

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZHEJIANG LINGDI DIGITAL TECHNOLOGY CO., LTD.
Petitioner,

v.

CLO VIRTUAL FASHION, INC.
Patent Owner.

Case No. IPR2024-00980
U.S. Patent No. 11,222,448

PATENT OWNER'S PRELIMINARY RESPONSE

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PATENT OWNER'S EXHIBIT LIST

Exhibit No.	Description
2001	Declaration of Dr. Muthu Govindaraj

Pursuant to 35 U.S.C. § 313 and 37 C.F.R. § 42.107, Patent Owner CLO Virtual Fashion, Inc. (“Patent Owner” or “CLO”) hereby submits its Patent Owner Preliminary Response and exhibits thereto.

I. INTRODUCTION

The Board should deny institution of the Petition for *Inter Partes* Review (“IPR”) of U.S. Patent No. 11,222,448 (“the ’448 Patent”) because the ’448 Patent claims a novel and non-obvious method, software and apparatus for taking a measurement between two points in three-dimensional (3D) virtual clothing that accounts for the effects of gravity, material properties, and physical laws of the fabric on the polygons of mesh forming the virtual clothing. These advantages are critical to users of Patent Owner’s patented software, and are not found in the prior art.

Patent Owner is a pioneer in the virtual clothing design software industry and consistently innovates and improves its technology. Clothing simulation technology is a billion-dollar market, and is used to model clothing in various industries such as fashion, animation, movie visual effects, and gaming. Clothing simulation programs generally involve virtually sewing 2D digital patterns together along seam lines to create 3D clothing. A user selects the seam lines or line segments on the 2D patterns to be sewn together. The software then virtually drapes the 3D clothing formed from 2D patterns over a 3D avatar to allow a user to visualize how the clothing fits on an

actual person. Changes to the 2D patterns, length of the seam lines and type of fabric affect the draping of the 3D clothing.

3D clothing modeling is complex. 2D patterns are modeled with a mesh including a plurality of polygons to simulate the 3D virtual clothing. For example, three vertices of a triangle may be point masses having mass, and sides of the triangle may be represented as springs having elasticity which connects the point masses. Thus, the 2D pattern may be modeled by a mass-spring model, with the springs having respective resistance values against, for example, stretch, shear, and bending, depending on a material property of fabric used.

There are many instances in which measuring the length between points on 3D virtual clothing is needed or helpful when designing virtual clothing. This is particularly the case when the virtual rendering is used for fashion design or garment manufacturing, when designers must provide a number of points of measurements to manufacturers, customers or vendors. Accuracy and precision are required, but due to the complexities, measuring an accurate length between two points on virtual 3D clothing is not easy. For example, each polygon of mesh in the virtual fabric forming the virtual clothing is affected by gravity, wind, choice of fabric, collisions with the body and other physical laws that impact stretching or movement of the fabric.

The '448 Patent recognizes these difficulties and provides a method and apparatus that allows a user to more accurately and efficiently measure lengths between two or more desired points by measuring a length on a 2D pattern corresponding to 3D virtual clothing, instead of engaging in the difficult and potentially inaccurate exercise of measuring the distance in the 3D virtual clothing itself. The '448 Patent uses points in the 2D patterns, line segments between those points and attributes of the areas in which the points are located to carry out the measurements. And the points in the 2D patterns can be anywhere in or on the patterns to provide the type of important point of measurement information necessary for successful virtual clothing design and garment manufacturing.

Nothing comparable to this is disclosed in the prior art of record. Petitioner's primary reference does not include any disclosure of measuring the length of segments in different 2D fabric patterns – the very focus of the '448 claims. It fails to disclose many key elements of the '448 claims. Petitioner's secondary reference, a short video limited to arranging set images in space, has nothing to do with virtual clothing design and likewise fails to disclose those same key claim elements. Combining them cannot and does not create those elements where they don't exist in the first place. Petitioner cannot make a *prima facie* case of invalidity of the challenged claims.

Patent Owner's Preliminary Response lays out several independent reasons why this proceeding should not be instituted.

First, Petitioner's proposed combination fails to satisfy several significant claim elements. The Petitioner's primary reference is Grinspun, a patent publication showing bidirectional editing of virtual clothing, which simply means that a user's modifications to 2D patterns change the 3D rendering, and vice versa. For example, the user can click and drag an edge of a 2D pattern to change its length, and the corresponding changes are shown in the 3D view. But it is critical to understand that Grinspun's 2D patterns are virtually sewn together along seam lines to render the 3D virtual clothing garment. The seam lines dictate the 3D rendering. The location of the 2D patterns in the 2D window **does not matter**. A user can arrange or position the 2D patterns anywhere in the 2D window – the location of one 2D pattern relative to another 2D pattern in the 2D window does not affect the 3D rendered view. Grinspun does not take measurements of a 2D pattern, set points based on attributes of the areas, or determine the length of line segments between those points, let alone determine the length of line segments extending between points in 2D patterns by accounting for the separation between the different patterns.

Second, Petitioner attempt to bring in Graphicextras – a YouTube video showing a user's explanation of an Adobe Photoshop tool – does not help. The

Graphicxtras video starts with a user inserting an image of an object on a screen. The Photoshop software then generates a rectangular “bounding box” around the object. Like a stencil, the user simply copies and pastes the image multiple times. The Photoshop software determines the distances between the respective bounding boxes in order to evenly space the objects. The software never measures any part of the image itself, and is incapable of making any measurements from points inside the image. The software can only measure the rectangular bounding boxes around the objects and the distance between those bounding boxes. Petitioner completely ignores this, and instead inexplicably argues that the Grinspun-Graphicxtras combination would yield a system that determines distances between points *on the objects themselves*. That is not what Graphicxtras teaches at all.

Graphicxtras has nothing to do with settings points on 2D clothing patterns, and taking measurements between those points to provide accurate measurement information for implementation of a 3D virtual clothing design into actual garment construction or manufacturing. Like Grinspun, Graphicxtras cannot determine whether the points are located on the same pattern piece, or different pattern pieces because it cannot determine attributes of areas on the pattern on which the points are located. These elements are missing entirely from any Grinspun-Graphicxtras combination.

Third, the Petitioner's combination of Grinspun and Graphicxtras completely misses the claims. Rather than accounting for the claimed change in the length of a fixed line segment that spans two patterns based on the separation between the pattern pieces, Petitioner relies on the Grinspun-Graphicxtras combination to achieve the claimed change by moving the second pattern in its entirety. This is not what the claims say or require. Moreover, even if a user can see the distance between the 2D patterns on the 2D screen, this distance information is of *no benefit* to the user because the distance between the 2D patterns *does not affect* the rendered 3D clothing whatsoever. It is the dimensions *of the 2D patterns themselves* that affects the 3D rendering in Grinspun, not the dimensions *between* the 2D patterns.

Accordingly, for each of these reasons, the Petition is deficient and IPR should not be instituted.

II. OVERVIEW OF THE '448 PATENT

The '448 Patent discloses a method and apparatus for taking measurements of 2D digital fabric patterns corresponding to 3D virtual clothing. EX1001, Title, Abstract. A user defines a series of points, or points of measurement, in the 2D patterns, determines attributes of the areas in which those points of measurement are selected, measures the length of the line segments between the selected points, and outputs those lengths to a table or other list of the points of measurement to allow clothing designers and garment manufacturers to have accurate, precise

measurement data for the design and manufacture of actual clothing based on virtual 3D clothing. EX2001, ¶57.

These measurements must be accurate. *Id.* So the '448 Patent inventors recognized that it is difficult to measure a length between two points of three-dimensional (3D) virtual clothing. EX1001, 1:37-47; 9:17-20. The '448 Patent explains that when measuring a distance of length between two points from simulated 3D virtual clothing, the fabric mesh is made up of polygons, which are affected by several variables such as gravity, material, physical laws of the source fabric, and fabric properties such as stretch, ease or stiffness. EX2001, ¶58.

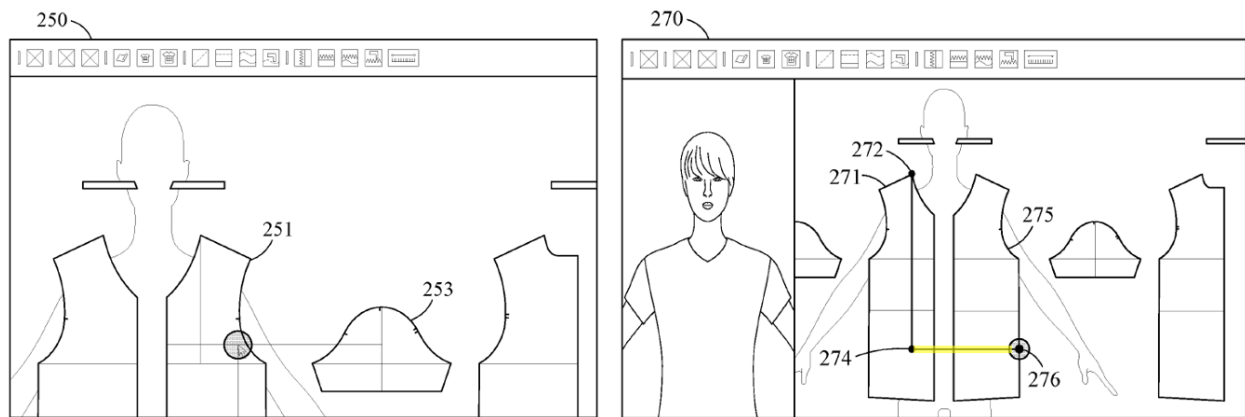
The '448 Patent's digital clothing program allows a user to set points of measurement anywhere in or on two or more 2D patterns and more accurately measure the lengths between two or more points on those patterns that correspond to the 3D virtual clothing. EX2001, ¶59. The '448 invention allows a user to account for space between patterns by changing the length of line segments that span two 2D patterns to account for that space. *Id.* This happens frequently. For instance, a garment manufacturer may need to check a dimension of a garment that would span two 2D patterns per the virtual 3D clothing design. But at that point, the garment is a single 3D piece of clothing. The '448 invention allows a designer to include as a point of measurement a distance spanning from one 2D pattern to

another 2D pattern, for use in both the 3D virtual rendering and the actual 3D garment. EX2001, ¶59.

Taking a measurement using the '448 Patent's digital clothing program starts with the user inputting two or more points in a space in which a 2D pattern of clothing is displayed, *e.g.* a starting point and an ending point. EX1001, 6:43-48; 7:25-30. The computer program determines certain attributes of areas in which the points are located, and then determines a length of a line segment between those points based on the determined attributes. EX1001, 6:55-67; 7:26-40; 8:1-58. The attributes include whether the points are located in a same pattern piece of the clothing or different pattern pieces of the clothing. *Id.*, 7:5-12; 8:4-27. The length of the line segment between the points can be different depending on whether the points are determined to be on the same pattern piece, or different pattern pieces. When the points are located in different pattern pieces, the determined length of the line segment is changed to account for separation between the pattern pieces in the 2D display space. *Id.*, 8:4-27; EX2001, ¶60.

As illustrated in Fig. 2A, a user may view 2D digital clothing patterns in a 2D window 210. EX2001, ¶61. A pattern 235 is shown as the right side of a shirt. *Id.* The user can select a "point of measurement" or a "tape measure" tab 215 at the top of the screen. As illustrated in Fig. 2B below, a user may set starting point 272 on

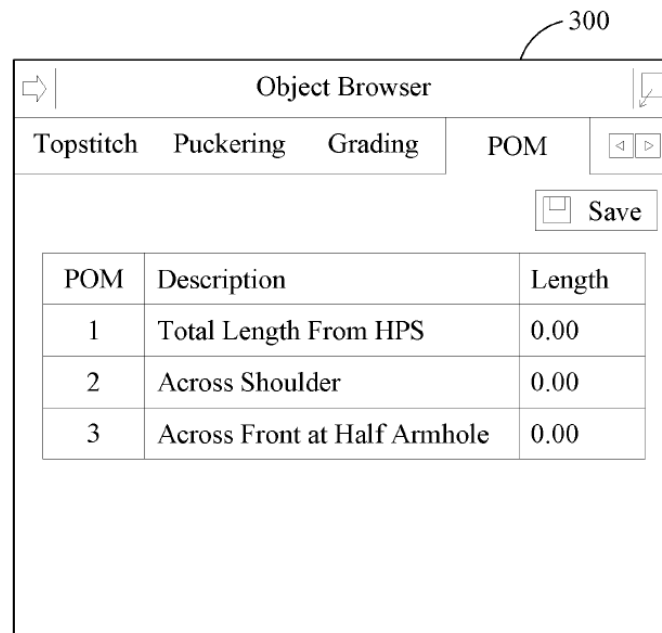
first pattern 271, ending point 276 on second pattern 275, and an intermediate point 274 on first pattern 271. EX1001 at 11:19-21. The '448 program measures the length of the first segment between points 272 and 274, and the length of the second segment between points 274 and 276. *Id.* at 11:22-26. There is a “connection line” (no reference numeral, highlighted in yellow below) that spans the space between the first and second patterns. Depending on what lengths are important to a user, the program can output the total length of the segment from points 272 to 276, and/or the lengths of the first and second segments. *Id.* at 11:27-39. The length of the total segment and/or just the second segment is calculated by removing the length of “connection line” from the length of the second segment spanning from point 274 to point 276. *Id.* EX2001, ¶61.



EX1001, FIG. 2A (annotated); EX2001, ¶61.

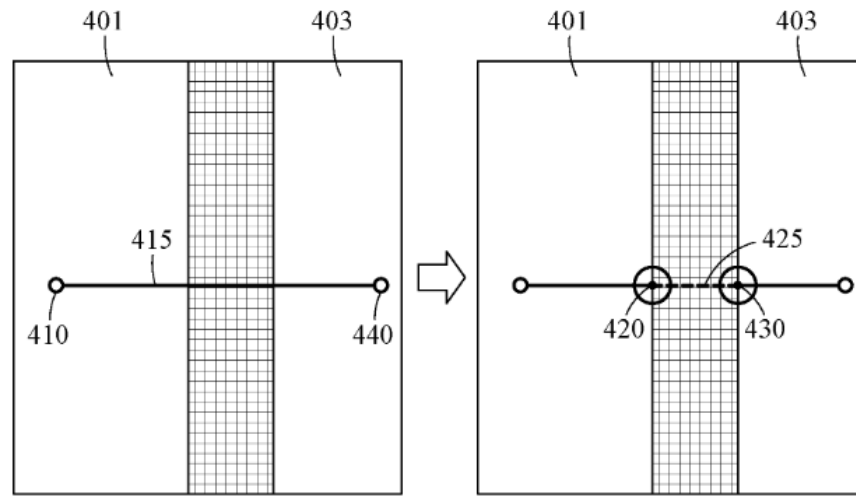
As shown in Fig. 3 below, the program includes a user interface that displays the list of points of measurement and the measurements between those points. *Id.* at

11:40-45. The points of measurement may be labelled to assist with subsequent use, and the segments assigned names so they are easily identifiable. *Id.* at 11:56-66. The line segments lengths may be automatically updated based on modifications to the size or configuration of the 2D patterns. EX2001, ¶62.



EX1001, FIG. 3

Another example is shown in FIG. 4, reproduced below. The '448 Patent's digital clothing program measures a length of a line segment 415 that connects the start point 410 from one pattern piece 401 to the end point 440 of another pattern piece 403. EX1001, 12:20-23. The points may be set inside of the 2D patterns, depending on what points of measurement are important or necessary to garment design and manufacturing. EX2001, ¶63.



EX1001, FIG. 4

The program measures “a length of a connection line 425 (indicated by a broken line) that connects an intersection point 420 at which the line segment 415 crosses an outer line of the pattern piece 401 and an intersection point 430 at which the line segment 415 crosses an outer line of the pattern piece 403.” *Id.*, 12:23-29. The determined length between the start point 410 and the end point 440 may be determined “by subtracting the length of the connection line 425 from the length of the line segment 415.” *Id.*, 12:29-31. “[T]he length of the connection line 425 may be changed as a user deforms or changes a position or size of a pattern piece or changes positions of points selected from the pattern piece.” *Id.*, 12:31-34. But the length of the connection line can still be determined after a user adjusts the pattern piece. That length is of the fixed line segment, not the difference between the old connection line and the new connection line. EX2001, ¶64. It is important that the

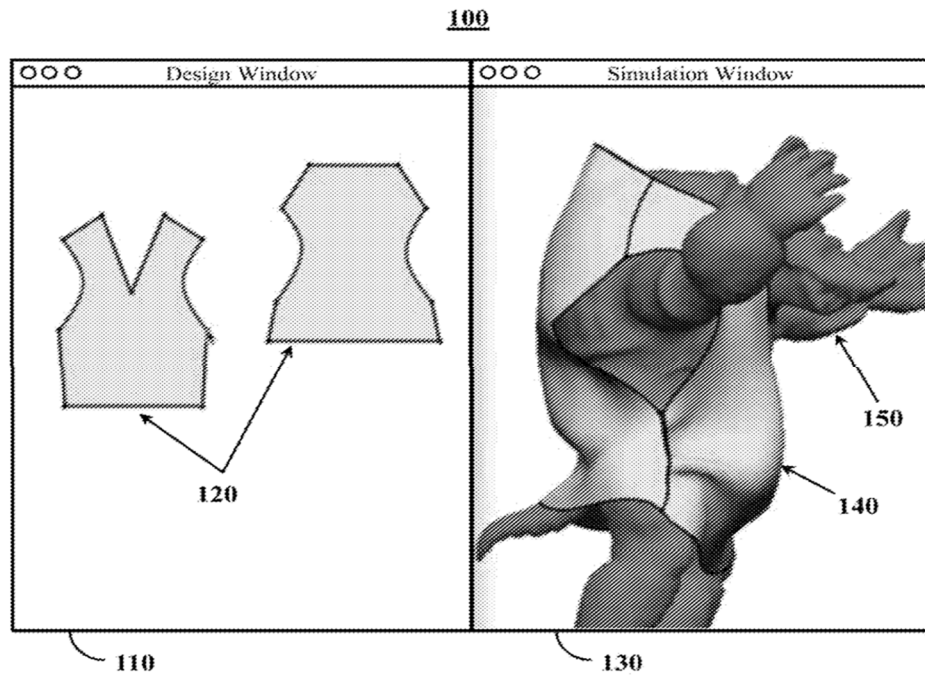
point of measurement data be accurate to reflect the dimensions of the current 2D patterns. *Id.*

The '448 Patent likewise describes setting points of measurement and calculating line segment lengths when the points in the two 2D patterns are offset, or don't match. See Figs. 5A and 5B. EX2001, ¶65.

III. OVERVIEW OF THE CITED REFERENCES

A. Grinspun

Grinspun is a patent application publication that describes CAD software enabling “interactive garment modeling and editing.” EX1004, [0010]-[0013], FIGS, 1-4 and 14-19. The CAD software provides an “interactive garment designing application that simultaneously and synchronously models a two-dimensional garment pattern and its corresponding three-dimensional draped representation.” *Id.*, [0003].



Manipulation of the shape or pattern boundary in the Design Window 110 can update the corresponding 3D draped representation in the Simulation Window 130. *Id.*, [0038]. For example, as shown in the example below, a user clicks and drag an edge of a sleeve of a 2D pattern to extend it out, causing the 3D rendering to show an extended sleeve. EX1004, [0042]-[0044], [0057], [0069]; EX2001, ¶67-68.

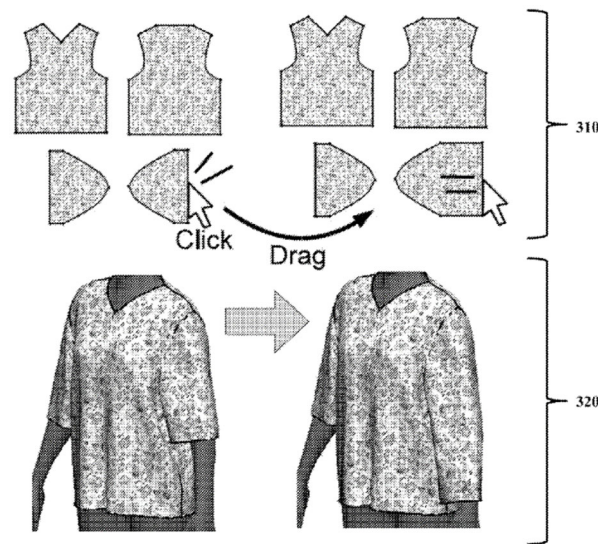


FIG. 3

EX1004, FIG. 3

But Grinspun has no disclosure or teaching of (1) selecting points of measurement in the 2D window, (2) determining attributes of the areas in which those points exist, or (3) measuring the lengths of the segments defined by those points. EX2001, ¶69. Rather, Grinspun is directed to ensuring that changes made to the patterns in the 2D window are carried over to the 3D window, and that changes made to the 3D clothing in the 3D window are carried over to the patterns in in the 2D window. *Id.* Grinspun was focused on the math that allowed the bidirectional adjustments, not on key virtual measurements that assist with actual garment manufacturing. *Id.*

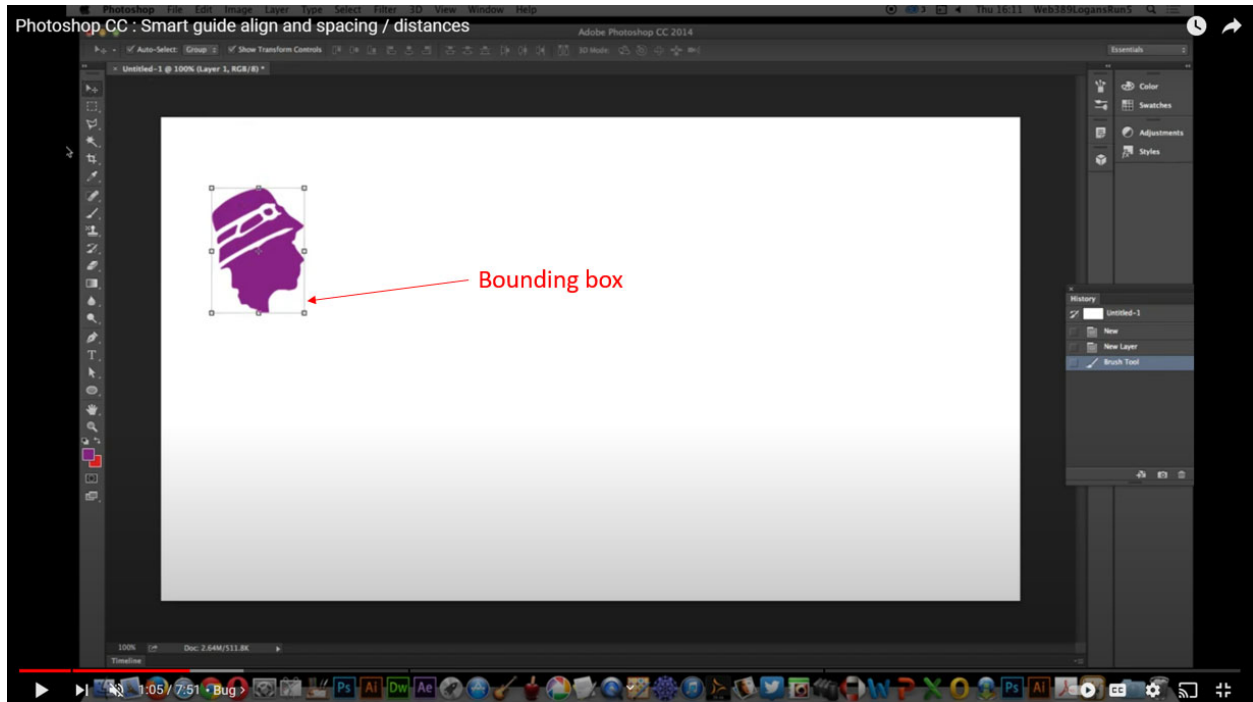
Additionally, to create the 3D rendering from the 2D patterns, the user must select seam lines on each pattern and virtually sew them together. EX2001, ¶70.

The relative positions and arrangement of the two 2D patterns in Grinspun's 2D window has *no effect* on the 3D display or the bidirectional editing. *Id.* A user is free to move and arrange the two 2D patterns in the 2D window without any effect on the 3D rendering in 3D window. *Id.* If the user were to move the 2D patterns closer or further away from one another, it would *not* alter the appearance of the 3D rendering at all. *Id.*

B. Grahpicxtras

Graphicxtras is a short YouTube video showing the use of a basic image-editing feature in Adobe Photoshop CC 2014. It has nothing to do with virtual clothing design. EX2001, ¶71.

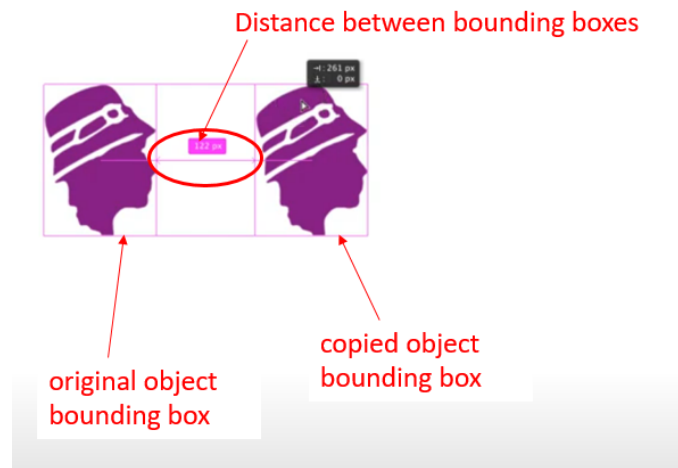
Graphicxtas describes its “Smart Guide” feature which provides distances between objects or images. The video depicts introducing an object (in this case, an icon of a person wearing a hat), onto the screen. EX2001, ¶72. The Photoshop software automatically generates a bounding box around the object. The bounding box corresponds to a rectangular area that defines the two-dimensional spatial extent of the object (*i.e.*, width and height). The bounding box has eight defined points (four at the corners, and four at the midpoints of the horizontal and vertical border lines). *Id.*



EX1005, 1:06 (annotated); EX2001, ¶72.

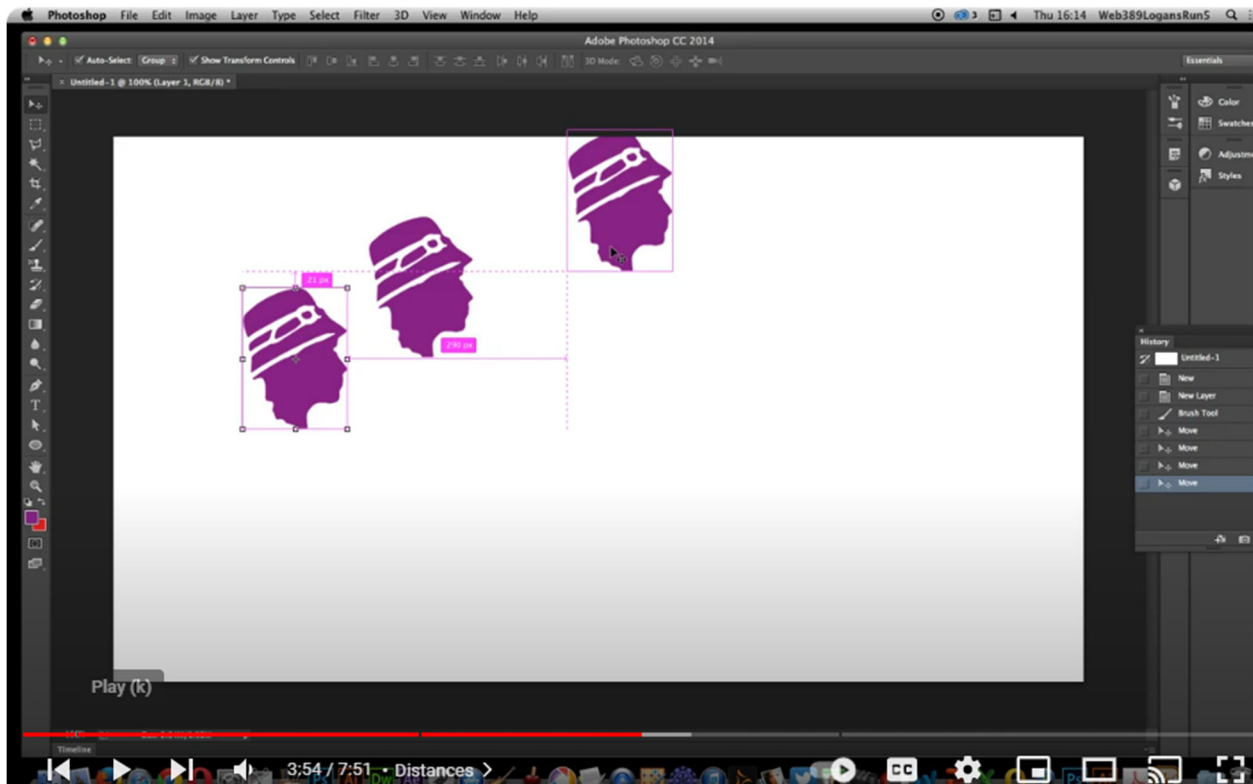
The video continues with copying the object and moving the copied object to a new location. Both the original object and the copied object are provided with a bounding box. The software displays the distance between the bounding box of the original object and the bounding box of the copied object. EX2001, ¶73. Notably, this distance (and all measurements in the video) are always taken relative to the ***bounding boxes***, and not the objects themselves. *Id.* Graphicextras **cannot** (i) set any points of measurement inside the bounding boxes (they are fixed images), (ii) measure any line segments between points within a bounding box, or (iii) measurement any line segments originating from a point within the bounding box. *Id.* This is not surprising, as Graphicextras does not contemplate and is not concerned

with providing accurate measurements between points of measurement set in 2D patterns for the design of 3D virtual clothing. *Id.* Graphicextras simply shows equal spacing between what amounts to digital stencils of images. *Id.*



EX1005, 1:25 (annotated); EX2001, ¶73.

Since the function of the Smart Guide feature is to provide distances between bounding boxes for spacing purposes, only horizontal and/or vertical distances are computed and displayed. EX2001, ¶74. As shown in the screenshot below, both horizontal and vertical distances between two objects are displayed when the objects are both horizontally and vertically offset:



EX1005, 3:54 (annotated); EX2001, ¶74.

IV. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner argues that a person of ordinary skill in the art (“POSITA” or “POSA”) would have had “a minimum of a bachelor’s degree in an engineering, computer science, graphic design, or a related field plus 2-3 years of work and/or research experience in the field of computer aided design (CAD) software.” Petition at 12.

Patent Owner agrees with a portion of Petitioner’s proposal, but respectfully submits that it fails to account for a key aspect of the ’448 Patent’s invention – creating computer programs for virtual or digital clothing design. General CAD

software is not suitable to solve the intricacies of virtual clothing design, such as converting a 2D fabric into a draped 3D clothing article. As explained above in Sections II and III above, the types of problems encountered in the art would include determining distances between points taking into consideration gaps between the pattern pieces and the effect of gravity and material choice of the fabric. The conversion of 2D fabric into 3D clothing (*i.e.*, draping) is a specialized process that static, generic CAD software is not suited for.

A POSA to which the '448 Patent pertains would have had a minimum of a bachelor's degree in mechanical engineering, textile engineering, computer engineering, computer science, graphic design, or an equivalent degree, with at least 2-3 years of experience in software design for the creation of digital or virtual clothing.

V. CLAIM CONSTRUCTION

Petitioner submits that no claim terms need be construed. Patent Owner generally agrees, except to note that the preamble in the method claims (*i.e.*, claims 1-14) is limiting. “While there is no bright-line rule for determining whether a preamble is limiting, we have generally construed statements of intended purpose in such method claims as limiting.” *Eli Lilly and Co. v. Teva Pharma. Int’l GmbH*, 8 F.4th 1331 (Fed Cir. 2021). This is important to note because Grinspun does not discuss or describe taking a measurement between points of a 2D pattern, and

Graphicextras only describes taking a measurement *between the bounding boxes* of two objects or patterns. That is, neither Grinspun nor Graphicextras discloses “taking a measurement of a two-dimensional (2D) pattern” (emphasis added) which is the preamble of claim 1.

VI. PETITIONER HAS FAILED TO DEMONSTRATE A REASONABLE LIKELIHOOD THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE¹

A. Even if Grinspun is modified by Graphicextras in the manner proposed by Petitioner, the combination fails to disclose several claim elements

1. Element [1.pre]

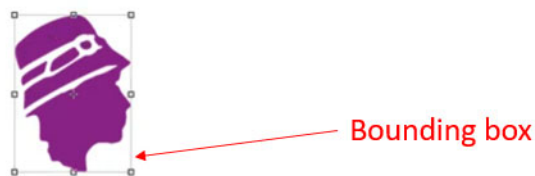
Foundationally, neither Grinspun nor Graphicextras teach taking a measurement *of a 2D pattern* which is the foundation of claim 1 and found specifically in the preamble. Thus, Petitioner fails to provide a *prima facie* case of obviousness in view of the Grinspun-Graphicextras combination. EX2001, ¶¶76-86.

While Grinspun provides 2D patterns in its 2D window, Grinspun does not disclose or teach taking any measurements of the 2D patterns. EX2001, ¶77.

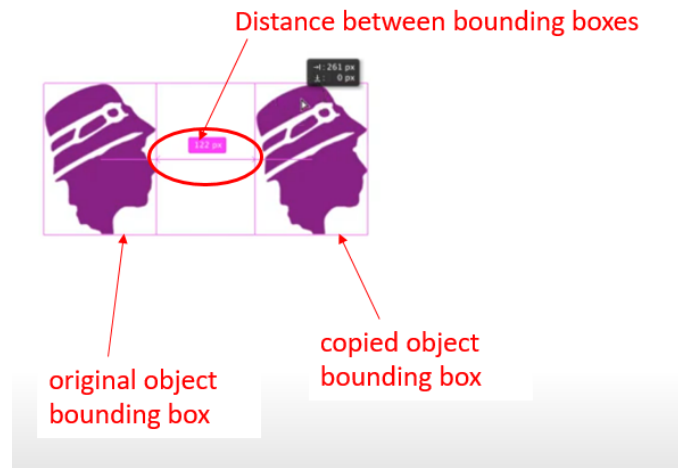
¹ In this preliminary response, Patent Owner only presents arguments against institution of this Petition. In the event that this Petition is instituted, Patent Owner reserves the right to raise additional or different arguments in its Patent Owner Response.

Petitioner turns to Graphicxtras’s so-called “suggested improvements” such that the Grinspun-Graphicxtras combined system would “enabl[es] presentation of onscreen measurement information associated with 2D patterns within Grinspun’s design window 110” and “display[s] an onscreen measurement that changes to account for a separation distance between two objections.” Petition, p.32. According to Petitioner, the user would have received a “measurement of a line segment appearing between garment patterns 120 in the design window 110” of Grinspun. *Id.*; EX2001, ¶78.

However, as noted above, Graphicxtras does not teach taking measurements of a 2D pattern or object. Rather, Graphicxtras teaches creating a “bounding box” around the object, shown below, for purposes of taking measurements *between* those bounding boxes:

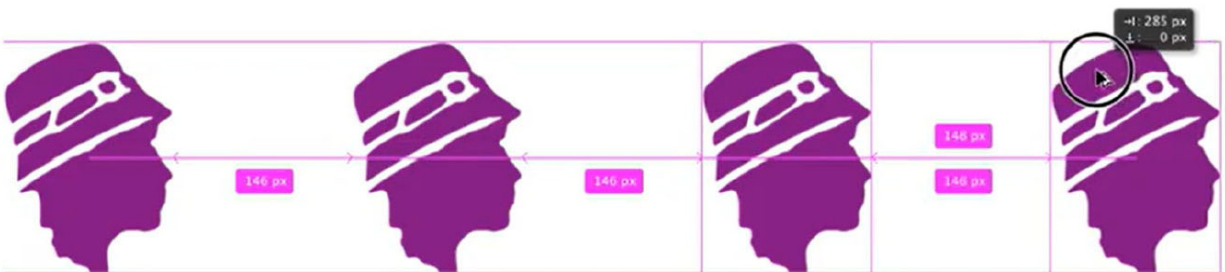


EX1005, 1:06 (annotated); EX2001, ¶79.



EX1005, 1:25 (annotated); EX2001, ¶79.

For example, Petitioner argues that Graphicxtras’ “measurement guide” function displays various horizontal distance measurements. Petition, p.22-23. But these are horizontal distance measurements between the bounding boxes of objects, and are *not* measurements of points within the bounding boxes. EX2001, ¶80



EX1005, 6:00; Petition, p.23.

Petitioner even admits that the “displayed length” in Graphicxtras’ “measurement guide” is a “horizontal distance measurement (*from the adjacent 2D*

object)”. Petition, p.23 (emphasis added). Measuring distances *between* objects or bounding boxes is not measurements *of* an object. EX2001, ¶81.

Even if determining a distance *between* objects would be a measurement *of* an object, any attempt to combine Grinspun and Graphicxtras is completely contrary to the teachings of Graphicxtras. Petitioner creates an illustration that purportedly shows that the Grinspun-Graphicxtras combination would look like:

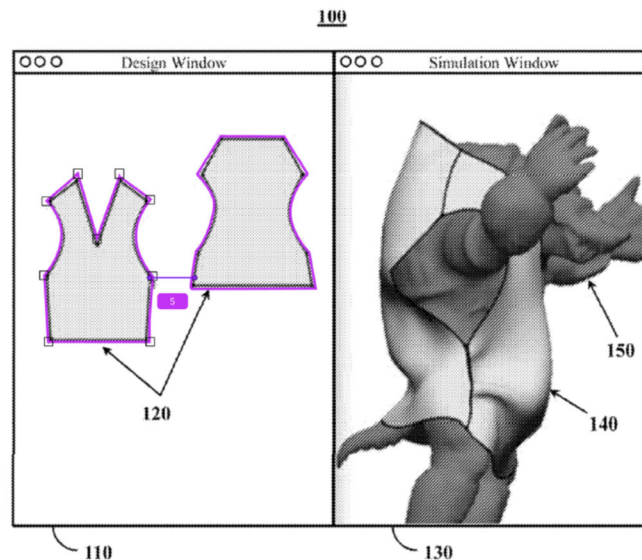


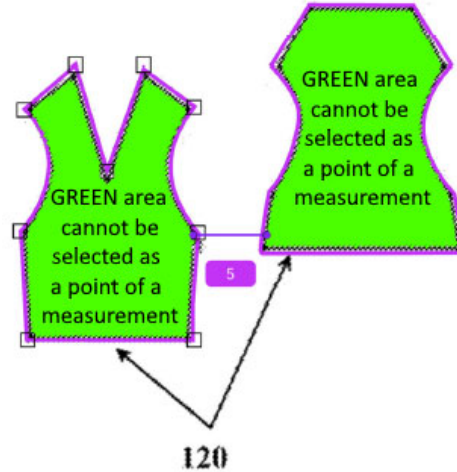
FIG. 1

Petition, p.29. According to Petitioner, this combination would have a line (shown in purple) that traces all edges of the 2D patterns such that distance between the 2D patterns (represented by the number “5”) is displayed. But nothing in Graphicxtras teaches drawing or tracing the outline of the pattern itself, or determining the distances between the patterns themselves. Rather, Graphicxtras teaches bounding boxes, not 2D digital clothing patterns like those in Grinspun. Petitioner creates this

purple outline out of thin air. This is a self-serving and driven solely by hindsight. EX2001, ¶82-83.

Additionally, the combination also fails because Grinspun has no reason or motivation to measure the distance between the 2D patterns. EX2001, ¶110-114. Grinspun teaches virtually sewing the 2D patterns together along seam lines, which are located in the outlines of the patterns. The distance between the 2D patterns does not impact the virtual sewing, and does not matter. EX2001, ¶114. The 2D patterns can be moved to different positions or distances from one another, and the virtual sewing result remains the same. There is simply no motivation, teaching, disclosure or support for measuring the distance between Grinspun's 2D patterns in view of Graphicextras. EX2001, ¶111-114. And even if combined, nothing in Graphicextras would lead a POSA to determine a difference between outer edges of 2D patterns. EX2001, ¶110-114.

Finally, even assuming Grinspun and Graphicextras can be combined, the combined system would not allow a user to select points inside of the 2D objects, *i.e.* within the 2D pattern piece, as illustrated by this annotated portion of Fig. 1 of Grinspun:



EX1004, FIG. 1 (annotated) EX2001, ¶84

Graphicxtras only teaches images bound by the bounding boxes. A user cannot set points from which to measure inside the bounding box, and the software cannot measure the distance of line segments inside or originating from inside the box. The strained Grinspun-Graphicxtras combination does not take any measurements *of* a 2D pattern as required by claim 1.

The '448 Patent overcomes the difficulties of taking a measurement of two or more points of 3D clothing by measuring a length on the 2D patterns that accounts for separation between pattern pieces. The Grinspun-Graphicxtras combination cannot accomplish this. At best, the combination only results in measurements of the spacing *between* bounding boxes of two 2D pattern pieces – completely unnecessary for Grinspun - and does not provide measurements *of* a 2D pattern. EX2001, ¶86.

This is one reason Petitioner has not presented a *prima facie* case of obviousness with respect to independent claim 1.

2. Elements [1.2]-[1.3] [15.2], [16.2]

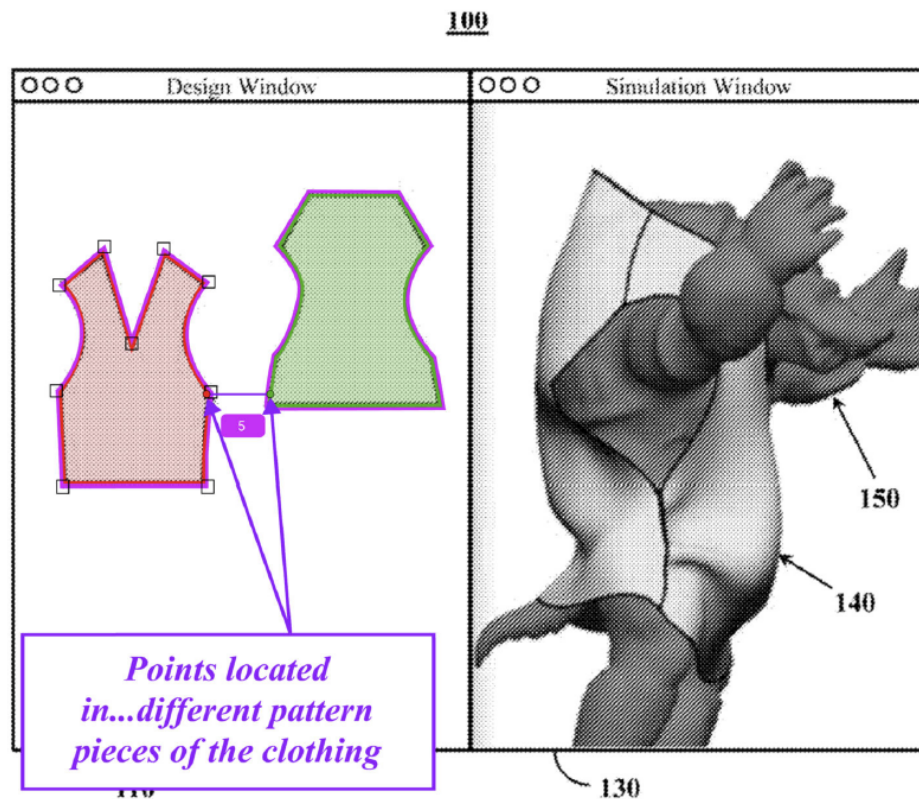
Elements [1.2]-[1.3]², [15.2], and [16.2] require determining attributes of areas in which the points are located, wherein the attributes indicate at least whether the points are located in a *same* pattern piece of the clothing or *different* pattern pieces of the clothing. For example, the system's "measuring apparatus may determine that areas to which the two points A and B belong correspond to different pattern pieces based on the data structure corresponding to each of the two points A and B." EX1001, 7:25-40. The data structure corresponding to each point that allows the system to determine whether the points are on the same or different pattern pieces may include "a link, information associated with at least one of a pattern piece in which each of the points is positioned, a line in a pattern piece on which each of the points is positioned, or a point on a line in a pattern piece." EX1001, 2:20-25; 6:58-62. As another example:

² In Petitioner's "Listing of Challenged Claims" on page iv. of the Petition, Elements [1.2] and [1.3] are separated, however both are combined as Element [1.2] in pages 34-35 of the Petition. For purposes of this Reply, Patent Owner is relying on the arrangement of the Elements as set forth in the Listing of Challenged Claims.

The data structure corresponding to each of the points may store information corresponding to each of the points in the form of a linked list, a tree, or a table, for example. The information corresponding to each of the points may include, for example, identification information of a pattern piece in which each of the points is positioned, identification of a line in a pattern piece in which each of the points is positioned, a coordinate of a point on a line of a pattern piece, and the like. EX1001, 6:63-7:4.

Petitioner's entire analysis for these limitations can be summarized as follows:

“[T]he Grinspun-Graphicxtras system would have determined that two points (plurality of points) associated with a line segment are each associated with distinct 2D patterns 120” and “[t]hus... a POSITA would have recognized from Graphicxtras’ demonstration that the process of establishing points for distance measurement by the system would have involved determining attributes of areas in which the points are located.” Petition, pp.34-35. But neither Grinspun, Graphicxtras or any proposed combination of the two determines whether two points are on the same pattern piece or different pattern pieces. EX2001, ¶87-88.



Petition, p.35

The Grinspun-Graphicxtras combination does not make any affirmative determination that the points are on the same or different pattern pieces. For example, Petitioner never explains any data that the system would look to in order to determine if the points are on the same or different pattern pieces. The illustration above merely shows that the two points selected by the user are on two different pattern pieces, but the system makes no affirmative determination of such by examining at “attributes of areas” in which the points are located. EX2001, ¶89.

Moreover, in the Petitioner's Grinspun-Graphicxtras combination, the borders of the 2D pattern pieces and all of its points are *always* on two different pattern pieces. There is therefore never any use for an affirmative determination that *the points are located in a same or different pattern pieces*. EX2001, ¶90. There is no disclosure that Graphicxtras's Smart Guide function or any related software in the Grinspun-Graphicxtras combination actually and affirmatively determines whether or not these points are located in the same or different pattern pieces. That decision would be of no consequence in the Grinspun-Graphicxtras combination. *Id.*

Petitioner has not presented a *prima facie* case of obviousness with respect to independent claims 1, 15 and 16 (and thus all claims depending therefrom).

3. Elements [1.4], [15.3], and [16.3]

Elements [1.4], [15.3] and [16.3] require “determining a length of **a line segment** using the points based on the determined attributes of the areas, **the determined length of the line segment changed to account for separation between the pattern pieces responsive to determining that the points are located in different pattern pieces.**”

The Petition is deficient in two ways. First, the Grinspun-Graphicxtras combination does not determine the length of a line segment *based on determined attributes* of the areas associated with those points, for the same reasons given above in parts VI.A.2 and VI.A.3.

In further support of this point, the '448 Patent teaches determining “a length of a first line segment between two points 272 and 274 present in the same pattern piece 271, and a length of a second line segment between the point 274 in the pattern piece 271 and the point 276 in the pattern piece 275.” EX1001, 11:22-26; Fig. 2B. In such a scenario, “the length of the second line segment may include a length of a connection line between the point 274 in the pattern piece 271 and the point 276 in the pattern piece 275.” EX1001, 11:32-34. Thus the determined length of the second segment is different than the determined length of the first segment because the “total length” of the second segment can be “obtained by subtracting the length of the connection line from the length of the second line segment.” EX1001, 11:35-39. In other words, the distance of the second segment is determined differently than the distance of the first segment, *depending on whether the points are located in different pattern pieces or the same pattern piece*, which is something the Grinspun-Graphicxtras combination cannot perform. EX2001, ¶92.

Likewise, Petitioner does not even address the last part of this claim element: “responsive to determining that the points are located in different pattern pieces.” For good reason, as the Grinspun-Graphicxtras combination does not teach the determined length of the line segment being changed “*responsive to* determining

that the points are located in different pattern pieces” as required by the claims. EX2001, ¶93.

Second, the Grinspun-Graphicxtras combination does not teach or disclose the other portion of this claim element: “**length of the line segment changed to account for separation between the pattern pieces.**” In fact, Petitioner completely misinterprets the claim language in trying to stretch the Grinspun-Graphicxtras combination to meet this limitation. This complete miss is by itself fatal to the petition. EX2001, ¶94.

More particularly, Petitioner proposes a specific user operation where the user moves one pattern piece relative to another in order to achieve this feature. See Petition, pages 37-43. Petitioner argues that the Grinspun-Graphicxtras system provides that the determined length of the line segment is changed to account for separation between distinct two-dimensional flat patterns 120, because a user would have “generally create[d] and/or edit[ed] patterns and draped forms using mouse movements” within the 2D design window 110. Petition, pgs. 37, citing to EX1003, ¶77. Petitioner further explains that the user would have performed an initial measurement at a first time point (T_1) using a first instance of the “measurement guide” function, and then performed a positioning adjustment by dragging one two-dimensional flat pattern (green) and

moving its position within the design window 100 relative to the position of the other two-dimensional flat pattern (red). EX1003, ¶80; *see* EX1005, 5:47-6:00.

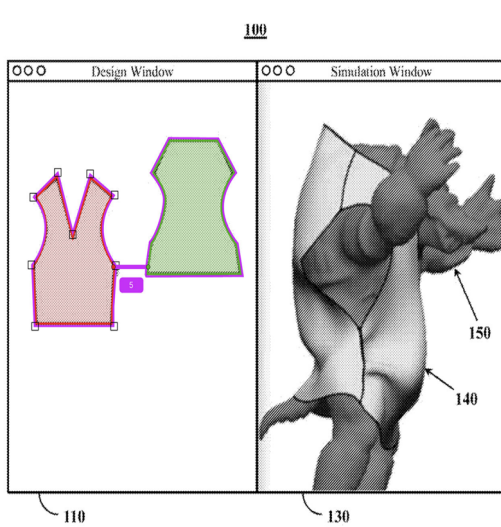


FIG. 1

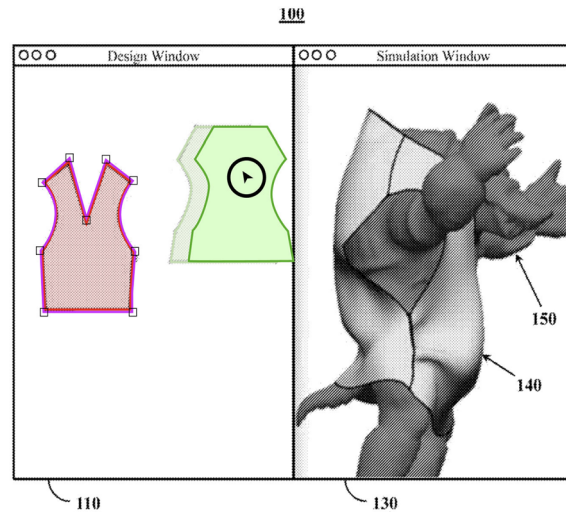


FIG. 1

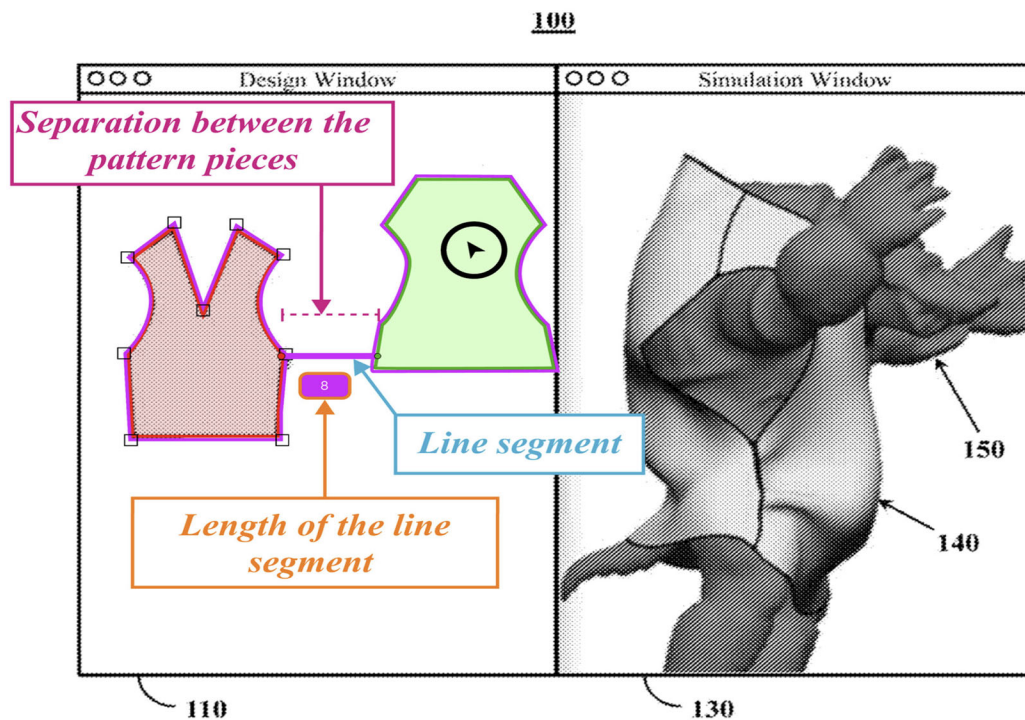


FIG. 1

Petition, pp.38-42

But the “changed” does not mean moving the second pattern to a new position, or a comparison of the length of a line segment between first and second patterns before and after the second pattern is moved. EX2001, ¶95. Rather, the ’448 teaches repeatedly and the claims require that the patterns are fixed relative to one another, that the selected points are fixed, and that the line segments are fixed. *Id.* The entire purpose of the claimed invention is to measure the length of a line segment in response to determining that the points are located in different pattern pieces, and then accounting for the “white space” or “separation between” the two patterns. *Id.* The “changed” in the claims refers to modifying the length of the line segment to account for the space between the patterns. *Id.* This concept is clearly described in the ’448 patent, and illustrated in Figures such as 2B, 4, 5A and 5B. *Id.* This feature is important because when a user or ultimately a garment manufacturer is attempting to determine the measurement of a portion of the 3D clothing, that length must be accurate – no matter whether the length was determined by measuring the distance between two points on the same 2D pattern, or two points on different 2D patterns. *Id.*

Not only did Petitioner misconstrue the claims, but the Grinspun-Graphicextras combination does not and cannot disclose this limitation. In the Grinspun-Graphicextras combination, the claimed “points” can never be inside or within the

pattern pieces. EX2001, ¶96. The points can only be along their edges. *Id.* Because there can be no portion of the line segment extending into either 2D pattern piece, there can be no change in the length of the line segment to account for the separation between the patterns pieces. *Id.* The line segment is always “0.” And one cannot move the second pattern piece to generate an artificial change. *Id.* The claimed measurement of the new line would still be “0” every time. *Id.* This just illustrates the problem with Petitioner’s argument and interpretation of this claim language – the distance is not changed *to account for* separation between the pattern pieces, the distance *is* the separation between two pattern pieces. EX2001, ¶96.

Additionally, the Grinspun-Graphicxtras combination fails because the “points” are always on different pattern pieces. EX2001, ¶97. The determined length of the line segment is thus not changed *in response to* determining that the points are located in different pattern pieces – the displayed length is only changed by a manual operation performed by a user. *Id.* The software and system of the Grinspun-Graphicxtras combination does not determine a length of a line segment, and then change the length based on a determination of the points being in different pattern pieces. *Id.*

This is another stand-alone reason the Petitioner has not presented a *prima facie* case of obviousness with respect to independent claims 1, 15 and 16.

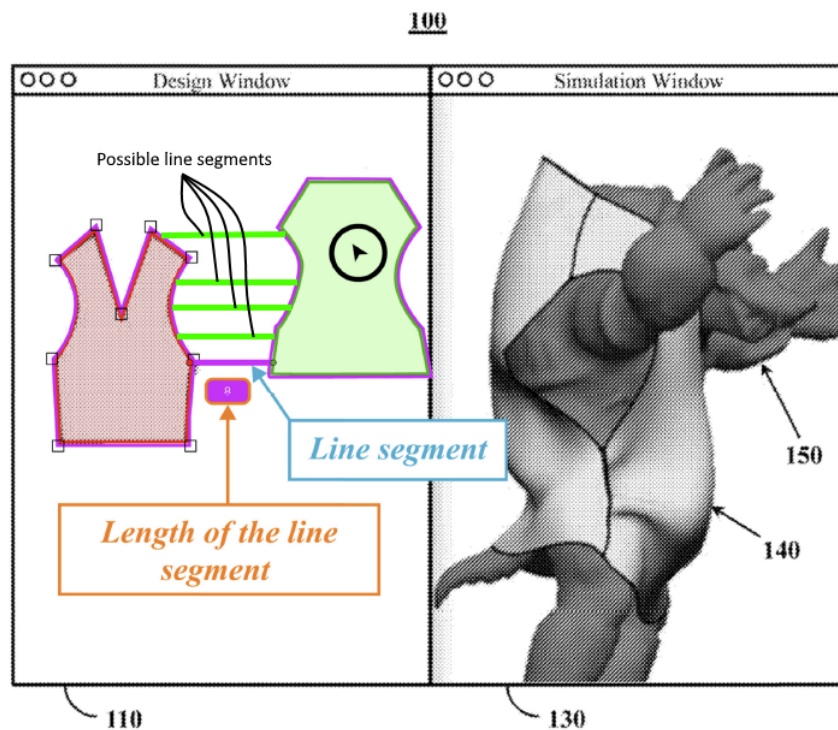
B. A POSA would not modify Grinspun based on Graphicextras as proposed by Petitioner, further distinguishing Claims 1, 15 and 16.

In addition to the deficiencies of the Grinspun-Graphicextras combination set forth above, a POSA would not have been motivated to combine Graphicextras with Grinspun. EX2001, ¶98-101.

Petitioner contorted Graphicextras's bounding boxes in such a way that they trace the edges of the 2D pattern pieces in Grinspun. This reading is supported only by the Declaration of Petitioner's expert (EX1003, ¶67), someone with no experience in virtual clothing design. Petitioner's expert provides no explanation for why the Grinspun-Graphicextras combination does not include Graphicextras's bounding boxes. EX2001, ¶99. Likewise, neither Grinspun nor Graphicextras teach tracing the outer edges of a 2D fabric pattern to determine the distance of a line segment between those outer edges. *Id.*

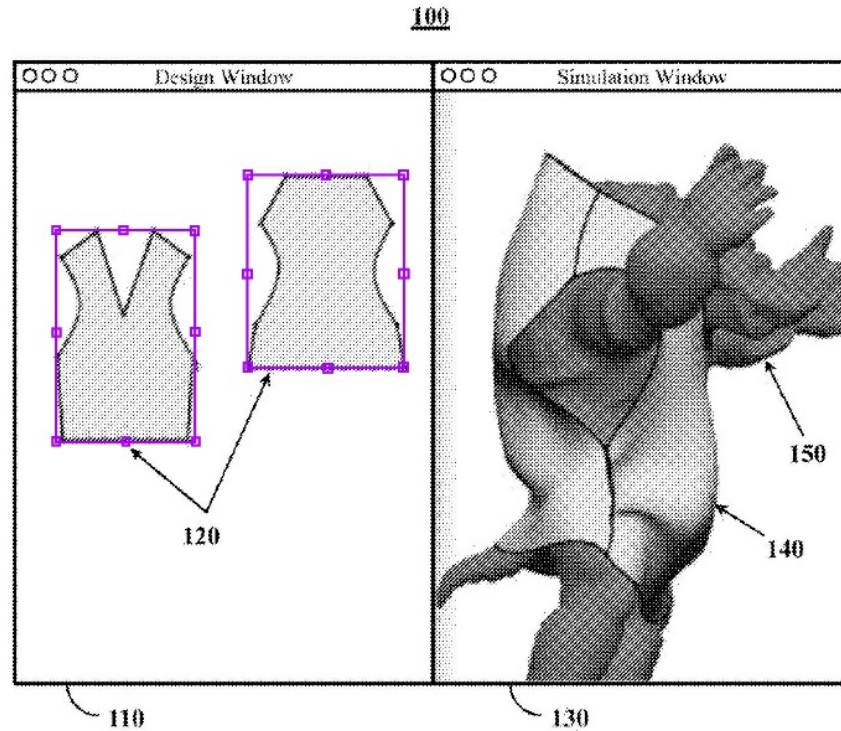
The use of bounding boxes make it fairly simple to calculate the distance between two bounding boxes. EX2001, ¶99. The distance between the bounding boxes is the same no matter which points on the edges of the bounding boxes are selected. *Id.* In other words, the vertical edges of two adjacent bounding boxes have a length between them that is the same no matter where the length is measured from on the those vertical edges. *Id.* However, since the bounding boxes are not included in the Grinspun-Graphicextras combination, the proposed combination would need to

identify a start point and an end point for a length measurement. EX2001, ¶99. For example, referring to Petitioner's annotated FIG. 1 of Grinspun below, there are many possible line segments (shown in green below) that each represent different distances between the patterns. Nowhere does the proposed combination identify how to select a line segment (or its start/end points) for the display of a length of the spacing:



EX1004, FIG. 1 (annotated); EX2001, ¶99

If a POSA incorporated the Graphicextras bounding boxes into Grinspun, they would appear as shown in purple in the following annotated Fig. 1:



EX1004, FIG. 1 (annotated); EX2001, ¶100

Notably, when a bounding box is created around the 2D pattern pieces in Grinspun, the points along the four lines forming the border may, or may not, coincide with an area of the pattern piece. EX2001, ¶101. This leads to further distinctions between the claims of the '448 Patent and the combination of Grinspun and Graphicextras, as discussed below.

1. Elements [1.2]-[1.3], [15.2], and [16.2]

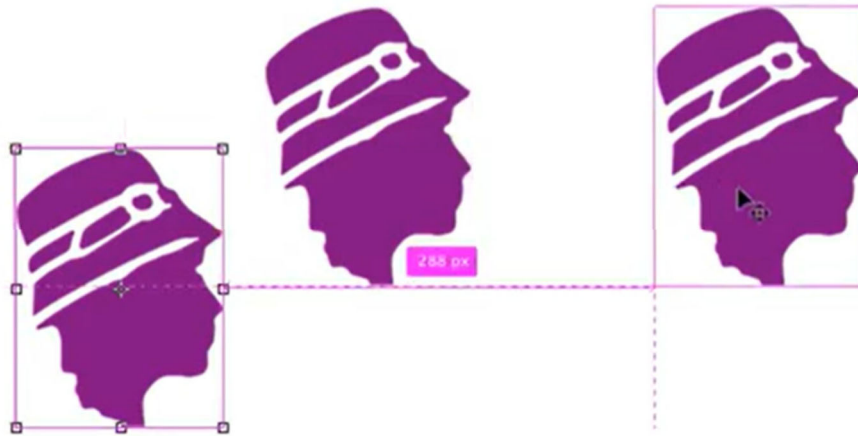
Petitioner argues that in the Grinspun-Graphicextras system, upon the user providing an initiating command for the “measurement guide” function, the Grinspun-Graphicextras system would have *determined* that two points (*plurality*

of points) associated with a line segment are each associated with distinct 2D patterns 120 (the attributes being that the points are located in different pieces of clothing). Petition, pgs. 34-35.

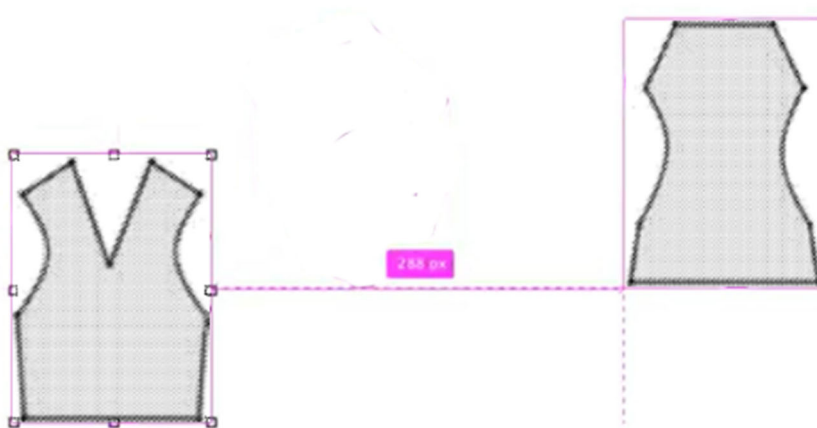
However, when the bounding boxes from Graphicxtras are used around each 2D pattern piece, a particular point along these bounding boxes may or may not lie within the confines of a 2D pattern piece. EX2001, ¶103. In other words, a portion of the bounding boxes may intersect the corresponding 2D pattern piece, while an overwhelming majority of the bounding boxes does not intersect the corresponding 2D pattern piece. Nothing in either Grinspun or Graphicxtras teaches actively “determining” whether any of these points would be within, or outside of, the 2D pattern piece. *Id.* Hence, the Grinspun-Graphicxtras combination does not determine whether the two points are in an area located in the same or different pattern pieces, and the user does not actually select specific points. *Id.*

Moreover, the points along the bounding boxes can never be “located *in* a same pattern piece” or be “located *in* different pattern pieces of the clothing” because the points will always be on the bounding box which is never inside of the 2D shape. EX2001, ¶104. This can be seen in the image taken from

Graphicextras appearing on page 20 of the Petition, which has also been edited as applied to the pattern pieces of Grinspun:



(Petition, pg. 20)



EX2001, ¶104

The Grinspun-Graphicextras combination, with a rectilinear bounding box around each pattern piece, also does not actively *determine* attributes of areas in which the points are located, where the attributes indicate at least whether the points

are located in a same pattern piece of the clothing or different pattern pieces of the clothing. EX2001, ¶105. This step and feature is entirely missing when the rectilinear border of Graphicextras is applied to Grinspun.

For at least these additional reasons, Petitioner has not presented a *prima facie* case of obviousness with respect to independent claims 1, 15 and 16.

2. Elements [1.4], [15.3], and [16.3]

Petitioner argues that in the Grinspun-Graphicextras system, the determined length of the line segment would be changed to account for separation between the 2D patterns. Petition, pp.37-43. Petitioner's theory is that if the user were to move the 2D patterns further away from one another, then a line segment connecting two points would naturally change. *Id.*

But, as indicated above, is not a proper reading of Element [1.4]. Element [1.1] requires "receiving a plurality of points." Element [1.4] requires determining a length of a line segment *using these same points*. Petitioner's theory of moving the pattern pieces relative to one another to change the length of the line would require changing the points on which the measurement is based. In other words, Petitioner is proposing that "the points" for purposes of Element [1.1] are different than the "points" of Element [1.4]. EX2001, ¶106.

Unlike the proposed Grinspun-Graphicextras system, the '448 patent describes how a user selects points anywhere on the 2D screen, determines at least if they are

on the same pattern piece or different pattern pieces, and when on different pieces it accounts for separation between the pattern pieces – namely because when sewn together (as is depicted in the 3D window) this separation is not present in the 3D virtual clothing. The patented system thus provides a distance measurement as would be actually found in the 3D clothing when the patterns are sewn or otherwise connected to form the clothing. EX2001, ¶107. This length change to account for separation between the pattern pieces is clearly shown in Fig. 4 of the '448 patent:

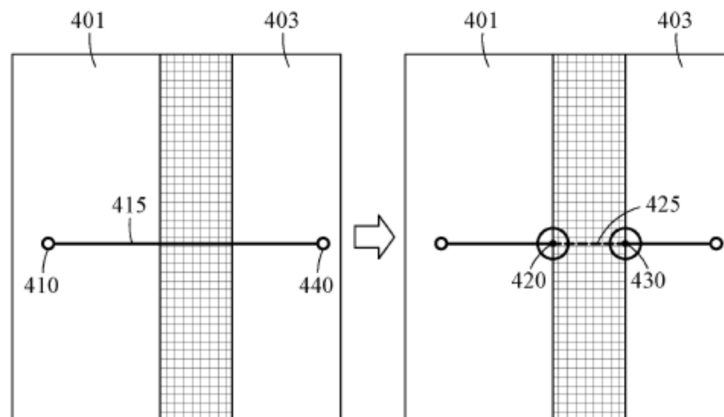


FIG. 4

Unlike the '448 patent, the measurements in the proposed Grinspun-Graphicextras system are not “responsive to determining that the points are located in different pattern pieces” as is required by claims 1, 15 and 16. EX2001, ¶108.

C. Petitioner’s enumerated reasons for combining Graphicextras with Grinspun are improper, and in fact a POSA would not have been motivated to make the proposed combination

Petitioner acknowledges that Grinspun does not expressly disclose a method of taking a measurement of a two-dimensional (2D) pattern. Petitioner proposes to modify Grinspun with Graphicextras to provide measurement functionality to the system and method of Grinspun. However, for the reasons set forth below, a POSA would *not* have been motivated to modify Grinspun based on Graphicextras.

1. Determining a distance between the two 2D patterns in Grinspun’s Design Window would provide no benefit

Petitioner first argues that “a POSITA would have modified Grinspun’s onscreen interface of the CAD software to include Graphicextras’ suggestion for a ‘measurement guide’ so as to provide the user with real-time measurement information within Grinspun’s design window 110 and thereby facilitate rapid organization/positioning of multiple garment pieces within the window 110.” Petition, pp.25-26. Several problems exist with this rationale. EX2001, ¶110.

First, the preciseness of the relative positions of the 2D patterns in Grinspun’s Design Window 110 has *no effect* on the 3D display or the bidirectional editing that is the focus of the Grinspun patent publication. EX2001, ¶111. In other words, movement of one 2D clothing pattern within the Design Window 110 relative to the other 2D clothing pattern would not change

the 3D rendering or draping of the clothing. *Id.* The 2D patterns are virtually sewn together along seam lines, no matter where the patterns are located relative to one another. *Id.* The Petitioner is simply wrong to state that it would have been obvious to “facilitate rapid organization/positioning of multiple garment pieces within the window 110” because movement of those garment pieces in the window 110 does ***nothing*** to affect the 3D draping of the clothing.

The fact that the user in Grinspun can move and edit the 2D clothing patterns does not make it obvious that the user would like to have the distance between those objects visualized on the screen. Petitioner argues that a “POSITA would have recognized that incorporation of the ‘measurement’ function within the Grinspun system would have allowed a user to achieve greater precision” in moving the 2D clothing patterns. Petition, p.26. But this reasoning falls apart because movement of the 2D clothing patterns has no impact on the resulting 3D draped clothing article. EX2001, ¶113-114.

Determining and displaying the distance between (boundary boxes of) objects in Graphicextras may be beneficial in Graphicextras itself because the user is evenly spacing objects on the screen – a display of that distance between objects allows the user to confirm that the objects are evenly spaced. EX2001, ¶113. The same is not true in Grinspun, where the user only sees two 2D

patterns, and the distance between those two 2D patterns is not compared to any other distance. *Id.*

Regardless, this entire rationale for obviousness is pure hindsight. It merely restates the “result” of the Grinspun-Graphicxtras combination as a “reason” to make the combination in the first place. The fact that Graphicxtras has a “measurement guide” is not a reason to include it in Grinspun. Grinspun is absolutely silent about the organization of multiple patterns in the 2D windows. EX2001, ¶114.

2. There is no ‘known’ problem with onscreen displays of garment design applications

Third, Petitioner argues that “a POSITA would have been further motivated to combine the teachings of Grinspun and Graphicxtras because the combination would have involved using known user interface improvement (suggested in Graphicxtras) to address a known problem within onscreen displays of garment design applications like that of Grinspun.” Petition, pp.27-28.

This again is blatant hindsight. Petitioner fails to explain how this alleged “problem” was known in the field, or how the prior art suggested a “solution” to this problem. EX2001, ¶116. Regarding the alleged “known problem with onscreen displays,” the Petition never explains exactly what the “problem” is. The Petition alludes to the fact that Grinspun’s Design Window 110 may “begin with a blank

screen” which can create “spacing issues.” Petition, p.28. Neither the Petition nor its expert (EX1003) explain what exactly these “spacing issues” are, or why they are problematic. Moreover, the only evidence that Petitioner cites to support the notion that this problem was “known” is ¶66 of its expert’s declaration (EX1003), but that paragraph merely parrots the text of the Petition. It provides no analysis or discussion as to how this problem was allegedly “known.” EX2001, ¶116.

Grinspun-Graphicextras is a failed, hindsight-driven combination that does not provide any of the claimed limitations.

VII. CONCLUSION

For the above reasons, Patent Owner requests that institution of this Petition for *inter partes* review be denied.

Dated: September 16, 2024

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CERTIFICATE OF SERVICE

The undersigned certifies that on September 16, 2024, I will cause a true and correct copy of the foregoing Patent Owner's Preliminary Response to be served via electronic mail at: IPR57721-0002IP1@fr.com, pursuant to Petitioner's consent.

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This paper contains 13,192 words, excluding the parts of the paper exempted by 37 C.F.R. § 42.24(a).

This paper also complies with the typeface requirements of 37 C.F.R. § 42.6(a)(ii) and the type style requirements of 37 C.F.R. § 42.6(a)(iii)&(iv).

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