600

Decided: April 16, 2008

Before JOHN C. MARTIN, LEE E. BARRETT, and MARK NAGUMO, *Administrative Patent Judges.*

MARTIN*, Administrative Patent Judge.*

DECISION ON APPEAL

---

[1] Reissue application filed June 6, 2002.
[2] Issued June 6, 2000.

STATEMENT OF THE CASE

This is an appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 8, 11-14, 20-46, 48-51, 55-79, and 129-44 under §§ 102 and 103(a). Claims 1-7 and 80-128 stand allowed, and claims 9, 10, 15-19, 47, and 52-54 stand objected to for depending on rejected claims (Final Action 1).

We have jurisdiction under 35 U.S.C. § 6(b). We affirm.[3]

A. Appellants' invention

The invention described in Appellants' Patent 6,070,671, of which reissue is sought, relates to expandable tubulars for use in well casings. Figures 1 and 2 of the '671 patent are reproduced below:

[3] The record includes a number of Answers, Briefs, and Reply Briefs. Unless otherwise indicated, "Brief" refers to the second Brief of Appellant (filed November 30, 2005), "Answer" refers to the Second Revised Examiner's Answer (mailed September 8, 2006), and "Reply Brief" refers to the Reply Brief filed on April 26, 2006.

FIG. 1

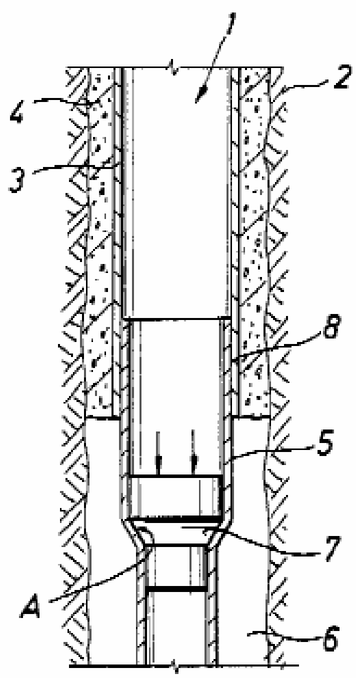


FIG. 2

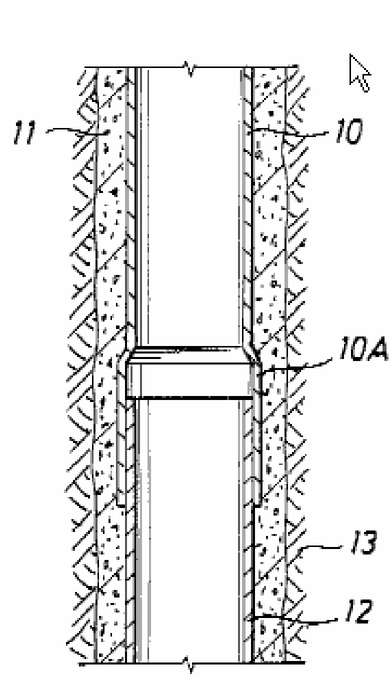


Figure 1 shows a borehole 1 traversing an underground formation 2 and a well casing 3 that has been fixed within the borehole 1 by means of an annular body of cement 4 (col. 2, ll. 54-57). An expandable tubular 5 in the form of a liner is run into the well casing 3 and maintained in a position such that the lower end of the tubular protrudes into an uncased lower section of the borehole 1 and the upper end of the tubular is surrounded by the lower end of the well casing 3 (col. 2, ll. 58-62). Figure 1 shows the effect of moving an expansion mandrel 7 axially through part of the length of tubular 5 by pulling, pushing and/or pumping the mandrel 7 in the direction of the arrows (col. 2, ll. 53-65). Such movement of mandrel 7 causes the outer surface of tubular 5 to expand against the inner surface of the lower end of the well casing 3, thereby creating an interference fit 8 capable of achieving a shear bond and a hydraulic seal between the surrounding surfaces (col. 2, l. 65 to col. 3, l. 2).

Figure 2 shows a different embodiment, in which the lower end 10A of the well casing 10 has been expanded to a larger internal diameter than the rest of the casing (col. 3, ll. 42-44). This expansion of lower end 10A of the well casing and the expansion of the tubular 12 can be effected together by the expansion cone while the annular body of cement 11 is still in a liquid state (col. 3, ll. 47-50). The enlarged diameter of lower end 10A of the casing 10 in this manner results yields a well that has a uniform internal diameter throughout the length of the well (col. 3, ll. 52-55).

Figures 3 and 4 of the '671 patent are reproduced below.

FIG. 3

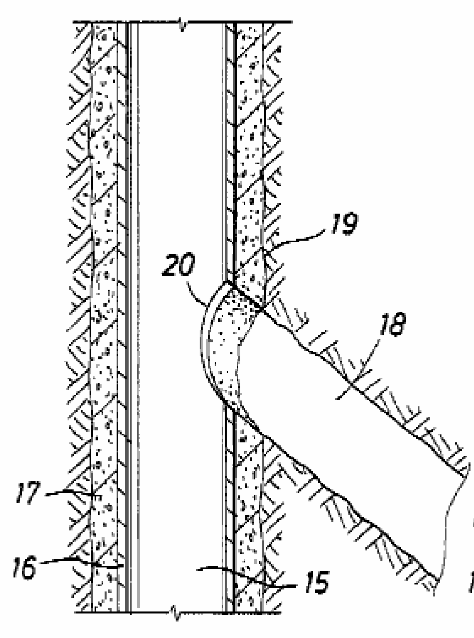
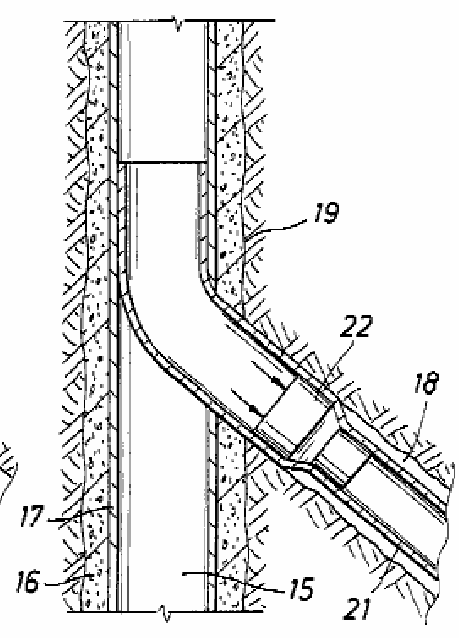


FIG. 4



Figures 3 and 4 show the technique of Figure 1 as applied to a tubular 21 that has been bent so as to extend through an opening 20 in the side of the well casing 16[4] and into a lateral borehole 18 (col. 4, ll. 4-15). The expanded tubular 21 and well casing 16 provide an adequate zonal isolation between the interior and exterior in the region of the junction between the lateral borehole 18 and the mother well 15 and also robust anchoring of tubular 21 to well casing 16 (col. 4, ll. 22-26).

The ‘671 patent further explains that “[o]ptionally at least the upper end of the tubular 21 may be expanded in a two stage expansion process where a flexible expansion mandrel is used in the second stage of the expansion process” (col. 4, ll. 43-46), with the first stage employing the inflexible mandrel described above.

B. The claims (Claims App., Br. 55-64)

There are four independent claims (i.e., claims 8, 32, 46, and 67), each of which recites an “interference fit” between a well casing and a tubular. Claims 46 and 67 are representative:

> 46. A method of coupling an expandable tubular to an existing well casing positioned within a borehole that traverses a subterranean formation, comprising:
>
> inserting the expandable tubular into the existing well casing; and

[4] The well casing is designated 16 in Figure 3 and 17 in Figure 4.

expanding the expandable tubular against the existing well casing using an expansion mandrel such that the outer surface of the expandable tubular is pressed against the inner surface of the existing well casing thereby creating an interference fit.

67. An underground well system, comprising:

a borehole that traverses a subterranean formation;

a well casing installed in a portion of the borehole;

a tubular installed in the borehole that is pressed against the well casing thereby creating an interference fit.

C. The references and rejections[5]

The references relied on by the Examiner are:

Malone	US 3,477,506	Nov. 11, 1969
Worrall et al. (Worrall)	US 5,348,095	Sep. 20, 1994
Jordan, Jr. (Jordan)	US 5,388,648	Feb. 14, 1995
Abdrakhmanov et al. (Abdrakhmanov)	RU 2,079,633 C1	May 20, 1995[6]

[5] The statements of the rejection as reproduced herein are taken from the Second Revised Examiner's Answer (i.e., "Answer"), which was the first of the Answers to include Worrall in the statements of the rejections. However, Worral was previously discussed in the Examiner's Answer and Revised Examiner's Answer.

[6] Our understanding of this reference is based on a translation, of record, provided by TransPerfect Translations, Inc.

Claims 8, 11, 28, 31, 32, 34, 44-46, 63, 66, 67, 78, 79 and 129-40 stand rejected under 35 U.S.C. § 102(e) for anticipation by Abdrakhmanov (Answer 5).

Claims 32, 33, 44, 46, 48, 50, 51, 63, 64, 65, 67, 68, 78, 132-40 and 142-44 stand rejected under § 102(b) for anticipation by Malone[7] (Answer 9).

Claims 12 and 13 stand rejected under § 103(a) for obviousness over Abdrakhmanov in view of Jordan (Answer 12).

Claims 29, 30, 64, 65 and 141-44 stand rejected under § 103(a) for obviousness over Abdrakhmanov in view of Malone (Answer 12).

Claims 14, 20-27, 35-43, 49, 55-62 and 69-77 stand rejected under § 103(a) for obviousness over Abdrakhmanov considered alone or in view of Worrall (Answer 13).

Claims 35-43, 49, 55-62 and 69-77 stand rejected under § 103(a) for obviousness over Malone considered alone or in view of Worrall (Answer 14).

THE ISSUE

The issue is whether Appellants have shown reversible error by the Examiner in maintaining any of the rejections.[8] The primary question before us is whether Abdrakhmanov and Malone describe an "interference fit."

---

[7] At page 19 of the Answer, the Examiner withdrew this rejection as to claims 129-31, which were previously rejected on this ground (Final Action 2).

[8] Appellants have the burden on appeal to the Board to point out the errors in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection by showing

(Continued on next page.)

THE MEANING OF "INTERFERENCE FIT"

Claims in a reissue application are given their broadest reasonable interpretation consistent with the specification. *In re Sneed*, 710 F.2d 1544, 1548 (Fed. Cir. 1983). While such an interpretation must take into account any definitions given in the specification, *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997), it is improper to read into the claims limitations from examples given in the specification. *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989). *See also Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) ("[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments."). Furthermore, "[a]bsent an express definition in their specification, the fact that appellants can point to definitions or usages that conform to their interpretation does not make the PTO's definition unreasonable when the PTO can point to other sources that support its interpretation." *Morris,* 127 F.3d at 1056.

Appellants' Specification does not contain a definition of "interference fit." Appellants argue that "interference fit" is a term of art that, when used to describe engagement of tubular members, means that "both tubular members are elastically deformed in the resulting connection" (Br. 6). As support, Appellants rely on a

insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)).

website entitled “ETB – ENGINEERSTOOLBOX” and, more particularly, on a discussion of “interference fit” at the following web page: http://www.engineerstoolbox.com/doc/etb/mod/statl/interference/interference help.html (last visited Feb. 4, 2005) (hereinafter “ETB article”) (App. B to first Brief, filed Feb. 15, 2005).

The ETB article explains that “[a]n ‘interference fit’ is used when two cylindrical parts are assembled by shrink-fitting or press-fitting one part upon another (a common means of coupling a hub to a shaft)” (ETB article 1). Elastic deformation of both members is mentioned in the discussion of press fitting (which is not the procedure employed in Abdrakhmanov or Malone):

> A *press fit* is obtained by machining the hole in the hub (the outer member) to a slightly smaller diameter than that of the shaft (the inner member, note that the shaft does not have to be solid). The two parts are then forced together slowly using a press (normally with oil applied at the intersection to act as a lubricant). The subsequent *elastic deformation of both the shaft and the hub* act to create large normal and frictional forces between the parts. The frictional force transmits the shaft torque to the hub and also resists axial motion.

ETB article 1 (emphasis added). The ETB article also discusses shrink fitting (*id.*).

The ETB article does not address whether an “interference fit” can be achieved by expanding one tubular member inside of another. However, the ETB article describes an “interference fit” in a way that appears to be independent of the process used to make the connection:

> Regardless of the fitting method, an interference fit creates a contact pressure (also termed radial pressure, interference pressure, etc.), p, between the two parts at the transition radius (also termed the

> common radius), r. This contact pressure causes radial stresses equal to -p in each member at the contacting surfaces.

ETB article 1. This "contact pressure"-based definition of "interference fit" is consistent with the use of that term in Appellants' patent disclosure, which in describing the Figure 1 embodiment explains that an "interference fit" is generated by "caus[ing] the outer surface of tubular 5 to expand against the inner surface of the lower end of the well casing 3" (col. 2, ll. 65-67) without indicating that the well casing also experiences some expansion. In fact, the presence of cement 4 in the Figure 1 embodiment would appear to preclude any significant expansion of well casing 3. While in Appellants' Figure 2 embodiment the mandrel is used to significantly expand lower end portion 10A of the well casing together with the tubular while cement 11 is still in a liquid state (col. 3, ll. 44-50), Appellants do not contend that expansion of the well casing is necessary to an interference fit.

For the foregoing reasons, the broadest reasonable interpretation of "interference fit" as used in Appellants' claims is satisfied if contact pressure is present at the transition radius between the expandable tubular and the well casing. It is therefore not necessary for us to determine whether or, if so, to what extent, there is elastic deformation of both components in Appellants' disclosed embodiments or in the prior art relied on by the Examiner.

The other evidence relied on by Appellants does not persuade us that this "contact pressure"-based definition of "interference fit" is unduly broad. Appellants' reliance (Reply Br. 3-5) on the discussion of a "diametrical interference fit" in Vick et al. U.S. Patent 5,988,277 (col. 6, ll. 53-60) is misplaced because that discussion does not purport to offer a broadest reasonable definition of "interference fit." Appellants' reliance (Reply Br. 9) on the quoted passages from Adam Cort, *Assembly presses: A Pressing Issue*, Assembly Magazine (May 18, 2003) (at http://www.assemblymag.com/CDA/Archives/73f08a566b5c9010VgnVCM100000f932a8c0) (presumably last visited on or about the April 26, 2006 filing date of the Reply Brief) is misplaced because those passages are limited to press fits.

On the other hand, the web page definitions offered by the Examiner are consistent with the "contact pressure"-based definition. The Examiner stated:[9]

> For example[], the website: http://www.reference.com/browse/wiki/Interference fit defines an "interference fit" is "a fastening between two components which is achieved by friction after the parts are pushed together, rather than by any other means of fastening."
>
> The website http://ww2.mne.ksu.edu/classes/ME3OO/Lectures/Lect8 27.htm provides an article entitled "ME300 - Introduction to Mechanical Engineering Design" dated August 27, 2001, in which different types of fits are listed and defined. In this article, an "interference fit" is defined as "a tight press fit. The two mating parts may range from a snug fit to fits that require changes in temperature to assemble."

Answer 16. The "friction" and "tight press fit" mentioned in these definitions imply the presence of contact pressure. Appellants' reliance (Reply Br. 6-7) on the

[9] Copies of these web pages are attachments to the first Examiner's Answer, mailed March 10, 2006.

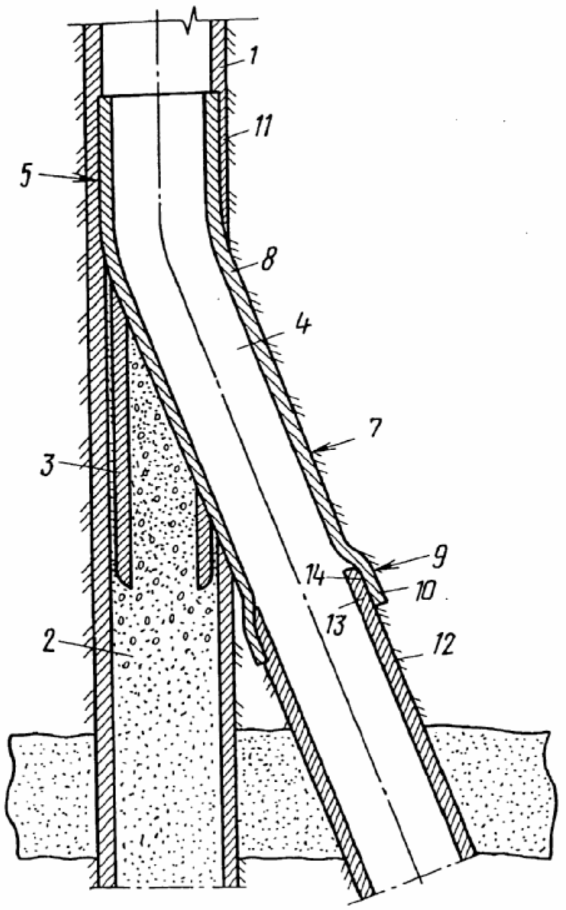
diametrical overlap depicted in the external link "Diagram of an Interference fit" in the above-noted www.reference.com web page cited by the Examiner is misplaced because that diagram concerns only press fits.

For the foregoing reason, we conclude that the term "interference fit" as used in Appellants' claims requires no more than the presence of contact pressure at the transition radius between an expandable tubular and a well casing.

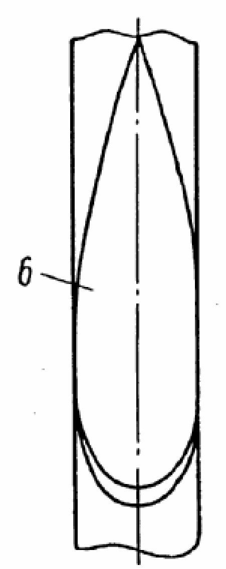
THE REJECTIONS BASED ON ABDRAKHMANOV

Abdrakhmanov describes a method for drilling an additional borehole from a production casing string 1 that extends into a borehole 2 to be abandoned (Description at 1, ¶ 1 and at 2, ¶ 5[10]). Figures 1 and 2 are reproduced below.

[10] The Abdrakhmanov translation has five unnumbered pages of text, one of which contains the title and abstract, another contains the "Claims," and the remaining pages contain the "Description."



Фиг.1



Фиг.2

Before the shaped piping 8 is inserted into production casing string 1, the deflector 3 is inserted and oriented in the desired direction, after which a tool is used to form an opening 6 (Fig. 2) in the wall of casing string 1 and an additional borehole 4 (*id*. at 2, para. 5), which initially has a diameter smaller than that shown in Figure 1.

Next, an unspecified tool is used to enlarge the inner diameter of region 5 of casing string 1 and the diameter of region 7 of borehole 4 to the diameter shown in Figure 1 (*id*. at 2, para. 6).[11] The resultant inner diameter is "the inner diameter of the production casing string after the reduction in the casing string thickness approximately by half" (*id*.), as can be seen in Figure 1. In addition, the diameter of region 9 of borehole 4 is further increased to the diameter shown in Figure 1 in order to be able to later accommodate the enlarged bottom end 10 of shaped piping 8 (*id*.).

The shaped piping 8, which initially has a diameter smaller than the final diameter shown in Figure 1, is then inserted into the position shown in Figure 1 (*id*. at 2, para. 7). Two techniques are then employed to expand piping 8 to the dimensions depicted in Figure 1. First,

> [a] shoe with the first valve (not shown) is mounted at the bottom end 10 of the shaped piping 8. Then, a pressure is developed inside the lowered piping 8 by pumping in washing fluid with the result that the shaped piping is enlarged and its walls are pressed against those of the enlarged sections 6, 7 and 9 of the production casing string 1 and of the additional borehole 4.

Id. Second,

> the drill string is disconnected from the shaped piping 8 and lifted out of the well, and an expander (not shown) is connected to the drill string which is then lowered into the well and imparted rotation whereby *the shaped piping 8 is expanded until its walls are tightly pressed against the walls of the enlarged production casing string 1*

[11] Presumably opening 6 in casing string 1 is also enlarged.

> and additional borehole 4. In so doing the shoe with the valve at the bottom end 10 of the shaped piping 8 is broken off and falls onto the well bottom where the shoe and the valve are subsequently drilled out.

Id. at 2-3 (bridging para.) (emphasis added). We understand the foregoing passage to mean that the walls of shaped piping 8 remain "tightly pressed" against the walls of enlarged production casing string 1 after the expander is removed. Appellants do not contend otherwise.

A. Anticipation (claims 8*, 11, 28, 31, 32, 34, 44-46, 63, 66, 67, 78, 79, and 129-40)*

Comparing claim 67 to Abdrakhmanov, the recited "borehole that traverses a subterranean formation" reads on the borehole 2, and the recited "well casing installed in a portion of the borehole" reads on production casing string 1. The Examiner (Answer 15) reads the recited "a tubular installed in the borehole that is pressed against the well casing thereby creating an interference fit" on shaped piping 8 after it has been "expanded until its walls are tightly pressed against the walls of the enlarged production casing string 1" (Description at 2-3, bridging para.). This language of Abdrakhmanov clearly satisfies the above-discussed "contact-pressure"-based definition of "interference fit." Furthermore, inasmuch as Abdrakhmanov and Appellants employ the same technique for forming the connection, i.e., expanding the tubular enough to cause it to be and to remain pressed against the casing, the term "interference fit" reads on Abdrakhmanov in the same way that it reads on Appellants' disclosure.

We are therefore affirming the § 102 rejection based on Abdrakhmanov with respect to independent claims 32 and 67, as to which Appellants have argued only the "interference fit" limitation.

Independent claims 8 and 46, in addition to reciting the "interference fit" limitation, specify that expansion of the expandable tubular is effected by "an expansion mandrel." Appellants deny that the recited "expansion mandrel" reads on Abdrakhmanov's shoe or pressurized washing fluid (9/20/06 Reply Brief 1-2). As correctly noted by the Examiner (Supplemental Examiner's Answer 2-3[12]), that argument is unconvincing because it overlooks the fact that Abdrakhmanov additionally describes using "an expander" to enlarge shaped piping 8 (Description 2, para. 8).

Regarding dependent claims 129, 131, 132, 134, 135, 137, 138, and 140, which specify that the interference fit provides a "shear bond" between the surrounding surfaces, Appellants argue:

> Abdrakhmanov does not disclose or suggest that a shear bond is provided between the shaped piping 8 and the production casing string 1. Moreover, the present application provides:
>
> > Experimental test data on unclad steel tubulars and steel tubulars clad with gasket material has confirmed that significant shear bond can be achieved. This is evidenced

[12] Mailed January 23, 2007, without the Technical Center (TC) Director's approval and remailed May 30, 2007, with the TC Director's approval.

> for example, by the shifting force of 650 kN/m required to remove a[n] expanded tubular of dimensions (108x119 mm) (ID/OD) from a steel casing pipe of dimensions 119x133 mm (ID/OD). (Column 3, lines 3-9).

By contrast, Abdrakhmanov fails to disclose test data of any kind. 9/20/06 Reply Br. 2-3.

We agree with the Examiner that the "shear bond" limitation is satisfied by Abdrakhmanov. While Appellants' Specification characterizes a "shifting force" of 650 kN/mn as a "significant shear bond," it does not provide a definition of "shear bond." Nor have Appellants established (or even alleged) that the term "shear bond" had or has a recognized meaning in the art. As a result, that term appears to be broad enough to read on any amount of force required to disconnect an interference fit, including the interference fit present in Abdrakhmanov. As a result, Abdrakhmanov's failure to provide test data does not disprove the existence of the claimed "shear bond." We are therefore affirming the anticipation rejection with respect to claims 129, 131, 132, 134, 135, 137, 138, and 140.

In addition, we are affirming the rejection with respect to dependent claims 11, 28, 31, 34, 44, 45, 63, 64, 66, 78, 79, and 130, 133, 136, and 139 because the limitations recited therein are not separately argued.

B. Obviousness based on Abdrakhmanov in view of Jordan (claims 12 and 13)

The rejection of claims 12 and 13 under § 103(a) for obviousness over Abdrakhmanov in view of Jordan is affirmed because Appellants argue (Br. 10-11) only the "interference limitation" of parent claim 8, which is anticipated by Abdrakhmanov.

C. Obviousness based on Abdrakhmanov in view of Malone (claims 29, 30, 64, 65, and 141-44)

Claims 29, 30, 64, 65, and 141-44 stand rejected for obviousness over Abdrakhmanov in view of Malone (discussed in detail *infra*). The rejection is affirmed with respect to claims 29, 30, 64, and 65 because Appellants do not argue the limitations recited in these claims, instead arguing the "interference fit" limitation of parent/grandparent claim 8 (Br. 12-13).[13]

Claims 141-44 specify that expansion of the tubular provides strain hardening of the tubular. The Examiner held (Answer 13) that it would have been obvious to have the expandable pipe 8 of Abdrakhmanov hardened in order to extend its service life in view of Malone's description of "a tubular member 17 which is of suitable thickness and fabricated of a high yield strength material adapted to be expanded *in situ* and work hardened into a linear sleeve, or the like" (Malone, col. 3, ll. 47-50). Although Appellants' discussion (Br. 13-14) of the rejection of these claims quotes the "strain hardening" limitation in the rejected claims, Appellants do not contend that the Examiner erred in relying on Malone to satisfy that claim limitation. Instead, Appellants argue the merits of only the "interference fit" limitation that appears in the parent claims (*id.*). Consequently, we are affirming the rejection with respect to claims 141-44.

---

[13] The argument that the references fail to teach strain hardening (Br. 13, first para.) is unconvincing with respect to claims 29, 30, 64, and 65 because they
(Continued on next page.)

D. Obviousness based on Abdrakhmanov alone or in view of Worrall (claims 14, 20-27, 35-43, 49, 55-62 and 69-77)

The claims that stand rejected for obviousness over Abdrakhmanov considered alone or in view of Worral recite the physical properties of the expandable tubular. Claims 14 and 20-27 are representative:

> 14. The method of claim 8, wherein the tubular comprises a high-strength low-alloy steel tubular having a yield strength-tensile strength ratio which is lower than 0.8 and a yield strength of at least 275 MPa.
>
> 20. The method of claim 8, wherein the expandable tubular comprises a formable steel grade tubular.
>
> 21. The method of claim 20, wherein the formable steel grade tubular comprises a formable steel grade tubular having a yield strength-tensile strength ratio that is less than 0.8.
>
> 22. The method of claim 20, wherein the formable steel grade tubular comprises a formable steel grade tubular having a yield strength greater than or equal to 275 Mpa.
>
> 23. The method of claim 22, wherein the formable steel grade tubular comprises a formable steel grade tubular having a yield strength-tensile strength ratio that is less than 0.8.
>
> 24. The method of claim 20, wherein the formable steel grade tubular is selected from a group consisting of dual phase high strength low alloy steels, formable high strength steel grades, and high retained austentite high strength hot rolled steel.

---

do not require strain hardening.

> 25. The method of claim 24, wherein the formable steel grade tubular comprises a formable steel grade tubular having a yield strength greater than or equal to 275 Mpa.
>
> 26. The method of claim 24, wherein the formable steel grade tubular comprises a formable steel grade tubular having a yield strength-tensile strength ratio that is less than 0.8.
>
> 27. The method of claim 26, wherein the formable steel grade tubular comprises a formable steel grade tubular having a yield strength greater than or equal to 275 Mpa.

Abdrakhmanov does not identify the material of which shaped piping 8 is made or discuss any physical property values. The Examiner concluded that it would have been prima facie obvious in view of Worrall to form Abdrakhmanov's shaped piping 8 from any of the known materials identified in the foregoing passage, because

> it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, [277 F.2d 197] 125 USPQ 416 [(CCPA 1960)]. Steel casing is extremely well known. Expandable liner or casing of formable grade steel is also well known in the art. See Worral[l] et al '095 (US 5,348,095 cited by applicant in IDS filed 9/24/2002) for example. It is considered within one skilled in the art to select the formable grade steel having yield strength and tensile strength in the claimed ranges since unexpected results have not been shown by appellant and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, [220 F.2d 454] 105 USPQ 233 [(CCPA 1955)].

Answer 13. Worrall explains that the expandable casing 5 can be formed of steel (col. 3, l. 1) and preferably "is capable of sustaining a plastic deformation of at least 25% uni-axial strain, so that the casing can be sufficiently expanded in the borehole without rupture of the casing material" (col. 2, ll. 38-41).

The rejection is affirmed with respect to claim 20 ("wherein the expandable tubular comprises a formable steel grade tubular") and similar claims 36, 55, and 70 because Appellants do not separately argue the merits of those claims, instead arguing only the "interference fit" limitation recited in the independent claims (Br. 20-21).

Regarding claims 14, 21-27 and similar claims 35, 37-43, 49, 56-62, 69, and 71-77, Appellants correctly note that steel grades having the material properties and compositions recited in these claims are not described in Abdrakhmanov or Worrall (Br. 14-37) and argue that obviousness is lacking because each of those steel grades "provides superior properties for a radial expansion process," citing *In re Dillon*, 919 F.2d 688 (Fed. Cir. 1990) (en banc). *See*, *e.g.*, Br. 16. This argument is unconvincing because it fails to address Appellant's apparent admission that known, commercially available steel grades possessed the claimed material properties and compositions:

> The expandable tubular 5 is made of a formable steel grade which is subject to strain hardening without incurring any necking an ductile fracturing as a result of the expansion. Suitable formable steel grades are steel grades having a yield strength-tensile strength ratio which is lower than 0.8, preferably between 0.6 and 0.7, and a yield strength of at least 275 MPa. Steel grades which have these properties are dual

> phase (DP) high-strength low-alloy (HSLA) steel, such as Sollac grade DP55 or DP60 or Nippon grade SAFH 540 or 590 D, and formable high-strength steel grades, such as ASTM A106 HSLA seamless pipe, ASTM A312 austenitic stainless steel pipe, grades TP304 and TP316 and high-retained austenite high strength hot rolled steel, known as TRIP steel. These formable steel grades can be expanded by a ceramic cone 7 to an outer diameter which is at least 20% larger than the outer diameter of the unexpanded tubular.

‘671 Specification, col. 3, ll. 12-28. The Specification does not credit Appellants with being the first to recognize (1) that these steel grades had the above-noted properties or (2) that those properties would permit those steel grades to be used as expandable tubulars for use in wells. The Examiner was therefore correct to conclude that it would have been prima facie obvious to select a known material on the basis of its suitability for the intended use. *See Leshin*, 277 F.2d at 199 (“Mere selection of known plastics to make a container-dispenser of a type made of plastics prior to the invention, the selection of the plastics being on the basis of suitability for the intended use, would be entirely obvious.”).

Although a prima facie case for obviousness can be rebutted by a persuasive showing of unexpected results, *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1369 (Fed. Cir. 2007), Appellants have failed to make such a showing for two reasons. First, there is no evidence establishing the alleged superiority of the claimed materials. *See Abbott Labs. v. Andrx Pharm., Inc.*, 452 F.3d 1331, 1345 (Fed. Cir. 2006) (“when unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with the closest prior art.”) (citations omitted). Second, evidence of superiority of a property is not sufficient in and of itself -- the superior property must also be shown to have been unexpected. *Pfizer*, 480 F.3d at 1371.

The rejection of claims 14, 20-27, 35-43, 49, 55-62 and 69-77 for obviousness over Abdrakhmanov considered alone or in view of Worrall is therefore affirmed.

THE REJECTIONS BASED ON MALONE

Malone discloses expandable tubular liners for insertion into bore holes (col. 1, ll. 39-40) in order to cover perforations, patch split casings, repair corroded pipe, or effect other repairs (col. 1, ll. 66-70).

Figure 1 is reproduced below.

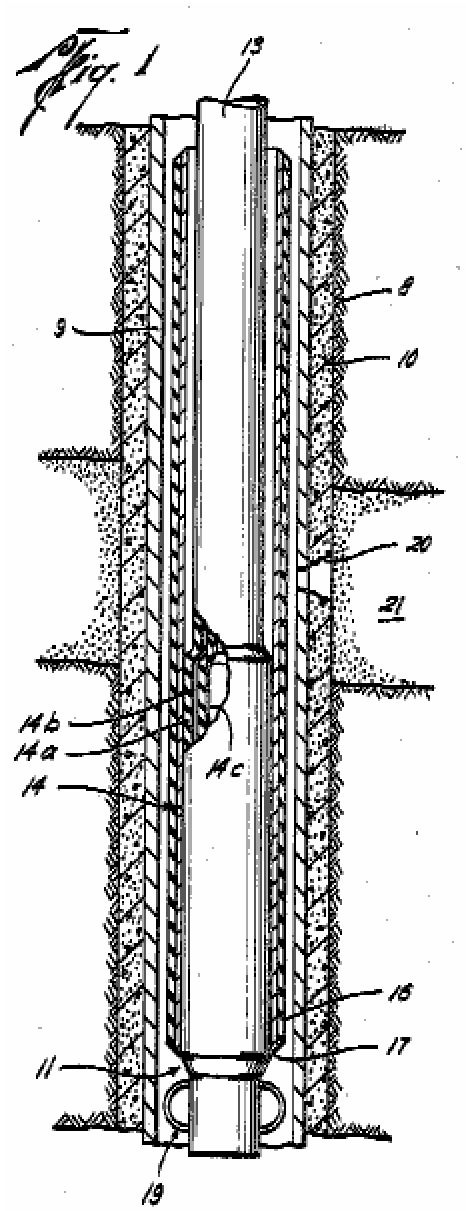


Figure 1 shows a well casing 9 in which is inserted a well string 13 that supports an expandable tubular liner member 17 that may be formed of 1/8" stainless steel (col. 3, ll. 69-72) and surrounds an inflatable element 14 for expanding liner 17 into engagement with casing 9 when the liner is in the desired vertical position (col. 4, ll. 32-54). Liner 17 is fabricated of a high yield strength material adapted to be expanded *in situ* and work hardened into a liner, sleeve, or the like (col. 3, ll. 47-50).

The Examiner reads the independent claims on the embodiment of a liner depicted in Figure 5 of Malone, presumably because the liner extends past the bottom end of the casing, as required to satisfy independent claims 8 and 32. Figure 5 is reproduced below together with an enlargement of a portion thereof.

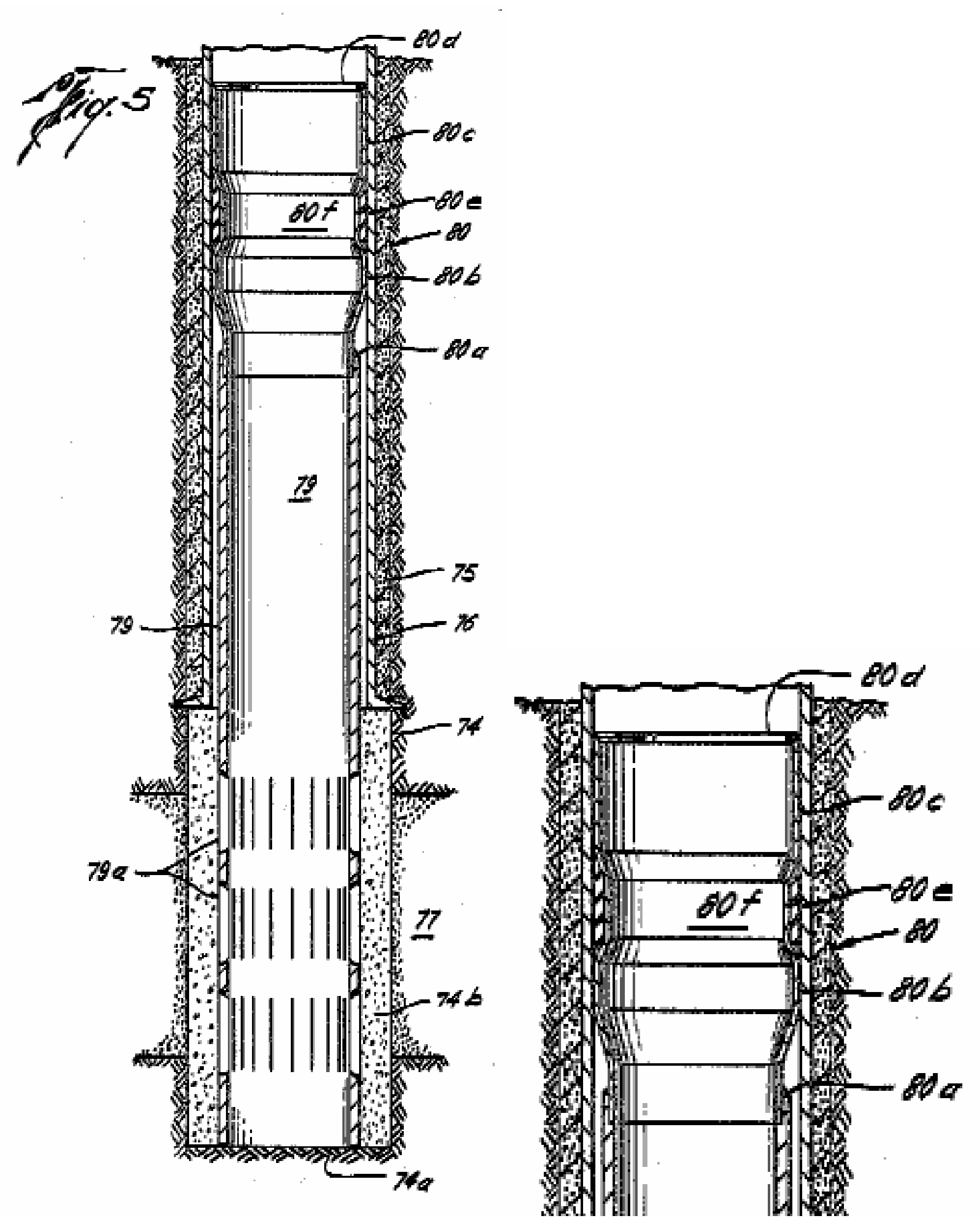


Figure 5 shows a well string (i.e., casing) 76 secured in a well bore 74 by cementitious material 75 (col. 8, ll. 22-26). The figure shows a slotted liner 79 (col. 8, ll. 34-36) that extends below the bottom end of casing 76 and rests on the bottom surface 74a of the well bore. Attached by a welding 80a at the upper end of liner 79 is an "anchor member 80" that has been expanded *in situ* to circumferentially contract casing 76 at lands 80b and 80c (col. 8, ll. 40-45) and also at a sealing, resilient member 80e located between lands 80b and 80c (col. 8, ll. 48-51). As explained at column 8, limes 55-61, expansion of anchor member 80 can be effected using the means and methods described in connection with other embodiments.

As noted above in the discussion of the Figure 1 embodiment, expansion of the tubular member 17 forms it into a work-hardened liner. Likewise, inflation of the inflatable device 36 in the Figure 2 embodiment stresses the tubular member 42 beyond its yield strength and causes it to be work hardened in order to maintain the diameter of the uncased hole on collapse of the inflatable element and removal thereof (col. 6, ll. 36-41).

A. Anticipation (claims 32, 33, 44, 46, 48, 50, 51, 63, 64, 65, 67, 68, 78, 132-40 and 142-44)

Comparing claim 67 to Malone, the Examiner reads the recited "a tubular installed in the borehole that is pressed against the well casing thereby creating an interference fit" on the circumferential contact of lands 80a and 80b and resilient member 80e with casing 76 (Answer 9-10). Appellants argue that "circumferential contact" does not meet the definition of "interference fit." Reply Br. 5.

Because the effect of the "circumferential contact" of lands 80a and 80 of anchoring means 80 with casing 76 is to "anchor[] the slotted liner 79 in the well bore 74" (col. 8, ll. 59-60), we find that the "contact pressure"-based definition of "interference fit" is satisfied. Consequently, we are affirming the rejection with respect to claims 32 and 67, as to which only the "interference fit" limitation is argued.

Independent claim 46, as noted earlier, further specifies that expansion of the expandable tubular is effected by "an expansion mandrel." The Examiner reads this limitation on the inflatable mandrel 94 depicted in Malone's Figure 6 (Answer 10, 11). Appellants contend that "[t]hose skilled in the art understand that such an inflatable member is not the same as an expansion mandrel, at least in the context of claim 46 of the present application" (9/20/06 Reply Br. 3). The Examiner correctly concluded that nothing in claim 46 prevents the recited "expansion mandrel" from being read on inflatable mandrel 64 (Fig. 4) or 94 (Fig. 6). The rejection is therefore affirmed with respect to claim 46.

Dependent claims 50 and 51, which are separately argued (Br. 9-10), read as follows:

> 50. The method of claim 46, wherein the expansion mandrel comprises a conical outer surface.
>
> 51. The method of claim 50, wherein the angle of the conical outer surface of the expansion mandrel ranges from 5 to 45 degrees.

The Examiner reads these claims on the unnumbered conical surface between cylindrical surfaces 94c and 94d in Figure 6 (Answer 18). As Appellants have failed to point out any error in the Examiner's position, we are affirming the rejection as to these claims.

Dependent claim 65, separately argued (Br. 10), and its parent claim 64 read:

> 64. The method of claim 46, expanding the expandable tubular using an expansion mandrel comprises:
> expanding the expandable tubular using a flexible expansion mandrel.
>
> 65. The method of claim 64, wherein expanding the expandable tubular using a flexible expansion mandrel comprises:
> expanding the expandable tubular using a flexible expansion mandrel in a second stage of the expanding.

Appellants contend that "Malone does not disclose or suggest anything other than using the inflatable element 14 to expand the tubular member 17" (Br. 10). We agree with the Examiner that "claim 65 does not preclude the use of a flexible expansion mandrel in both the first stage and the second stage," which can be considered to be "two different points in time during the inflation of inflatable element 94" (Answer 19). Malone explains that liner 17 is expanded by inflatable element 14 until it "circumferentially contact[s]" the wall of the casing (col. 4, ll. 41-46), after which a further increase in pressure in inflatable element 14 forces the resilient material of the outer coating 16 of the liner into any voids, cracks, and other irregularities in casing 9 in order to "fixedly seal and seat the liner in position" (col. 4, ll. 46-51). We are therefore affirming the rejection with respect to claim 64.

The anticipation rejection is also affirmed with respect to claims 129, 131, 132, 134, 135, 137, 138, and 140, which are separately argued (Reply Br. 3) and include the "shear bond" limitation, which we have construed supra as requiring some amount of force to move the components relative to each other. After inflation and anchoring are complete, some amount of force will be necessary to shift Malone's liner 17 relative to casing 9.

The rejection is affirmed with respect to dependent claims 33, 44, 48, 63, 64, 68, 78, 130, 133, 136, 139, and 142-44 because their limitations are not separately argued.

B. Obviousness based on Malone considered alone or with Worrall (claims 35-43, 49, 55-62 and 69-77)

The rejection of these claims, which recite the physical properties of the tubular, is affirmed for the essentially the same reasons that we affirmed the rejection of these claims for obviousness over Abdrakhmanov considered alone or in view of Worrall.

DECISION

All of the rejections are affirmed with respect to all of the rejected claims. The decision of the Examiner is therefore affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. 1.136(a). *See* 37 C.F.R. §§ 41.50(f) and 41.52(b).

AFFIRMED

MAT

HAYNES AND BOONE, LLP
901 Main Street
Suite 3100
Dallas TX 75202