

Petition for *Inter Partes* Review of USP 11,392,818

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Review of:)
U.S. Patent No. 11,392,818)
Issued: Jul. 19, 2022)
Application No.: 17/216,096)
Filing Date: Mar. 29, 2021)

For: Graphically Encoded Icons Having Intrinsic Attributes Embedded Therein and Systems and Methods for Using Same

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,392,818**

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Ex.	Description
1001	U.S. Patent No. 11,392,818 (“’818 Patent”)
1002	File History of U.S. Patent No. 11,392,818 (“’818 FH”)
1003	Declaration of Majid Sarrafzadeh (“Sarrafzadeh Decl.”)
1004	Curriculum Vitae of Majid Sarrafzadeh
1005	U.S. Patent Application Publication No. US 2016/0292486 (“Prusik”)
1006	U.S. Patent No. 7,691,634 (“Vaillant”)
1007	U.S. Patent Application Publication No. US 2015/0308961 (“Burg”)
1008	U.S. Patent No. 10,146,909 (“Dimov”)
1009	Joseph Kerry & Paul Butler, <i>Smart Packaging Technologies for Fast Moving Consumer Goods</i> 33-74 (2008) (“Kerry”)
1010	U.S. Patent No. 10,229,387 (“Wade”)
1011	Antonacci et al., <i>Commercially Available (Bio)sensors in the Agrifood Sector</i> , 74 <i>Comprehensive Analytical Chemistry</i> 1 (2016) (“Antonacci”)
1012	U.S. Patent No. 9,221,273 (“Hyde”)
1013	U.S. Patent Application Publication No. US 2009/0020609 (“Cohen”)
1014	U.S. Patent No. 7,600,912 (“Leute”)
1015	U.S. Patent Application Publication No. US 2015/0021401 (“Rajagopal”)
1016	Jerry Zeyu Gao et al., <i>Understanding 2D-BarCode Technology and Applications in M-Commerce – Design and Implementation of A 2D Barcode Processing Solution</i> , IEEE Xplore (Aug. 2007) (“Gao”)
1017	U.S. Patent No. 9,811,632 (“Grabiner”)
1018	U.S. Patent No. 5,929,422 (“Lappe ’422”)
1019	U.S. Patent No. 6,036,092 (“Lappe ’092”)

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1020	U.S. Patent No. 6,685,094 (“Cameron”)
1021	U.S. Patent No. 6,770,487 (“Crosby”)
1022	U.S. Patent No. 10,318,781 (“Prusik ’781”)
1023	U.S. Patent No. 5,496,702 (“Bishop”)
1024	U.S. Patent Application Publication No. US 2017/0169738 (“David”)

I. Introduction

Abbott Laboratories (“Petitioner”) requests IPR of claims 1 and 4-20 of U.S. Patent No. 11,392,818.

The ’818 patent relates to “graphically encoded icons” (such as letters or symbols on a label) to convey both static and dynamic information about an object. *See, e.g.*, Ex. 1001 1:23-27, 1:39-47. But as the ’818 patent admits, graphically encoded icons for static data—including barcodes and two-dimensional barcodes, such as QR codes—existed well before the claimed priority date. Ex. 1001 3:56-5:32, Figs. 1-2. So too have ways of displaying dynamic data, such as “commercially available” substances on litmus strips or magnetic films that “exhibit a visible change based on factors such as humidity, pH, the wavelength and/or intensity of impinging light, an electrical field, [or] a magnetic field.” *Id.* 6:38-51.

The ’818 patent purports to have invented the combination of these two well-established technologies—i.e., using both a static portion (e.g., “a traditional one-dimensional barcode”) and a variable portion (an “intrinsic attribute portion” with “stimuli-responsive materials” that change based on an attribute of the object). *Id.* 6:3-54. Unsurprisingly, this combination was previously disclosed in multiple references, rendering the challenged claims obvious as shown in the following grounds.

Petitioner asks the Board to institute review and find the challenged claims unpatentable.

II. Identification of Challenges (37 C.F.R. § 42.104(b))

Ground 1(a): Claims 8-15 are obvious under 35 U.S.C. §103 over U.S. Patent Pub. No. 2016/0292486 to Prusik et al. (“Prusik”) (Ex. 1005) in view of a POSITA’s knowledge.

Ground 1(b): Claims 1, 4-7, and 16-20 are obvious under 35 U.S.C. §103 over Prusik in view of U.S. Patent 7,691,634 (“Vaillant”) (Ex. 1006).

Ground 2: Claims 8-15 are obvious under 35 U.S.C. §103 over U.S. Patent Application Publication 2015/0308961 (“Burg”) (Ex. 1007) in view of a POSITA’s knowledge.

Ground 3: Claims 8-15 are obvious under 35 U.S.C. §103 over U.S. Patent 10,146,909 (“Dimov”) (Ex. 1008) in view of a POSITA’s knowledge.

III. Background

A. The ’818 Patent (Ex. 1001)

The ’818 patent is directed to using “graphically encoded icons” (such as letters or symbols on a label) to convey information about an object. *See, e.g.*, Ex. 1001 1:23-27, 1:39-47; Ex. 1003 (Sarrafzadeh Decl.) ¶¶22-30. The specification explains that “[u]p until the late 1800s, commercial establishments tracked their inventory primarily by hand.” *Id.* 3:49-50. But that required “[m]anual entry of large amounts of data,” which was “laborious,” “time consuming,” and “prone to error.”

Id. 3:51-54. To alleviate that effort, “machine readable indicia” were developed—including barcodes in the 1950s and two-dimensional barcodes, such as QR codes, in the late 1980s. *Id.* 3:56-5:32. Figures 1 and 2, reproduced below, illustrate these prior art machine-readable barcodes.

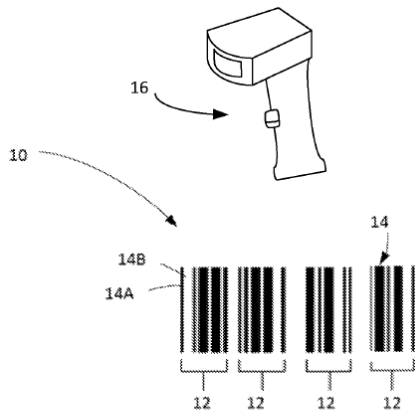


FIG. 1
(PRIOR ART)

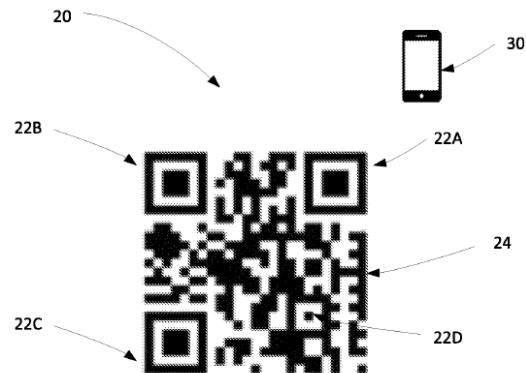


FIG. 2
(PRIOR ART)

By scanning these codes, machines could collect and track product information like the product’s name, source, or price. But, the ’818 patent alleges, these well-known ways of conveying information were “limited in that the information represented thereby is static”—once a barcode is printed on a product’s label, it cannot convey “variable information” such as the object’s current temperature or quantity. *Id.* 5:33-40.

Accordingly, the ’818 patent discloses “machine-readable indicia including both static and variable information.” *Id.* 5:41-43. The patent accomplishes this combination not with any improved technology but with the use of a known static

portion (e.g., “a traditional one-dimensional barcode”) and a known variable portion (an “intrinsic attribute portion” with “stimuli-responsive materials” that change based on an attribute of the object). *Id.* 6:3-54. For example, Figure 3A, reproduced below, illustrates a label with a “graphically encoded icon 310 [that] includes a static portion 312 and an intrinsic attribute portion 314.” *Id.* 6:3-5. The static portion 312 can be a “traditional” barcode. *Id.* 6:5-8.

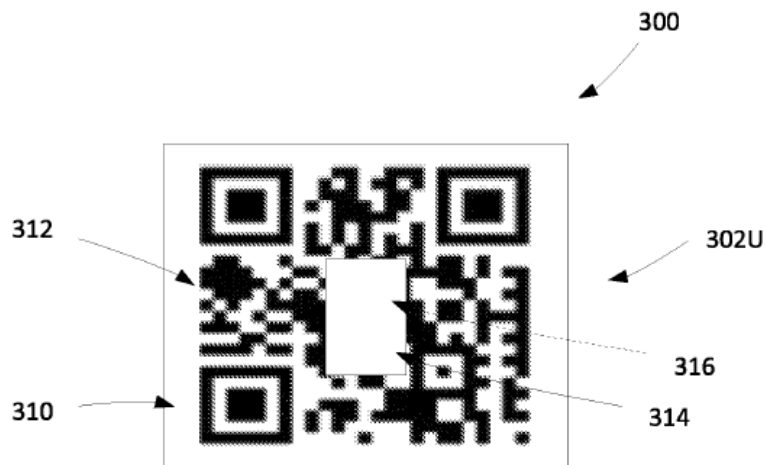


FIG. 3A

Conversely, the intrinsic attribute portion 314 changes states based on a trigger. Ex. 1001 6:23-24. This portion could be, for example, “temperature sensitive ink” that is initially “invisible to the naked eye” but then appears, or changes color, “based on temperature.” *Id.* 6:24-38. Or it could be a “commercially available” item such as a litmus strip or magnetic film containing a known substance that “exhibit[s] a visible change based on factors such as humidity, pH, the wavelength and/or

intensity of impinging light, an electrical field, a magnetic field.” *Id.* 6:38-51. The ’818 patent therefore applies the combination of traditional and “commercially available” techniques to convey static and variable information.

The ’818 patent discloses a specific example of this combination of known techniques in the form of a label on shrimp containers, illustrated in Figure 4B, below. In addition to the conventional QR code, the intrinsic attribute portion 414 of label 401 (left) “displays a trigger notification 420 (an X in this example)” indicating that the shrimp container experienced an environment where the temperature exceeded –22 degrees Fahrenheit. Ex. 1001 8:2-8. Such an indicator can employ “commercially available” products such as “thermochromic (i.e., temperature sensitive ink) that changes colors based on temperature.” *Id.* 6:35-38. The intrinsic attribute portion 414 of label 401’ (right) does not display this trigger notification.

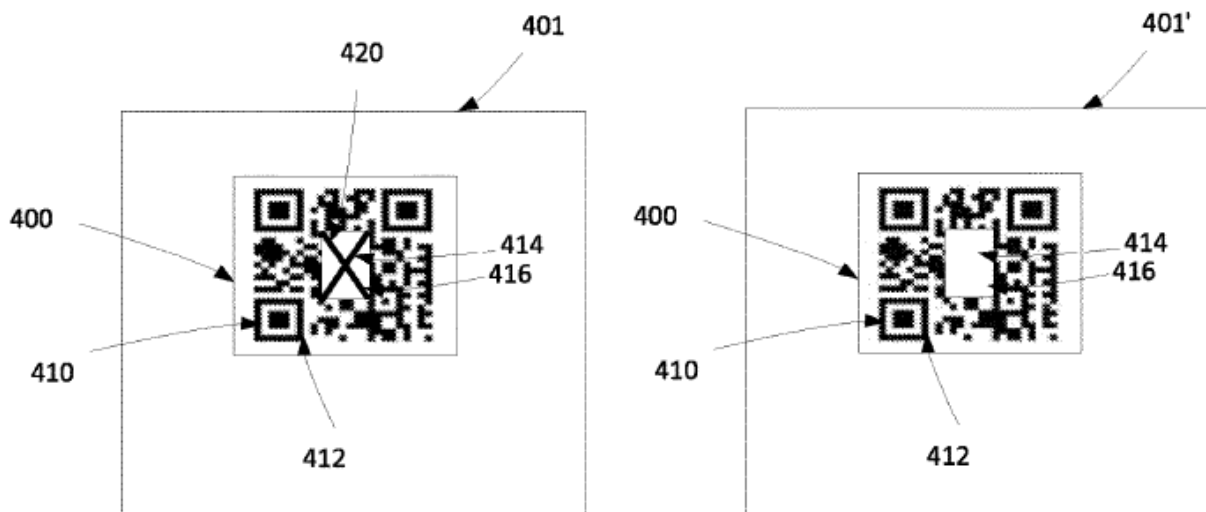


FIG. 4B

The human- or machine-readable variable indicator thus informs the recipient that the shrimp labeled with label 401 might be spoiled, whereas the shrimp labeled with label 401' was maintained at a proper temperature. Ex. 1001 8:5-16.

B. Prosecution History

The '818 patent originates from U.S. Patent Application 17/216,096 ("096 application"), filed March 29, 2021. The '818 patent claims priority to two earlier non-provisional applications, and two provisional applications, the earliest of which was filed November 22, 2017.

The as-filed claims of the '096 application were broadly directed to a graphically encoded icon with a machine-readable static portion (e.g., a barcode) and an intrinsic portion with stimuli-responsive material.'818 FH (Ex. 1002) 152-155. The Examiner rejected claims 8-13 as anticipated by U.S. Patent Application Publication 2017/0169738 ("David," Ex. 1024), but found dependent claims 14 and 15 to be patentable if written as independent claims. '818 FH 47-48. Specifically, claim 14 recited a "transformation of the stimuli-responsive material" to be "a change in reflection," and claim 15 recited a "transformation of the stimuli-responsive material" to be a change in "transparency." The Examiner also issued a nonstatutory double patenting rejection for claims 1-9, 12-20, which include limitations relating to use of the graphically encoded icon in a transaction. '818 FH 48-55.

In response, the applicant filed terminal disclaimers to overcome the double patenting rejections, incorporated claim 15 into independent claim 8, and rewrote claim 14 as an independent claim. '818 FH 35-41.

The Examiner issued a Notice of Allowance, broadly noting the terminal disclaimer and amendment as the reasons for allowance. '818 FH 8-14.

C. Person of Ordinary Skill in the Art

A person of ordinary skill in the art ("POSITA") as of the November 2017 claimed priority date would have had a bachelor's degree in computer science, electrical engineering, systems engineering, biomedical engineering (or a related or equivalent field), and two or more years of experience researching, developing, designing and/or evaluating embedded systems, graphically encoded icons, or diagnostic systems that provide dynamic information. A person with less or different education but more relevant practical experience, or vice versa, may also meet this standard. A POSITA may be part of an interdisciplinary team with others having the relevant experience set forth above. The prior art also evidences the level of skill in the art. Sarrafzadeh Decl. ¶¶16-21.

D. Claim Construction

The prior art relied on in this Petition discloses the subject matter of the challenged claims under any reasonable construction, including their plain meaning.¹

IV. Ground 1(a): Claims 8-15 are obvious over Prusik in view of a POSITA

A. Overview of Prusik (Ex. 1005)

U.S. Patent Pub. No. 2016/0292486 to Prusik et al. (“Prusik”) is prior art under §§ 102(a)(1) and 102(a)(2) because it was filed on March 30, 2016 and published on October 6, 2016, before the ’818 patent’s earliest claimed priority date of November 22, 2017. Prusik was not cited or considered during prosecution of the ’818 patent.

Prusik discloses “combining preprinted information together with coded sensor information within a two-dimensional barcode.” Prusik Abstract; Sarrafzadeh Decl. ¶¶79-85. The two-dimensional barcode thus includes “a set of static data and a set of dynamic data.” Prusik [0005]. The dynamic data is printed using “dynamic ink which changes states responsive to at least one environmental change.” Prusik [0005].

Like the ’818 patent, Prusik discloses an embodiment where dynamic information within the barcode can indicate whether a label has been exposed to

¹ Petitioner reserves the right to argue alternative constructions in other proceedings, and where such a defense is available, that the claims are indefinite.

certain temperatures. Figure 6C, reproduced below, illustrates an embodiment where “dynamic ink 198 [] activates from white to black in response to [] a temperature greater than the threshold exposure temperature.” Prusik [0105]. When “the dynamic ink irreversibly changes, the set of dynamic data 136 may be decoded to inform the supplier that the chemical was exposed to a temperature above 30° C. and that the contents of the container may have experienced thermal degradation.” Prusik [0085], Fig. 6C.

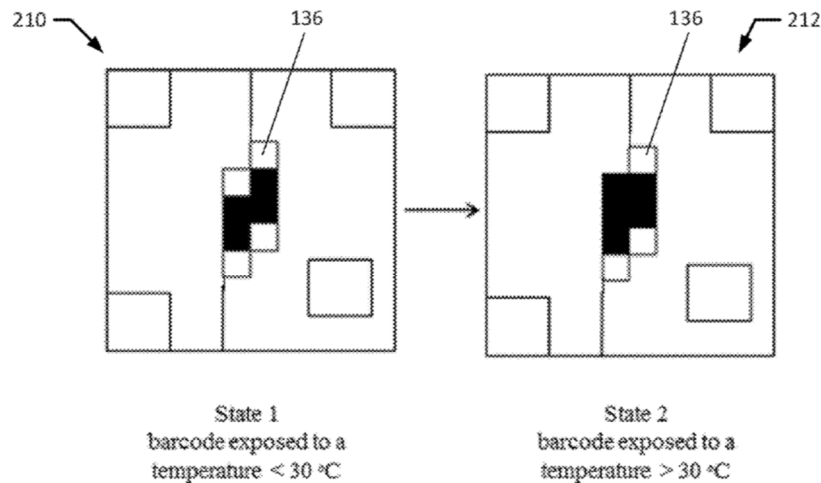


FIG. 6C

In various embodiments “the [] dynamic ink may be sensitive to an environmental factor such as temperature, time, time and temperature, freezing, radiation, toxic chemicals, or a combination of such factors.” Prusik [0111].

As shown below, Prusik renders claims 8-15 obvious in view of a POSITA’s knowledge.

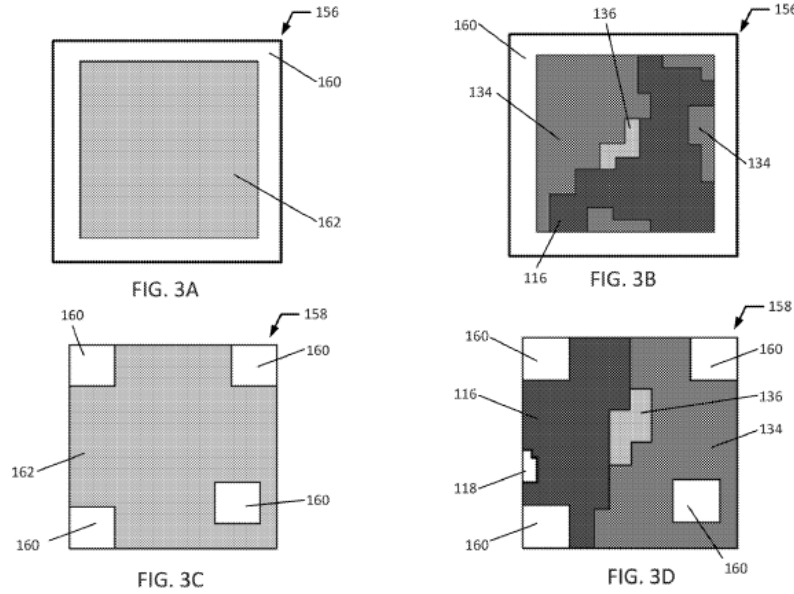
B. Claims 8 and 14

Independent claims 8 and 14 both recite a “graphically encoded icon” comprising “a label attached to an object.” These two independent claims are identical except for reciting a different “transformation of the stimuli-responsive material.” Specifically, claim 8 recites that the transformation is a “change in transparency” of the material; claim 14 recites that it is a “change in the reflection.”

Prusik in view of the knowledge of a POSITA renders both claims obvious.

1. 8[pre]/14[pre]: Preamble

The preambles of claims 8 and 14 recite: “A graphically encoded icon.” The preambles are not limiting, as they do not recite any essential structure, nor are they necessary to give life, meaning, and vitality to the claims. *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002). Nevertheless, to the extent Patent Owner argues they are limiting, Prusik discloses them.

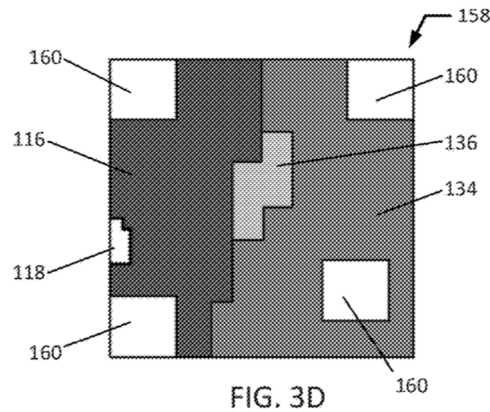
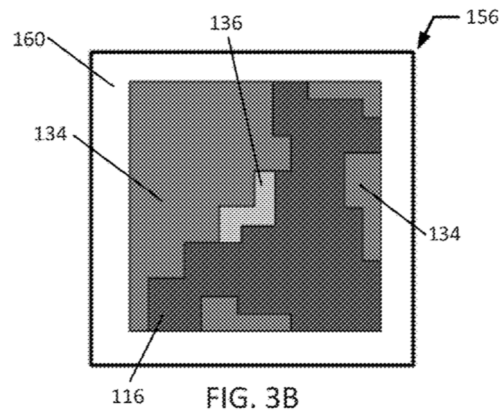


As shown in Figs. 3A-D above, Prusik discloses a graphically encoded icon through its “two dimensional barcode with dynamic environmental data,” which includes a combination of “preprinted information together with coded sensor information.” Prusik Abstract; Figs. 3A-D. The two dimensional barcode uses a sensor dye chemistry so that “a specified condition of the sensed property” “causes a change in the color state of sensor dye modules embedded within the sensor-augmented two-dimensional barcode” and thus “encod[es] sensor digital information.” Prusik Abstract; Sarrafzadeh Decl. ¶¶111-113.

2. 8[a]/14[a]: Label with Static and Intrinsic Portions

Limitations 8[a] and 14[a] recite: “a label attached to an object, the label comprising a static portion and an intrinsic portion.” Prusik discloses or suggests these limitations. Sarrafzadeh Decl. ¶¶114-120.

Prusik discloses an object such as “a container holding the pharmaceutical, biological, or food product, preferably a vaccine vial” and a label attached to that object through its “sensor-augmented two-dimensional barcode symbol provided on or in the container, preferably being applied to the outside surface of the container.” Prusik [0003]. A POSITA would have understood the application of this barcode to the outside surface of the container to constitute a label attached to an object. For example, Prusik discloses that the applied sensor information “records a change in status of the environmental or biological condition to which the labeled product has been exposed.” Prusik Abstract. Prusik also discloses that “the 2D barcode may be attached to various products such as food product, pharmaceutical products, etc.” Prusik [0114]; *see also* [0162] (describing that the barcode may be “attached ... [to] any other product that may benefit from environmental, physical, or biological monitoring”).



Prusik’s two-dimensional barcode label includes a set of static data 134 as shown in Figures 3B and 3D corresponding to the claimed static portion. Prusik [0070]. The two-dimensional barcode label also includes a set of dynamic data 136 corresponding to the claimed intrinsic portion. Prusik [0070]. The dynamic data, like the ’818 patent’s intrinsic portion, includes “stimuli-responsive material” (Ex. 1001 1:42-44) through the use of “dynamic ink” which “may be sensitive to an environmental factor such as temperature, time, time and temperature, freezing, radiation, toxic chemicals, or a combination of such factors, or the like.” Prusik [0084]; *see also* Prusik [0007] (explaining that the “first group is printed in the static

ink” while the “second group is printed in the dynamic ink.”) The information encoded by the dynamic ink is therefore tied to an intrinsic attribute of the product to which it is attached. Sarrafzadeh Decl. ¶119; *cf.* Ex. 1001 5:43-46. In fact, the ’818 patent specifically discloses that a label’s intrinsic portion can include “temperature sensitive ink.” Ex. 1001 6:35-38.

Thus, Prusik discloses or renders obvious limitations 8[a] and 14[a].

3. 8[b]/14[b]: Static Portion Comprises Machine-Readable Indicia

Limitations 8[b] and 14[b] recite: “the static portion comprises machine-readable indicia.” Prusik discloses or suggests these limitations. Sarrafzadeh Decl. ¶121.

As described above for limitation 8[a]/14[a], Prusik’s 2D barcode labels in Figures 3B and 3D each include “static data 134” constituting the claimed static portion. Prusik [0070]. A POSITA would have understood that the static data 134 comprises machine-readable indicia. Sarrafzadeh Decl. ¶¶122-123. For example, the static data 134 is part of the “encoded data region 162” of the 2D barcode label. Prusik [0070]. Prusik further discloses that embodiments can employ 2D barcode standards such as “Data Matrix,” which Prusik describes as “a two-dimensional error-correcting barcode symbol formed in compliance with ISO/IEC 16022 Information technology—automatic identification and data capture techniques—Data Matrix barcode symbology specification.” Prusik [0071]. Prusik describes the

encoding process for Data Matrix, where, for example, each module is colored nominally black or white to represent an encoded bit. Prusik [0073]; *see generally* Prusik [0071]-[0082].

A POSITA would have understood that the encoded data in the Data Matrix format is specifically designed to be machine readable. Sarrafzadeh Decl. ¶¶124-127; Ex. 1016, 1 (describing barcodes as “machine-readable representation of information in a visual format”); *see also* Prusik [0001] (“A barcode is an optical-machine readable representation of data”). Further, Prusik discloses that “the set of static data 134 is readable by the reader of the 2D barcode” regardless of which state the dynamic data 136 is in. Prusik [0084]. This machine-readable set of static data allows “a reader to obtain the set of static data 134, such as serial number, lot number, and batch number.” Prusik [0085].

Accordingly, Prusik discloses or renders obvious this limitation.

4. 8[c]/14[c]: Intrinsic Portion Comprises Stimuli-Responsive Material

Limitations 8[c] and 14[c] recite: “the intrinsic portion comprises an area of stimuli-responsive material.” Prusik discloses these limitations. Sarrafzadeh Decl. ¶¶128-131.

As discussed above for limitations 8[c] and 14[c], Prusik teaches that the dynamic data 136 (the claimed intrinsic portion) is printed using dynamic ink, which constitutes stimuli-responsive material. Prusik [0084]; [0006] (describing “dynamic

ink” that is “adapted to activate in response to the occurrence of a specific environmental factor.”). A POSITA would understand that this dynamic ink is a stimuli-responsive material because it “may be sensitive to an environmental factor such as temperature, time, time and temperature, freezing, radiation, toxic chemicals, or a combination of such factors, or the like.” Prusik [0084].

Just like the ’818 patent, Prusik discloses an embodiment using temperature-sensitive ink that is responsive to temperature, i.e., “thermochromic ink” that is “a water-based irreversible thermochromic ink designed to change permanently from white to black at 40° C.” Prusik [0084]; *cf.* Ex. 1001 6:35-38 (disclosing thermochromic ink in the intrinsic attribute portion). As another example, “this thermochromic ink may be reversible,” e.g., “a liquid crystal ink or a leuco dye ink” such as “QCR Solutions Reversible Thermochromic Inks and H.W. Sands Corporation inks.” Prusik [0084] (further explaining that “the ink may be a photochromic ink which may be either reversible or irreversible.”); Sarrafzadeh Decl. ¶130.

Thus, Prusik discloses limitations 8[c]/14[c].

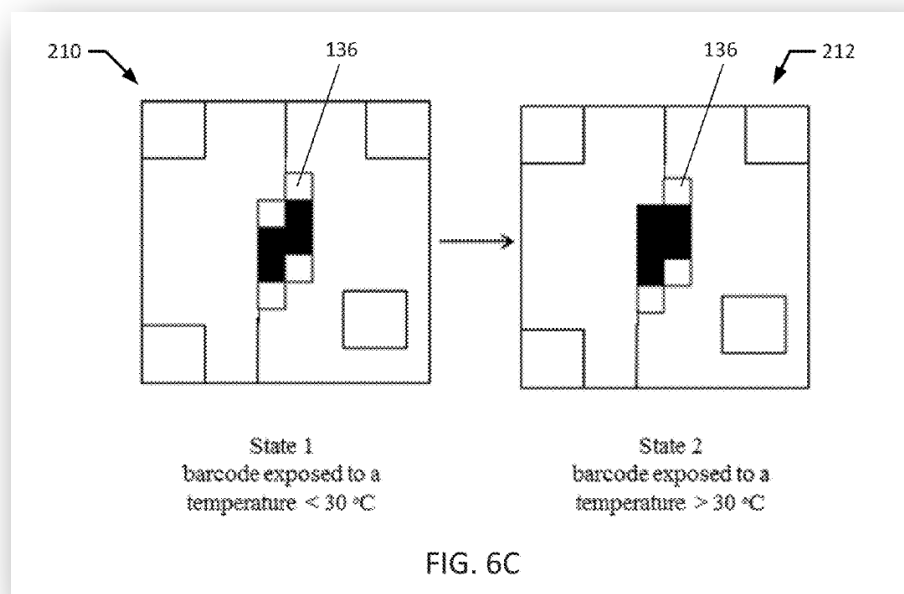
5. 8[d]/14[d]: Stimuli-Responsive Material Changes States

Limitations 8[d] and 14[d] recite: “the stimuli-responsive material is configured to change from a first state to a second state in response to a trigger, the

change in state being based on an attribute about the object.” Prusik discloses these limitations. Sarrafzadeh Decl. ¶¶132-137.

Prusik’s dynamic ink is configured to change from a first state to a second state in response to a trigger based on a change in the product’s environment. Sarrafzadeh Decl. ¶133. For example, Prusik discloses that the “dynamic ink [] changes states responsive to at least one environmental change, such that the set of dynamic data 136 is in one of a plurality of states.” Prusik [0084]. As discussed above for limitation 8[c]/14[c], the dynamic ink can change states based on a trigger “such as temperature, time, time and temperature, freezing, radiation, toxic chemicals, or a combination of such factors, or the like.” Prusik [0084].

For example, in reference to Figure 6C, below, the dynamic ink for providing dynamic data 136 changes from a first state 210 to a second state 212 based on exposure of the dynamic ink “to an environmental change such as the temperature rising above 30° C.” Prusik [0105]. As Prusik explains, “FIG. 6C shows a dynamic ink 198 that activates from white to black in response to [] a temperature greater than the threshold exposure temperature.” Prusik [0105]. But Prusik’s response to stimulus is not limited to changing color in response to temperature. Sarrafzadeh Decl. ¶134. As discussed below for limitation 8[e]/14[e], Prusik discloses that the dynamic ink can change transparency or reflection.



A POSITA would understand that Prusik's ink changes from a first state to the second state based on a change in an attribute of the object. Sarrafzadeh Decl. ¶135. Prusik explains that its "bar code may be printed on or applied to a container for" "various products such as food products, pharmaceutical products, biologics, or any other product that may benefit from environmental, physical, or biological monitoring," i.e., the claimed object. Prusik [0162]. And as discussed above, Prusik discloses that the change in state of the dynamic data can be based on "an environmental factor such as temperature, time, time and temperature, freezing, radiation, toxic chemicals, or a combination of such factors, or the like," i.e. the claimed attribute of the object. Prusik [0083], [0084] (same); Sarrafzadeh Decl. ¶136. Thus, in the same way that the label of the '818 patent changes states based on the temperature of shrimp, Prusik's prior art label changes states based on the

temperature of the product to which it is attached. Sarrafzadeh Decl. ¶¶XXX; *see, e.g.*, Prusik [0085] (irreversible change in state of dynamic ink can indicate “that the chemical was exposed to a temperature above 30° C and that the contents of the container may have experienced thermal degradation”).

Accordingly, Prusik discloses or renders obvious this limitation.

6. 8[e]/14[e]: Change in Transparency/Reflection of Stimuli-Responsive Material

Limitation 8[e] recites: “the transformation of the stimuli-responsive material is a *change in the* transparency of the stimuli-responsive material.” Limitation 14[e] uses similar language but recites that “the transformation of the stimuli-responsive material is a *change in the reflection* of the stimuli-responsive material.” Prusik discloses these limitations. Sarrafzadeh Decl. ¶¶138-144.

Prusik discloses that the change in state of the dynamic data of the two-dimensional bar code can include a change in transparency or a change in reflectiveness of the dynamic data 136. For example, Prusik describes that “[t]he dynamic ink ... may change levels of transparency or opacity, and/or may change levels of reflectivity or absorptivity” Prusik [0084].

Regarding a change in transparency (limitation 8[e]), Prusik discloses dynamic ink that can change from a colored state to a transparent state, or from a transparent state to a colored state. Table 1, below, shows Prusik’s possible changes in transparency based on dye chemistry.

TABLE 1

Types and Color Properties of Selected Sensor Dye Chemistries		
Sensor dye chemistry	Unactivated State	Activated State
W→X	White	Transparent
W→B	White	Black
B→W	Black	White
B→X	Black	Transparent
X→W	Transparent	White
X→B	Transparent	Black

Prusik [0087].

If transitioning from a colored to transparent state, the dynamic ink typically reveals a bit pattern when activated. Prusik [0089]. Alternatively, if transitioning from a transparent to a colored state, the dynamic ink typically covers a previously-visible pattern with a new pattern. Prusik [0089].

Regarding a change in the reflection (limitation 14[e]), Prusik repeatedly describes that the 2D barcode can use modules with “various ... levels of reflectivity or absorptivity ... allowing the barcode to be readable by a reader.” Prusik [0111]. A POSITA would have been motivated to have the dynamic ink transition states using a change in reflectivity because the different reflectivity is read by the reader as a different state. Sarrafzadeh Decl. ¶142. To this end, Prusik’s express disclosure of “dynamic ink [that] ... may change levels of reflectivity” suggests its use in Prusiks’ barcode. Prusik [0084]; Sarrafzadeh Decl. ¶142.

Accordingly, Prusik discloses or renders obvious limitations 8[e] and 14[e].

C. Dependent Claims 9-13 and 15

Claims 9-13 depend from claim 8. Claim 15 depends from claim 14, but recites an identical limitation as claim 13. Prusik renders all of these dependent claims obvious in view of the knowledge of a POSITA.

1. Claim 9: Change in Stimuli-Responsive Material Results in Machine-Readable Indicia

Claim 9 recites: “The graphically encoded icon of claim 8, wherein the change in state of the stimuli-responsive material results in machine-readable indicia.” As described above, Prusik renders claim 8 obvious. Prusik also discloses this additional limitation and renders claim 9 obvious. Sarrafzadeh Decl. ¶¶145-151.

As discussed above for limitation 8[b]/14[b], a POSITA would have understood Prusik’s 2D barcode to be machine readable. Sarrafzadeh Decl. ¶149; *see also* Prusik [0001] (“A barcode is an optical-machine readable representation of data”). As Prusik describes, it is machine-readable under any of the states of the dynamic data 136—including after the change in state as recited in claim 9.

For example, Prusik states that “the set of dynamic data 136 is readable by a reader of the 2D barcode ... when the set of dynamic data 136 is in each one of the plurality of states.” Prusik [0084]. Thus, a reader can “read the 2D barcode both before the dynamic ink has activated and after the dynamic ink has activated from the set of dynamic data 136 in a first state to represent a set of dynamic data 136 in a second state.” Prusik [0085]. The change in state results in machine-readable

indicia, for example, by revealing an underlying machine-readable bit pattern (if transitioning from a colored state to a transparent state) or covering a portion of the barcode with a newly visible bit pattern (if transitioning to a colored state from a transparent state). Prusik [0089].

Accordingly, Prusik renders claim 9 obvious in view of the knowledge of a POSITA.

2. Claim 10: Indicia of Stimuli-Responsive Material is Non-Human Readable

Claim 10 recites: “The graphically encoded icon of claim 9, wherein the machine-readable indicia of the stimuli-responsive material is non-human readable.” As described above, Prusik renders claim 9 obvious. Prusik also renders claim 10 obvious. Sarrafzadeh Decl. ¶¶152-156.

Prusik’s 2D barcode label, including the dynamic data encoded therein, uses machine-readable indicia before and after changing states as shown above for claim 9. This machine-readable indicia includes a number of modules that can have various states that can be easily read by a barcode reader. Sarrafzadeh Decl. ¶153. For example, Prusik discloses that its two-dimensional barcode encoded with the static data 134 and dynamic data 136 (the stimuli-responsive material) can be a “Data Matrix or QR code” where “the set of static data 134 is readable by the reader of the 2D barcode and the set of dynamic data 136 is in each of the plurality of states.” Prusik [0001], [0084]. A POSITA would understand that Prusik’s 2D barcode,

including the machine-readable indicia of the dynamic ink, is non-human-readable as that term is used in claim 10 of the '818 patent. Sarrafzadeh Decl. ¶___. For further example, Prusik discloses that its sensor dye modules (e.g., the portions using dynamic ink) can be encoded with an error-correcting code (which a human could not readily decode) to account for cases where “the entire sensor-augmented two-dimensional barcode may not have been exposed uniformly to the condition activating each sensor dye module.” Prusik [0096]; Sarrafzadeh Decl. ¶154.

In any event, using a 2D barcode lacking any human-readable component would have been obvious to a POSITA. Sarrafzadeh Decl. ¶¶155-156; *see, e.g.*, Ex. 1014 4:47-49 (describing a temperature sensitive label 102 that “may be readable either by a machine, human, or both”). Doing so would have been obvious, for example, to a POSITA to allow for the transmittal of encoded information such as confidential information or Prusik’s error correction coded information. *See* Ex. 1016 at 6 (describing 2D barcodes that include credit card information, security key information, and user information). Thus, a POSITA would have known of the capability of 2D barcodes to lack any human-readable component and would have been motivated to use such barcodes.

3. Claim 11: Machine-Readable Indicia of Static Portion is Non-Human Readable

Claim 11 recites: “The graphically encoded icon of claim 10, wherein the machine-readable indicia of the static portion is non-human readable.” Prusik discloses this limitation. Sarrafzadeh Decl. ¶¶157-158.

As discussed above for claim 10, Prusik discloses that its two-dimensional barcode encoded with the static data 134 (the static portion) and dynamic data 136 can be a “Data Matrix or QR code” where “the set of static data 134 is readable by the reader of the 2D barcode and the set of dynamic data 136 is in each of the plurality of states.” Prusik 1:14-17, 10:55-59. For the same reasons as discussed above for the intrinsic portion, the static portion as recited in claim 11 of Prusik’s two-dimensional barcode is non-human readable, and a non-human-readable barcode would have been obvious to a POSITA. *See* Section IV.C.2.

4. Claim 12: Temperature Trigger Above or Below a Threshold

Claim 12 recites: “The graphically encoded icon of claim 8, wherein the trigger is a change in temperature, and wherein the trigger occurs when the change in temperature is above or below a predetermined threshold.” Prusik renders dependent claim 12 obvious. Sarrafzadeh Decl. ¶¶159-166.

As discussed above for limitation 8[c]/14[c], the dynamic ink can change states based on a trigger “such as temperature, time, time and temperature, freezing,

radiation, toxic chemicals, or a combination of such factors, or the like.” Prusik [0084]. And as discussed above for limitation 8[e], in this same paragraph Prusik describes that “[t]he dynamic ink ... may change levels of transparency or opacity, and/or may change levels of reflectivity or absorptivity” Prusik [0084].

Prusik provides an example where dynamic ink is configured to change from a first state 210 to a second state 212 based on exposure “to an environmental change such as the temperature rising above 30° C.” Prusik [0105]. As illustrated in Figure 6C below, the dynamic ink in the 2D barcode “activates from white to black in response to [] a temperature greater than the threshold exposure temperature.” Prusik [0105]; Sarrafzadeh Decl. ¶161.

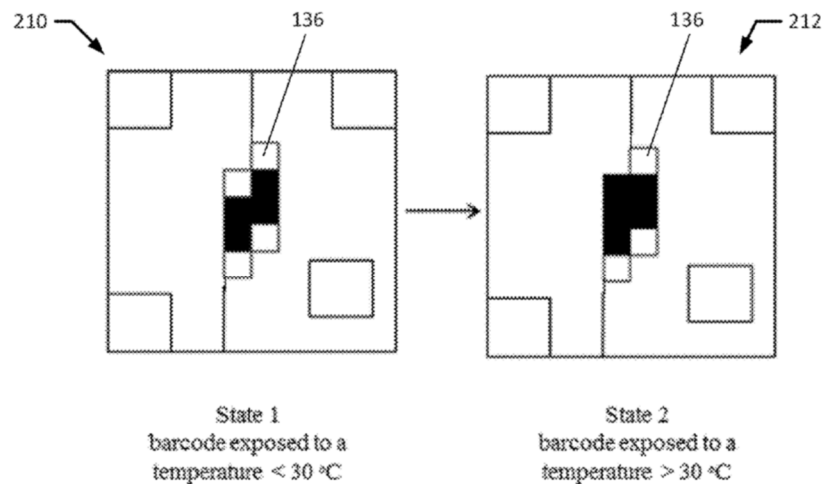


FIG. 6C

Notably, Prusik’s “threshold exposure temperature” is predetermined as required by claim 12. For example, the threshold exposure temperature is “specified in the set of static data 134” as illustrated in Figure 6A, below. Because the static

data 134 does not change, the threshold is predetermined at the time of printing. Sarrafzadeh Decl. ¶162. This predetermined threshold is important, for example, where a supplier needs to know if a chemical “is exposed to a certain temperature” due to thermal degradation at that certain temperature. Prusik [0085].

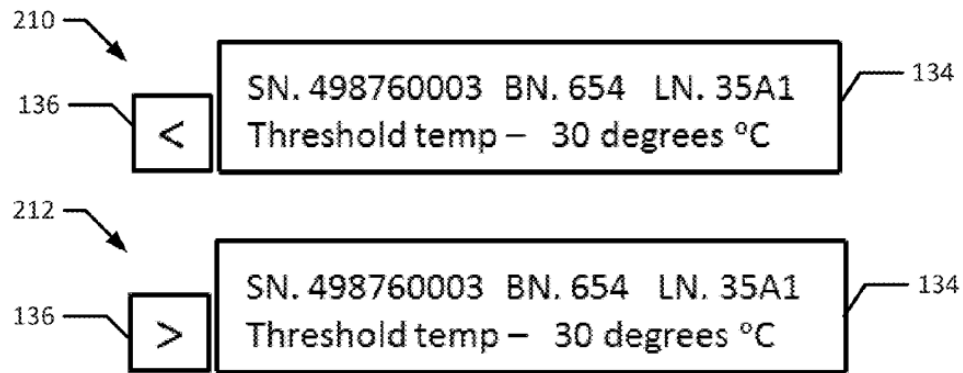


FIG. 6A

Similarly, Figure 6D illustrates a change in state of the dynamic ink from black to white based on exposure to a temperature below 0°C. Prusik [0105].

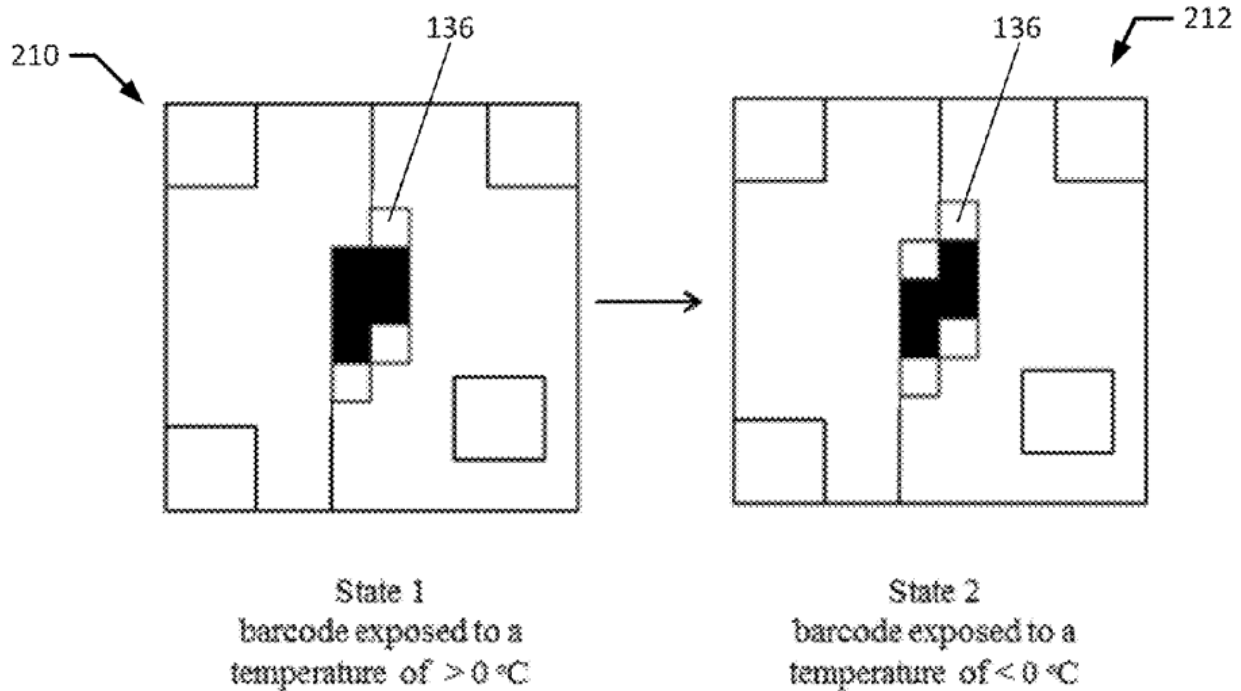


FIG. 6D

Prusik does not limit its disclosure to changing color in response to the temperature crossing a threshold exposure temperature. To the contrary, Figures 6C and 6D illustrate an “example process” according to “an example embodiment.” Prusik [0029]. In fact, Prusik discloses that the dynamic ink “may change any other suitable characteristic” including “transparency or opacity.” Prusik [0084].

To the extent Patent Owner argues that Prusik does not explicitly disclose changing transparency in response to a threshold exposure temperature, it would have been obvious at least because Prusik suggests such a response. Prusik discloses “6 types of sensor dye chemistries” that include change in color and change in transparency, as discussed above for limitation 8[e]. Prusik [0086]. Prusik also

describes the use of thermochromic ink in the same paragraph as his disclosure that the dynamic ink may change levels of transparency in response to stimulus. Prusik [0084]. The use of sensor dye chemistry of W→X (White to Transparent) or B→X (Black to Transparent) instead of W→B or B→W (as explicitly disclosed in Figures 6C/6D) was nothing more than a simple substitution of a known, equivalent element for another to obtain predictable results, as taught and suggested by Prusik's Table 1:

TABLE 1

Types and Color Properties of Selected Sensor Dye Chemistries		
Sensor dye chemistry	Unactivated State	Activated State
W→X	White	Transparent
W→B	White	Black
B→W	Black	White
B→X	Black	Transparent
X→W	Transparent	White
X→B	Transparent	Black

Sarrafzadeh Decl. ¶¶164-165.

Accordingly, Prusik renders claim 12 obvious.

5. Claims 13 and 15: Automatic Trigger Based on Predetermined Condition

Claim 13 depends from claim 8 and recites: “wherein the trigger occurs automatically based on a predetermined condition about the attribute of the object.”

Claim 15 depends from claim 14 and has identical language to claim 8. Prusik discloses these limitations. Sarrafzadeh Decl. ¶¶167-169.

As discussed above for claim elements 8[c]/14[c], Prusik discloses that the change in state of the dynamic data 136 from the first state to the second state in the two-dimensional barcode label applied to a container can be based on predetermined environmental factors “such as temperature, time, time and temperature, freezing, radiation, toxic chemicals, or a combination of such factors.” *See* Section IV.B.4; Prusik [0003], [0084]. Prusik further discloses a “thermochromic ink” that is “designed to change permanently from white to black at 40° C.” Prusik [0084]. And as discussed above for claim 12, a POSITA would understand that these environmental factors are a predetermined condition about the attribute of the object. Sarrafzadeh Decl. ¶168. A POSITA would also understand that the trigger—e.g., reaching a temperature of 40°C—occurs automatically. Sarrafzadeh Decl. ¶168. As Prusik discloses, the trigger is based on “environmental, physical or biological condition.” Prusik [0002]; *see also, e.g.*, [0105] (“[T]he dynamic ink 198 may activate from black to white in response to an environmental change 506....”).

V. Ground 1(b): Claims 1, 4-7 and 16-20 are obvious over Prusik in view of Vaillant

Like claims 8-15, which are obvious based on Prusik in view of the POSITA’s knowledge, independent claims 1 and 16 recite (1) a graphically encoded icon, (2) a static portion, (3) an intrinsic portion, and (4) a stimuli-responsive material that

transforms from a first state to a second state, resulting in a machine-readable indicia. However, claims 1 and 16 recite additional limitations related to a transaction. For the reasons explained below, Prusik in view of Vaillant renders these claims, along with dependent claims 4-7 and 17-20, obvious.

A. Overview of Vaillant (Ex. 1006)

U.S. Patent No. 7,691,634 to Vaillant (“Vaillant”) is prior art under both §§ 102(a)(1) and 102(a)(2) because it was filed on September 16, 2002 and issued on April 6, 2010, more than six years before the ’818 patent’s earliest claimed priority date. Vaillant was not cited or considered during prosecution of the ’818 patent.

Vaillant relates to controlling the preservation of a product. For example, Vaillant discloses “systematically and automatically controlling a product, whose preservation in a distribution circuit depends on the temperature, in particular a product subjected to a cold chain.” Vaillant 1:8-12. Vaillant employs a bar code “affixed on the product” that is used to “manag[e] the marketing of the product between,” for example, “a distributor and a consumer or between a pharmaceutical laboratory and a hospital.” Vaillant 3:52-57.

Figure 1 of Vaillant illustrates the marketing of the product 1 under the use of a cold chain. Vaillant 8:1-2. In this embodiment, a product is manufactured and distributed by different entities at potentially different temperatures. *See* Vaillant

8:2-9. The cold chain could be broken at any point by any of these entities. Vaillant

8:9-15. Vaillant therefore discloses that “it appears to be necessary to be able to

perform a check of the products 1 at each step of their marketing.” Vaillant 8:15-17.

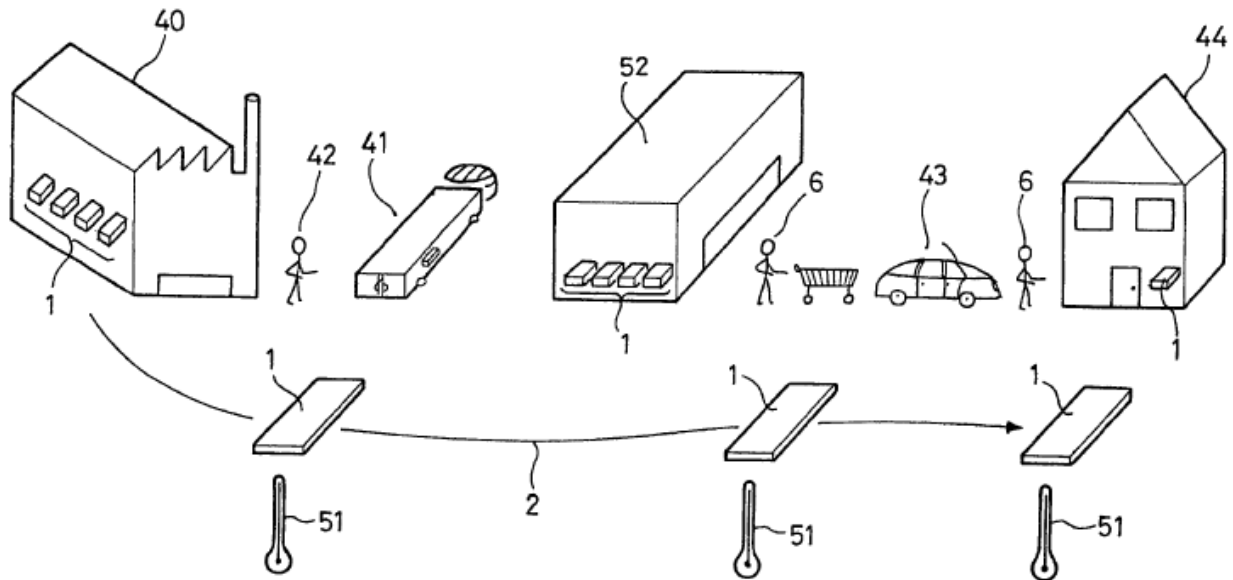


FIG. 1

As shown below in Figure 2, Vaillant affixes a label component 6 to product 1, which is illustrated as a tray of sausage. Vaillant’s label component 6 can mask portions of a barcode affixed on the product 1 “at least temporarily, without modifying them, when the temperature of the product 1 exceeds a specific temperature threshold.” Vaillant 8:35-39. As a result, “automatic processing units can no longer read the [barcode] markers 3 under these circumstances.” Vaillant 10:7-9.

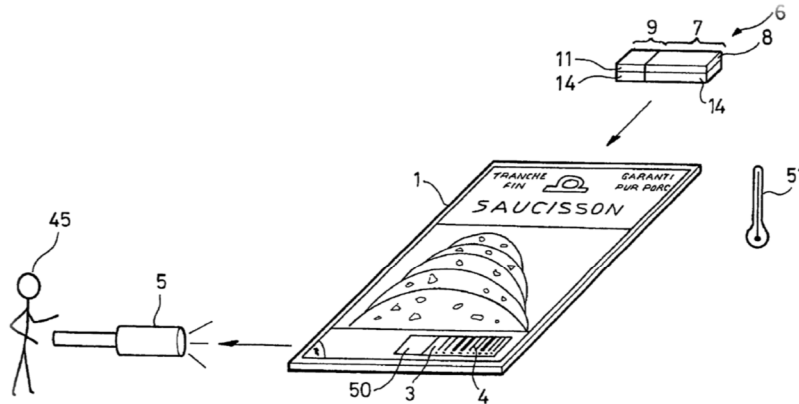
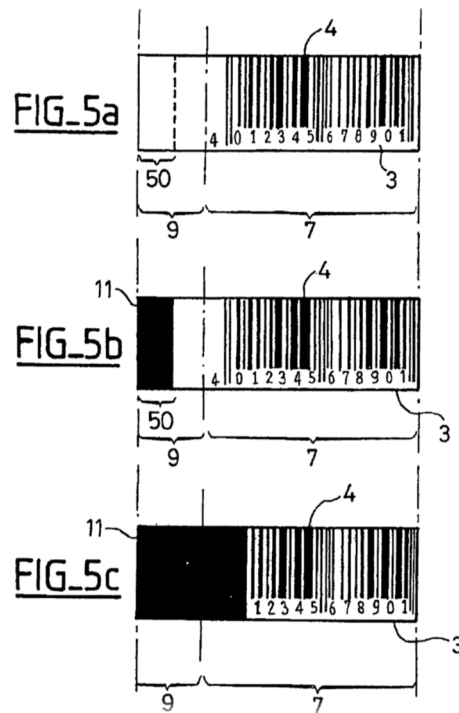


FIG. 2

Figures 5A, 5B, and 5C below “show the progressive masking of the [barcode] marker 3” as the product and marker are exposed to temperatures exceeding a predetermined threshold. Vaillant 12:58-60, Figs. 5A-5C.



For example, Figure 5A shows a barcode marker “not having undergone a break in the cold chain” and therefore, all the bars 4 of the bar code 3 are visible, making the marker “capable of activating the automatic processing unit 5.” Vaillant 12:60-64. Figure 5B shows an instance where the “[barcode] marker 3 ha[s] undergone a brief break in the cold chain” so that “first substance 11 migrates to the surface of the marker 3, covering the warning zone 50,” and thus, “[t]he marker 3 can no longer activate the automatic processing unit 5.” Vaillant 12:65-13:2. Figure 5C shows an example where the marker 3 has “undergone a prolonged break in the cold chain” so that the first substance 11 “form[s] a screen between the marker 3 and the automatic processing unit 5” so that “[t]he product 1 can therefore no longer be sold.” Vaillant 13:4-8.

B. Motivation to Combine Prusik and Vaillant

Prusik discloses a barcode with a static portion and a dynamic portion that is machine-readable both before and after the dynamic portion changes state in response to an environmental trigger. Sarrafzadeh Decl. ¶¶171-177. In other words, the barcode has encoded within it whether the product labeled by the barcode has been exposed to, e.g., a temperature exceeding a predetermined threshold. *See* Prusik [0084] (“[T]he set of dynamic data 136 may include information that when decoded by a reader informs a user whether the product exceeded the threshold exposure temperature.”).

Prusik, however, does not explicitly teach a POSITA how a user might use the encoded information about the product's exposure to a temperature. As a result, the POSITA would have looked to the prior art for teachings about using temperature exposure information, and would have found Vaillant. In fact, Vaillant is cited on the face of the patent that issued from Prusik (Ex.1022).

Vaillant discloses marketing of products through a "cold chain" using an automatic processing unit. When a temperature-sensitive mask covers the barcode on a product, it indicates that the product has "undergone a prolonged break in the cold chain" and "can therefore no longer be sold." Vaillant 13:2-8. Thus, Vaillant teaches that the information about whether the product has been exposed to threshold temperatures can be used to permit or deny a user to engage in a transaction.

A POSITA would have been motivated to apply Prusik's machine-readable barcodes to Vaillant's marketing management system for several reasons. Prusik discloses that its barcode "may be attached to various products such as food products, pharmaceutical products, biologics, or any other product that may benefit from environmental, physical, or biological monitoring" (Prusik [0162]) including temperature monitoring (Prusik [0067]). Similarly, Vaillant's goal for its marketing management system "is to make it possible to systematically and automatically control a product 1, whose preservation in a distribution circuit 2 depends on the temperature 51." Vaillant 6:6:58-61; Figure 1. Further, Prusik and Vaillant both

enable such monitoring using barcode modification techniques that allow a user to determine whether a product has been exposed to a predetermined temperature threshold. Sarrafzadeh Decl. ¶174.

Using modified barcodes, Prusik and Vaillant both provide temperature exposure information to a user for product preservation purposes. Sarrafzadeh Decl. ¶175. Vaillant provides the information using a mask that can cover the barcode when the product has been exposed to unacceptable temperatures. The mask then makes the barcode unreadable and “[t]he product 1 can therefore no longer be sold.” Vaillant, 13:4-8. Prusik, meanwhile, discloses a barcode that remains readable after the change in state triggered by the temperature. *E.g.*, Prusik [0084]. Prusik’s barcode thus enables a reader to decode the specific temperature that was exceeded. For example, Figure 6A shows that the static portion 134 of a barcode can encode a temperature threshold (e.g., 30 degrees) and the dynamic portion 136 can indicate whether the temperature was exceeded. In the application of Prusik to Vaillant’s system, the product “can therefore no longer be sold” when the reader decodes from Prusik’s barcode that an unacceptable temperature has been exceeded. Sarrafzadeh Decl. ¶175.

A POSITA would have also recognized that applying a sale acceptance/rejection functionality to Prusik’s barcode reader is a mere application of a known method of product handling and processing to Prusik’s system to achieve

the predictable result of preventing sale of products that have been exposed to hazardous or improper environmental conditions. Sarrafzadeh Decl. ¶176.

Vaillant provides known techniques that a POSITA could and would have implemented with Prusik's barcode. Sarrafzadeh Decl. ¶177. A POSITA would have understood that Prusik's machine-readable two-dimensional barcodes that change in response to exposure to predetermined environmental conditions (such as temperature) would naturally lend themselves to allowing or preventing sale of associated products when they are scanned by a barcode reader. Sarrafzadeh Decl. ¶177. Thus, a POSITA would have been motivated to modify Prusik's system that includes a barcode reader to include an automatic processing unit as disclosed by Vaillant to prevent the sale of a product where the dynamic data in the two-dimensional barcode indicates that the product has been exposed to a temperature exceeding a predetermined threshold. Sarrafzadeh Decl. ¶177.

C. Independent Claim 1

1. 1[pre]: Preamble

Claim 1 recites: "A user instrument for engaging in a transaction." The preamble is not limiting, as it does not recite any essential structure, nor is it necessary to give life, meaning, and vitality to the claim. *Catalina Mktg.*, 289 F.3d at 808. To the contrary, it merely recites an intended use (engaging in a transaction) for a "user instrument" that is not recited in the body of the claim. *Id.* To the extent

Patent Owner argues that it is limiting, Prusik in view of Vaillant renders this obvious. Sarrafzadeh Decl. ¶¶178-180.

Prusik discloses a “labeled product” that includes a “two dimensional barcode with dynamic environmental data.” Prusik Abstract. The label attached to the product constitutes a “user instrument for engaging in a transaction.” Sarrafzadeh Decl. ¶179. Note that dependent claim 4 recites that the user instrument can be a label. Likewise, Vaillant discloses a system which includes “a marker” “affixed on the product” and “systematically and automatically control[s] a product” that is “subjected to a cold chain.” Vaillant Abstract, 10:55-62. Vaillant’s system is used for “identif[ying] by automatic processing units managing the marketing of the product between,” for example, “a distributor and a consumer or between a pharmaceutical laboratory and a hospital.” Vaillant 1:8-12, 3:52-57. When Prusik’s label is used for “managing the marketing of the product” as disclosed in Vaillant, it is a user instrument for “engaging in a transaction” between the various entities involved in bringing the product to market, including the consumer. Sarrafzadeh Decl. ¶180.

2. 1[a]: Graphically Encoded Icon

Limitation 1[a] is identical to limitation 8[pre]/14[pre]. Prusik discloses this limitation for the reasons discussed above for claim element 8[pre]/14[pre]. *See* Section IV.B.1; Sarrafzadeh Decl. ¶181.

3. 1[b]: Static Portion

Limitation 1[b] recites: “a static portion.” Prusik discloses this limitation for the reasons discussed above for the “static portion” recited in limitations 8[a]/14[a] and 8[b]/14[b]. *See* Section IV.B.2; Sarrafzadeh Decl. 182.

4. 1[c]: Intrinsic Portion Comprises Stimuli-Responsive Material

Claim element 1[c] recites: “an intrinsic portion comprises an area of stimuli-responsive material defining a first machine-readable indicia.” Prusik discloses this limitation for the reasons described above for limitations 8[c]/14[c] and claim 9. For example, as discussed above for claim 9, Prusik discloses that its indicia are machine-readable both before and after a change of state triggered by the environment. Therefore Prusik’s dynamic ink defines a machine readable indicia. *See* Sections IV.B.4, IV.C.9; Sarrafzadeh Decl. ¶183.

5. 1[d]: Stimuli-Responsive Material Transforms States

Claim element 1[d] recites: “at least a portion of the stimuli-responsive material transforms from a first state to a second state in response to a trigger.” Prusik discloses this limitation for the reasons described above for substantially identical limitations 8[d]/14[d]. *See* Section IV.B.5; Sarrafzadeh Decl. ¶184.

6. 1[e]: Transformation Results in Machine-Readable Indicia

Claim element 1[e] recites: “the transformation from the first state to the second state of the portion of the stimuli-response material results in a second

machine-readable indicia” Prusik discloses this limitation for the reasons described above for claim 9. *See* Section IV.C.1; Sarrafzadeh Decl. ¶185.

7. 1[f]: Engaging in a Transaction

Claim element 1[f] recites: “the second machine-readable indicia comprises information to permit or deny the user to engage in a transaction via the user instrument.” The combination of Prusik and Vaillant discloses this limitation. Sarrafzadeh Decl. ¶¶186-189.

After changing state, Prusik’s dynamic portion comprises information that the product was exposed to certain environmental conditions, such as a threshold exposure temperature. Prusik [0084] (“[T]he set of dynamic data 136 may include information that when decoded by a reader informs a user whether the product exceeded the threshold exposure temperature.”). For example, as discussed above for claim 12 in Ground 1(a), Prusik’s static information 134 can include the threshold exposure temperature (e.g., 30 degrees in Figure 6A, below), and Prusik’s dynamic information 136 can include whether that threshold was exceeded (“>”) or not (“<”). Prusik [0105]; Sarrafzadeh Decl. ¶187.

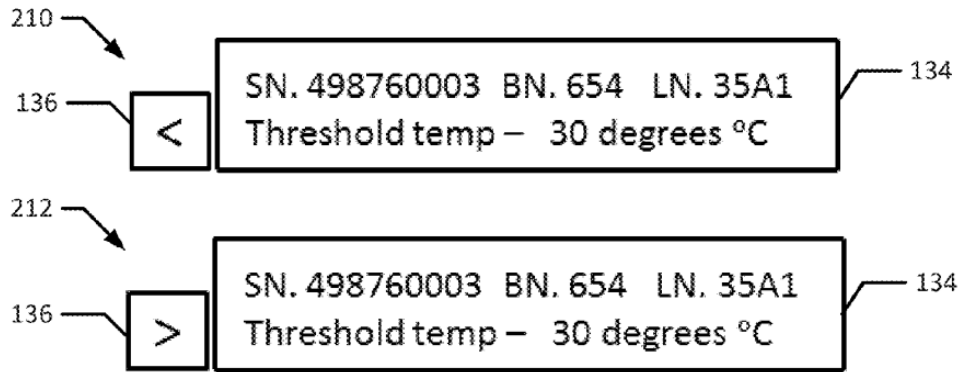


FIG. 6A

When applied to Vaillant’s marketing management system, the information about exposure to the environmental condition constitutes the claimed information to permit or deny the user to engage in a transaction via the label that has the 2-D barcode (i.e., the user instrument).

For example, Vaillant’s system includes bar codes that are “identified by automatic processing units” that manage the transaction of the product “between a distributor and a consumer or between a pharmaceutical laboratory and a hospital.” Vaillant 3:52-57. When the barcode indicates that a temperature threshold has been exceeded, “the product can [] no longer be sold.” Vaillant 13:4-8. Although Vaillant accomplishes this goal by masking the barcode to prevent its reading, Prusik discloses a dynamic barcode that enables the reader to decode information telling it that the product has been exposed above a threshold temperature. Prusik [0084]. Thus, in the combination of Prusik and Vaillant, Prusik’s dynamic information 136

“comprises information to permit or deny the user to engage in a transaction via the user instrument” as recited in limitation 1[f].

D. Dependent Claims 4-7

Claims 4-7 all depend from claim 1 and are obvious over the combination of Prusik and Vaillant for the reasons described below.

1. Claim 4: User Instrument is a Label

Claim 4 recites: “The user instrument of claim 1, wherein the user instrument is a label.” Prusik discloses this element for the reasons described above for 1[pre]. *See* Section V.C.1; Sarrafzadeh Decl. ¶¶190-191.

2. Claim 5: Second Area of Stimuli-Responsive Material Results in Human-Readable Indicia

Claim 5 recites: “The user instrument of claim 1, further comprising a second area of stimuli-responsive material configured to transform in response to a trigger, wherein the transformation of the stimuli-responsive material of the second area results in human readable indicia.”

The combination of Prusik and Vaillant renders this obvious. Specifically, Prusik discloses that its sensor dye (the claimed stimuli-responsive material) may include “visual patterns and images of any type, such as ISO or ANSI or ISO warning signs or symbols, or any other type of designed graphic.” Prusik [0101]. A POSITA would have understood that the visual pattern or image would be designed

to be human readable to alert the human reader to the intended warning. Sarrafzadeh Decl. ¶192.

3. Claim 6: Stimuli-Responsive Material Forms Part of Graphically Encoded Icon

Claim 6 recites: “The user instrument of claim 5, wherein the second area of stimuli-responsive material forms a part of the graphically encoded icon.” As explained above for Claim 5, Prusik discloses a second area of stimuli-responsive material to provide “visual patterns and images.” *See* Section V.D.2. A POSITA would understand that this second area would also form part of the graphically encoded icon. Sarrafzadeh Decl. ¶193. For example, Prusik explains that these visual patterns and images would occupy components of the 2D barcode including a “number of bits” and a “number of utahs” which are groups of modules roughly shaped like Utah. Prusik [0101]; [0076]. Thus, this second area of stimuli-responsive material is part of the Data Matrix two-dimensional barcode, which in turn forms the graphically encoded icon. Sarrafzadeh Decl. ¶193.

4. Claim 7: Machine-Readable Indicia is Non-Human Readable

Claim 7 recites: “The user instrument of claim 1, wherein the machine-readable indicia is non-human readable.” Notwithstanding the fact that claim 7 does not specify whether it relates back to the “first” or “second machine-readable indicia” of claim 1, the first and second machine-readable indicia are both non-human

readable for the same reason. Specifically, and as explained above for claim 10, a POSITA would understand that Prusik's 2D barcode, including the machine-readable indicia of the dynamic ink, is nonhuman readable as that term is used in claim 10 of the '818 patent. Sarrafzadeh Decl. ¶194; *see also* Prusik [0001], [0084] (describing a two-dimensional barcode encoded with the static data 134 and dynamic data 136 that can be a "Data Matrix or QR code" where "the set of dynamic data 136 is readable by a reader of the 2D barcode ... when the set of dynamic data is in each of the plurality of states.").

E. Independent Claim 16

1. 16[pre]: Preamble

Claim 16's preambles recite: "An article, comprising."

Prusik discloses a "labeled product" that includes a "two dimensional barcode with dynamic environmental data." Prusik Abstract. This labeled product constitutes an "article." Sarrafzadeh Decl. ¶195.

2. 16[a]: User Instrument Comprising Graphically-Encoded Icon

Limitation 16[a] recites: "a user instrument associated with a user, the user instrument comprising a graphically encoded icon."

Prusik discloses this limitation for the reasons discussed above for claim element 1[pre]/1[a]. *See* Sections V.C.1, V.C.2; Sarrafzadeh Decl. ¶196. Further, the label (user instrument) of the labeled product is associated with a user at least to the

extent that the user wishes to use the label to further the marketing of the product (e.g., to purchase the product or move it along the cold chain) in the combination of Prusik and Vaillant.

3. 16[b]: Stimuli-Responsive Material is Machine-Readable Indicia

Limitation 16[b] recites: “the graphically-encoded icon comprising an area of stimuli-responsive material defining a machine-readable indicia.” The combination discloses this limitation for the same reason as described above for limitation 1[c]. Sarrafzadeh Decl. ¶197.

4. 16[c]: Intrinsic Portion Comprises Stimuli-Responsive Material

Claim element 16[c] recites: “wherein: the stimuli-responsive material is configured to change from a first state to a second state in response to a trigger.” Prusik discloses this limitation for the reasons described above for limitation 1[d]. *See* Section V.C.5; Sarrafzadeh Decl. ¶198.

5. 16[d]: Engaging in a Transaction

Claim element 16[d] recites: “after the change of the stimuli-responsive material from the first state to the second state, the machine-readable indicia comprises information to permit or deny a user to engage in a transaction using the user instrument.” The combination of Prusik and Vaillant renders this claim element obvious for the same reasons as described above for limitations 1[f]. *See* Section V.C.7; Sarrafzadeh Decl. ¶199.

F. Dependent Claims 17-20

Claims 17-20 depend on claim 16 and are obvious in view of Prusik and Vaillant for the reasons provided below.

1. Claim 17: User Instrument

Claim 17 recites: “The article of claim 16, wherein the user instrument is selected from the list consisting of: a label, a credit card, and a badge.” The combination of Prusik and Vaillant discloses this limitation for the same reason as described above for limitation 1[pre] and claim 4—i.e., the user instrument is a label. *See* Sections V.C.1, V.D.1; Sarrafzadeh Decl. ¶¶200-203.

2. Claim 18: Machine-readable Indicia is Non-Human Readable

Claim 18 recites: “The article of claim 16, wherein the machine-readable indicia is non-human readable.” The combination of Prusik and Vaillant renders this element obvious for the same reason that Prusik’s barcode renders it obvious as described above for claim 10 in Ground 1(a). *See* Section IV.C.2; Sarrafzadeh Decl. ¶204.

3. Claim 19: Automatic Trigger Based on Predetermined Condition

Claim 19 recites: “The article of claim 16, wherein the trigger occurs automatically based upon a predetermined condition.” The combination of Prusik and Vaillant renders this element obvious for the same reason as described above for

Prusik’s barcode in relation to claims 13 and 15 in Ground 1(a). *See* Section IV.C.5; Sarrafzadeh Decl. ¶205.

4. Claim 20: Graphically Encoded Icon Configured as QR Code

Claim 20 recites: “The article of claim 16, wherein the graphically encoded icon is configured as a QR code.” As discussed above for claim 10 in Ground 1(a), Prusik discloses that its two-dimensional barcode can be configured as a “Data Matrix or QR code.” Prusik [0001]; *see* Section IV.C.10; Sarrafzadeh Decl. ¶206; *see also* Prusik [0109] (describing a 2D barcode in the form of a QR code).

VI. Ground 2: Claims 8-11 and 13-15 are obvious over Burg in view of a POSITA’s knowledge

Claims 8-11 and 13-15 are obvious over Burg for the reasons discussed below.

A. Overview of Burg (Ex. 1007)

U.S. Publ. No. 2015/0308961 to Burg et al. (“Burg”) is prior art under both §§102(a)(1) and 102(a)(2) because it was filed on February 27, 2015 and published on October 29, 2015, both of which were before the ’818 patent’s earliest claimed November 22, 2017 priority date. Burg was not cited or considered during prosecution of the ’818 patent.

Burg discloses “performing quantitative assessment of color changes induced by exposure of multiple test strips to a biological material/fluid.” Ex. 1007 (Burg) [0009].

For example, Burg's Figure 1 below shows a diagnostic instrument 10 with test strips 14 that include "test media such as chemical test pads (CTP) 22" which have a "color changing reagent for identifying the concentration of certain analytes in a patient fluid, such as urine, blood, or saliva." Burg [0047].

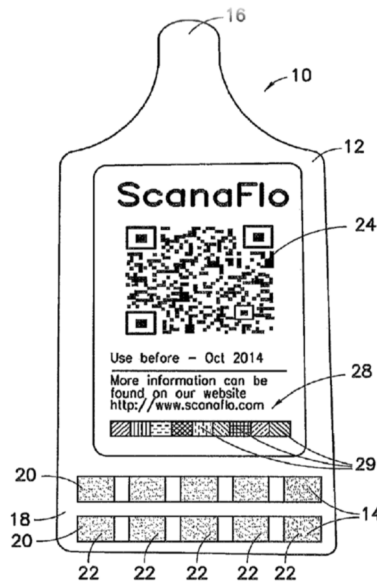


FIG. 1

The diagnostic instrument also includes a unique identification (UID) 24 that may "contain certain identification information about the diagnostic instrument 10, such as a list of the analytes that are being tested, expiration date of the instrument 10, the conditions that are being tested, and other identifying information." Burg [0050]. This identifying information "may be printed directly on or encrypted with the UID 24, such as is the case with a label or two-dimensional bar code, such as a QR code." Burg [0050].

Burg further discloses “the performance of color-based reaction testing of biological material in an automatically calibrated environment” that can be “implemented as a software application (an ‘App’) running on a portable electronic device, such as a cell phone, tablet PC, computer, laptop, or other dedicated electronic device.” Burg [0044].

B. Claims 8 and 14

1. 8[pre]/14[pre]: Preamble

The preambles of claims 8 and 14 recite: “A graphically encoded icon.” The preambles are not limiting for the reasons discussed above for Ground 1(a). Nevertheless, to the extent the preambles are limiting, Burg discloses them. Sarrafzadeh Decl. ¶¶207-211.

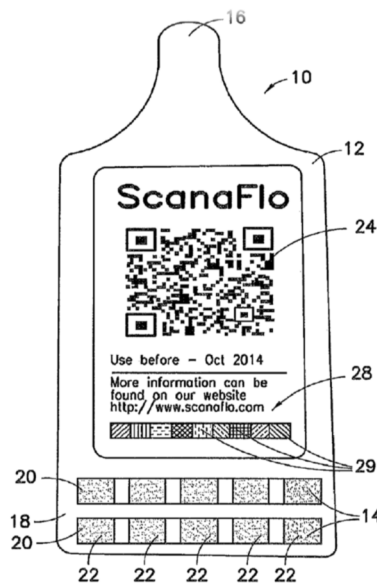
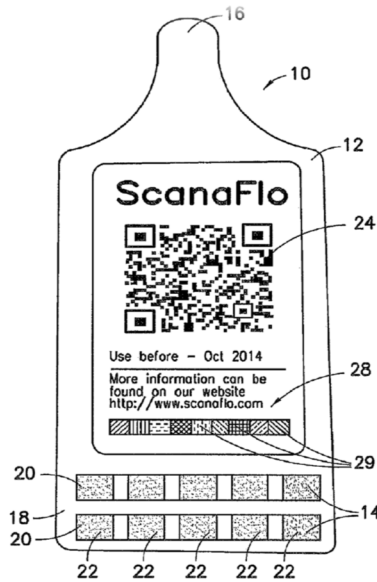


FIG. 1

As shown above in Fig. 1, Burg discloses a diagnostic instrument that allows for a “quantitative assessment” of color changes to test strips caused by exposure to biological material/fluid. Burg [0009]. Burg’s diagnostic instrument includes a paddle with (1) a unique identification (UID) 24, which can be a two-dimensional bar code such as a QR code, and (2) test strips 14 with “a plurality of test media such as chemical test pads (CTP) 22, containing a color changing reagent for identifying the concentration of certain analytes in a patient fluid, such as urine, blood, or saliva.” Burg [0046], [0050]; Sarrafzadeh Decl. ¶210. Together, the UID and test strips on the paddle are a graphically encoded icon. Sarrafzadeh Decl. ¶211.

2. 8[a]/14[a]: Label With Static and Intrinsic Portions

Limitations 8[a] and 14[a] recite: “a label attached to an object, the label comprising a static portion and an intrinsic portion.” Burg discloses these limitations. Sarrafzadeh Decl. ¶¶212-214.

**FIG.1**

Burg's diagnostic instrument shown in Fig. 1 above includes a paddle 12 with a static portion including an identification label with identification code (UID 24), which can be a "two-dimensional bar code, such as a QR code." Burg [0050]. Fig. 1; Sarrafzadeh Decl. ¶213. The diagnostic instrument also includes an intrinsic portion made up of test strips 14 that are attached to the paddle. Burg [0047]; Sarrafzadeh Decl. ¶216. Burg's test strips are configured to display intrinsic attributes of the tested biological fluid, which each "contain[] a color-changing reagent for identifying the concentration of certain analytes in a patient fluid, such as urine, blood, or saliva." Burg [0047]; Sarrafzadeh Decl. ¶213.

A POSITA would have understood the application of the two dimensional barcode and test strips to the paddle to constitute a label attached to an object. As Burg explains, handling a used test strip which is "soiled by biological samples such

as urine, blood, feces, etc.,” is undesirable and thus, Burg’s paddle with the two dimensional barcode and test strips attached helps the user “confidently perform the test” without “worrying that he or she will accidentally contact patient fluid.” Burg [0048], [0051]; Sarrafzadeh Decl. ¶214.

3. 8[b]/14[b]: Static Portion Comprises Machine-Readable Indicia

Limitations 8[b] and 14[b] recite: “the static portion comprises machine-readable indicia.” Burg discloses these limitations. Sarrafzadeh Decl. ¶¶215-216.

As discussed above, the UID of Burg’s diagnostic instrument is the static portion, which can be a “two-dimensional bar code, such as a QR code,” which a POSITA would understand to be machine-readable indicia. Burg [0050]; Sarrafzadeh Decl. ¶216. Burg discloses that a portable electronic device captures an image of the diagnostic instrument, which includes “an optical reader (e.g. bar code, matrix bar code reader, two-dimensional bar code reader, or a QR code reader)” that is “associated with the portable electronic device.” Burg [0065]. This is used to “scan the captured digital image to locate the UID.” Burg [0065]. The UID “includes or corresponds to” information about the diagnostic instrument that is being tested, and “software is configured to ensure that the diagnostic instrument is safe for use and suitable for a specific application, based on the identification information from the UID.” Burg [0065].

4. [8c]/[14c]: Intrinsic Portion Comprises Stimuli-Responsive Material

Limitations [8[c] and 14[c] recite: “the intrinsic portion comprises an area of stimuli-responsive material.” Burg discloses these limitations. Sarrafzadeh Decl. ¶¶217-218.

Burg’s diagnostic instrument comprises the claimed intrinsic portion via test strips made of a stimuli-responsive material that changes color in response to exposure to chemical analytes in patient fluid. Sarrafzadeh Decl. ¶218. For example, Burg describes that the test strips include test media “such as chemical test pads (CTP) 22, containing a color-changing reagent for identifying the concentration of certain analytes in a patient fluid.” Burg [0047]. Burg explains that these chemical test pads change color “over a range of analyte concentrations or titration level (e.g. absent, normal, positive, very positive ...).” Burg [0068].

5. 8[d]/14[d]: Stimuli-Responsive Material Changes States in Response to a Trigger

Limitations 8[d] and 14[d] recite: “the stimuli-responsive material is configured to change from a first state to a second state in response to a trigger, the change in state being based on an attribute about the object.” Burg discloses these limitations. Sarrafzadeh Decl. ¶¶219-221.

As discussed above, Burg discloses that the chemical test pads of the test strips change color from a first state to a second in response to a trigger of exposure to

analytes in a patient fluid. Section VI.B.4; Burg [0047]; Sarrafzadeh Decl. ¶220. The level of analytes (in the patient fluid contained in the paddle) to which the test pads have been exposed constitutes an attribute of the object. Burg explains that a user exposes “the diagnostic instrument to a biological sample, which exposes the plurality of CTP to analytes contained in the sample and begins a chemical reaction between the CTP and analytes.” Burg [0063]. In response to being exposed to a chemical analyte (the claimed trigger), the CTP change from a first color to a color corresponding to a “range of possible color changes of the CTP being tested.” Burg [0068]; Sarrafzadeh Decl. ¶221.

6. 8[e]/14[e]: Change in Transparency/Reflection of Stimuli-Responsive Material

Limitation 8[e] recites: “the transformation of the stimuli-responsive material is a change in the transparency of the stimuli-responsive material.” Limitation 14[e] uses similar language but recites that “the transformation of the stimuli-responsive material is a change in the reflection of the stimuli-responsive material.” Burg discloses these limitations. Sarrafzadeh Decl. ¶¶222-228.

For example, Burg explains that exposing the CTP to a biological fluid containing levels of chemical analyte results in a color change where “the intensity of a color change of the test strip is an indication of the concentration of the analyte or disease marker in the patient fluid.” Burg [0045]. A POSITA would understand that this change in color intensity is the claimed change in transparency or reflection

of the CTP. Sarrafzadeh Decl. ¶223. For example, a POSITA would have understood that the color of a sample corresponds to the wavelength of light that is reflected by the sample; similarly, the intensity of the color corresponds to how much light reflects versus passes through the sample (e.g., how transparent the color is). Thus, changing color at different intensities also changes reflection and transparency. Sarrafzadeh Decl. ¶223.

To the extent Patent Owner argues that this limitation is missing in Burg, it would have been obvious to a POSITA. For example, the intensity of the color change can be attributed to the transparency of a material—i.e., when more light passes through the CTP and onto the white surface of the strip behind it, the color is perceived as less intense than an opaque strip that reflects all of the light at a given color/wavelength. Sarrafzadeh Decl. ¶224.

Additionally, a POSITA would have known that the stimuli-responsive material in diagnostic test strips, such as dip sticks, is colorless by default and transforms to a colored state when exposed to a certain analyte or disease agent. For example, U.S. Patent 5,496,702 describes the state of the art as early as 1996. Ex.1023 (Bishop), 1:11-23. Even then, “[v]arious dry analytical assay elements [were] commercially available” as well as “known dry multilayer immunoassay elements [that] include a layer comprising a leuco dye.” Bishop 1:11-14. Specifically, the leuco dye “is oxidized *to a colored form*” (from a colorless form) when exposed

to a specified analyte in the course of an assay. Bishop 1:14-17. A POSITA would have therefore been motivated to apply such well-known leuco dyes to the dipsticks and immunoassays of Burg, which does not require its test to have an initial color or limit its changing stimuli-responsive material. Sarrafzadeh Decl. ¶¶XXX; *see also* Burg [0004], [0006]. Thus, the use of well-known leuco dyes, which start as transparent and change to a colored form, would have been nothing more than the use of a known technique to a known device (Burg’s dipsticks and immunoassays) with predictable results. Sarrafzadeh Decl. ¶¶225-226.

It also would have been obvious to a POSITA for the transformation to be a change in the reflection of the material. Sarrafzadeh Decl. ¶¶227. Specifically, a POSITA would have understood that when leuco dyes change to a colored form, “the reflection density of the color is proportional to the concentration of analyte in the sample,” a fact that was “well known” as early as 1996. Bishop 1:17-19. This density corresponds to the “intensity” of the color change disclosed in Burg. Burg [0145]. As was well-known, this reflection density can be measured using a reflectometer. Bishop 1:19-20.

Accordingly, Burg renders limitations 8[e]/14[e] obvious.

C. Dependent Claims 9-11, 13, and 15

Claims 9-13 depend from claim 8. Claim 15 depends from claim 14, but recites an identical limitation as claim 13. Burg renders all of these dependent claims obvious in view of the knowledge of a POSITA.

1. Claim 9: Change in Stimuli-Responsive Material Results in Machine-Readable Indicia

Claim 9 recites: “The graphically encoded icon of claim 8, wherein the change in state of the stimuli-responsive material results in machine-readable indicia.” As explained below, Burg discloses this limitation through its “computer-implemented method for quantifying color change of at least one test medium.” Sarrafzadeh Decl. ¶¶229-234; Burg [0010].

After the CTP change colors in response to being exposed to a chemical analyte, Burg explains that the CTP are analyzed by a portable electronic device configured “to determine a test result including an analyte concentration of the biological sample being tested” based on an image captured by the device. Burg [0014]; [0063]; [0068]. Burg then discloses methods of performing “color-based reaction testing of biological material in an automatically calibrated environment” that can be “implemented as a software application (an ‘App’) running on a portable electronic device, such as a cell phone, tablet PC, computer, laptop, or other dedicated electronic device.” Burg [0044].

As Burg explains, the electronic device's processor "controls a digital image analyzer 120 for identifying regions of a digital image containing relevant data, color correcting the digital image, and comparing the corrected portions of the digital image to table entries of the MICC to determine test results." Burg [0058]. Therefore, because the color changes of the CTP are analyzed by an electronic device running a software application on a processor, a POSITA would understand that the change in color of the CTP when exposed to a chemical analyte results in machine readable indicia. Sarrafzadeh Decl. ¶234.

2. Claim 10: Machine-Readable Indicia of Stimuli-Responsive Material is Non-Human Readable

Claim 10 recites: "The graphically encoded icon of claim 9, wherein the machine-readable indicia of the stimuli-responsive material is non-human readable." Burg renders this claim obvious. Sarrafzadeh Decl. ¶¶235-238.

Burg explains that one benefit of the disclosed system is that it not reliant on visual interpretation of CTP color changes by a human. Burg [0120]; Sarrafzadeh Decl. ¶¶236-237. Specifically, its disclosed methods and system are "quite tolerant of nonlinearities, and do[] not require a unitary relationship with any human visual properties, making its numerical value and interpretation independent of the color vision of the observer, ambient lighting when the digital image was taken, residual metamerism, or indeed most commonly encountered errors, for which calibration and compensation did not formerly exist." Burg [0120]. Like embodiments in

the '818 patent, Burg's machine-readable indicia does not include symbols that are readable to a human with the naked eye, such as Arabic numerals, Greek numerals, Chinese numerals, or the Roman alphabet. *See* 'Ex. 1001, 5:6-10 (unlike Arabic numerals, "humans are typically unable to decipher such machine-readable indicia using the naked eye").

Burg's disclosed method thus applies computer-implemented image processing techniques to "automatically read[] test strips..., which uses a digital image captured in an un-calibrated environment." Burg [0008]. Further, Burg's system is "configured to automatically calibrate the digital image to correct any color deficiencies, artifacts, or other ambiguities." Burg [0008]. Moreover, Burg's system "also automatically identif[ies] the relevant portions of the digital image, regardless of how the test strip and/or color reference are positioned in the digital image." Burg [0008]. Thus, a POSITA reading Burg would understand that the CTP captured in a digital image are non-human readable. Sarrafzadeh Decl. ¶238.

3. Claim 11: Machine-Readable Indicia of Static Portion is Non-Human Readable

Claim 11 recites: "The graphically encoded icon of claim 10, wherein the machine-readable indicia of the static portion is non-human readable." Burg renders this claim obvious. Sarrafzadeh Decl. ¶¶239-240.

As discussed above for claims 8/14, the UID of Burg's diagnostic instrument is the claimed static portion. Burg's UID can be a "two-dimensional bar code, such

as a QR code” that includes machine-readable indicia that are non-human readable. Burg [0050]; Sarrafzadeh Decl. ¶240. Burg explains that “the UID 24 may be configured to contain certain identification information about the diagnostic instrument 10, such as a list of the analytes that are being tested, expiration date of the instrument 10, the conditions that are being tested, and other identifying information” and that this information may be “encrypted with the UID 24.” Burg [0050]. And like embodiments in the ’818 patent, Burg’s machine-readable indicia does not include symbols that are readable to a human with the naked eye, such as Arabic numerals, Greek numerals, Chinese numerals, or the Roman alphabet. *See* Ex. 1001, 5:6-10. Thus, a POSITA would understand that this encrypted information contained within the UID is non-human readable. Sarrafzadeh Decl. ¶240.

4. Claims 13 and 15: Automatic Trigger Based on Predetermined Condition

Claim 13 depends from claim 8 and recites: “wherein the trigger occurs automatically based on a predetermined condition about the attribute of the object.” Claim 15 depends from claim 14 and has identical language to claim 8. Burg discloses these limitations. Sarrafzadeh Decl. ¶¶241-242.

As discussed above for limitations 8[d]/14[d], the CTP of Burg’s test strips changes color in response to being exposed to a biological fluid containing chemical analytes (the claimed trigger). The exposure to the analytes (trigger) occurs automatically when the test strips are put in contact with the biological fluid

containing the analytes. Sarrafzadeh Decl. ¶242. The trigger is based on a predetermined condition (i.e., the level of exposure to a chemical analyte that triggers color change) about the attribute of the object (the concentration of a chemical analyte in the fluid contained on the paddle) as the CTP's color automatically changes to a color intensity that is indicative of the concentration of that chemical analyte in the biological fluid. Burg [0063], [0068], [0009] (disclosing that "color changes [are] induced in various test strips by exposure to the [biological] sample."). Further, because a computer is able to determine the level of chemical analytes from the color change, the level of analytes that generate the change in state is predetermined. Sarrafzadeh Decl. ¶242.

VII. Ground 3: Claims 8-11 and 13-15 are obvious over Dimov

Challenged claims 8-11, and 13-15 are rendered obvious by Dimov in view of a POSITA's knowledge for the reasons discussed below.

A. Overview of Dimov (Ex. 1008)

Dimov was filed on April 6, 2017 and is prior art under 35 U.S.C. §102(a)(2). Dimov was not cited during prosecution of the '818 patent.

Dimov discloses a diagnostic system able to perform multiple disease diagnostic tests (e.g., influenza A and B) from a sample. Dimov 5:52-53. As illustrated in Figure 2, Dimov's system performs "image-based disease diagnostic tests" using (1) an "optical property modifying device" 120 containing a machine-

readable code and “reaction chambers” 240 and (2) a mobile device 110. *See* Dimov Abstract, 1:7-9; 4:57-67.

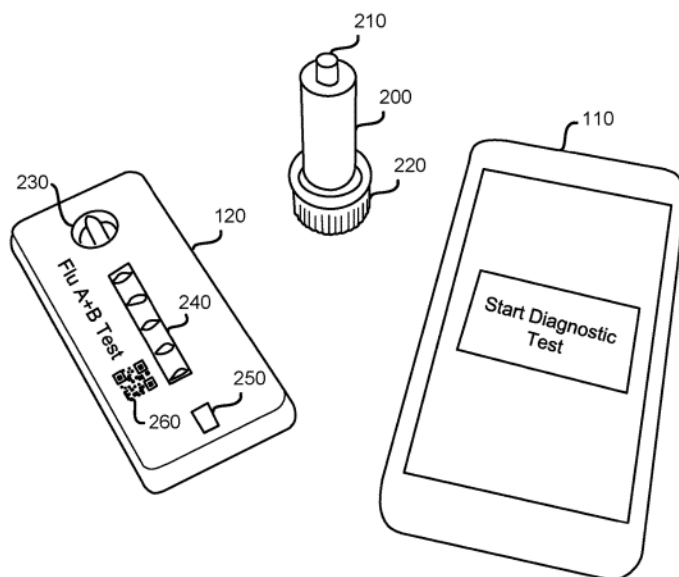
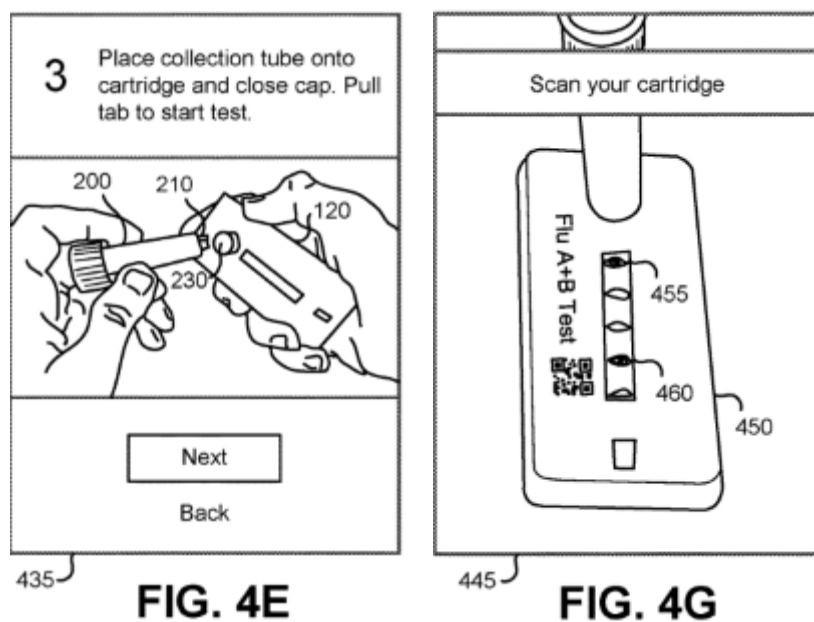


FIG. 2

The optical property modifying device can be attached to a sample collection tube. When attached as illustrated in Figures 4E and 4G, the collection tube provides a stored biological sample to the optical property modifying device 120. Dimov 6:19-34.



The reaction chambers within the optical property modifying device have “an optical property modifying reagent” that is used to “determine the presence or amount of a particular genetic target in a biological sample.” Dimov 5:29-35. The modifying reagent reacts to “[t]he presence or amount of this target nucleic acid sequence within the biological sample” to indicate to the system that the patient is infected or otherwise carries a disease. Dimov 5:38-41. The optical property modifying reagent “includes a dye which changes color or fluoresces upon target amplification, resulting in a visible change in the solution’s optical properties.” Dimov 5:41-44.

A mobile device captures an image of the optical property modifying device using an optical sensor, which the mobile device uses to perform an image analysis

to determine the test result. Dimov 2:25-28, 2:14-21. After an image of the optical property modifying device is acquired and processed by an image processing engine, Dimov’s image analysis engine analyzes the images and “determines one or more optical properties of the reaction chambers 240 such as the color, transparency, translucency, opacity, or uniformity of the reaction chambers 240 and/or contents within the reaction chambers.” Dimov 8:38-47.

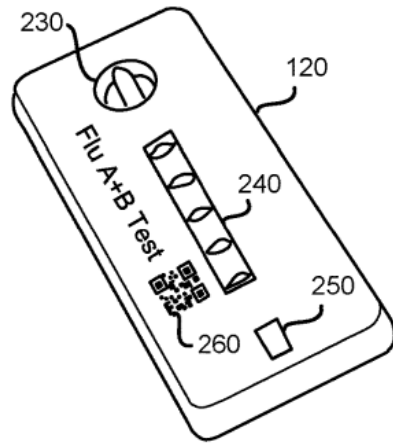
In addition, the optical property modifying device’s machine-readable code—which may be a “QR code 260,” “a barcode, or other identifier or machine-readable signature”—is “associated with information for a disease diagnostic test such as a type of test or expiration date of the test.” Dimov 5:21-26. The diagnostic system can then “determine the information for [the] disease diagnostic test by processing images of the QR code 260 scanned by an optical sensor of the mobile device 110.” Dimov 5:21-26.

B. Claim 8

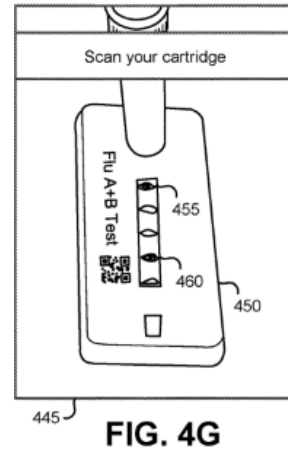
1. 8[pre]: Preamble

The preambles of claim 8 and 14 recite: “A graphically encoded icon.” The preambles are not limiting for the reasons discussed above for Ground 1(a). Nevertheless, to the extent that the preambles are limiting, Dimov discloses a graphically encoded icon through its “image-based disease diagnostic tests,” which uses an “optical property modifying device” containing a graphically encoded icon

in the form of “reaction chambers” and a QR code. *See* Dimov 1:7-9; 4:57-67; Sarrafzadeh Decl. ¶¶243-244.



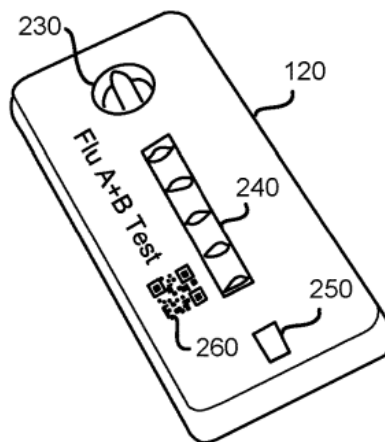
Dimov Figure 2 (excerpt)



Dimov Figure 4G

2. 8[a]/14[a]: Label With Static and Intrinsic Portions

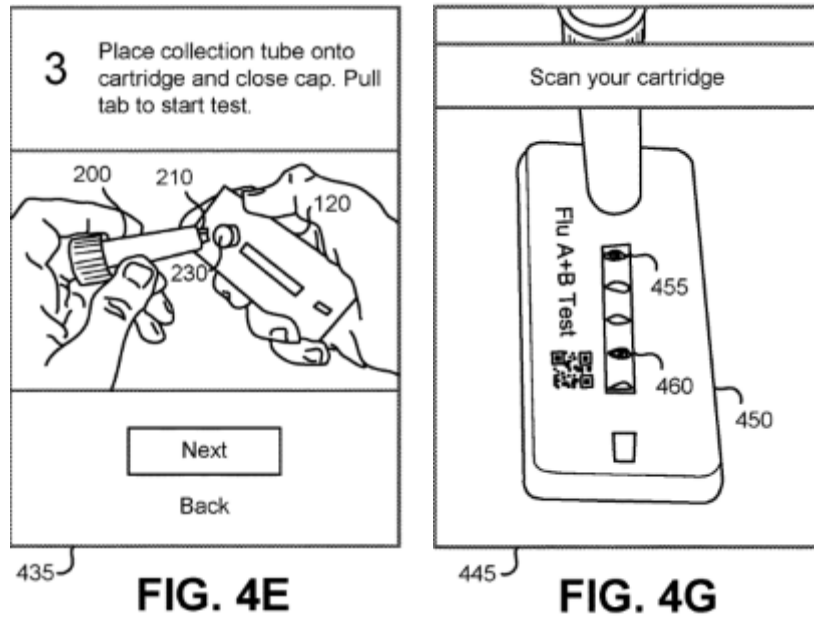
Limitations 8[a] and 14[a] recite: “a label attached to an object, the label comprising a static portion and an intrinsic portion.” Dimov discloses or suggests these limitations. Sarrafzadeh Decl. ¶¶245-248.



Dimov Figure 2 (excerpt)

Dimov discloses an optical property modifying device 120 with a QR code 260 (static portion) and reaction chambers 240 (intrinsic portion). Dimov 5:21-33. The reaction chambers 240 include “a dye which changes color or fluoresces upon target amplification, resulting in a visible change in the solution’s optical properties.” Dimov 5:31-44.

A POSITA would have understood the QR code and reaction chambers as applied and integrated onto the optical property modifying device to constitute a label attached to an object. Sarrafzadeh Decl. ¶¶246-247. The optical property modifying device, when attached to a collection tube, constitutes an object to which the label is attached. Sarrafzadeh Decl. ¶247. Dimov’s collection tube attaches to the optical property modifying device by “physically contacting the cartridge interface 210 of the collection tube 200 to the collection tube interface 230 of the optical property modifying device 120.” Dimov 6:23-27.



The static portion includes the QR code and the intrinsic portion includes the reaction chambers. Dimov 5:21-33.

Accordingly, Dimov discloses or renders obvious this limitation.

3. 8[b]/14[b]: Static Portion Element

Limitations 8[b] and 14[b] recite: “the static portion comprises machine-readable indicia.” Dimov discloses these limitations. Sarrafzadeh Decl. ¶¶249-252.

As described above for limitation 8[a]/14[a], Dimov discloses a “QR code 260” that corresponds to the claimed static portion. For example, the QR code “may be associated with information for a disease diagnostic test such as a type of test or expiration date of the test.” Dimov 5:21-23. A POSITA would have understood that this QR code comprises machine readable indicia. Sarrafzadeh Decl. ¶251. As Dimov explains, this QR code is machine-readable since the “diagnostic system 100

can determine the information for [the] disease diagnostic test by processing images of the QR code 260 scanned by an optical sensor of the mobile device 110.” Dimov 5:23-26. Dimov further explains that “[t]he QR code 260 can also be another type of code, such as a barcode, or other identifier or machine-readable signature.” Dimov 5:26-28.

Accordingly, Dimov discloses or renders obvious this limitation.

4. 8[c]/14[c]: Intrinsic Portion Element

Limitations [8[c] and 14[c] recite: “the intrinsic portion comprises an area of stimuli-responsive material.” Dimov discloses these limitations. Sarrafzadeh Decl. ¶¶253-255.

As explained above for limitations 8[c] and 14[c], Dimov’s reaction chambers 240 (the claimed intrinsic portion) have an optical property modifying reagent that determines the presence or amount of a particular genetic target in a biological sample using a “solution comprising nucleic acid enzymes and primers which specifically [] target [a] nucleic acid sequence specific to an organism of interest.” Dimov 5:33-38. A POSITA would understand that this optical property modifying reagent is a stimuli-responsive material because it has “a dye which changes color or fluoresces upon target amplification,” resulting in “a visible change in the solution’s optical properties.” Dimov 5:41-44.

Thus, Prusik discloses limitations 8[c]/14[c].

5. 8[d]/14[d]: Stimuli-Responsive Material Changes States

Limitations 8[d] and 14[d] recite: “the stimuli-responsive material is configured to change from a first state to a second state in response to a trigger, the change in state being based on an attribute about the object.” Dimov discloses these limitations. Sarrafzadeh Decl. ¶¶256-259.

As explained above for claim elements 8[c] and 14[d], Dimov’s optical property modifying reagent has “a dye which changes color or fluoresces” that results in “a visible change in the solution’s optical properties” upon “target amplification,” i.e., when the solution is in “the presence...of a particular genetic target in the biological sample.” Dimov 5:29-44. A POSITA would understand that this change from a first state (the original color) to a second state (the changed color or fluorescing) is in response to a trigger (the “presence or amount of a particular genetic target”). A POSITA would further understand that the color change in the optical property modifying reagent is based on an attribute of the object—i.e., the biological sample stored in the collection tube and the reaction chamber. Sarrafzadeh Sarrafzadeh Decl. ¶258. As Dimov explains, “[t]he presence or amount of this target nucleic acid sequence within the biological sample may indicate that a patient is infected with a particular pathogen or carries a particular genetic disease.” Dimov 5:38-41. Thus, in the same way that the label of the ’818 patent changes states based on the temperature of shrimp, Dimov’s prior art optical property modifying reagent

changes states based on the presence or amount of a particular genetic target in the biological sample stored in the object.

Accordingly, Dimov discloses or renders obvious this limitation.

6. 8[e]/14[e]: Change in Transparency/Reflection

Limitation 8[e] recites: “the transformation of the stimuli-responsive material is a change in the *transparency* of the stimuli-responsive material.” Limitation 14[e] uses similar language but recites that “the transformation of the stimuli-responsive material is a change in the *reflection* of the stimuli-responsive material.” Dimov discloses these limitations. Sarrafzadeh Decl. ¶¶260-265.

As explained above for claim elements 8[d] and 14[d], Dimov’s optical property modifying reagent includes a “dye which changes color or fluoresces.” Dimov 5:41-43. A POSITA would understand that a change in color or fluoresces that results in “a visible change in the solution’s optical properties” is a change in the transparency and reflection of the stimuli-responsive material for the same reasons discussed above in Ground 2 for limitation 8[e]/14[e]. Dimov 5:41-44; Sarrafzadeh Decl. ¶261. In fact, Dimov’s system determines “transparency, translucency, [and] opacity” when analyzing the color change. Dimov 8:38-47. Dimov determines these properties because they change based on the trigger. Sarrafzadeh Decl. ¶261.

Additionally, to the extent Patent Owner argues that this limitation is missing in Dimov, it would have been obvious to a POSITA. For example, Dimov measures the transparency, translucency, and opacity of the reaction chambers; therefore, it would have been obvious for the stimuli-responsive material in the chambers to change transparency, translucency, and opacity (including reflection, which is an aspect of translucency and opacity) in response to the trigger based on Dimov's suggestion. Sarrafzadeh Decl. ¶262.

Additionally, as described above for Ground 2, a POSITA would have known that well-known leuco dyes were commonly applied to diagnostic tests to transform to a colored state (i.e., from a transparent state) when exposed to a certain analyte or disease agent. Ex.1023 (Bishop), 1:11-23; Sarrafzadeh Decl. ¶263; *see* Section VI.B.6, *supra*. A POSITA would have therefore been motivated to apply such well-known leuco dyes to Dimov's solution, which uses has an "optical property modifying reagent [that] includes a dye which changes color or fluoresces upon target amplification, resulting in a visible change in the solution's optical properties." Dimov 5:41-44. Thus, the use of well-known leuco dyes, which start as transparent and change to a colored form, would have been nothing more than the use of a known technique to a known device (Dimov's diagnostic system) with predictable results. Sarrafzadeh Decl. ¶253.

It also would have been obvious to a POSITA for the transformation to be a change in the reflection of the material for the same reasons discussed above for Ground 2. *See* Section VI.B.6.

Accordingly, Dimov discloses or renders obvious limitations 8[e] and 14[e].

C. Dependent Claims 9-11, 13 and 15

Claims 9-13 depend from claim 8. Claim 15 depends from claim 14, but recites an identical limitation as claim 13. Dimov renders all of these dependent claims obvious in view of the knowledge of a POSITA.

1. Claim 9: Change in State Yields Machine-Readable Indicia

Claim 9 recites: “The graphically encoded icon of claim 8, wherein the change in state of the stimuli-responsive material results in machine-readable indicia.” Dimov discloses this limitation and renders claim 9 obvious.

As discussed above for limitation 8[c]/14[c], Dimov discloses a change in state of a stimuli-responsive material by through its “optical property modifying device” that includes an “optical property modifying reagent” with a “dye which changes color or fluoresces” upon detecting a targeted nucleic acid sequence within a biological sample. Dimov 5:33-48; Section VII.B.4; Sarrafzadeh Decl. ¶¶266-272.

A POSITA would have understood this change in state to result in a machine-readable indicia because, as explained below, Dimov discloses an image analysis engine that determines the optical properties of the reaction chambers. Sarrafzadeh

Decl. ¶271. Dimov discloses that its diagnostic system uses a mobile device that “acquires images of an optical property modifying device 120 using the image processing engine 320 and provides the images to the diagnostic server 150 for further processing by the image analysis engine 325.” Dimov 8:42-56. Specifically, the image analysis engine analyzes images acquired and processed by the image processing engine and “determines one or more optical properties of the reaction chambers 240 such as the color, transparency, translucency, opacity, or uniformity of the reaction chambers 240 and/or contents within the reaction chambers.” Dimov 8:38-47.

For example, the image analysis engine “determines information about the optical properties of the reaction chambers” such as “the average and variance of color of a group of pixels in an image corresponding to each reaction chamber.” Dimov 8:48-52. In turn, the image analysis engine determines “test results for a disease diagnostic test by comparing the determined color information of a reaction chamber 240 to reference information that indicates one or more color ranges.” Dimov 9:1-4. Thus, a POSITA would understand that the change in state of the stimuli-responsive material—i.e., the change in optical properties—results in machine-readable indicia. Sarrafzadeh Decl. ¶272.

2. Claim 10: Non-Human Readable Stimuli-Responsive Material

Claim 10 recites: “The graphically encoded icon of claim 9, wherein the machine-readable indicia of the stimuli-responsive material is non-human readable.”

A POSITA would have found it obvious for the machine-readable indicia of the stimuli-responsive material to be non-human readable based on Dimov’s disclosures. Sarrafzadeh Decl. ¶273. As explained above, the stimuli-responsive material results in a change in optical properties. *See* Section VII.B.5. Further, Dimov explains that the purpose of Dimov’s system is to provide a “reliable and portable end-to-end system that patients can complete in the comfort of their homes.” Dimov 1:36-39. One issue with traditional disease diagnostic tests, however, is that “trained personnel such as a nurse, physician, or lab technician must analyze” the diagnostic test results. Dimov 1:17-20. To overcome this, Dimov discloses a system for performing disease diagnostic tests that uses an “image processing engine 320, image analysis engine 325, [and] diagnostic test engine 330” to analyze the machine-readable indicia. Dimov 8:35-41; 6:35-55. Further, Dimov explains that the diagnostic system “can provide the test result and relevant metadata” to healthcare providers, meaning that the machine-readable indicia of the stimuli-responsive material itself is not read by a human. Dimov 2:5-8; Fig. 4H (showing test results on a mobile device as a binary “Positive” or “Negative” indication). Like embodiments in the ’818 patent, Burg’s machine-readable indicia does not include symbols that

are readable to a human with the naked eye, such as Arabic numerals, Greek numerals, Chinese numerals, or the Roman alphabet. *See* Ex. 1001 5:6-10. Thus, a POSITA would understand that the machine-readable indicia of the stimuli-responsive material could and would be non-human readable. Sarrafzadeh Decl. ¶274.

3. Claim 11: Static Portion is Non-Human Readable

Claim 11 recites: “The graphically encoded icon of claim 10, wherein the machine-readable indicia of the static portion is non-human readable.” As explained above for claim elements 8[b]/14[b], Dimov discloses a “QR code 260 that may be associated with information for a disease diagnostic test such as a type of test or expiration date of the test.” Dimov 5:21-28. As discussed in Ground 1(a) and Ground 2 for claim 11, a POSITA would have understood that the QR code is non-human readable. Sarrafzadeh Decl. ¶275.

4. Claim 13 and 15: Trigger Occurs Automatically

Claim 13 depends from claim 8 and recites: “wherein the trigger occurs automatically based on a predetermined condition about the attribute of the object.” Claim 15 depends from claim 14 and has identical language to claim 8. Dimov discloses or renders obvious these limitations. Sarrafzadeh Decl. ¶¶276-277.

As discussed above for limitations 8[d]/14[d], Dimov’s optical property modifying reagent has “a dye which changes color or fluoresces” that results in “a

visible change in the solution's optical properties" upon "target amplification," i.e., when the solution is in "the presence...of a particular genetic target in the biological sample." Dimov 5:29-44. A POSITA would understand that the change in optical properties, e.g., from an original color or fluorescence to a second color or fluorescence, is in response to the claimed trigger (exposure to the "presence or amount of a particular genetic target" sufficient to change the optical properties) that occurs automatically based on an attribute about the object (the amount of the particular genetic target contained in the biological sample). Sarrafzadeh Decl. ¶277.

VIII. The Board Should Reach the Merits of This Petition

The Board should reach the merits of this petition and should not exercise its discretion to deny based on 35 U.S.C. § 314(a) or § 325(d). None of the prior art at issue in this petition was cited or relied upon during prosecution of the '818 patent. As for the district court case, the court is currently stayed pending a decision on a motion to dismiss with no trial date scheduled. *Newtonoid Technologies, LLC v. Abbott Laboratories*, Dkt. 28, 31, No. 1:23-cv-2532 (N.D. Ill.).

Petitioner reserves the right to address any discretionary issues raised by Patentee based on the facts and law as they stand at that time.

IX. Mandatory Notices under 37 C.F.R. § 42.8

A. Real Parties-in-Interest

The real party-in-interest is Petitioner Abbott Laboratories. No other party had access to, control over, or contributed to funding of the preparation or filing of this Petition.

B. Related Matters

Newtonoid LLC asserted the '818 patent in the following district court case pending in the Northern District of Illinois: *Newtonoid Technologies, LLC v. Abbott Laboratories*, No. 1:23-cv-2532 (N.D. Ill.).

The USPTO Patent Center indicates that U.S. Application Serial Nos. 17/813,254, which is currently pending; 17/216,096, which issued as 10,963,773; and 16/667,552, which issued as 10,460,222; are related to the '818 patent.

C. Grounds for Standing

Petitioner certifies that the '818 patent is available for *inter partes* review and that Petitioner is not barred from requesting this proceeding.

D. Lead and Backup Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), Petitioner designates the following lead counsel:

- S. Giri Pathmanaban (Reg. No. 75,986), giri.pathmanaban@lw.com, Latham & Watkins LLP; 300 Colorado St., Suite 2400; Austin, TX 78701-3295; 737.910.7345 (Tel.); 737.910.7301 (Fax).

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Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney from Abbott is attached. Abbott consents to electronic service.

E. Fee for *Inter Partes* Review

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 506269.

X. Conclusion

For the reasons set forth above, Petitioner respectfully requests *inter partes* review of the challenged claims of the '818 Patent.

Respectfully submitted,

Dated: May 22, 2024

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CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains a total of 13,840 words, as calculated by Microsoft Word's word-count feature. This total excludes the cover page, signature block, and the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1).

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CERTIFICATE OF SERVICE

The undersigned certifies that a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 11,392,818 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for the patent shown Patent Center:

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