

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Oh et al.
U.S. Patent No.: 10,733,773 Attorney Docket No. 57721-0003IP1
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Title: METHOD AND APPARATUS FOR CREATING DIGITAL
CLOTHING

DECLARATION OF DAN PERREAULT

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I, Dan Perreault, of Lake Mary, Florida, declare that:

I. ASSIGNMENT

1. I have been retained as a technical expert by counsel on behalf of Zhejiang Lingdi Digital Technology Co., Ltd. (“Lingdi” or “Petitioner”). I understand that Lingdi is requesting that the Patent Trial and Appeal Board (“PTAB” or “Board”) institute an *inter partes* review (“IPR”) proceeding of claims 1-11 (“Challenged Claims”) of U.S. Patent No. 10,733,773 (“the ’773 patent”). I have been asked to provide my independent analysis of the ’773 patent in light of the prior art publications cited below.

2. I am not, and never have been, an employee of Lingdi. I received no compensation for this declaration beyond my normal hourly compensation based on my time actually spent analyzing the ’773 patent, the prior art publications cited below, and the issues related thereto, and I will not receive any added compensation based on the outcome of any IPR or other proceeding involving the ’773 patent.

II. QUALIFICATIONS AND BACKGROUND INFORMATION

3. I have extensive experience in many aspects of metrology and engineering design, including three-dimensional scanning, computer-aided design, 3D modeling, three-dimensional printing, and rapid prototyping.

4. I received a Bachelor of Science in Aeronautical Engineering from the

Embry-Riddle Aeronautical University in 1989. My studies concentrated on engineering design, aerodynamics, aircraft structures, computer-aided design, and finite element analysis.

5. I am the founder and currently the President at NeoMetrix Technologies, Inc., and I have been providing engineering services in the field of prototyping and metrology for over 30 years. NeoMetrix provides a wide array of engineering services for rapid product development, including three-dimensional scanning, computer-aided inspection, on-site inspection, and professional training. As the founder of NeoMetrix, I built the organization from the ground up, going from a solo operation to leading a reputable engineering team that has been providing engineering solutions for a host of world class companies, such as Disney, Lockheed Martin, Northrop Grumman, and Johnson & Johnson.

6. In addition to serving as the President at NeoMetrix Technologies, Inc. (2003-present), my industry experience includes Sales Director at Direct Dimensions (2002-2003), Director in Applications Engineering at FARO Technologies (1997-2002), and Applications Engineer at FARO Technologies (1993-1997).

7. I began my career in the metrology and reverse engineering industry by serving as an applications engineer for FARO Technologies, where I worked hands-on with various portable coordinate measuring machines. I specifically

developed expertise in using the renowned FaroArm®—a portable, multi-jointed arm with a three-dimensional scanner/probe—for industrial applications. From 1993 to 1997, I traveled to various manufacturing sites throughout the United States, Latin America, and Europe to assist in developing applications to solve real manufacturing-related metrology issues, particularly in the automotive and aerospace industries. I also worked closely with FARO software engineers to adapt a medical measurement tool for industrial application.

8. By 1997, I was promoted to Director of Application Engineering at FARO. In this role, I recruited, hired, trained, and led a team of highly skilled applications engineers to promote the FaroArm® as the new standard in manufacturing metrology. I developed and deployed comprehensive training curriculum for data collection, computer-aided design, part inspection, and sheet metal measurement.

9. Before founding NeoMetrix Technologies, I also served as the Sales Director at Direct Dimensions, where I led sales of the portable coordinate measurement machines (e.g., FaroArm®), laser scanners (e.g., Perceptron & Minolta 3D Laser Scanners), and point cloud processing software (e.g., Geomagic™ and Polyworks™ software).

10. Throughout my career, including well before the April 2015 priority date of the '773 patent, I have gained specific experience with a variety of CAD

systems and the user interface features of such CAD systems. For example, while working for ECC International from 1990 to 1992 I became experienced with AutoCAD 10, which I used for 2D design of simulator components for C-17 jet engine maintenance trainer. This included the design and refinement of brackets, valves, tubing, and various other jet engine components. During this time I became experienced in the functionality and features of such CAD systems. While working with American General Aircraft from 1992 to 1993 I utilized Micro CADAM which I similarly used for 2D design of aircraft components, including updating of existing designs and incorporation of engineering change orders. From 1993 through 2002, my work for several different companies involved the use of AutoCAD 12, 13, & 14. I used these versions of AutoCAD for various projects including 3D & 2D design of structural components for flight simulator motion systems and CAD based computer aided inspection & reverse engineering. During this time frame I also used these versions of AutoCAD to import customer CAD files for comparison to manufactured parts using FARO Arm portable Coordinate Measuring Machine (CMM).

11. Since 2003, as part of my work for my company NeoMetrix, I have become familiar with and used a wide variety of CAD systems, including Rapidform, Geomagic Design X, Geomagic Studio, Geomagic Wrap, Solidworks, and Ansys SpaceClaim. Through my use of these and other CAD tools I have

become familiar with their features and functionality, including developing a knowledge of which features were common across various CAD platforms prior to the April 2015 priority date of the '773 patent. My use of CAD systems for NeoMetrix has included scan based reverse engineering, including for organic, free form geometry such as art, sculpture, bones & other anatomy, as well as organically shaped mechanical components; development of 3D CAD models from existing parts in aerospace, automotive, marine and general manufacturing applications; conversion of scan based CAD models to native parametric CAD for customers.

12. I am a co-inventor of two U.S. Patents relating to methods of using coordinate measuring machines: (1) U.S. Patent No. 6,820,346, titled "Method, System, and Storage Medium for Providing an Executable Program to A Coordinate Measurement System," filed August 26, 2003; and (2) U.S. Patent No. 6,879,933, titled "Method and System for Assisting a User Taking Measurements Using a Coordinate Measurement Machine," filed November 15, 2002.

13. A copy of my curriculum vitae ("CV") is submitted with this declaration as Appendix A. While not intended to be exhaustive, my CV provides a substantially complete list of my education, relevant experience, academic and employment history.

III. LEGAL PRINCIPLES

14. In forming my analysis and conclusions expressed in this declaration, I have applied the legal principles described in the following paragraphs, which were provided to me by counsel for the Petitioner.

A. Anticipation

15. It is my understanding that invalidation by “anticipation” exists only if a single alleged prior art reference discloses each and every limitation of the claim at issue, either expressly or inherently. In other words, every limitation of the claim must appear in a single prior art reference for the reference to anticipate that claim. I also understand that all elements of the claim must be disclosed in the reference as they are arranged in the claim. I also understand that to be considered anticipatory, the prior art reference must be enabling and must describe the patentee’s claimed invention sufficiently to have placed it in the possession of a person of ordinary skill in the field of invention. Under the principles of inherency, I understand that if the prior art necessarily functions in accordance with or includes the claimed limitations, it anticipates.

16. I have been informed that a claim is invalid if the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention. I further have been informed that a claim is invalid if an invention

described by that claim was described in a U.S. patent granted on an application for a patent (or in a published application for a U.S. patent) that was filed by another in the U.S. before the effective filing date of the claimed invention.

17. I understand that a dependent claim contains all of the limitations of the independent claim from which it depends. Thus, to establish anticipation, every limitation set forth in a dependent claim as well as the independent claim from which it depends must be found in an anticipatory reference.

B. Obviousness

18. I have been informed that a patent claim is invalid as “obvious” in light of one or more prior art references if it would have been obvious to a person of ordinary skill in the art at the time of the effective filing date of the claimed invention (“POSITA”; refer to ¶23 below), taking into account (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness, which include: (i) “long felt need” for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others. I understand that a patent cannot be properly granted for subject matter that would have been obvious to a POSITA at the time of the effective filing date of the claimed invention, and that a patent claim directed to

such obvious subject matter is invalid under 35 U.S.C. § 103. It is also my current understanding that in assessing the obviousness of claimed subject matter one should evaluate obviousness over the prior art from the perspective of a POSITA at the time of the effective filing date of the claimed invention (and not from the perspective of either a layman or a genius in that art).

19. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason that would have prompted a POSITA to modify the single prior art reference, or combine two or more references, in a manner that provides the elements of the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference(s) themselves, the knowledge or “common sense” of a POSITA, or from the nature of the problem to be solved, and this reason may be explicit or implicit from the prior art as a whole. I have been informed that, under the law, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

20. I know that the '773 patent claims priority to a Korean patent application filed on April 27, 2015 (EX1001 at Cover Page). For purposes of my

analysis here, I have applied a date of April 27, 2015 as the effective filing date of the claimed invention in my obviousness analysis.

C. Claim Construction

21. I understand that, for purposes of my analysis in this *inter partes* review proceeding, the terms appearing in the patent claims should be interpreted according to their “ordinary and customary meaning.” In determining the ordinary and customary meaning, the words of a claim are first given their plain meaning that those words would have had to a POSITA. I understand that the structure of the claims, the specification, and the file history also may be used to better construe a claim insofar as the plain meaning of the claims cannot be understood. Moreover, treatises and dictionaries may be used, albeit under limited circumstances, to determine the meaning attributed by a person of ordinary skill in the art to a claim term at the time of the effective filing date of the claimed invention. I have followed this approach in my analysis, and for all of the claim terms considered in this declaration, I have applied the plain and ordinary meaning of those terms.

22. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time of the effective filing date of the claimed invention (not today). I have used the date of April 27, 2015 for reasons explained in ¶20, above.

IV. PERSON OF ORDINARY SKILL IN THE ART

23. Based on my knowledge and experience in the field and my review of the '773 patent and its file history, and my first-hand knowledge of and experience with people working in the relevant field at the time of the '773 patent priority date of April 27, 2015, I believe a person of ordinary skill in the art ("POSITA") at the time of the earliest possible priority date of the '773 patent would have had 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. Additional education might substitute for some of the experience, and substantial experience might substitute for some of the educational background. For purposes of assessing this level of ordinary skill in the art, I have considered the types of problems encountered in the art, the prior solutions to those problems found in prior art references, the speed with which innovations were made at that time, the sophistication of the technology, and the level of education of active workers in the field. As previously described, I have reviewed and understand the '773 patent, and I understand these factors. I understand that a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors discussed above.

V. MATERIALS CONSIDERED

24. My analyses set forth in this declaration are based on my experience in the field of computer aided design (CAD) software. Based on my above-described experience in the field, I believe that I am considered to be an expert in the field. Also, based on my experiences, I understand and know of the capabilities of persons of ordinary skill in this field during the time before the alleged priority date (April 27, 2015) for the '773 patent and I participated in organizations and worked closely with many persons of such skill level in the field during that time frame.

25. As part of my independent analysis for this declaration, I have considered the following: the background knowledge/technologies that were commonly known to persons of ordinary skill in this field during the time before the alleged priority date for the '773 patent; my own knowledge and experiences gained from my work experience in the field of semiconductor integrated circuit manufacturing generally; my experience in teaching and advising others in such subjects; and my experience in working with others involved in the field of computer architecture or similar fields. In addition, I have analyzed the following publications and materials:

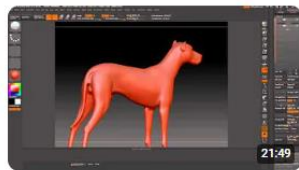
- U.S. Patent No. 10,733,773 (“the '773 patent”) (LINGDI-1001)
- U.S. Patent No. 10,733,773 File History (LINGDI-1002)

- EZBRUSH, *trace pattern* video (May 16, 2012), *available at* <https://www.youtube.com/watch?v=dRWJZab0tLA> (“EZBRUSH”) (LINGDI-1004)
- Corel DESIGNER Tutorial – Drawing With Precision (2013) (“Corel”) (LINGDI-1005)
- U.S. Patent No. 6,346,943 to Thoemmes et al. (“Thoemmes”) (LINGDI-1006)
- TUKATECH, *Manually Adjust CAD Pattern Grading | CAD Pattern Making Tutorial | TUKAtip - TUKAdesign* video (Sept. 23, 2013), *available at* <https://www.youtube.com/watch?v=hR3TcYDPjMU> (“TUKATECH”) (LINGDI-1007)
- Japanese Patent Pub. No. JP2005-309874 A (LINGDI-1008)
- Certified English Translation of Japanese Patent Pub. No. JP2005-309874 A (“Niterra”) (LINGDI-1009)

26. I note that persons of ordinary skill in the art during the relevant time frame would have been well-aware of YouTube and would have turned to YouTube to find information on the latest developments in design and drawing software, including clothing design software. Persons of ordinary skill would have found such information by, for example, performing keyword searches or viewing the channels of users that regularly publish videos related to design software. I conducted such YouTube searches myself when researching the latest design software developments during the relevant time frame and such searches on YouTube were (and still are) a common way for keeping up on such developments.

In particular, a person of ordinary skill and other interested members of the public would have been able to find both EZBRUSH and TUKATECH through the exercise of reasonable diligence by performing keyword searches using YouTube's search functionality.

27. Both EZBRUSH and TUKATECH were (and still are) hosted on YouTube pages by users that have each posted hundreds of videos relating to the use of CAD software including digital clothing design software. For example, EZBRUSH is part of a series of videos posted over twelve years ago showing various aspects of how to use Marvelous Designer software:



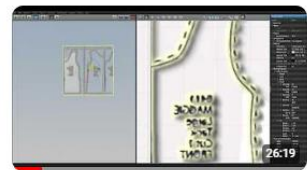
ZBrush_4R3-ZRemesher
1.4K views • 11 years ago



ZBrush_4R3-projected-Decimate plugin
208 views • 11 years ago



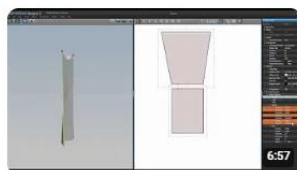
zbrush make your mesh have posable
symmetry
10K views • 12 years ago



trace pattern
1.8K views • 12 years ago



arrangement points
1.4K views • 12 years ago



bending angle
431 views • 12 years ago



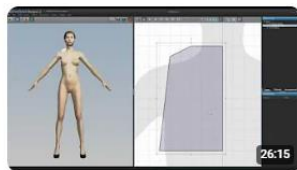
EZ MarvelousDesigner POCKET
4.4K views • 12 years ago



EZ Marvelous tips part2
1.5K views • 12 years ago



bv 002
314 views • 12 years ago



EZ Marvelous tips
878 views • 12 years ago



layers part2
538 views • 12 years ago

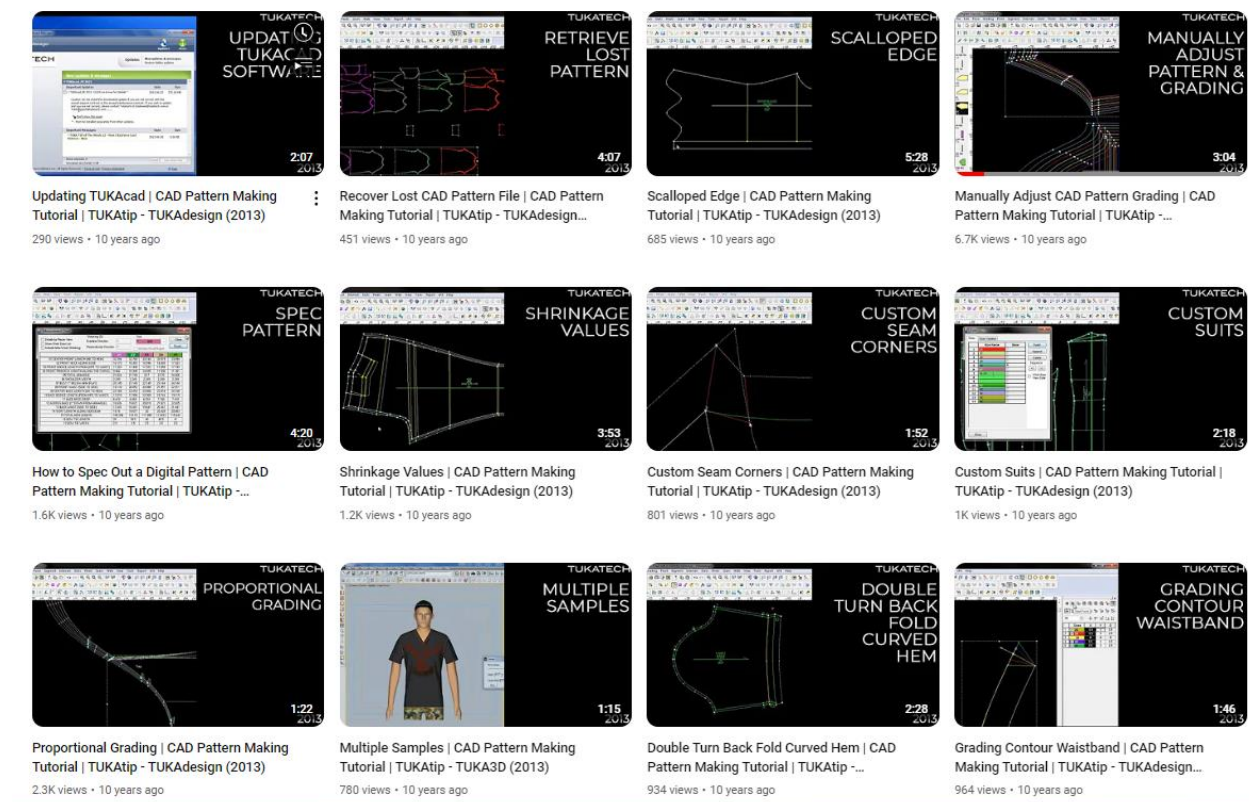


zipa split
645 views • 12 years ago

<https://www.youtube.com/@TheEZhexagon/videos> (screen shot of 12 of hundreds

of CAD software tutorial videos posted by user @TheEZhexagon, including the EZBRUSH “trace pattern” video (Exhibit LINGDI-1004)).

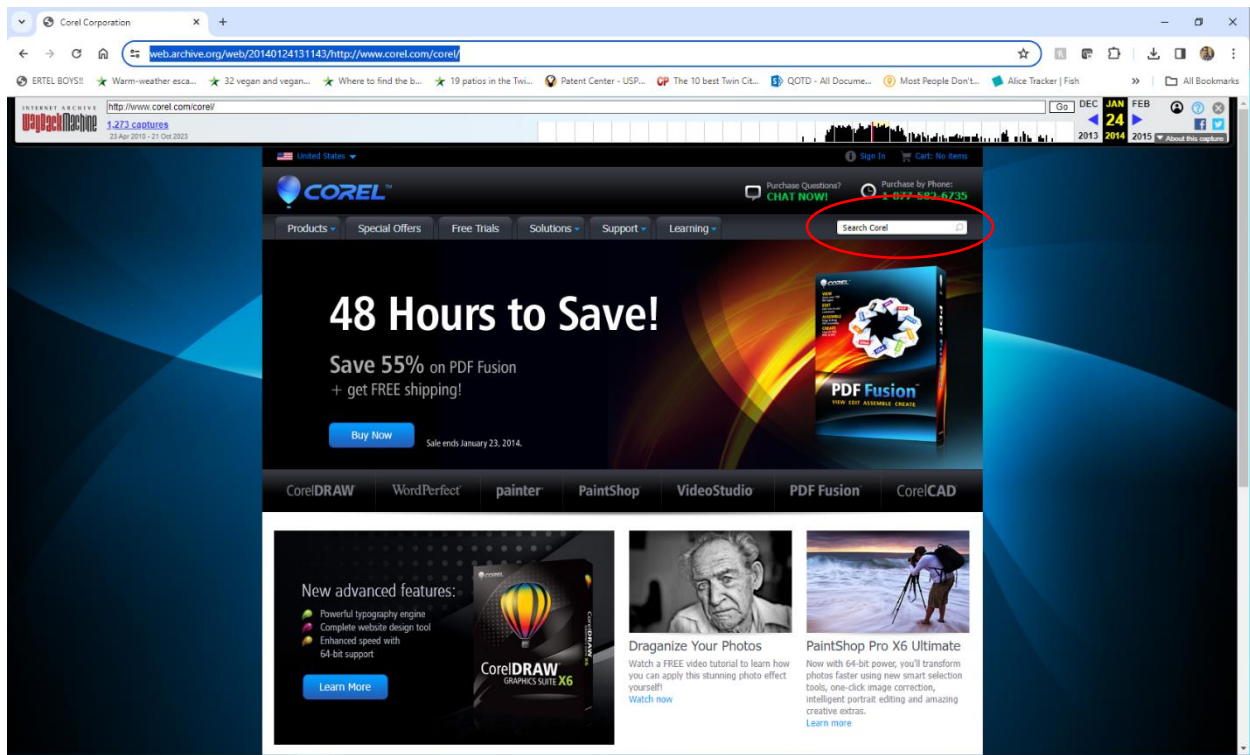
28. Similarly, TUKATECH is one of hundreds of videos posted on the official TukaTech YouTube page demonstrating how to use its TUKAdesign software:



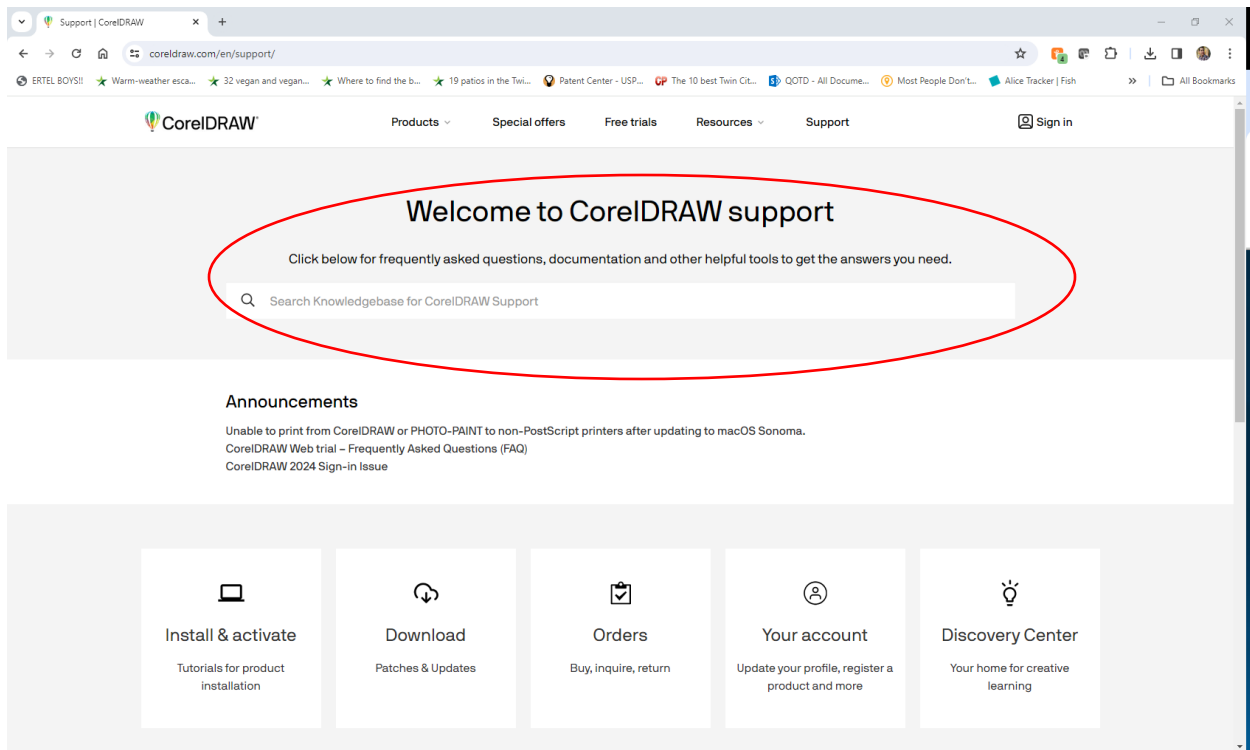
<https://www.youtube.com/@Tukatech/videos> (screen shot of 12 of hundreds of digital clothing design software tutorial videos posted by user @Tukatech, including the TUKATECH “Manually Adjust CAD Pattern Grading...” video (Exhibit LINGDI-1007)). Persons interested in learning more about CAD software in general and digital clothing design software more specifically, including tips for

how to use such software and useful features to include in such software, would have been able to find the EZBRUSH and TUKATECH videos by browsing the tutorials posted by the users and searching their specific video collections.

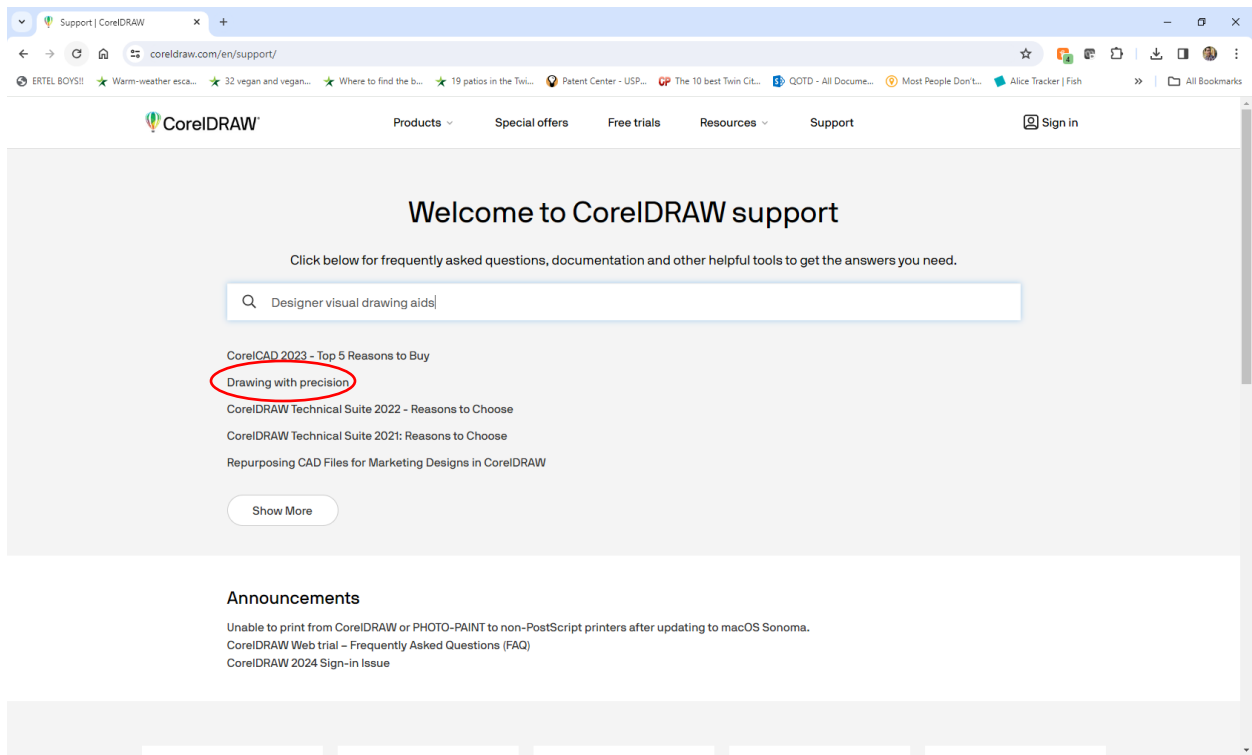
29. Furthermore, as would have been known to Persons of Ordinary Skill in the Art during the relevant timeframe, Corel was (and still is) a popular developer of design and drawing software. A person of ordinary skill in the art during this time frame would have therefore known to look to the Corel website to learn about new developments in design and drawing software. A person of ordinary skill and other interested members of the public would have been able to locate LINGDI-1005 through reasonable diligence. For example, an archived version of the Corel website front page from the same day that LINGDI-1005 was archived (January 24, 2014) shows that the website included a “search” function for searching the Corel website.



LINGDI-1013 (annotated with red oval). This is consistent with the present day Corel website, which includes a similar search function for inputting keywords:



LINGDI-1014 (annotated with red oval). A person of ordinary skill in the art would have used the “search” functionality at the Corel website itself to search for publications like LINGDI-1005 using predictable keywords such as “drawing,” “snapping,” “guides,” or “precision.” I conducted one specific example search to demonstrate that such persons of ordinary skill specifically interested in learning techniques for using the popular Corel DESIGNER software would have been able to readily locate LINGDI-1005 by searching for “DESIGNER” and other relevant terms. When I used this “search” function to search based on keywords “designer visual drawing aids,” LINGDI-1005 (“Drawing with precision”) is returned as the second result:



LINGDI-1015 (annotated with red oval). Interested persons would have known to look to the Corel website to find information on its popular products and developments in design and drawing software and would have employed reasonable diligence with keyword searching using the “search” functionality of Corel’s website to do so—all of which would have predictably led to locating LINGDI-1005 back in 2014.

30. Although for the sake of brevity this Declaration refers to selected portions of the cited references, it should be understood that one of ordinary skill in the art would have viewed the references cited herein in their entirety, and in combination with other references cited herein or cited within the references themselves. The references used in this Declaration, therefore, should be viewed

as being incorporated herein in their entirety.

VI. OVERVIEW OF THE '773 PATENT

31. The '773 patent “relates to computer simulation technology that processes 2D clothing patterns and thus creates digital clothing.” LINGDI-1001, 1:15-18. As the '773 patent describes:

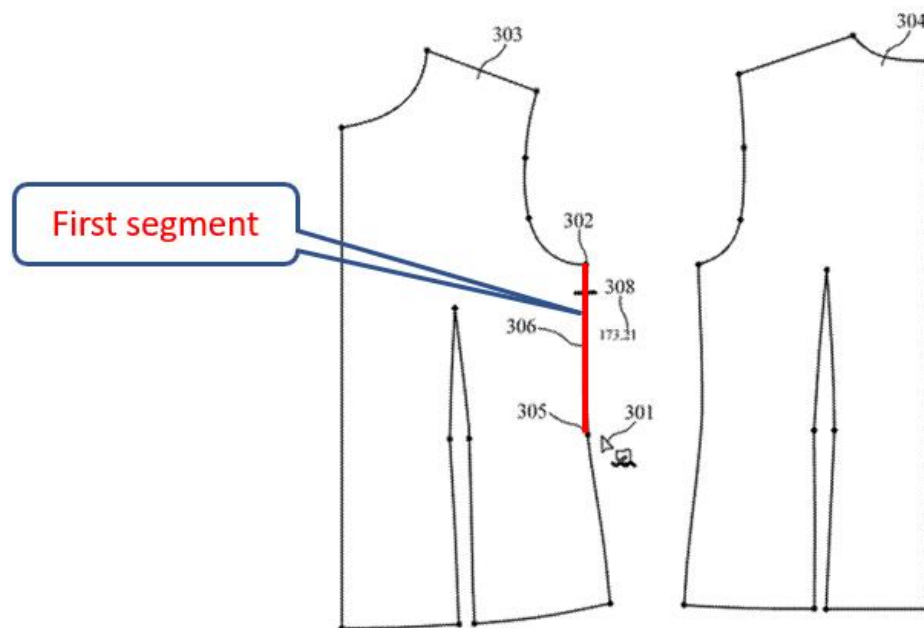
The purpose of the present disclosure is to easily adjust a length of another segment to be sewn the same as a length of a selected segment on a pattern when free-sewing.

LINGDI-1001, Abstract. The '773 patent does not purport to describe a pioneering innovation for such creation of digital clothing, but instead alleges a nuanced change to a user interface display in a then-common CAD software. This is demonstrated, for example by the '773 patent's citation to the Patent Owner's own “Marvelous Designer” software manual from 2014 (LINGDI-1001, cover page) and describes “[c]urrent clothing simulation technology” that includes methods using “free sewing” (LINGDI-1001, 1:20-67).

32. The '773 patent background section describes that such traditional CAD software would provide user interface options such as “segment sewing” and “free sewing” for purposes of digitally “sewing each of the different two patterns.” LINGDI-1001, 1:27-39; *see also* LINGDI-1004, 23:40-24:51. The '773 patent describes that “[s]egment is sewing the two selected segments among the segments

that are separated by dots; and free sewing is sewing two segments with the adjusted length that a user wants by freely adjusting each length of the two segments to be sewn.” LINGDI-1001, 1:30-34. More specifically, segment sewing is sewing functions to automatically sew two selected segments together along the full length of each segment. For example, if a user selects edges of two different patterns, the software will sew the two edges together along their full lengths, even if the lengths are not the same. Free sewing, by contrast, allows the user to specify how much of each segment or edge is to be sewn to the corresponding segment or edge by allowing the user to select the length for each sewing segment. This free sewing functionality provides the user with more control over each specific seam. The ’773 patent describes that “in the case of free sewing, if a user adjusts the two segments to be the same, accuracy is required when adjusting the length of another segment to be the same as the length of the first selected segment.” LINGDI-1001, 1:35-39. Along these lines, the ’773 describes techniques for providing more precision in free sewing techniques, including by providing visual aids to assist the user in selecting even length segments for sewing. However, as I discuss in more detail below, such features for aiding users in selecting line segment lengths to match other identified or selected segments was known in similar CAD software, including through the use of visual aids to assist the user in selecting segments of equal length and snapping of a cursor to snapping points.

33. Returning to the disclosures of the '773 patent, FIG. 4 illustrates “an operation of setting a first selected segment.” LINGDI-1001, 8:16-17. FIG. 4 of the '773 patent shows “two patterns 303 and 304 to be sewn; a starting point 302 of the first selected segment; an ending point 305 of the first selected segment; a first selected segment 306; a length 308 of the first selected segment; and a cursor 301,” with the user selecting “a first selected segment 306” on pattern 303, the segment 306 having a starting point 302 and an ending point 305:

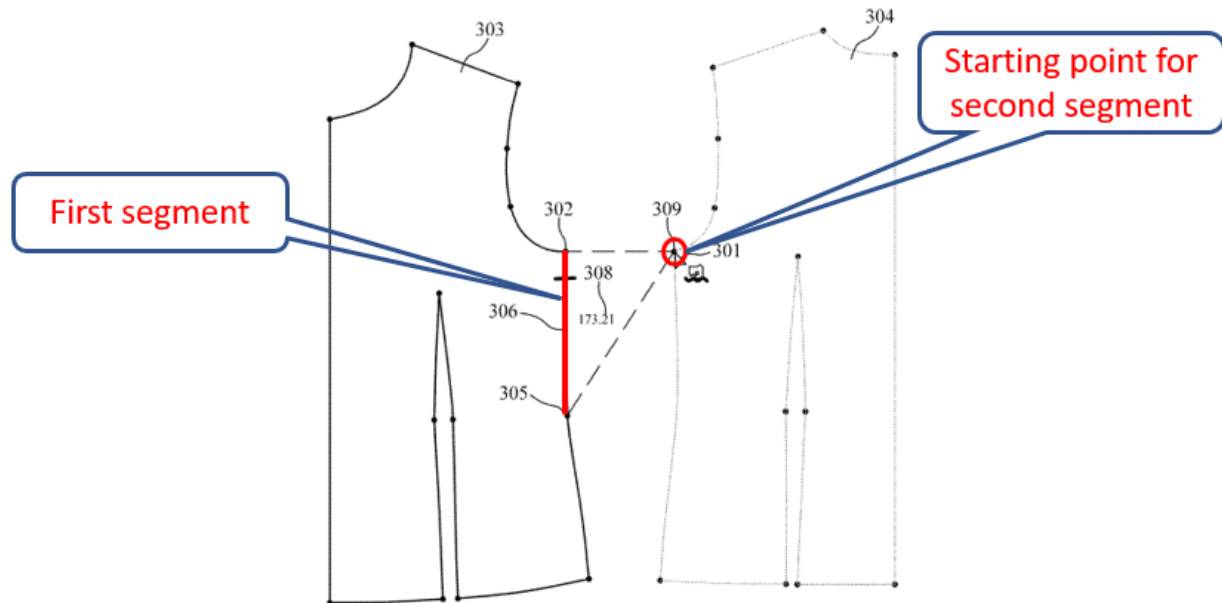


LINGDI-1001, FIG. 4 (annotated), 8:17-22.

34. FIG. 5 illustrates “an example of setting a second selected segment.” LINGDI-1001, 8:44-45. FIG. 5 shows “two patterns 303 and 304 to be sewn; a starting point 302 of the first selected segment; an ending point 305 of the first selected segment; a first selected segment 306; a length 308 of the first selected

segment; a starting point 309 of the second selected segment; and a cursor 301.”

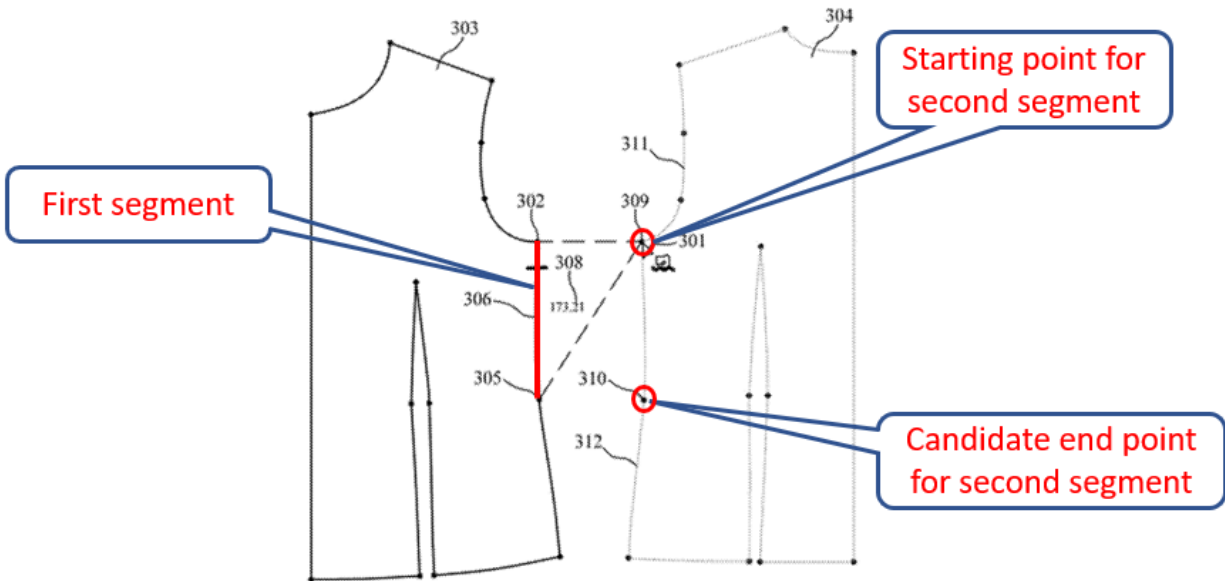
LINGDI-1001, 8:44-50. FIG. 5 shows the cursor 301 positioned at a point 309 to select a starting point for a second segment on pattern 304:



LINGDI-1001, FIG. 5 (annotated), 8:44-50.

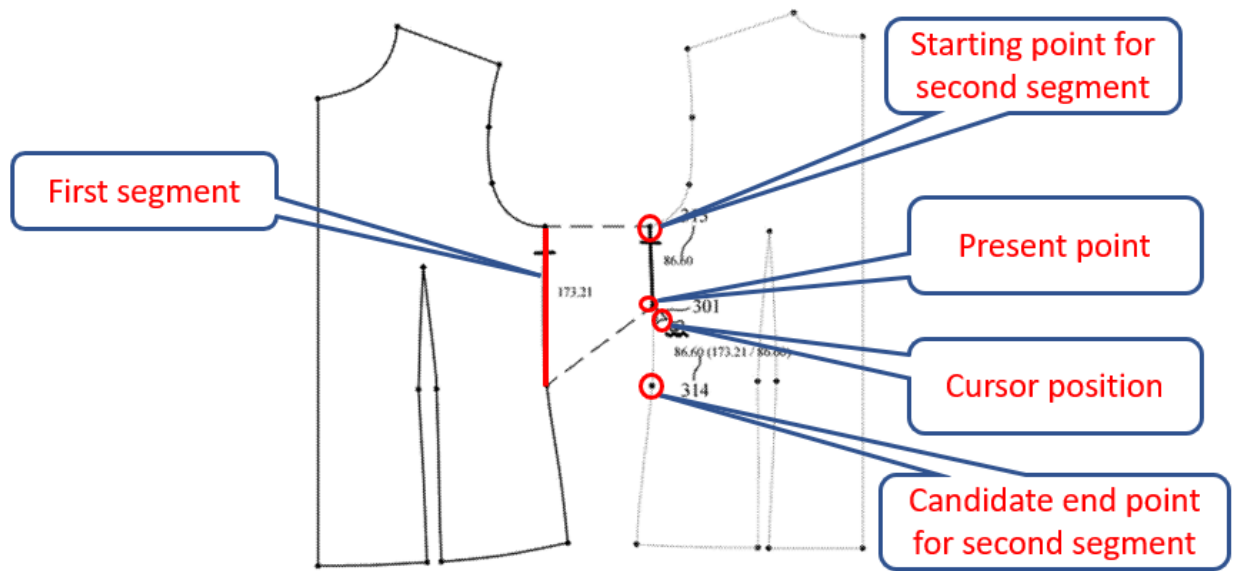
35. FIG. 6 illustrates “displaying a candidate for an ending point.”

LINGDI-1001, 9:3-4. In FIG. 6, the system displays a “candidate 310 for the ending point of the second selected segment” to “make[] the second selected segment the same as the length of the first selected segment.”



LINGDI-1001, FIG. 6 (annotated), 9:3-19.

36. FIG. 8 illustrates “displaying a difference value in 27 and displaying a warning sign in 28 and 29.” LINGDI-1001, 9:58-59. FIG. 8 shows a current cursor position and a present point that is “a point that is on the second segment that is the closest in distance to the current cursor position; and a difference value 314 between a length of a first selected segment and the length of a line” between the starting point 309 and the point along the second segment that is closest in distance to the current cursor position:



LINGDI-1001, FIG. 8 (annotated), 9:58-10:4.

37. The '773 patent also describes moving the present point to the candidate ending point so that the segments are substantially equal in length. For example, the '773 patent describes that “[t]he cursor position mover 231 moves the position of the cursor to the position of the determined candidate for the ending point and displays it the difference between the current cursor position and the determined candidate for the ending point is lower than a reference value.”

LINGDI-1001, 13:18-32.

VII. OVERVIEW OF THE '773 PATENT PROSECUTION HISTORY

38. The Application that became the '773 patent was filed on October 23, 2015. LINGDI-1002, 434-496. The '773 patent claims priority to an earlier filed Korean application filed April 27, 2015. The claims of the application were

rejected several times during prosecution in view of U.S. Publication 2004/0049309 (Gardner), U.S. Publication 2011/0298897 (Sareen), and U.S. Publication 2014/0135971 (Park), leading to numerous amendments of the claims by the applicant. In an office action response submitted March 3, 2020, the applicant amended independent claim 1 to add lengthy additional recitations—“connecting the starting point to a present point on the second selected segment closest in distance to the current cursor position to form a line based on a difference between the current cursor position and the present point being less than a first reference value; moving the present point to the candidate ending point in response to the difference between the present point and the candidate ending point being less than a second reference value” (issued Elements [1.5]-[1.6]). *Id.*, 62-76. The Examiner then added an examiner’s amendment to add Element [1.8], which recites “displaying a difference value between the length of the first selected segment and a length of the line.” *Id.*, 39-44. The claims were subsequently allowed after addition of these features to the claims. *Id.*, 34-43.

VIII. INTERPRETATION OF THE ’773 PATENT CLAIMS AT ISSUE

39. I understand that, for purposes of my analysis in this *inter partes* review proceeding, the terms appearing in the patent claims should be interpreted according to their plain meaning unless that meaning is inconsistent with the patent

specification or the patent's history of examination before the Patent Office. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time of the effective filing date of the claimed invention (not today). I have used the earliest possible priority date of the '773 patent as the point in time for claim interpretation purposes. That date was April 27, 2015.

IX. OVERVIEW OF CONCLUSIONS FORMED

40. This expert declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions:

- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that claims 1-3 and 6-9 of the '773 patent are rendered obvious by EZBRUSH in view of Corel, Thoemmes, and TUKATECH.
- Based upon my knowledge and experience and my review of the prior art publications listed above, I believe that claims 4-5 and 10-11 of the '773 patent is rendered obvious by EZBRUSH, Corel, Thoemmes, TUKATECH, and Niterra.

X. ANALYSIS OF THE PRIOR ART

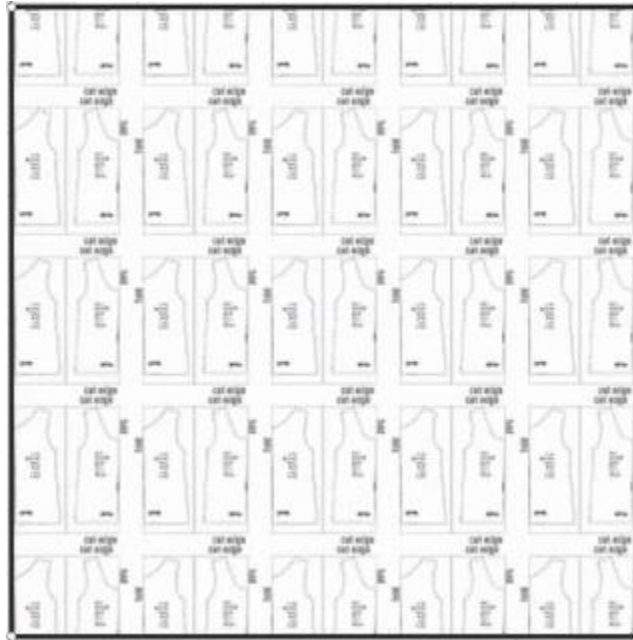
A. GROUND 1—Claims 1-3 and 6-9 are rendered obvious by EZBRUSH in view of Corel, Thoemmes, and TUKATECH

41. For the reasons articulated in detail below, and based on my review of

the '773 patent and the EZBRUSH, Corel, Thoemmes, and TUKATECH references, I am confident that a POSITA would have readily understood that the predictable combination of EZBRUSH in view of Corel, Thoemmes, and TUKATECH provides all elements of claims 1-3 and 6-9.

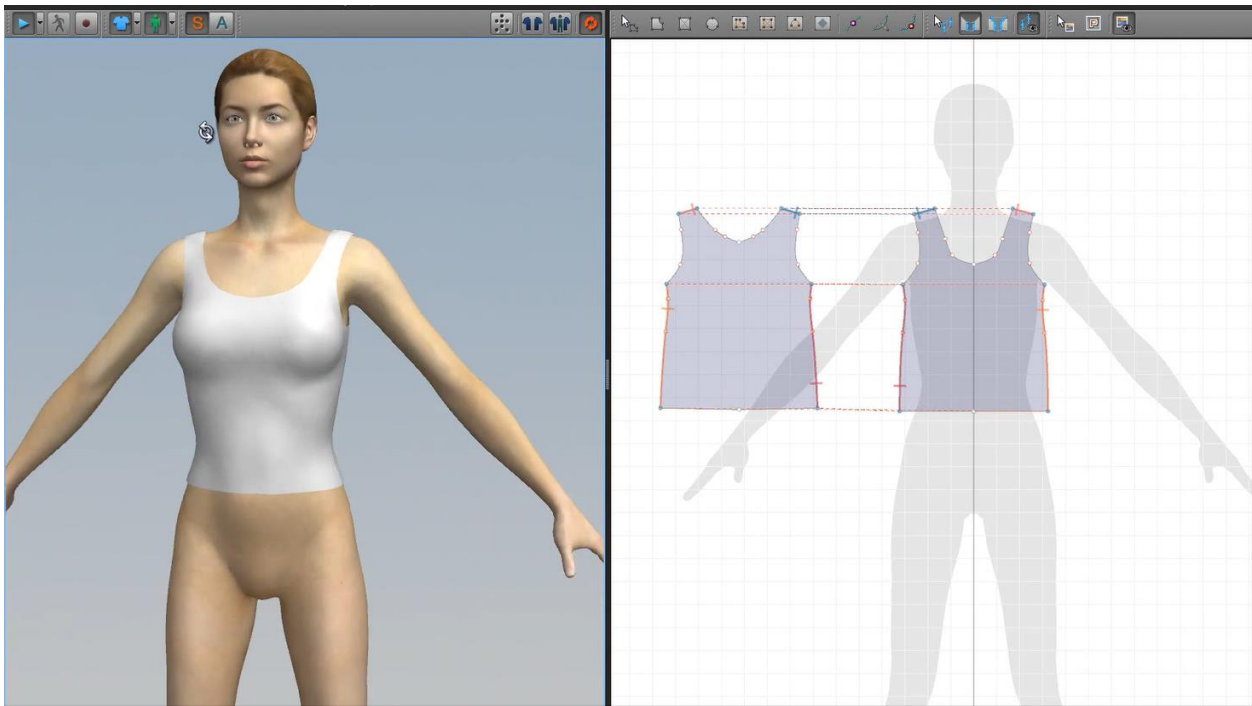
1. Overview of EZBRUSH

42. EZBRUSH is a video published on YouTube that shows various features of the “Marvelous Designer 2” software product as it was widely known in May 2012. LINGDI-1004, 0:16-0:25. The narrator introduces the video by describing he is demonstrating techniques for tracing patterns using “Marvelous Designer 2” software. *Id.*, 0:00-0:25. As I discussed above, the user who posted this video posted dozens of videos describing various features of the Marvelous Designer 2 software around the same time frame. The narrator of the EZBRUSH starts the tutorial for creating a shirt pattern by opening an image file of patterns stored on the computer and tracing a shirt pattern in the image file. LINGDI-1004, 0:00-20:00. Below is a still screenshot of EZBRUSH showing a stored image file of patterns:



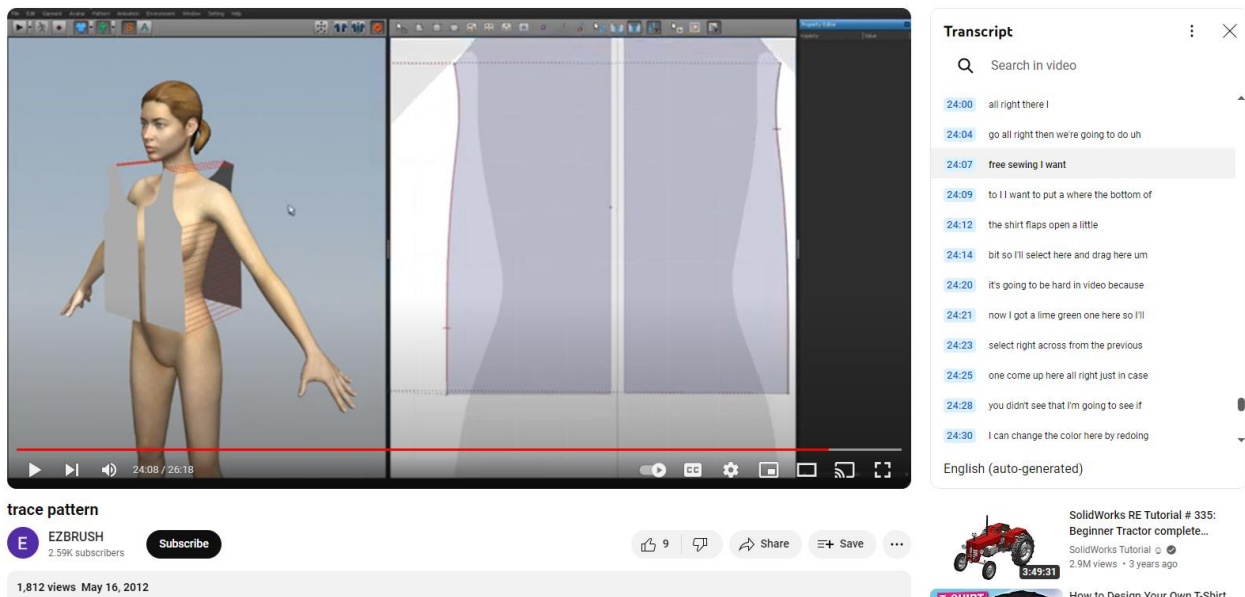
LINGDI-1004, 1:16-1:45. A POSITA would have already known from Marvelous Designer 2 and other digital clothing software systems that users were able open and save files of clothing patterns and draped digital clothing. The express description of using ‘Marvelous Designer 2’ and the opening of a file folder for selecting stored files plainly demonstrates what a POSITA would have already known from Marvelous Designer 2 and other digital clothing software systems—users were able open and save files of clothing patterns and draped digital clothing.

43. In the tutorial shown in the EZBRUSH video, the narrator demonstrates that after the user creates the front and back of the shirt, the front and back are sewn together and the software simulates draping of the shirt on an avatar.



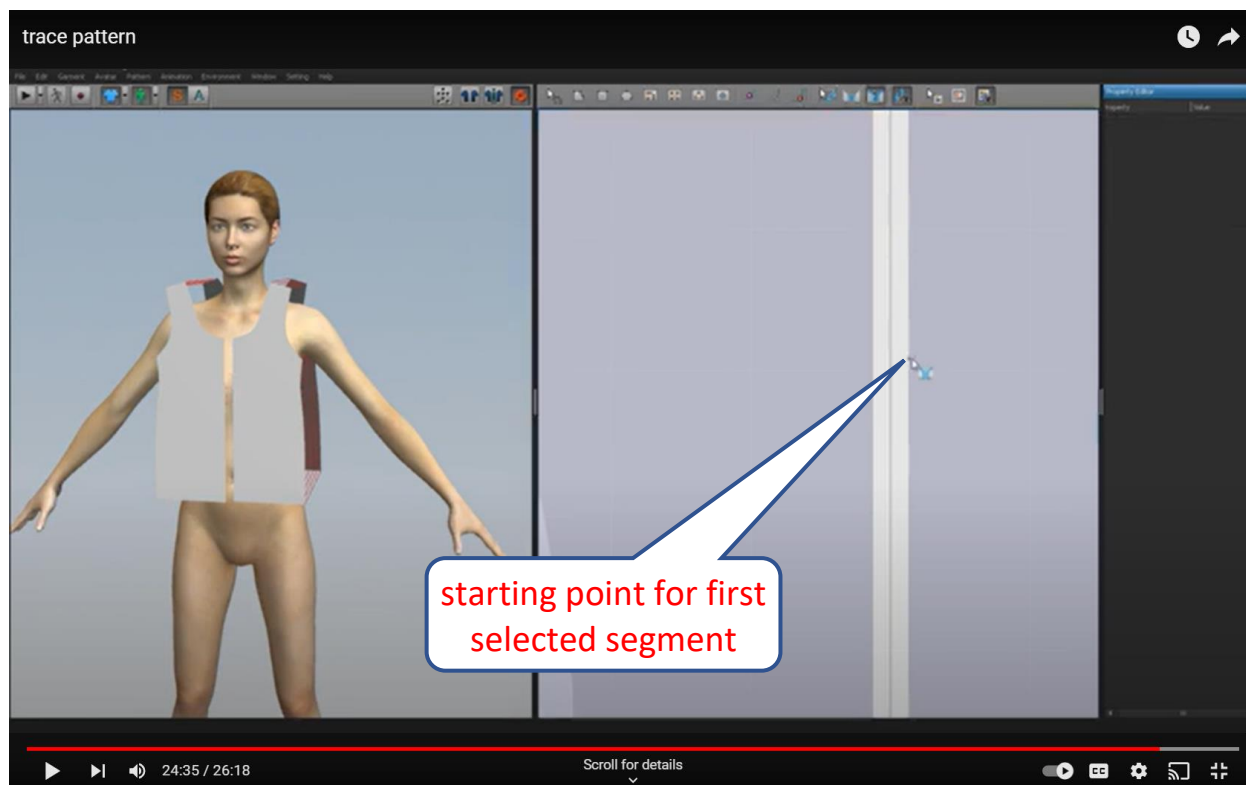
LINGDI-1004, 20:00-20:50.

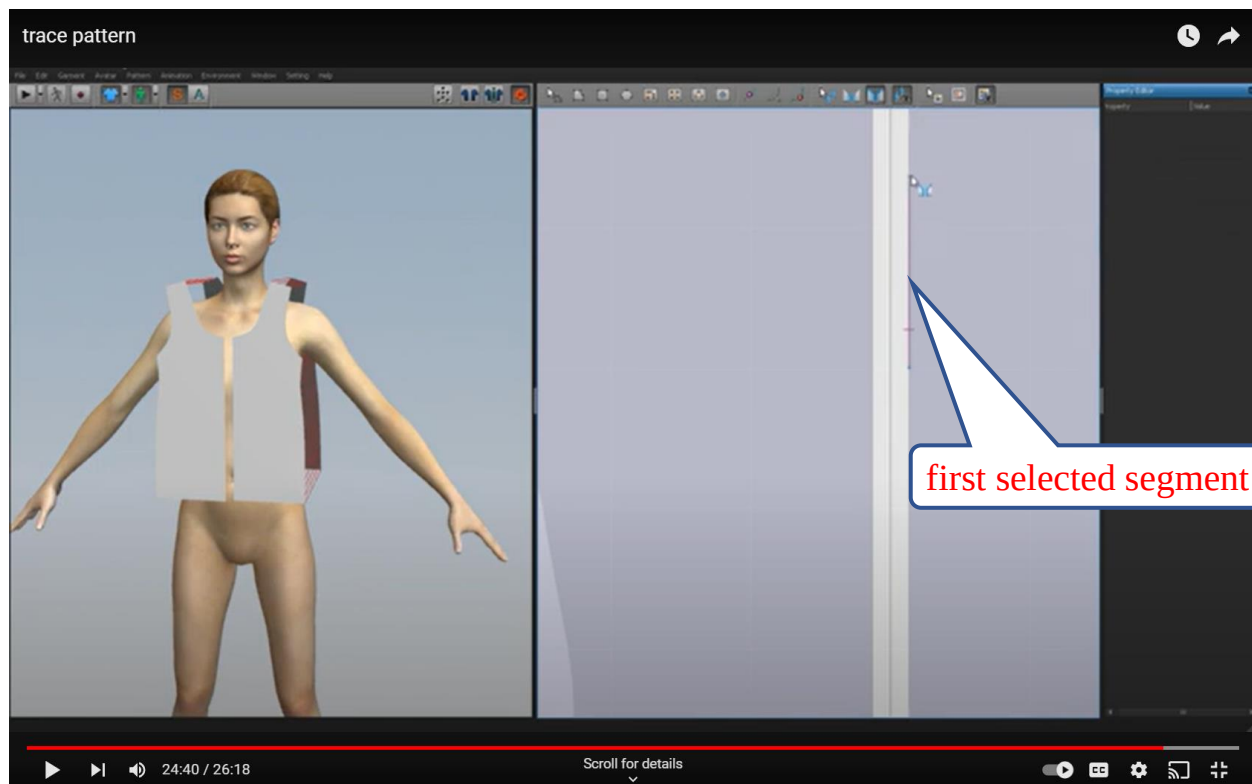
44. The narrator also walks through an example of “free sewing” two selected segments of the shirt pattern. LINGDI-1004, 24:00-24:50.



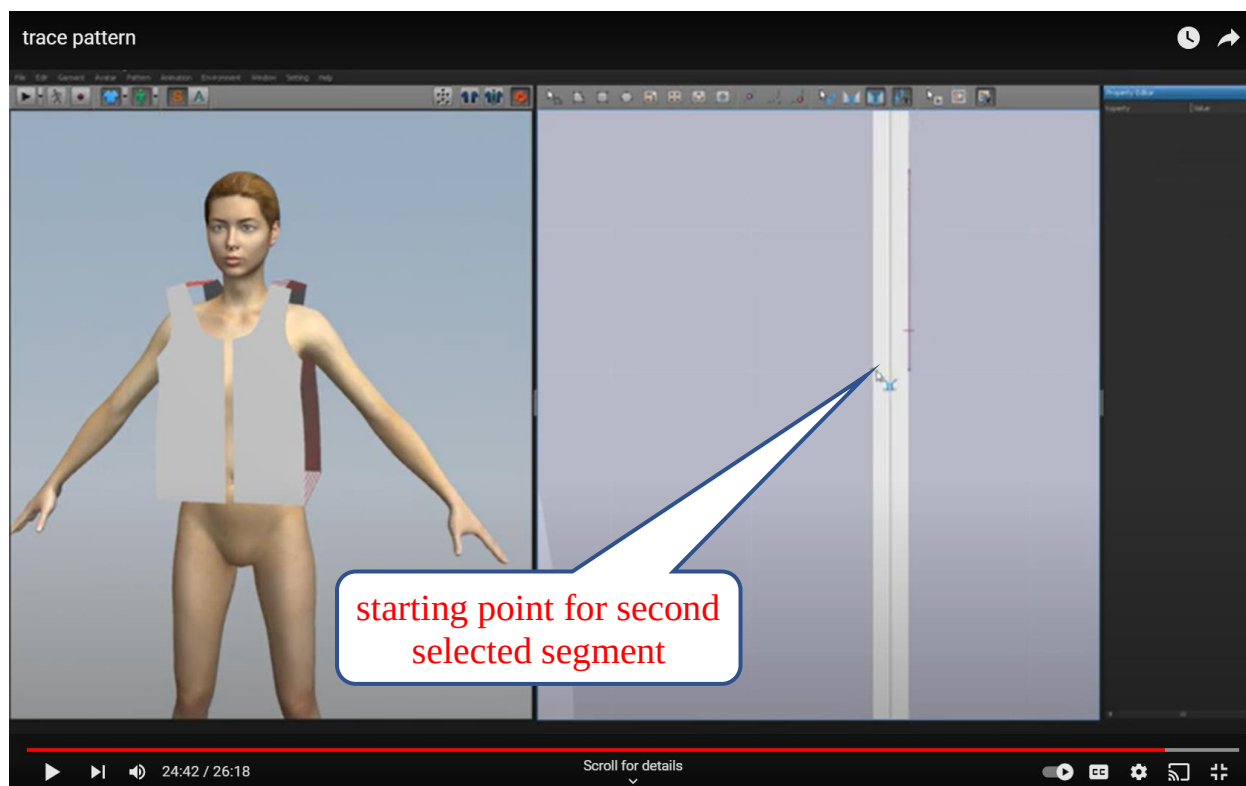
LINGDI-1004, 24:08 (with transcript of audio as available at

<https://www.youtube.com/watch?v=dRWJZab0tLA>). Below are still screenshots showing the user moving a cursor to set a first selected segment on a first segment of the right half of the shirt front:

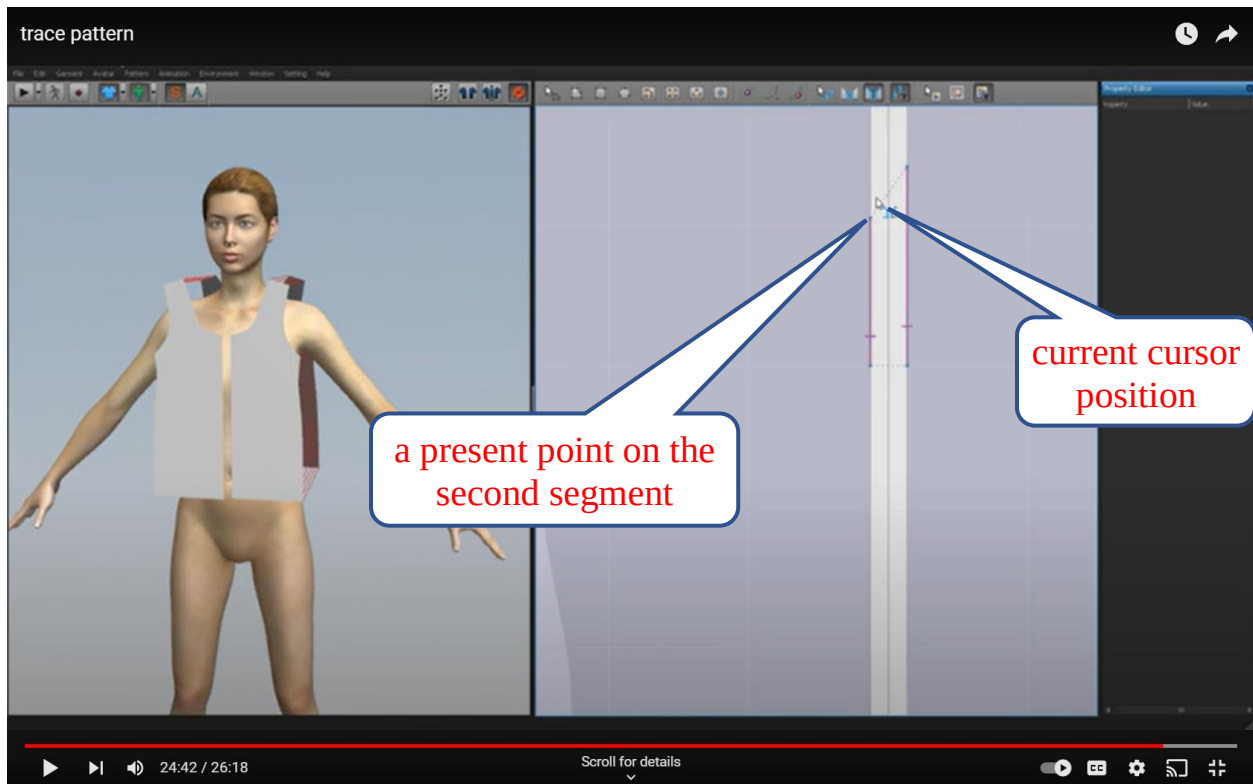




LINGDI-1004, 24:35-24:40 (annotated). Below is a still screenshot showing the user moving the cursor to set a starting point of a second selected segment on a second segment of the left half of the shirt front:

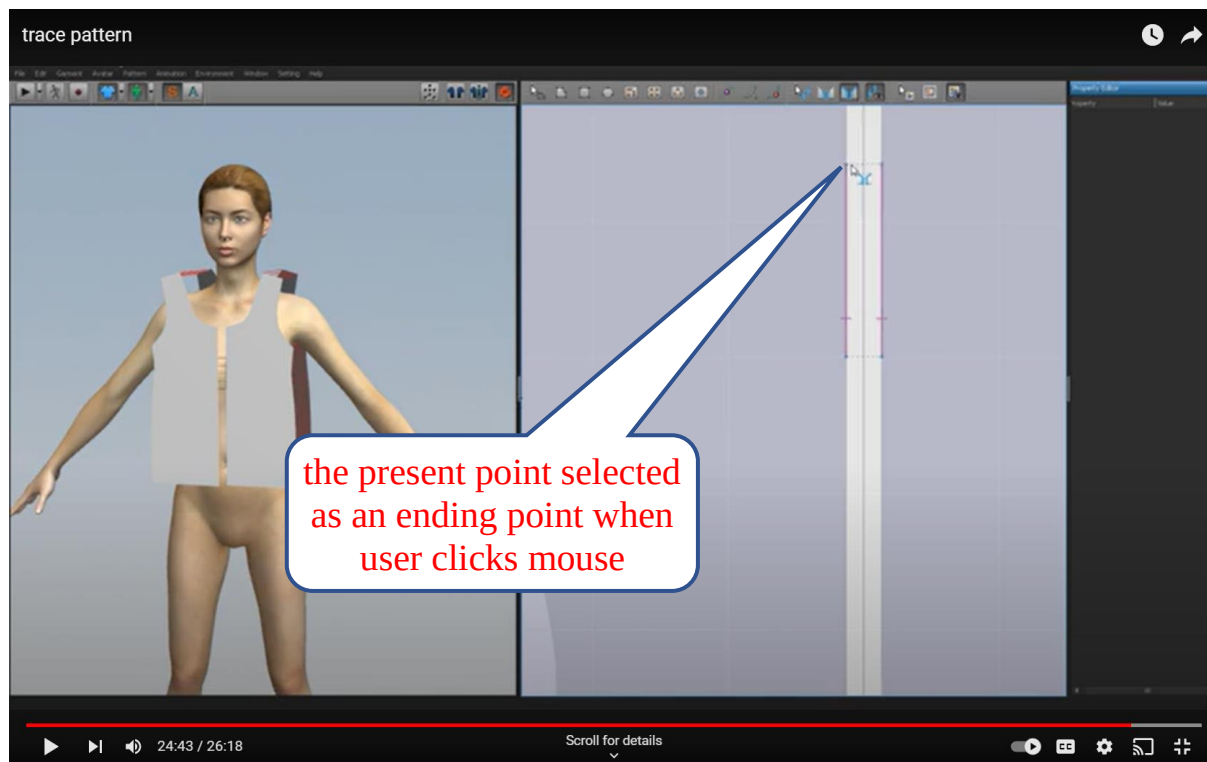


LINGDI-1004, 24:42 (annotated). Below is a still screenshot that shows that as the user moves the cursor along the second segment, a present point on the second segment is determined based on the current cursor position:

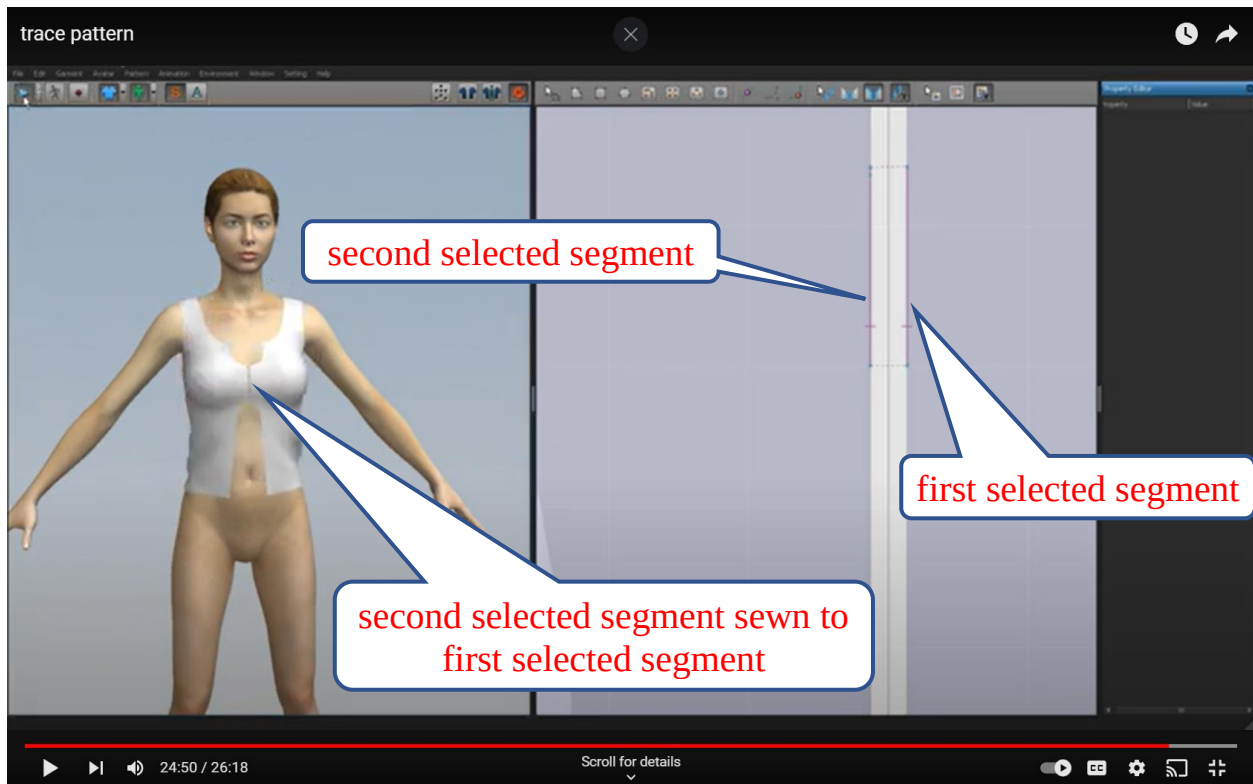


LINGDI-1004, 24:42 (annotated). The sequence of EZBRUSH from which the above screenshot was taken shows the present point moving along the selected segment (in this case, the edge of the clothing pattern on the left) while roughly tracking the location of the cursor. LINGDI-1004, 24:15-24:45. The movement of the present point in this video segment lags slightly behind movement of the cursor. *Id.* However, when the user slows or stops movement of the cursor, it becomes clear that the present point tracks to the closest point along the selected segment to the cursor (once the present point catches up to the location of the cursor). *Id.* Below is a still screenshot showing that when the user clicks the mouse, the present point on the second segment is selected as an ending point of

the second selected segment:



LINGDI-1004, 24:43 (annotated). Below is a still screenshot showing that the section of the second segment between the starting point and the ending point is set as the second selected segment to be sewn to the first selected segment:



LINGDI-1004, 24:50 (annotated).

2. Overview of Corel

45. Corel is a publication providing a tutorial for the then-popular Corel DESIGNER software, which is “a comprehensive vector-based drawing application for creating technical graphics.” LINGDI-1005, 1. Corel explains that:

Precision is essential in creating technical graphics. This tutorial introduces you to the two groups of precision tools in Corel DESIGNER. The first group consists of on-screen tools that provide visual aids in the drawing window—such as gravity snapping, dynamic guides, and guidelines.

Id.

Gravity snapping is the attraction of the pointer to a snap point. Snap points are precise mathematical drawing coordinates. When the pointer is close to a snap point, the gravity source of the snap point is highlighted. The highlighting identifies the snap point as the snapping target.

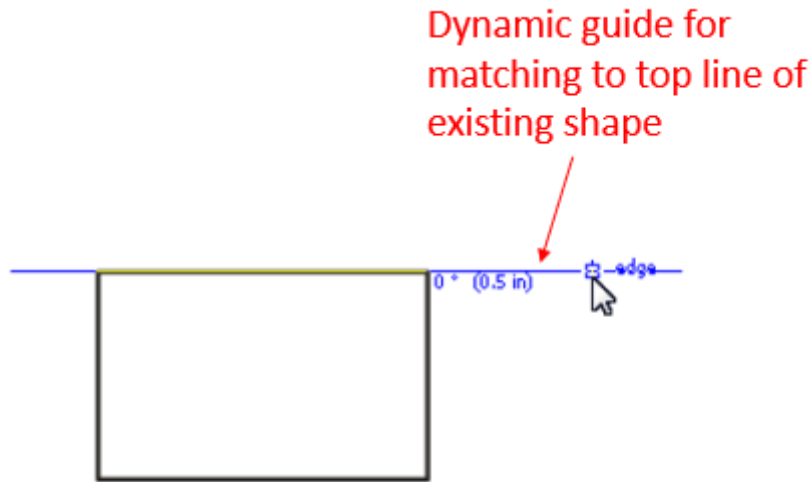
Id., 2.

Dynamic guides are temporary guidelines that you can display from the following snap points in objects—center, node, quadrant, and text-baseline end nodes. You can use dynamic guides to ensure precision when you draw and position objects in relation to other objects.

LINGDI-1005, 4.

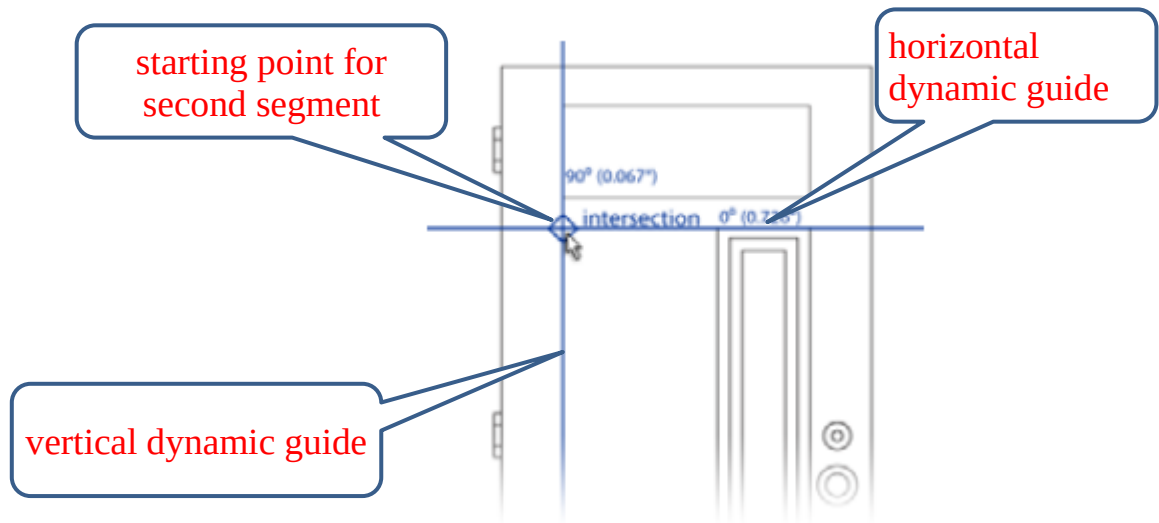
Dynamic guides contain invisible divisions, called ticks, to which the pointer is attracted. Ticks let you move objects with precision along a dynamic guide.

Id., 5. This Corel publication shows that Corel DESIGNER software allowed a user to select a segment of a shape to cause the software to display a dynamic guide:



LINGDI-1005, 6.

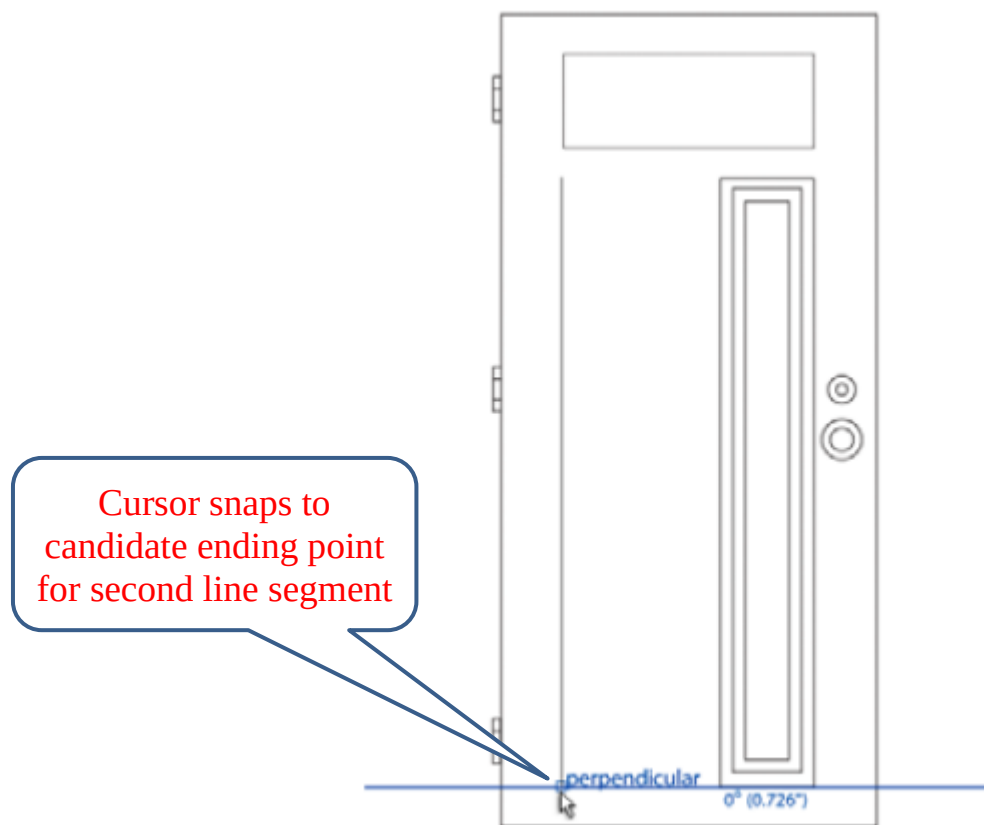
46. Corel’s dynamic guides and gravity snapping advantageously allow a user to draw a line segment that matches the length of an already existed, selected segment. Corel describes one example where the user selects an upper segment of a rectangle (“Point to the upper-left node of the right panel”) to cause the software “to display a horizontal dynamic guide.”



LINGDI-1005, 11 (annotated).

47. The figure above shows that although the cursor is not located at the precise intersection of the horizontal and vertical dynamic guides, the user can click to cause the starting point of the line segment to snap to the intersection of the dynamic guides. LINGDI-1005, 11 (“click to place the first point of the rectangle at the intersection point”). The user can then select a bottom of the already existing rectangle to cause the software to display a new horizontal dynamic guide. LINGDI-1005, 11 (“Drag downward to the lower-left node of the right panel, and then move the pointer to the left to display a horizontal dynamic guide.”). The user then “[c]ontinue[s] to move the pointer along the dynamic guide until the perpendicular snap point is displayed and the line becomes straight.” *Id.* A POSITA would have recognized that this “perpendicular snap point” is an example of a candidate end point for the second segment that, if

selected by the user, would make the length of the second segment equal to the length of the first segment, such that the two rectangles on the door in this example are the same length. Thus, the displayed dynamic guide and perpendicular snap point described by Corel allow the user to draw a line segment that is equal in length to the identified vertical segment of the existing rectangle. *Id.*



LINGDI-1005, 11 (annotated).

3. Overview of Thoemmes

48. Thoemmes is a patent describing “a computer-aided drafting tool for drawing lines at pre-settable angles from an existing linear entity and at pre-

settable distances from pick points on the existing linear entity.” LINGDI-1006, 1:23-29. Similar to EZBRUSH and Corel, Thoemmes describes “the ability to snap lines, and shapes” in a manner beyond snapping to “a fixed (x,y) Cartesian coordinate frame” as described in prior art systems. *Id.*, 1:38-57. Thoemmes thus provides “a tool that allows the user to draw new lines with specific, pre-defined geometrical relationships with existing, lines.” *Id.*, 1:38-57. Thoemmes describes that a new line can be “snapped to a pre-set line based upon the distance between the cursor and the pre-set line...depending upon the distance between the cursor and the first pick point” on the line. *Id.*, 1:67-2:10.

49. Thoemmes describes an example in which a user selects “a first pick point 308” along an already existing line and the software displays a “snap line 314” at a preset angle from the first line on which the pick point 308 is located:

First, a first pick point 308 on a linear entity such as existing line 302 is defined, as shown in block 202. This can be implemented by a command having the first pick point 308. Typically, the first pick point 308 is selected by positioning a cursor over the point with a mouse 116 or other pointing device, and depressing a mouse button.

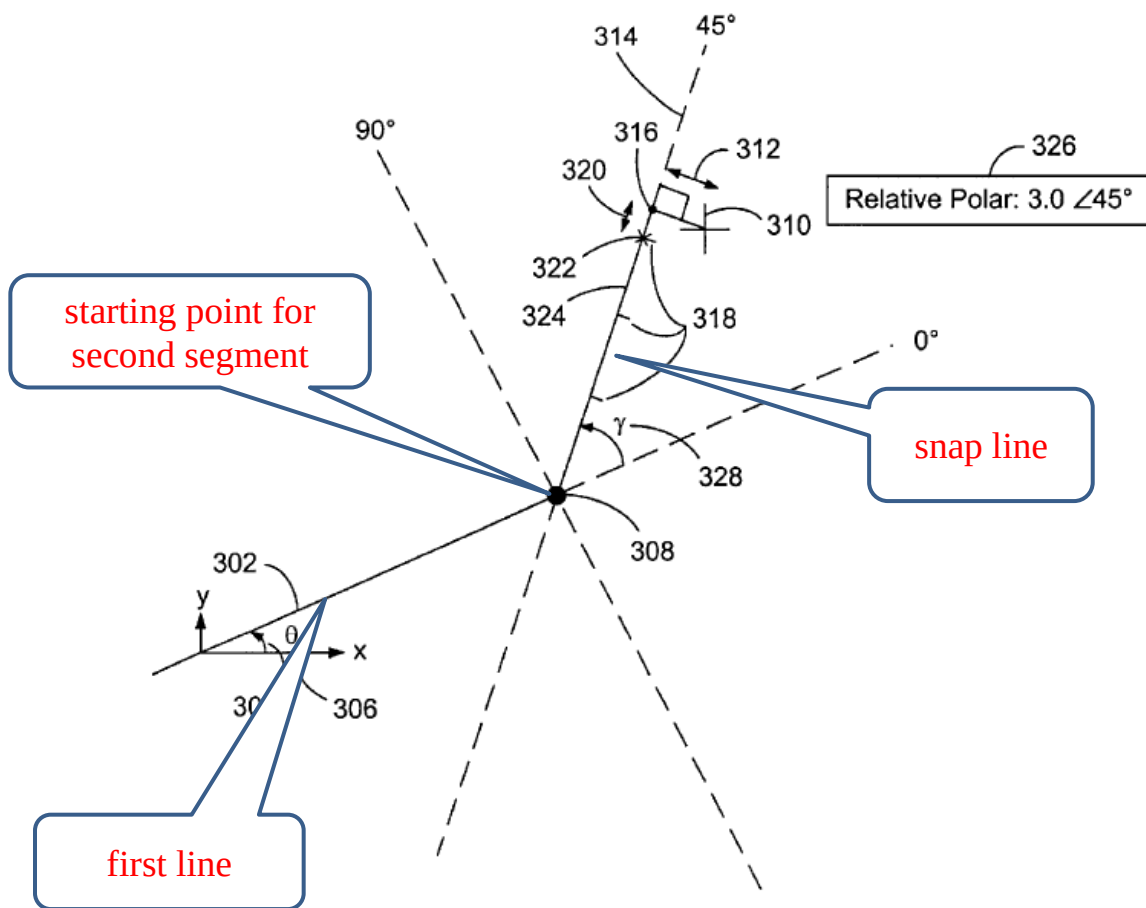
LINGDI-1006, 3:46-53.

In one embodiment, the length of the extension line 324 is determined by determining a reference point 316 on the extension or snap line 314 that is nearest the position of the first cursor 310.

LINGDI-1006, 4:22-25.

In this embodiment, the extension line 314 is computed from a distance 312 from a first cursor 310 and snap line 314 defined by the first pick point 308 and at a pre-settable angle γ 328 from the existing line 302, as shown in block 216.

LINGDI-1006, 4:48-52.



LINGDI-1006, FIG. 3.

50. Thoemmes describes that:

The extension line 324 extends from the first pick point 308 at a pre-settable relative angle from the linear entity 302.

LINGDI-1006, 4:8-11.

In one embodiment of the present invention, the relative snap tool also allows the user to snap to one of a plurality of pre-settable extension line lengths. This is accomplished by defining a second cursor 322 on the extension line 324, and displaying the second cursor 322 on the display 122. The user may then select a button on the mouse 116 to define the length of the extension line 324. In one embodiment, the length of the extension line 324 is determined by determining a reference point 316 on the extension or snap line 314 that is nearest the position of the first cursor 310. Then, a determination is made as to when the reference point 316 is within an extension line snap distance 320 from one of a plurality of pre-settable distances 318 from the first pick point 308. In the embodiment illustrated in FIG. 3, the reference point 316 is within an extension line snap distance 320 from the third pre-settable distance from the first pick point. Accordingly, the second cursor 322 is placed in this position along the extension line 324.

Id., 4:15-32.

In this embodiment, the extension line 314 is computed from a distance 312 from a first cursor 310 and snap line 314 defined by the first pick point 308 and at a pre-settable angle γ 328 from the existing line 302, as shown in block 216. If the distance 312 between the first cursor 310 and the snap line 314 is less than a snap distance,

an extension line 324 is defined from the snap line 314, as shown in blocks 218 and 222.

Id., 4:48-56.

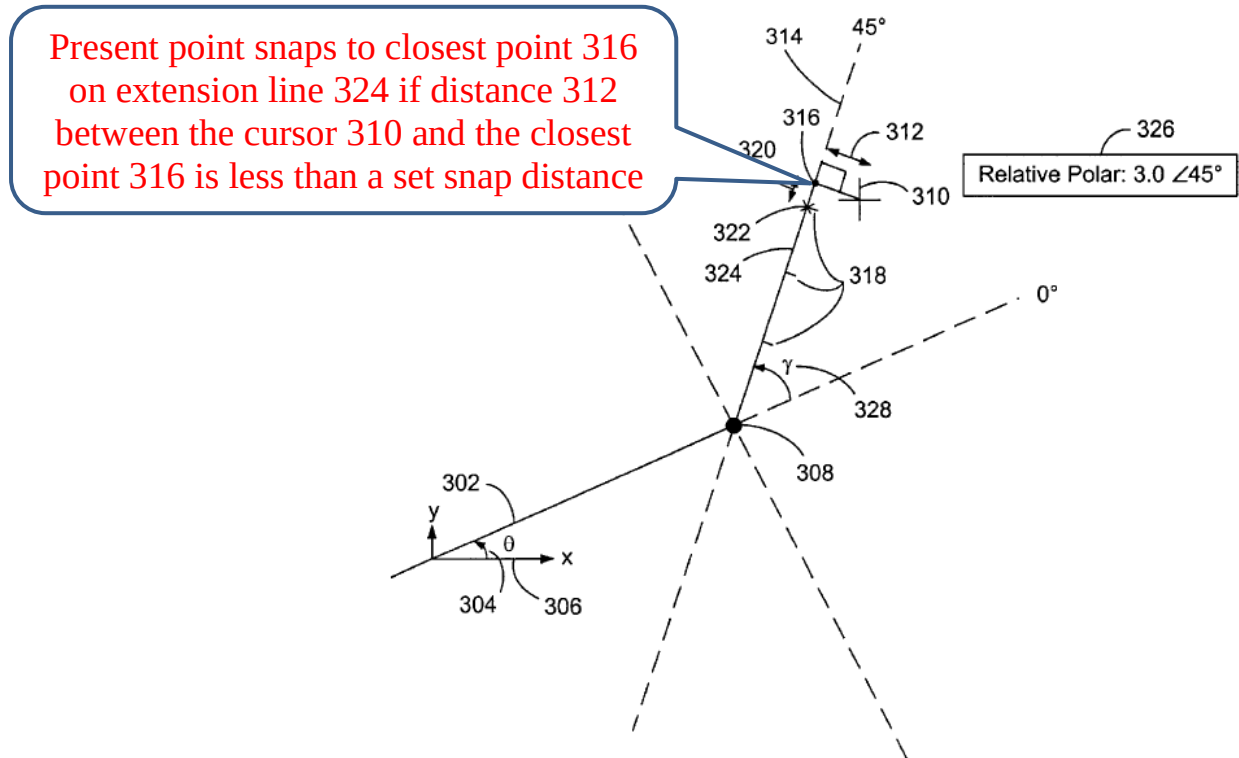


FIG. 3

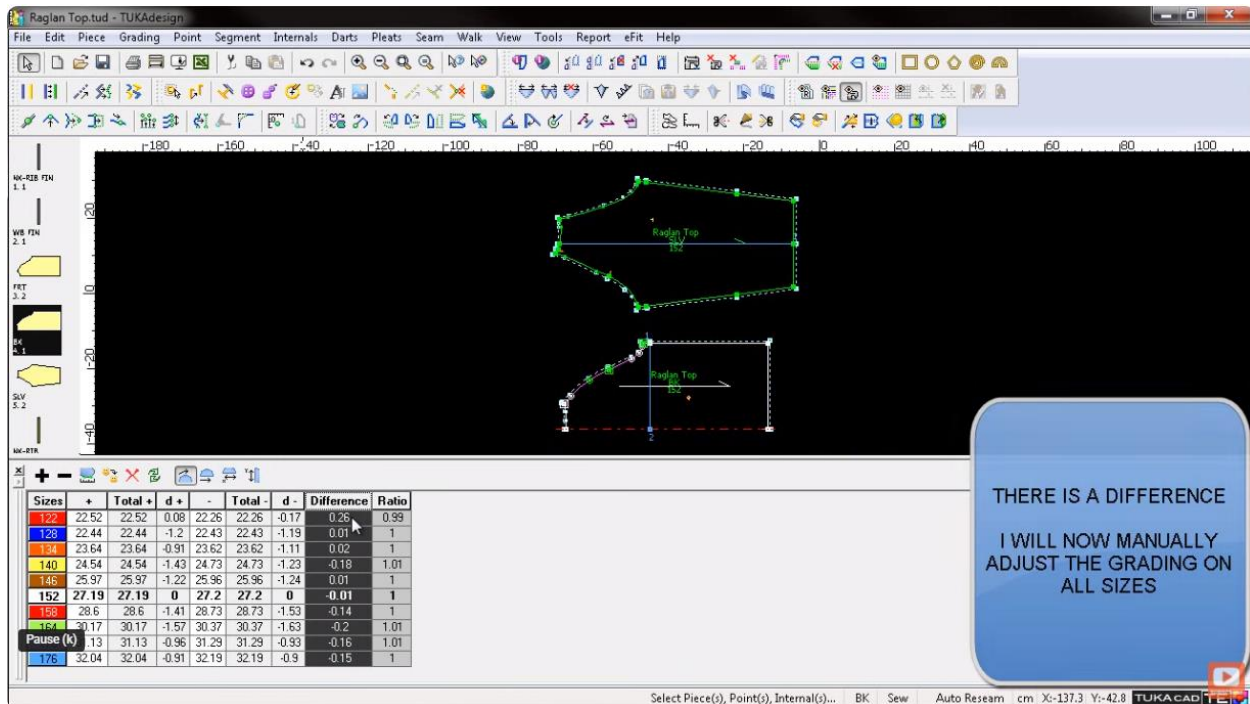
LINGDI-1006, FIG. 3 (annotated).

51. As shown in FIG. 3, several snap points 318 are displayed at set intervals along the extension line 324. *Id.*, 4:15-32. As discussed above, if “the reference point 316 is within an extension line snap distance 320 from one of the plurality of pre-settable distances 318,” the selected endpoint of the second line “is placed in this position along the extension line 324.” *Id.*

LINGDI-1006, FIG. 3 (annotated).

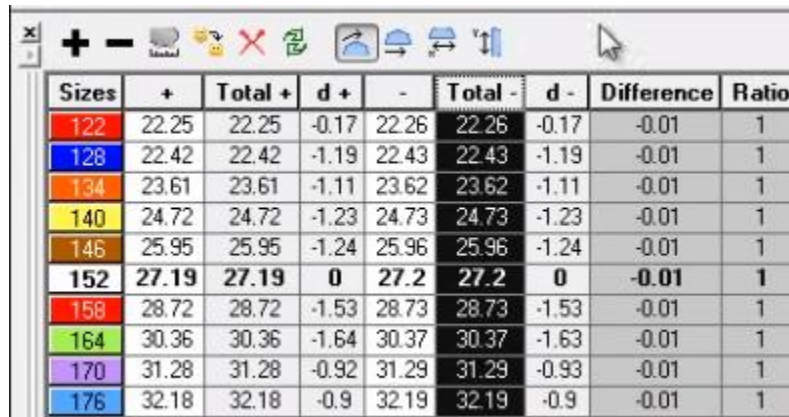
52. TUKATECH is a video published on YouTube showing various features of the then-popular TUKAcad software suite for pattern making, grading, and marker making. LINGDI-1007. The TUKATECH video appears to have been created and released by Tukatech, Inc., the company that released the TUKAcad software. TUKATECH demonstrates a conventional practice in such digital

clothing design software that allows a user to compare the length of two different segments from different patterns when designing a garment. *Id.*, 0:10-0:30.



Id. By displaying the length difference between the line segments, the TUKAcad software allows the user to manually adjust the segments for all sizes. *Id.*

53. As shown in the still screenshot from TUKATECH, after manually adjusting the lengths, the difference value for each size for the design is reduced to near zero:

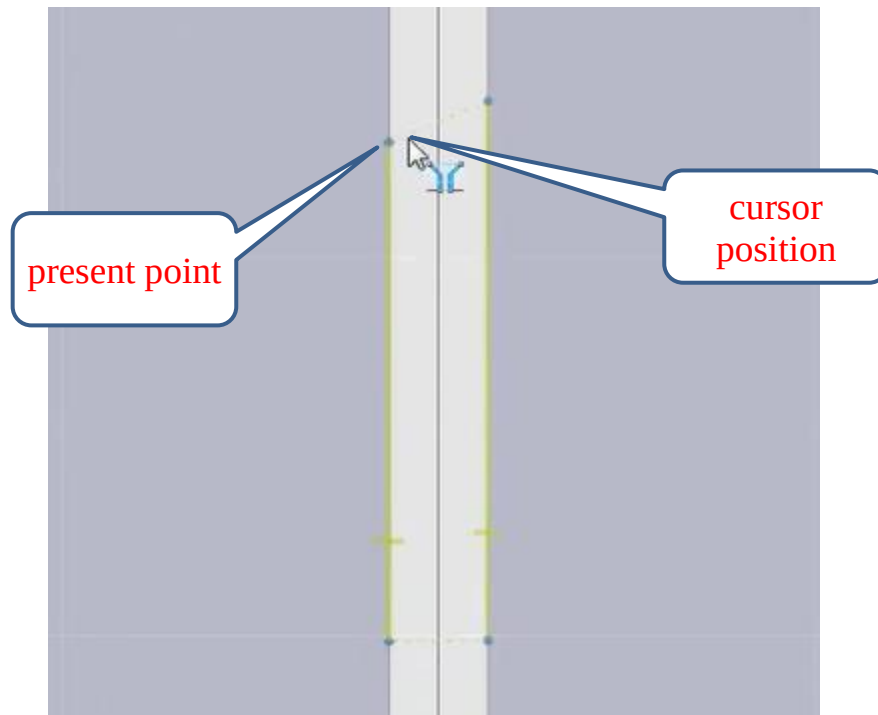


Sizes	+	Total +	d +	-	Total -	d -	Difference	Ratio
122	22.25	22.25	-0.17	22.26	22.26	-0.17	-0.01	1
128	22.42	22.42	-1.19	22.43	22.43	-1.19	-0.01	1
134	23.61	23.61	-1.11	23.62	23.62	-1.11	-0.01	1
140	24.72	24.72	-1.23	24.73	24.73	-1.23	-0.01	1
146	25.95	25.95	-1.24	25.96	25.96	-1.24	-0.01	1
152	27.19	27.19	0	27.2	27.2	0	-0.01	1
158	28.72	28.72	-1.53	28.73	28.73	-1.53	-0.01	1
164	30.36	30.36	-1.64	30.37	30.37	-1.63	-0.01	1
170	31.28	31.28	-0.92	31.29	31.29	-0.93	-0.01	1
176	32.18	32.18	-0.9	32.19	32.19	-0.9	-0.01	1

Id., 2:54-3:00.

5. The Combination of EZBRUSH with Corel, Thoemmes, and TUKATECH

54. As I discussed above, the Marvelous Designer 2 software demonstrated in the EZBRUSH video allows users to create virtual clothing designs. The software includes features for manually sewing together segments of garment patterns using “free sewing,” Which allows the user to manually select start and end points for segments on the displayed garment patterns to identify segments for creating custom seams. LINGDI-1004, 24:00-24:50. As part of the free sewing functionality demonstrated in EZBRUSH, the software includes snapping functionality that snaps to a present point along an existing segment of a garment pattern based on a current cursor position even when the cursor is not located precisely on the segment:



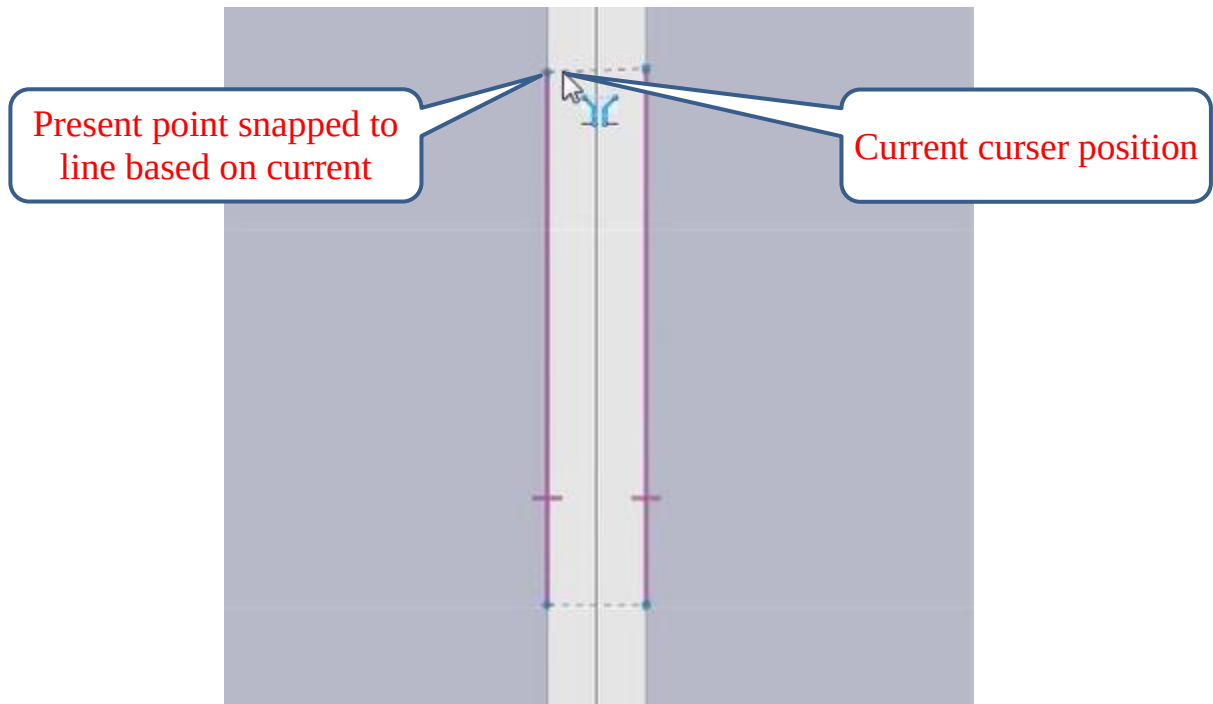
LINGDI-1004, 24:25.

55. There are multiple reasons (including the seven I articulate below) that would have prompted a POSITA to modify EZBRUSH's CAD system so as to implement conventional user interface improvements as suggested by Corel, Thoemmes, and TUKATECH. Such modifications would have led to predictable results. For example, Corel suggests using dynamic guides and implementing gravity snapping, for example, including the convenient display of candidate snap points for making a second segment equal in length to a first identified segment, and pertinent to the suggestions from Corel, a POSITA would have been prompted to modify EZBRUSH's CAD system in accordance with Corel's beneficial suggestions. And Thoemmes suggests how to implement intuitive and improved

snapping (e.g., based on the cursor being within a “snapping distance” threshold of an identified segment and to advantageously snap a present point to a candidate end point for the segment to achieve a desired, pre-specified length for the segment), and pertinent to the suggestions from Thoemmes, a POSITA would have been motivated to further modify EZBRUSH in light of Thoemmes’ suggestion. Lastly, TUKATECH suggests displaying a difference value between the lengths of two selected segments in the resulting CAD system, and pertinent to suggestions from TUKATECH, a POSITA would have been motivated to further modify EZBRUSH in light of TUKATECH’s suggestion to helpfully display such information.

(a) Articulated Reasons for modifications based on Corel and Thoemmes

56. As a first reason, a POSITA would have applied the suggestions of Corel and Thoemmes to EZBRUSH’s CAD system to supplement the snapping functionally shown in EZBRUSH. Doing so would thereby achieve a rapid and precise tracking/point selection for users. As discussed above, EZBRUSH shows several examples of a present point along a second selected line segment that is “snapped” to the selected segment even when the cursor is not precisely over the segment:



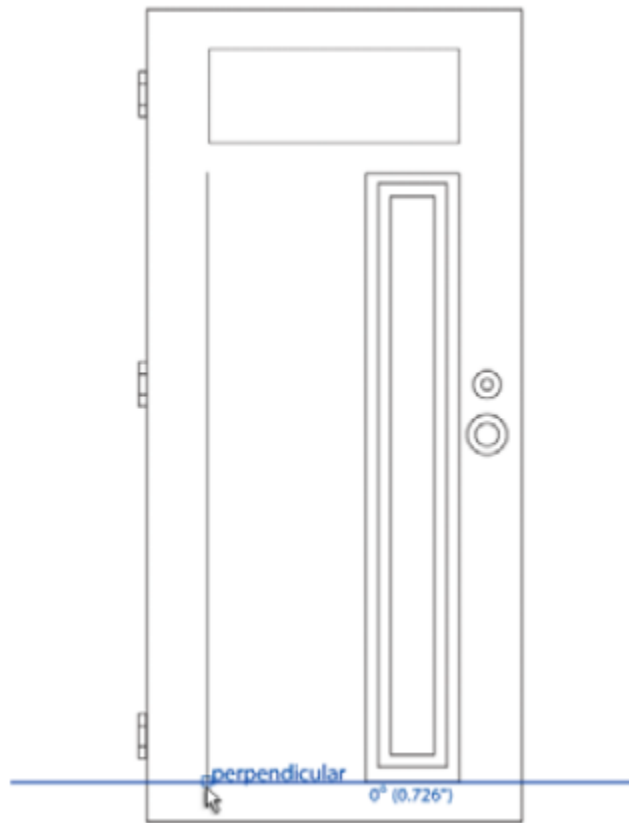
LINGDI-1004, 24:34-24:44. I note that EZBRUSH, by itself, does not provide all of the implementation details regarding how to implement the underlying cursor actions in the snapping action shown in the above cited portions of the video (including as shown in the above screen shot). For example, while it is clear to a POSITA from the EZBRUSH video that there are thresholds applied to the distance between the cursor and the segment that designate when the present point is snapped to the segment, the details on implementations of these thresholds are not express in EZBRUSH. Fortunately, long before the late time frame leading up to April 2015, other publications, such as Corel and Thoemmes, amply provided details on how to implement such snapping functionality in a manner that achieves rapid and precise point selection along a line segment. For example, Corel plainly

suggests an underlying motivation for improving user interfaces of CAD systems—“[p]recision is essential in creating technical graphics.” LINGDI-1005, 1. A POSITA would have been motivated to implement EZBRUSH to include the additional details regarding how to implement snapping (as suggested by Corel and Thoemmes (described above)) to beneficially achieve precise and predictive point selection along a line segment within the CAD user interface—an especially pertinent improvement for the free sewing functionality demonstrated by EZBRUSH.

57. As a second reason, a POSITA would have been motivated to implement Corel and Thoemmes’ suggested improvements for snapping functionality in EZBRUSH’s CAD system because doing so would increase user convenience while also providing greater precision within the CAD interface. By implementing such snapping functionality, a user would have been allowed to select points along an existing line segment (e.g., the edges of patterns) without having to precisely align the cursor with the line segment. Snapping to a line segment when the cursor is within a threshold distance of the line segment (as taught by Thoemmes) would have allowed the user to more quickly select start and end points along the line segment and thereby complete design tasks with more rapidity and less fatigue.

58. As a third reason, a POSITA would have been motivated to modify

EZBRUSH's CAD system in a manner that implements Corel's suggestions for using dynamic guides and for displaying a candidate endpoint for making a second segment equal in length to a first identified segment. Such implementation would allow advantageously snapping to the predictive point selection along an edge of EZBRUSH's garment pattern and would avoid inadvertent errors/bunching in the digital clothing. For example, a POSITA would have known that when sewing two garment patterns together during EZBRUSH's free sewing functionality, selecting the sewing segments to be equal in length would have been desirable to allow for a clean, smooth seam and prevent bunching or unintended stretching of the material. Implementing Corel's suggested improvements in EZBRUSH's CAD system would advantageously provide a snapping action toward selection of such equal length sewing segments in a manner that is intuitive and user friendly. Corel discloses displaying the dynamic guidelines and candidate end points in a different color from the rest of the design so that the guides stand out from the rest of the drawing, making such guides easy to use when selecting segments of equal length. A POSITA would have recognized that such efficiencies would have been beneficial in the resulting system. Using a circle to indicate the candidate endpoint for snapping (rather than just a point) also makes the candidate endpoint more apparent, which a POSITA would have recognized as further increasing the ease of use when selecting segments of equal length in the resulting system.



59. As a fourth reason, a POSITA would have been further motivated to modify the EZBRUSH-Corel combination in a manner that implements Thoemmes's suggestions for snapping the cursor to a reference point along a line and then snapping the reference point to a candidate endpoint at a predesignated distance from the starting point of the line. Such a predictable improvement would have allowed the user to more easily select the candidate end point when making the selected segments equal in length and would have allowed the user to accurately and promptly select the displayed suggested candidate endpoint without having to tediously/perfectly align the cursor with the displayed suggested

candidate endpoint. This modification also would have added additional design features to the resulting digital clothing design system, which would have increased the overall utility of the resulting system. A POSITA would have recognized that increasing the available functions of the software would have been viewed as desirable by most if not all users.

60. As a fifth reason, I note that EZBRUSH does not, by itself, fully describe how the “snapping” cursor action is achieved. However, both Corel and Thoemmes detail the conventional practice of doing so in a user interface for CAD systems where point selection along a line segment is an oft-repeated user action. A POSITA would have been motivated to combine a known technique to address a known problem using prior art elements according to their established functions. Here, EZBRUSH, Corel, and Thoemmes are all directed toward CAD systems. A POSITA would have recognized that applying the suggestions of Corel and Thoemmes to EZBRUSH’s CAD system would have led to predictable and advantageous results with a reasonable expectation of success without significantly altering or hindering the functions performed by EZBRUSH’s systems.

**(b) Articulated Reasons for further modification
based on TUKATECH**

61. A POSITA would have known that when using the resulting CAD system (EZBRUSH as modified by Corel and Thoemmes (detailed above)) to

digitally “sew” two garment patterns together, selecting the sewing segments to be equal in length would have been desirable when seeking a clean, smooth seam that prevents bunching or unintended stretching of the material. To this end, TUKATECH suggests the conventional practice in clothing design software (and CAD systems more generally) of providing an onscreen comparison of the lengths of two selected line segments. LINGDI-1007, 0:00-3:00. A POSITA would have been motivated to further modify EZBRUSH to implement TUKATECH’s suggested improvement for providing an onscreen comparison of the lengths of two selected line segments. Doing so would have provided more pertinent information for the user and would have achieved rapidly informed decision-making by the user during length selection. For example, this suggested functionality would have provided onscreen confirmation to the user that the two selected line segments are intentionally equal in length after selecting the candidate endpoint. This feature is particularly helpful when the user is seeking a clean, smooth seam. In another example, showing such length comparison information also would have allowed the user to more accurately choose unequal segment lengths (where the user is seeking a pleated or ruffled effect at the seam). Moreover, this relatively straightforward modification suggested by TUKATECH is consistent with and further enhances the above-described modifications related to the snapping functionality (suggested by Corel and Thoemmes).

62. As a second reason, a POSITA would have been prompted to modify the garment design software of EZBRUSH based on TUKATECH's suggested techniques because doing so would be merely the application of known techniques to a known system ready for improvement to yield predictable results. Here, EZBRUSH and TUKATECH are both directed toward other common CAD systems. A POSITA would have recognized that applying the suggested user interface improvement from TUKATECH to EZBRUSH's CAD system would have led to predictable and helpful results with a reasonable expectation of success without significantly altering or hindering the functions performed by EZBRUSH's system.

6. Analysis of the Combination of EZBRUSH, Corel, Thoemmes, and TUKATECH with respect to claims 1-3 and 6-9 of the '773 patent

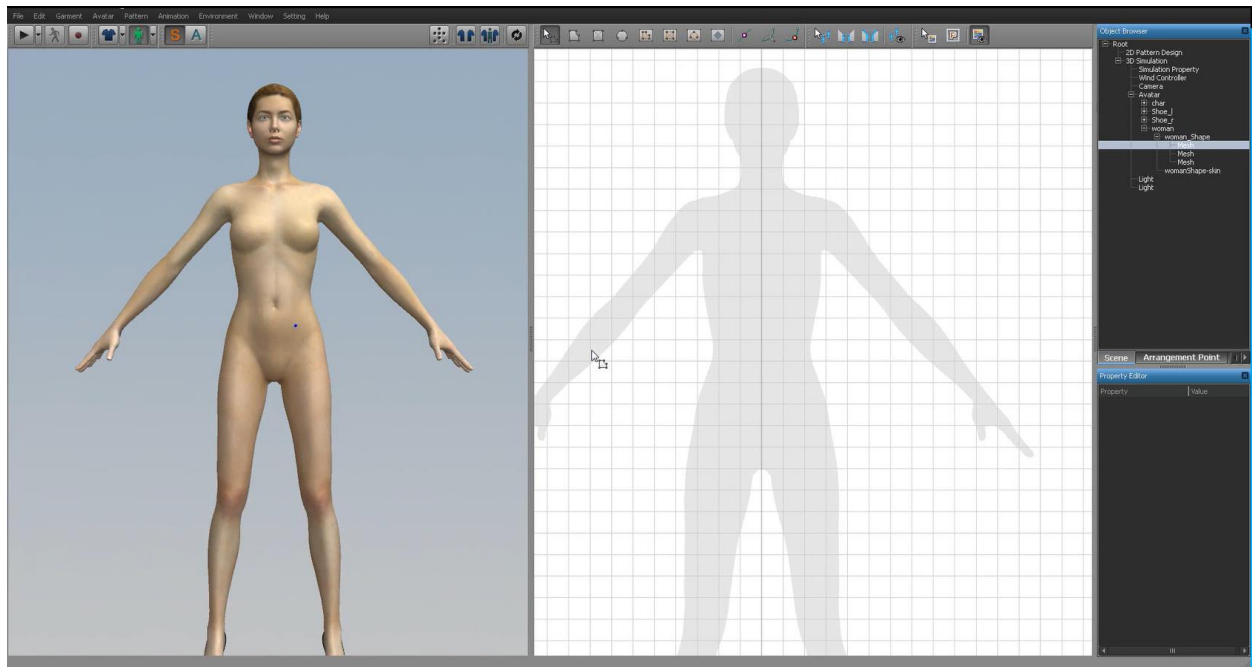
(a) Claim 1

[1.pre] A method of creating digital clothing executable by a computing device storing patterns and draped digital clothing, the method comprising:

63. If the preamble was considered to be a limiting element of claim 1, EZBRUSH teaches the method recited in the preamble. For example, the narrator of the EZBRUSH video starts the video by describing that he is demonstrating techniques for using Marvelous Designer 2 software. LINGDI-1004, 0:00-0:25. As demonstrated in EZBRUSH, the Marvelous Designer 2 software creates digital

clothing in both 3D space and 2D space in the computer's onscreen interface.

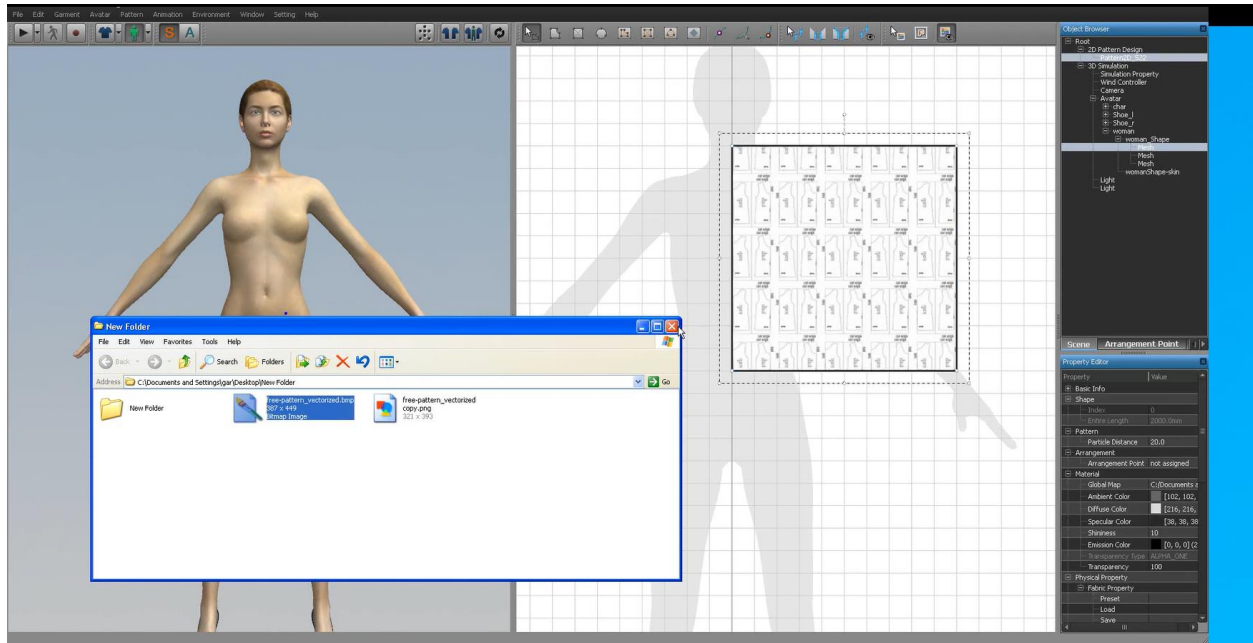
LINGDI-1004, 0:00-20:00 (“we’re going to do a shirt”). The express description of using “Marvelous Designer 2” and the digital clothing patterns upon the onscreen interface amply demonstrated that the Marvelous Designer 2 software was executed in its classic manner—on a computing device storing digital clothing patterns for draping simulation. The prior art Marvelous Designer 2 onscreen interface is presented from the very beginning of the EZBRUSH demonstration. As can be seen below, the user interface includes a three-dimensional display of an avatar on the left (for displaying draped clothing, as discussed below) and a two dimensional display with a shadow outline of the avatar on the right.



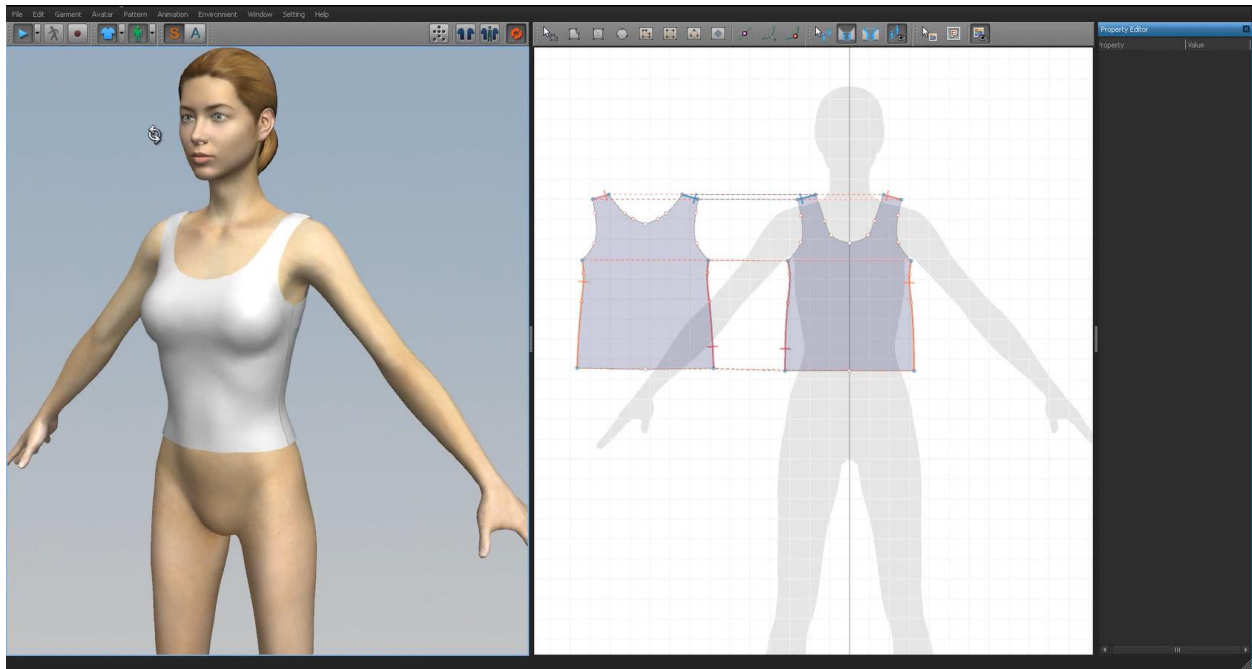
LINGDI-1004, 0:00.

64. As shown in EZBRUSH, Marvelous Designer 2 provides the

conventional option for the user to select an image file of patterns stored in a folder of the computing device for purposes of generating an editable pattern:



LINGDI-1004, 1:16-1:45; 4:20-54 (showing the “back” pattern and “front” pattern); 9:45-11:41 (“front side next”). The beginning half of the video includes the user walking through tracing patterns from the file of patterns. EZBRUSH also shows the 2D patterns (depicted on the right side of the interface) and draped digital clothing (depicted on the left side of the interface) provided by Marvelous Designer 2:

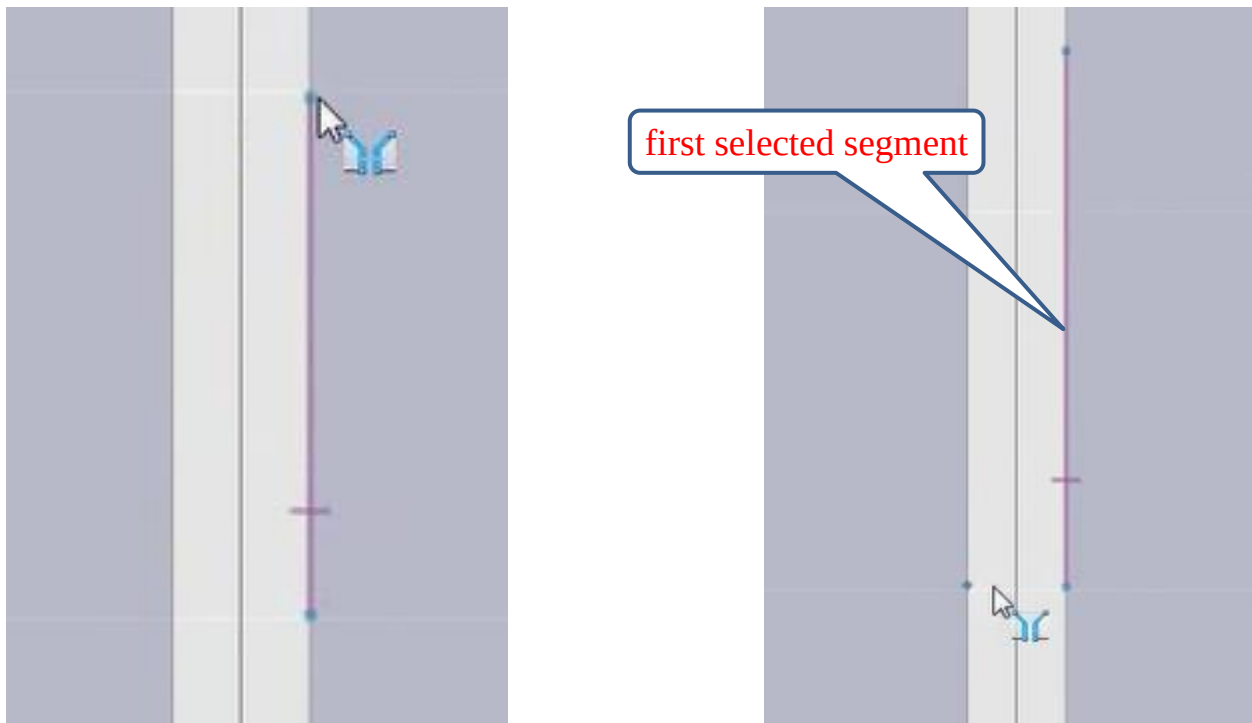


LINGDI-1004, 20:40-50. Here, a POSITA would have recognized that the computer executing the Marvelous Designer 2 software would have stored the patterns/draped digital clothing in a random access memory (RAM), display memory, or other memory of that computer in order to display the pattern pieces and draped clothing as shown in EZBRUSH. Based upon the demonstration in EZBRUSH and the state of the art for CAD systems before the relatively late time frame in April 2015, a POSITA would have recognized that the “Marvelous Designer 2” software demonstrated by EZBRUSH was “executable” on the computing device. In fact, a POSITA would have readily recognized that the installation and operation of “Marvelous Designer 2” on the computer of the EZBRUSH demonstration teaches that the method was executed on the recited

computing device.

[1.1] setting a first selected segment by inputting the first selected segment to be sewn on a first segment on a pattern; and

65. EZBRUSH discloses setting a first selected segment by inputting the first selected segment to be sewn on a first segment on a pattern. For example, EZBRUSH shows the user selecting a first segment by selecting start and end points along an edge of a clothing pattern in the 2D design panel:



LINGDI-1004, 24:00-24:42. EZBRUSH also demonstrates that this first segment is selected for the purposes of sewing, and a POSITA would have recognized that the first selected segment is a first segment on a pattern. The narrator states that he's going to "finish sewing this off" and describes the selected tool as "free sewing."

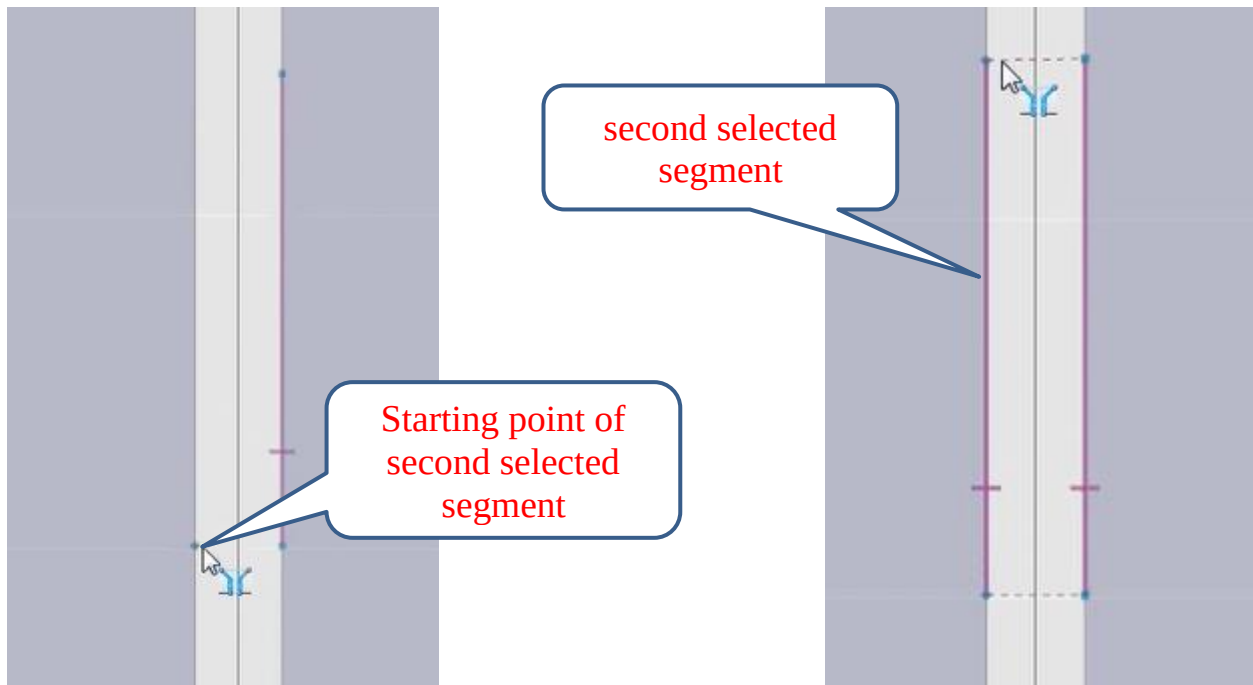
LINGDI-1004, 23:38-24:10. After selecting the first and second segments, the left panel shows that the software sews the selected segments together to create the garment, which is shown draped over the avatar in the 3D design panel:



LINGDI-1004, 24:46-24:50 (I describe the selection of the second segment in the following sections).

[1.2] setting a second selected segment, comprising inputting a starting point of the second selected segment on a second segment,

66. EZBRUSH discloses setting a second selected segment, comprising inputting a starting point of the second selected segment on a second segment. For example, EZBRUSH shows the user setting a selected second segment by setting a starting point of the second selected segment on a corresponding segment of the adjacent pattern:



LINGDI-1004, 20:40-20:43.

[1.3] wherein the second selected segment is sewn to the first selected segment,

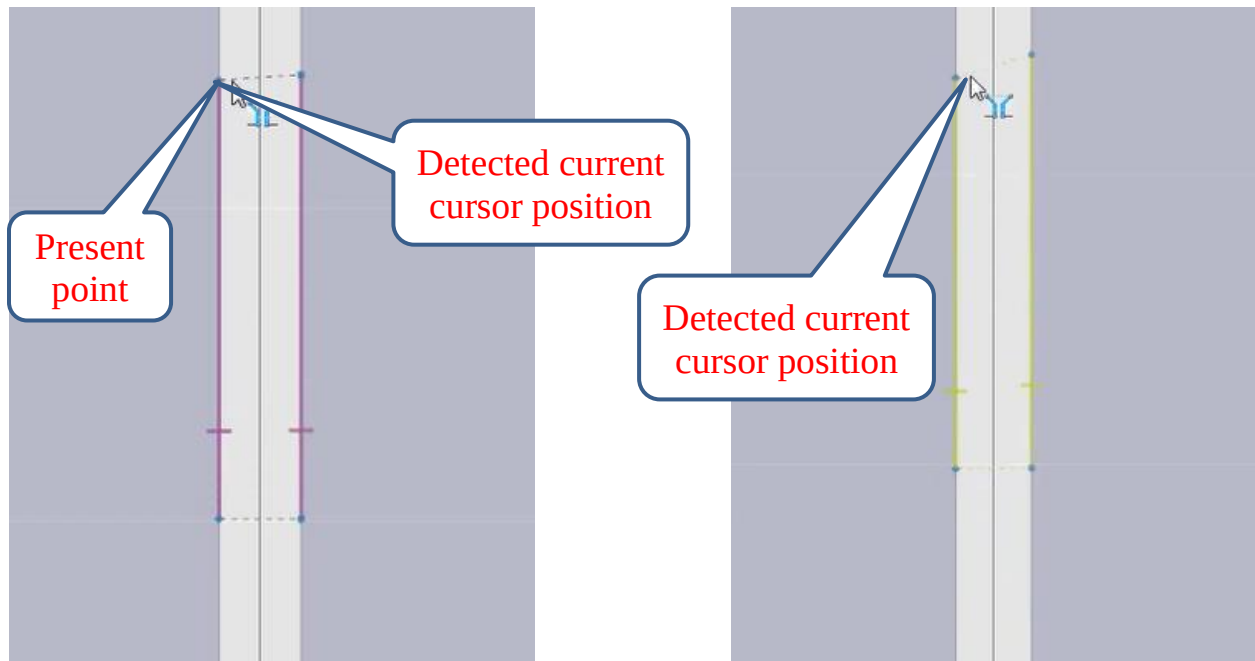
67. EZBRUSH discloses that the second selected segment is sewn to the first selected segment. For example, the still screenshot from EZBRUSH below shows that the first and second selected segments are sewn together to create the garment, which in this screen shot is shown draped over the avatar in the 3d design panel:



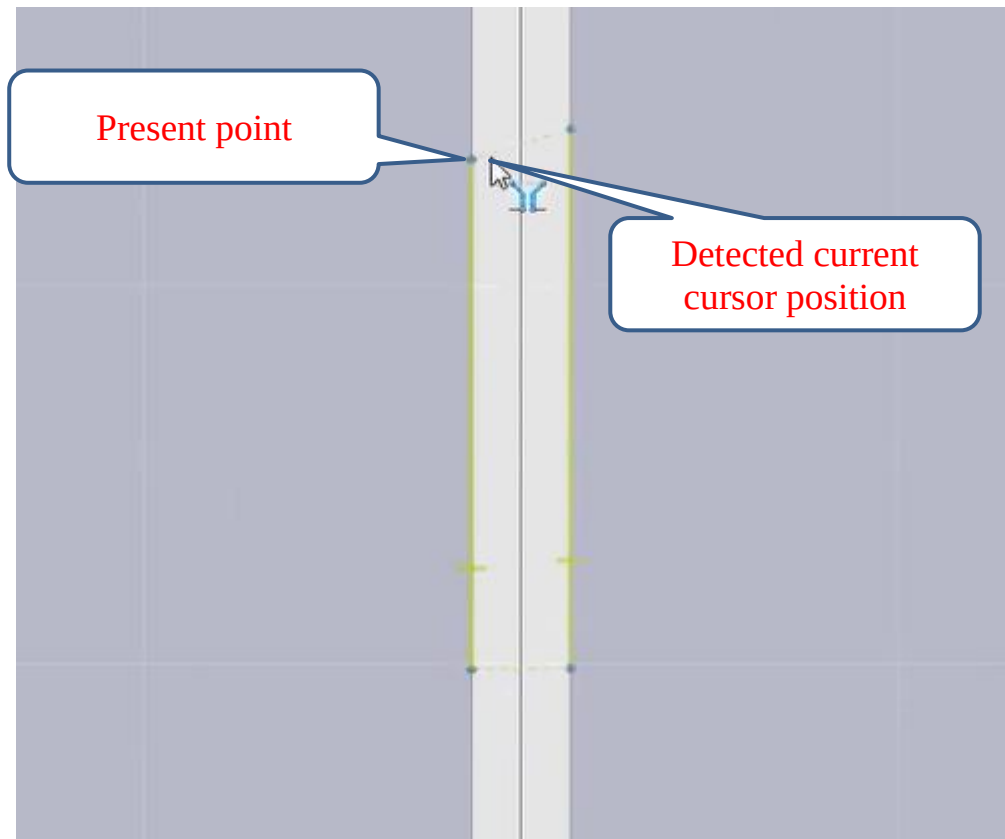
LINGDI-1004, 24:46-24:50, *see also* 23:38-24:45 (“free sewing”).

[1.4] detecting a current cursor position,

68. EZBRUSH in view of Corel and Thoemmes provides detecting a current cursor position. For example, the screenshots from EZBRUSH below show two examples of a position for the cursor being detected after selection of the starting point for the second segment and subsequent user movement of the cursor:



LINGDI-1004, 24:20-24:45. A POSITA would have recognized that this display of a cursor position indicates that the software detects the current cursor position. For example, as shown in the still screenshot from EZBRUSH below (and in the corresponding portion of the video), as the user moves the cursor away from the identified starting point of the second selected segment, the software displays movement of the cursor and a related present point on the second selected segment, with the location of the present point along the second segment being based on the detected current cursor position:



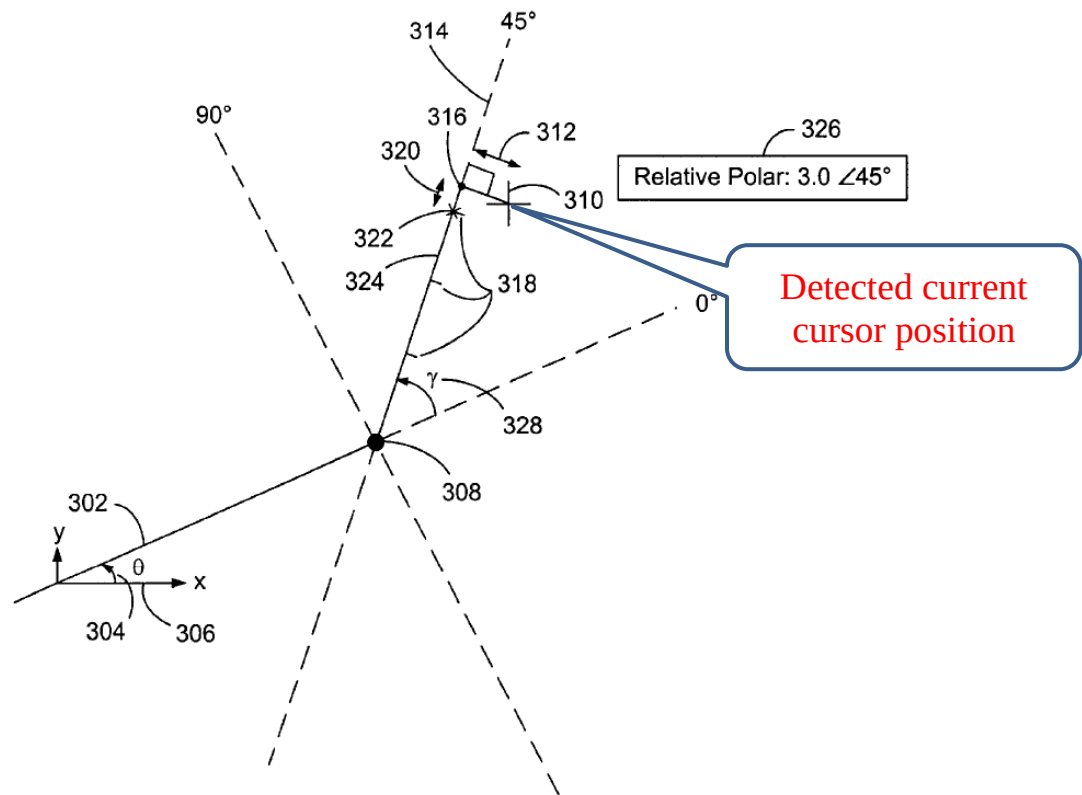
LINGDI-1004, 24:20-30.

69. Furthermore, in the predictable combination of EZBRUSH and Corel, Corel discloses that the resulting system includes functionality to determine “[w]hen the pointer is close to a snap point.” LINGDI-1005, 2. A POSITA would have recognized that making this determination that the cursor is within proximity to a snap point (e.g., a point along the second segment) predictably included detecting a current cursor position.

70. As I discussed above in Section X.A.5, a POSITA would have been motivated to further modify the EZBRUSH-Corel combination in light of

Thoemmes' suggestion for how to implement intuitive and improved snapping, for example, based on the cursor being within a "snapping distance" threshold of an identified segment. Similar to the disclosures of Corel, Thoemmes describes determining "[i]f the distance 312 between the first cursor 310 and the snap line 314 is less than a snap distance." LINGDI-1006, 4:48-58, *see also* 4:9-10 ("an extension line 324 is computed when indicated by ***the position of the cursor*** 310.")¹, 5:50-55 ("...indicated by a position of the first cursor."). Therefore Thoemmes provides additional examples that a POSITA would have recognized that determining the distance between the cursor and the snap line would have predictably included detecting a current cursor position.

¹ All emphasis added unless otherwise noted.



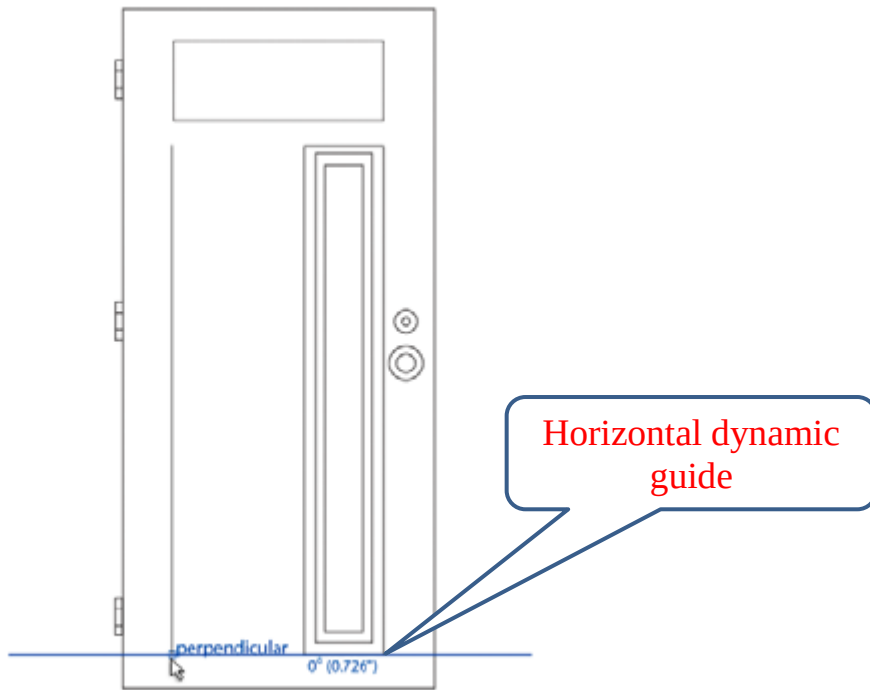
LINGDI-1006, FIG. 3.

71. Based on the disclosures of EZBRUSH, Corel, and Thoemmes and the understanding that a POSITA would have had from those disclosures, a POSITA would have recognized that the predictable combination therefore provides detecting a current cursor position.

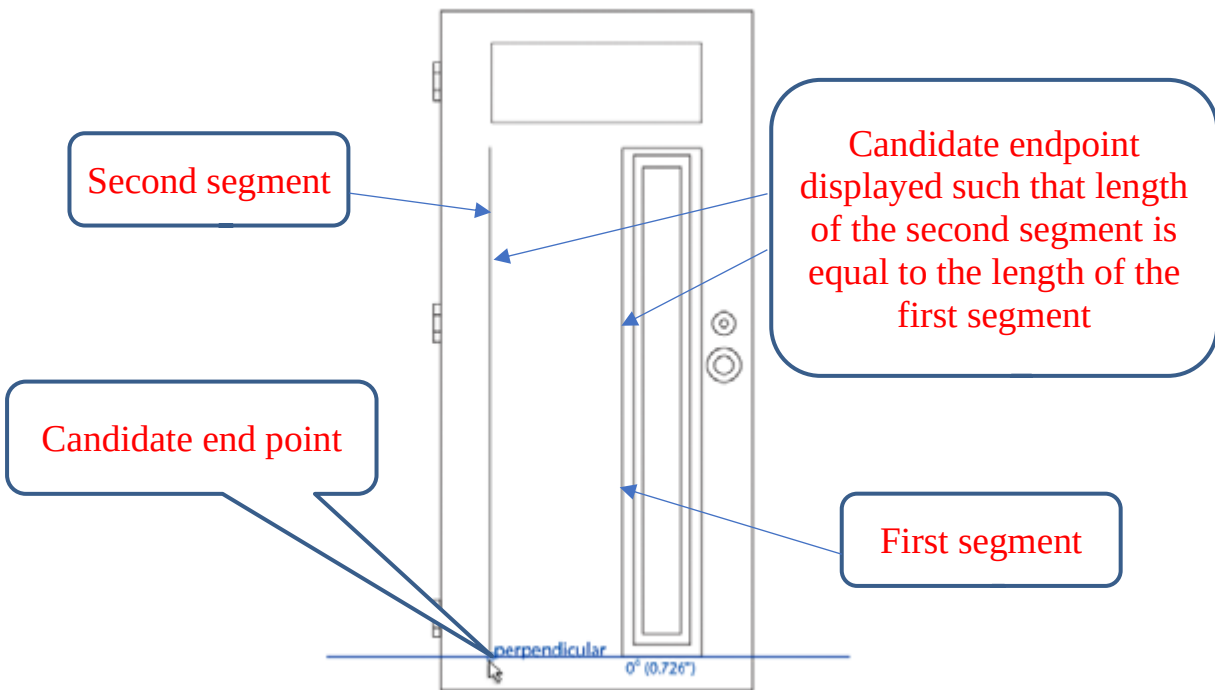
[1.5] displaying a point on the second segment as a candidate ending point of the second selected segment to make a length of the second selected segment substantially equal to a length of the first selected segment,

72. EZBRUSH in view of Corel and Thoemmes provides displaying a

point on the second segment as a candidate ending point of the second selected segment to make a length of the second selected segment substantially equal to a length of the first selected segment. As I discussed above in Section X.A.5, a POSITA would have been motivated to modify EZBRUSH's CAD system in a manner that implements Corel's suggestion for displaying a candidate ending point for a second segment to make the length of the second segment equal to a length of a first identified segment to achieve known benefits for the user. Corel describes displaying "dynamic guides to ensure precision when you draw and position objects in relation to other objects." LINGID-1005, 4. Corel further describes displaying a "horizontal dynamic guide" based on an existing identified line segment that helps the user to draw a parallel line of equal length:

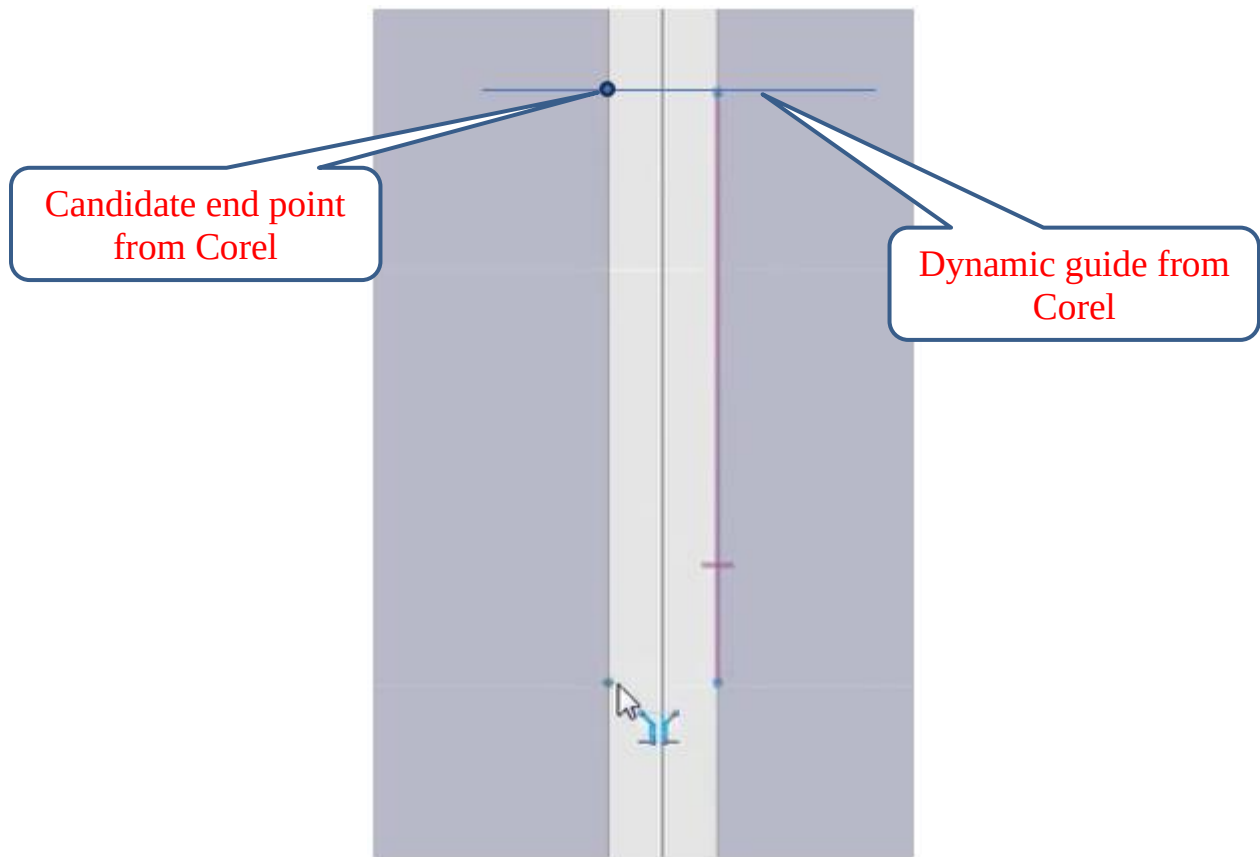


LINGDI-1005, 11. Corel further describes displaying a candidate end point in the form of a perpendicular snap point for the second segment, disclosing that as the user “move[s] the pointer along the dynamic guide...the perpendicular snap point is displayed.” *Id.* Based on Corel’s disclosure, a POSITA would have recognized that this perpendicular snap point, which causes the line segment to be equal in length to a corresponding side of an identified, existing rectangle, is an example of a candidate ending point for the second selected segment.



LINGDI-1005, 11. Corel describes this type of candidate endpoint as an “intersection” type “[g]ravity-snapping candidate” at the geometric intersection of the second line segment with the guideline. *Id.*, 3.

73. The system resulting from applying Corel’s suggestion to the CAD system of EZBRUSH would have predictably included the horizontal dynamic guide (suggested by Corel) based on the end point of the first segment and displayed the recommended snap point (candidate end point) along the horizontal dynamic guide where it intersects with the second segment, as shown in the below mockup of the system resulting from the application of Corel to the digital clothing design system of EZBRUSH:

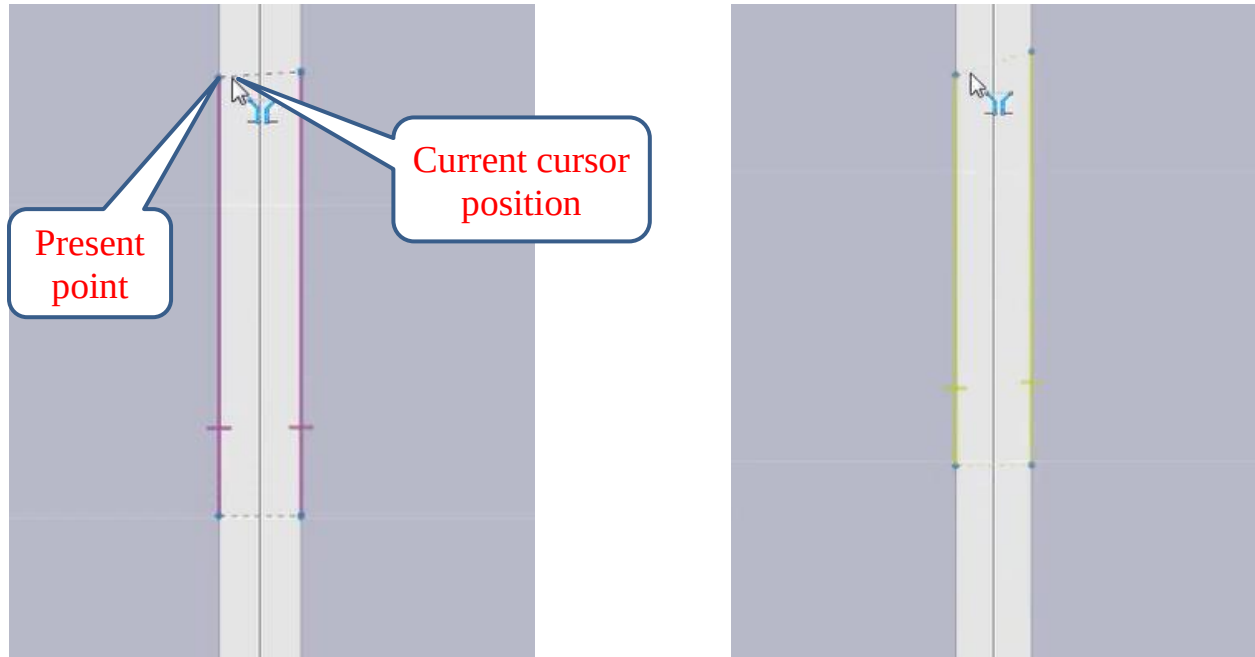


LINGDI-1004, 20:40-20:50 (modified based on Corel).

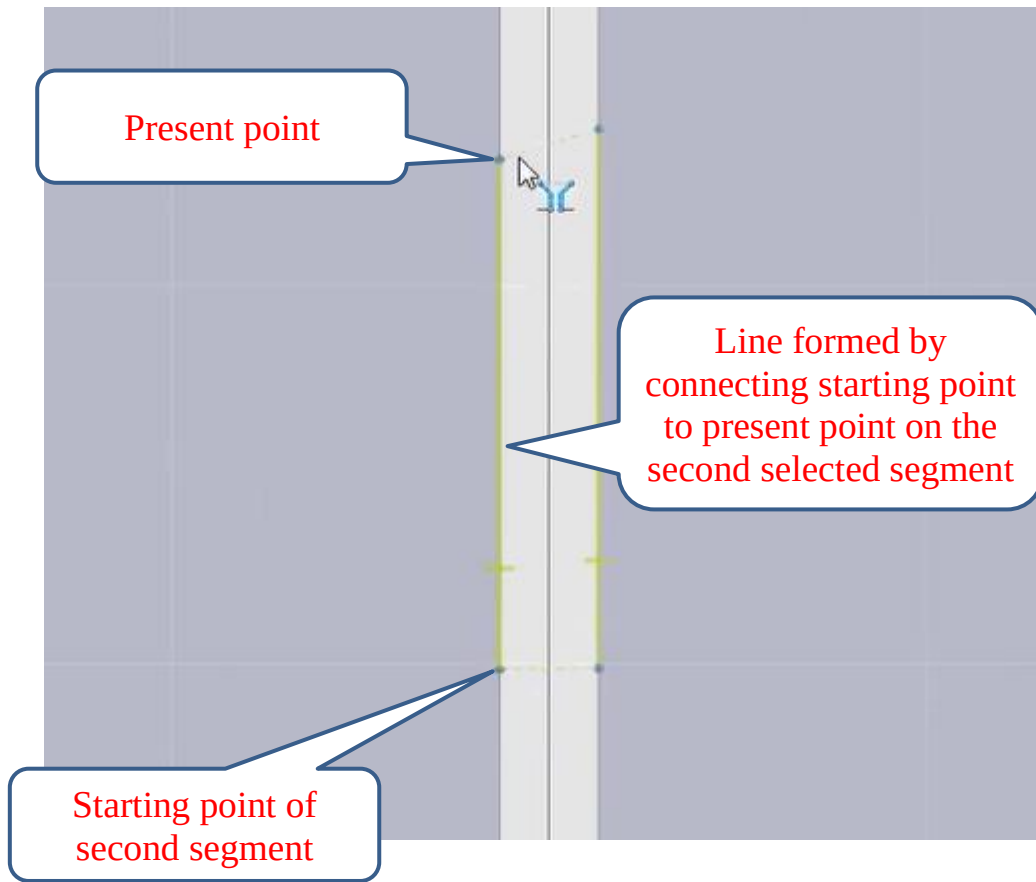
[1.6] connecting the starting point to a present point on the second selected segment closest in distance to the current cursor position to form a line based on a difference between the current cursor position and the present point being less than a first reference value,

74. The system resulting from the combination of EZBRUSH with Corel, Thoemmes, and TUKATECH provides connecting the starting point to a present point on the second selected segment closest in distance to the current cursor position to form a line based on a difference between the current cursor position and the present point being less than a first reference value. For example, the still screenshot from EZBRUSH below shows a present point on the second segment

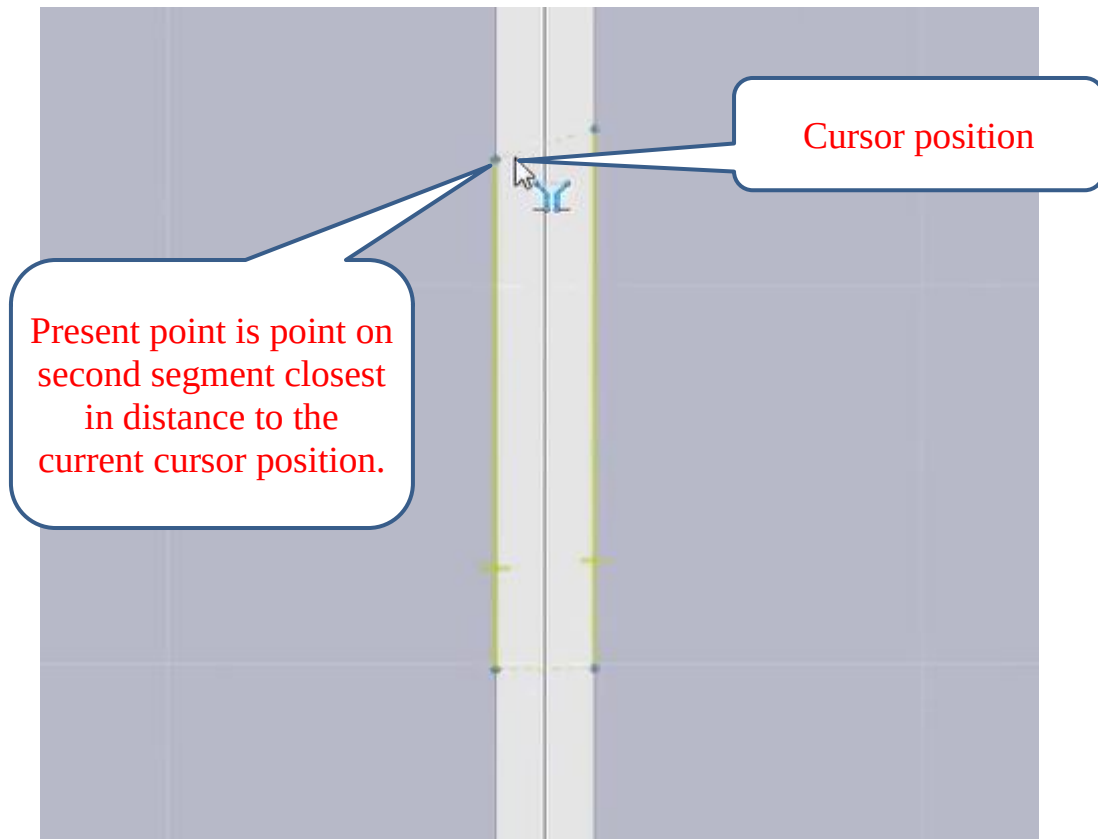
based on a position for the cursor after selection of the starting point for the second segment and subsequent user movement of the cursor:



LINGDI-1004, 24:20-24:45. A POSITA would have recognized that this display of a present point indicates that the software determines the present point based on a current cursor position. For example, as shown in the still screenshot from EZBRUSH below (and in the corresponding portion of the video), as the user moves the cursor away from the identified starting point of the second selected segment, the software displays a present point on the second selected segment and connects the starting point to the present point:



LINGDI-1004, 24:20-30. A POSITA would have further recognized that the present point is not at the precise point of the cursor but rather is a point on the second segment that is closest in distance to the current cursor position.



LINGDI-1004, 24:20-30.

75. Furthermore, in the predictable combination of EZBRUSH and Corel, Corel discloses that the resulting system includes functionality to determine “[w]hen the pointer is close to a snap point.” LINGDI-1005, 2. A POSITA would have recognized that making this determination that the cursor is within proximity to a snap point (e.g., a point along the second segment) predictably included determining a snap point based on a current cursor position.

76. As I discussed above in Section X.A.5, a POSITA would have been motivated to further modify the EZBRUSH-Corel combination in light of Thoemmes’ suggestion for how to implement intuitive and improved snapping, for

example, based on the cursor being within a “snapping distance” threshold of an identified segment. In accordance with Thoemmes’s suggested improvement for the predictable combination I discussed above, the present point identified along a selected segment is the point closest in distance to the current cursor position.

Specifically, Thoemmes discloses that “determining a reference point 316 on the extension or snap line 314 that is nearest the position of the first cursor 310.”

LINGDI-1006, 4:15-25.

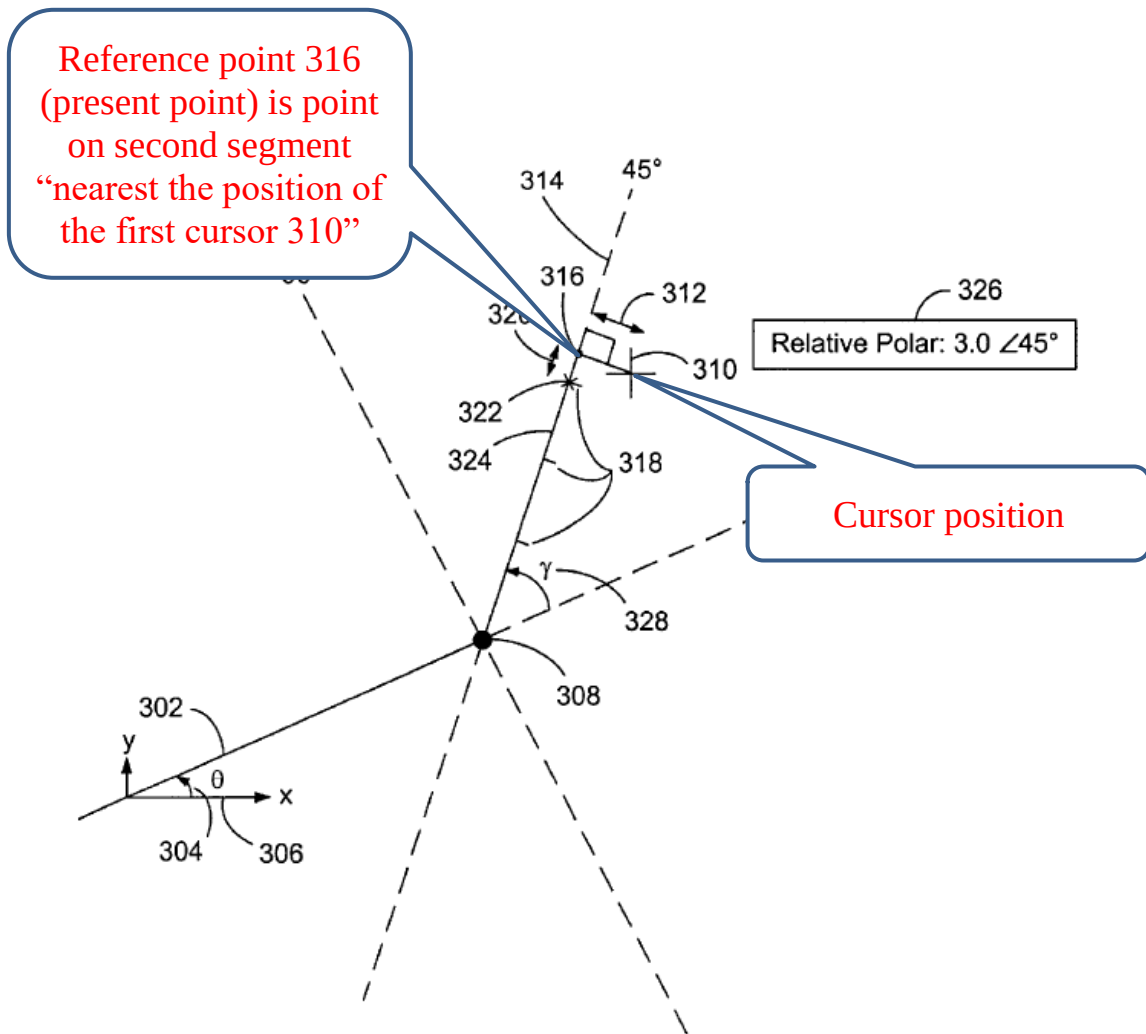


FIG. 3

LINGDI-1006, FIG. 3, 4:15-25.

77. Thoemmes further discloses that the present point is determined based on a difference between the current cursor position and the present point being less than a first reference value. Specifically, Thoemmes describes that extension line 324 from the starting point 308 to the reference distance 316 is displayed “[i]f the

distance 312 between the first cursor 310 and the snap line 314 *is less than a snap distance.*” LINGDI-1006, 4:45-59.

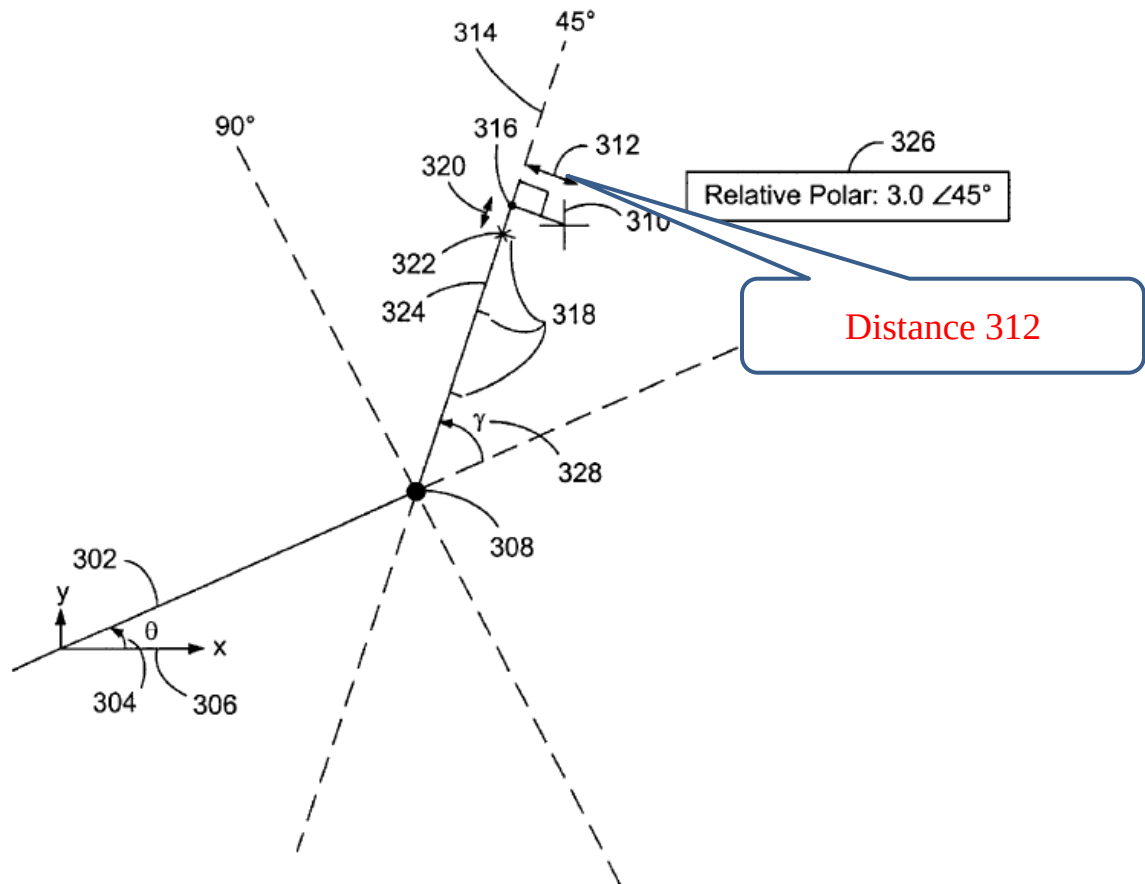


FIG. 3

LINGDI-1006, FIG. 3. Thoemmes further discloses that “[i]f the distance 312 between the first cursor 310 and the snap line 314 is more than the snap distance, *the extension line 324 is not defined or displayed.*” LINGDI-1006, 4:56-59. A POSITA therefore would have recognized based on these disclosures of Thoemmes that in the predictable combination, the line formed by connecting the

starting point to the present point is only displayed based on a difference between the current cursor position and the present point being less than a first reference value. This functionality of the predictable combination is also confirmed by Corel, which expressly suggests only highlighting a snap point “[w]hen the pointer is close to [the] snap point.” LINGDI-1005, 2. Based on the disclosures of EZBRUSH, Corel, and Thoemmes and the understanding that a POSITA would have had from those disclosures, a POSITA would have recognized that the predictable combination therefore provides determining a present point on the second segment based on a current cursor position and connecting the starting point to a present point on the second selected segment closest in distance to the current cursor position to form a line based on a difference between the current cursor position and the present point being less than a first reference value.

[1.7] moving the present point to the candidate ending point, in response to the difference between the present point and the candidate ending point being less than a second reference value,

78. The system resulting from the combination of EZBRUSH with Corel, Thoemmes, and TUKATECH provides for moving the present point to the candidate ending point, in response to the difference between the present point and the candidate ending point being less than a second reference value (based on the teachings of Corel and Thoemmes). For example, Thoemmes teaches that, after determining the reference point 316 by identifying the point on “extension or snap

line 314 that is nearest the position of the first cursor 310,” a determination is made “as to when the reference point 316 *is within an extension line snap distance 320* from one of a plurality of pre-settable distances 318 from the first pick point.”

LINGDI-1006, 4:15-32. Based on the disclosures of EZBRUSH, Corel, and Thoemmes and the understanding that a POSITA would have had from those disclosures, a POSITA would have recognized that the candidate end point along the dynamic guide line (from the EZBRUSH system as modified by Corel, described above) is an example of the pre-set snapping point like that of Thoemmes. LINGDI-1005, 11. Thoemmes further describes that if “the reference point 316 is within an extension line snap distance” from a pre-designated snapping point, “the second cursor 322 is placed in this position along the extension line 324. LINGDI-1006, 4:25-32.

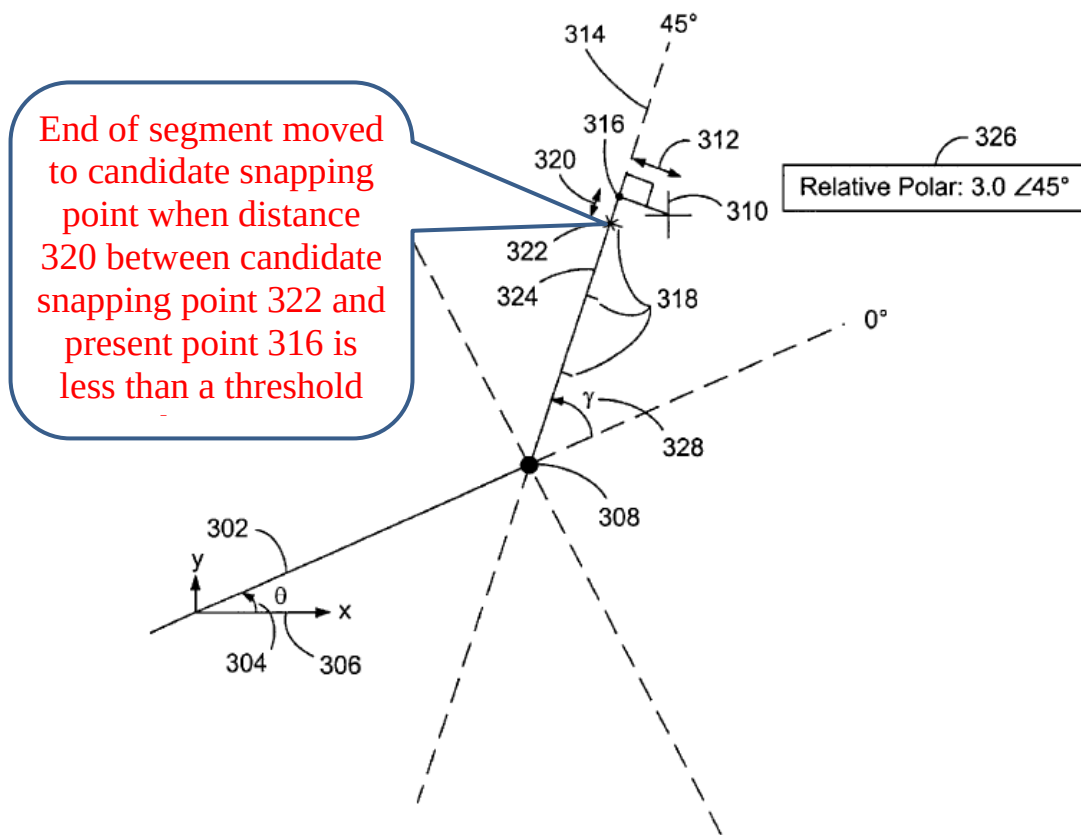
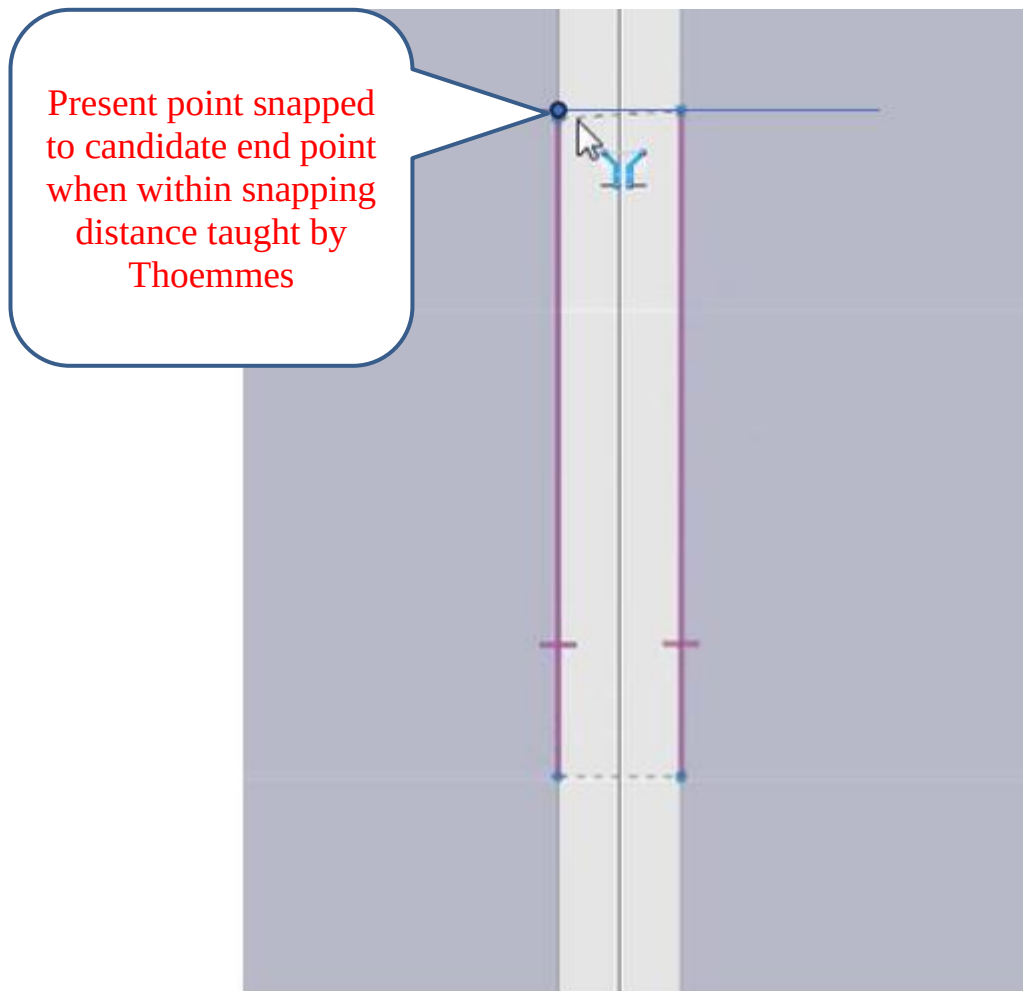


FIG. 3

LINGDI-1006, FIG. 3. A POSITA would have recognized that this snapping functionality described by Thoemmes is a version of the “gravity snapping” described in Corel and, as I discussed above, would have been a beneficial design implementation of the snapping already demonstrated in EZBRUSH. For example, Corel describes that “[w]hen the pointer is close to a snap point, the gravity source of the snap point is highlighted” to identify “the snap point as the snapping target for the pointer.” LINGDI-1005, 2. The “perpendicular snap point” (candidate end point) described by Corel is an example of such a gravity snapping point and

Thoemmes provides additional implementation details that would have been predictably applied to the resulting system to snap to the candidate end point “when the reference point 316 *is within an extension line snap distance 320* from” the candidate end point. LINGDI-1005, 11; LINGDI-1006, 4:15-32.

79. In the application of this suggestion of Thoemmes to the EZBRUSH CAD system (as predictably modified by Corel), a POSITA would have implemented the resulting CAD system user interface to snap the present point (the point along the second segment closest to the cursor) to the candidate end point when the distance between the present point and the candidate end point is within the snap distance threshold:

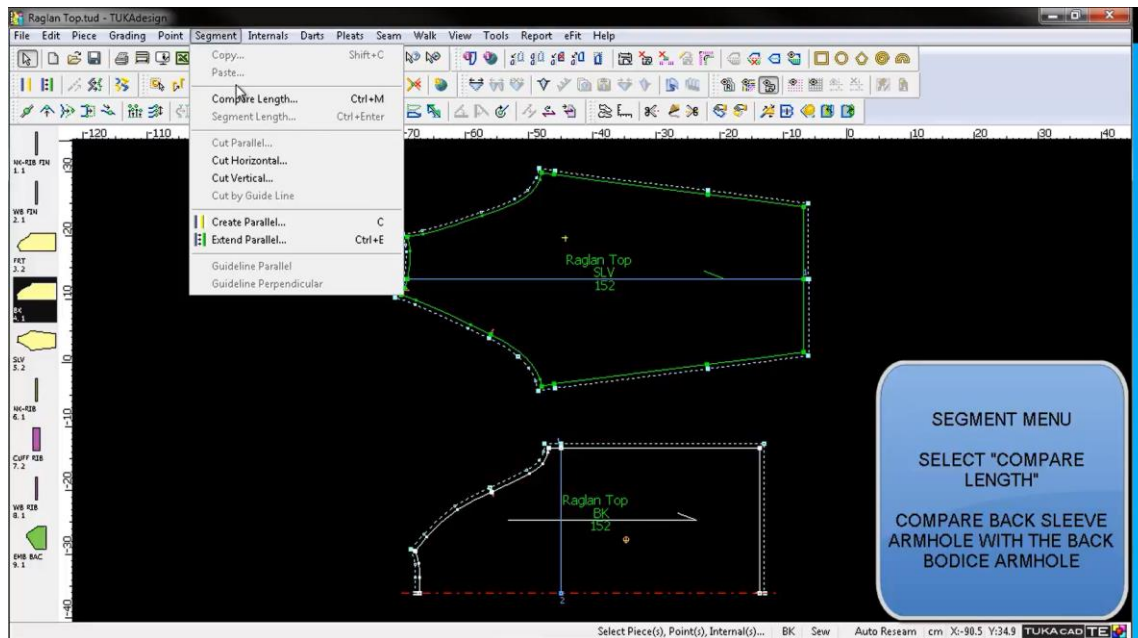


LINGDI-1004, 24:20-24:45; LINGDI-1006, 15-32.

[1.8] displaying a difference value between the length of the first selected segment and a length of the line,

80. EZBRUSH in view of Corel, Thoemmes, and TUKATECH provides displaying a difference value between the length of the first selected segment and a length of the line. As I described above in Section X.A.5, a POSITA would have been motivated to implement, in the EZBRUSH CAD system (as modified by Corel and Thoemmes), TUKATECH's suggestion, for example, to helpfully

display a difference value between the lengths of two selected segments to achieve known and predictable benefits. For example, the still screenshot below shows that TUKATECH plainly illustrates the convenience of presenting such length comparison information to a user during the digital clothing design of a shirt (much like the example in EZBRUSH):

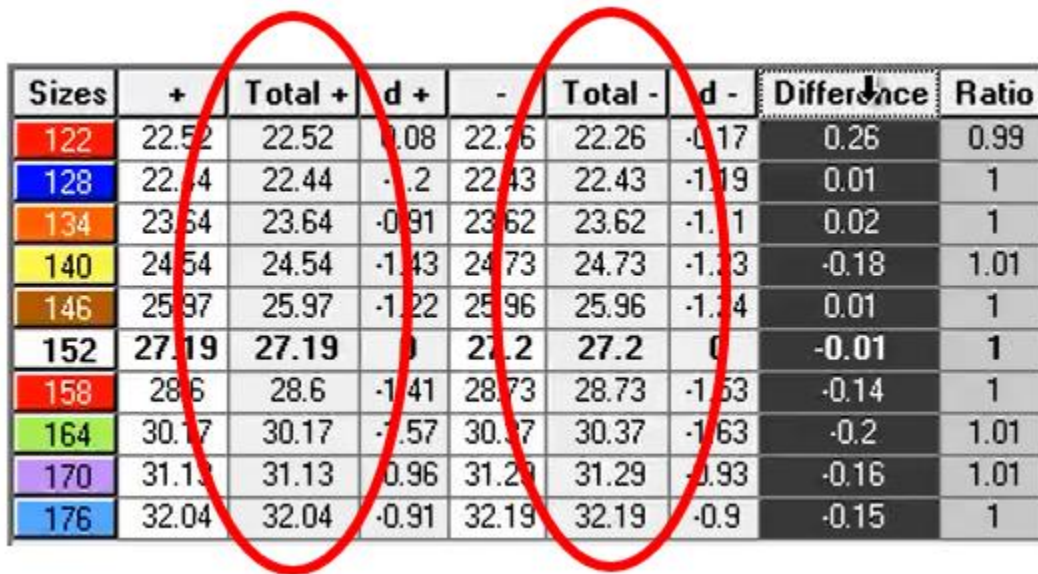


Sizes	+	Total +	d +	-	Total -	d -	Difference	Ratio
122	22.52	22.52	0.08	22.26	22.26	-0.17	0.26	0.99
128	22.44	22.44	-1.2	22.43	22.43	-1.19	0.01	1
134	23.64	23.64	-0.91	23.62	23.62	-1.17	0.02	1
140	24.54	24.54	-1.43	24.73	24.73	-1.23	-0.18	1.01
146	25.97	25.97	-1.22	25.96	25.96	-1.23	0.01	1
152	27.19	27.19	0	27.2	27.2	0	-0.01	1
158	28.6	28.6	-1.41	28.73	28.73	-1.53	-0.14	1
164	30.17	30.17	-1.57	30.37	30.37	-1.63	-0.2	1.01
170	31.13	31.13	-0.96	31.29	31.29	-0.93	-0.16	1.01
176	32.04	32.04	-0.91	32.19	32.19	-0.9	-0.15	1

LINGDI-1007, 0:11 and 0:10-0:30.² Including this suggested improvement in the

² TUKATECH shows an implementation in which the length difference between the selected segments is different for each possible size for the garment. A POSITA would have recognized that this teaching of TUKATECH was equally applicable to designs in which there is only a single size and therefore only a single length difference between the two selected segments, as described in the '773 patent specification.

predictable combination would have provided the calculation and display of the length both selected segments and the differences between the lengths as disclosed by TUKATECH, as shown in the still screenshot below.

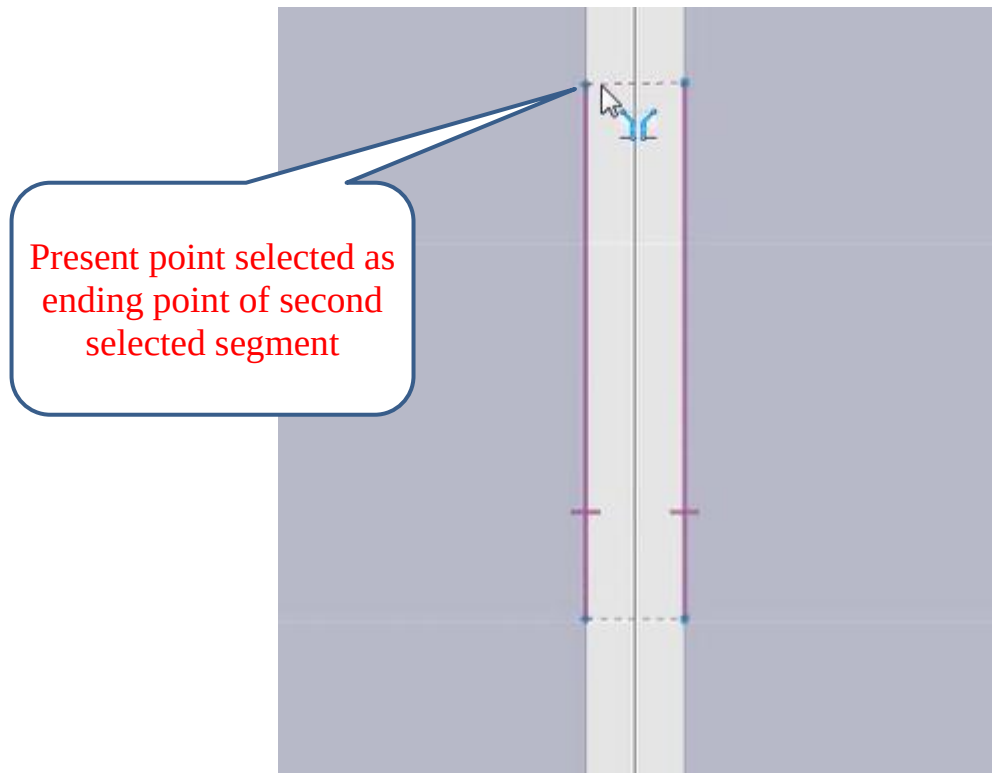


Sizes	+	Total +	d +	-	Total -	d -	Difference	Ratio
122	22.52	22.52	0.08	22.26	22.26	-0.17	0.26	0.99
128	22.44	22.44	-0.2	22.43	22.43	-1.19	0.01	1
134	23.64	23.64	-0.91	23.62	23.62	-1.11	0.02	1
140	24.54	24.54	-1.43	24.73	24.73	-1.23	-0.18	1.01
146	25.97	25.97	-1.22	25.96	25.96	-1.24	0.01	1
152	27.19	27.19	0	27.2	27.2	0	-0.01	1
158	28.6	28.6	-1.41	28.73	28.73	-1.53	-0.14	1
164	30.17	30.17	-1.57	30.37	30.37	-1.63	-0.2	1.01
170	31.13	31.13	-0.96	31.29	31.29	-0.93	-0.16	1.01
176	32.04	32.04	-0.91	32.19	32.19	-0.9	-0.15	1

LINGDI-1007, 0:10-0:30. As such, the resulting system would have provided an onscreen display showing not only the lengths of the selected segments but also the length differences between the selected segments as disclosed by TUKATECH.

[1.9] selecting the present point as an ending point of the second selected segment, in response to a user input, and

81. EZBRUSH in view of Corel, Thoemmes, and TUKATECH provides selecting the present point as an ending point of the second selected segment, in response to a user input. For example, the still screenshot from EZBRUSH below shows that the user selects the present point as the ending point of the second selected segment.



LINGDI-1004, 24:40-24:50. The audio at this section of EZBRUSH includes audible clicking sounds when the user selects the points for each segment.

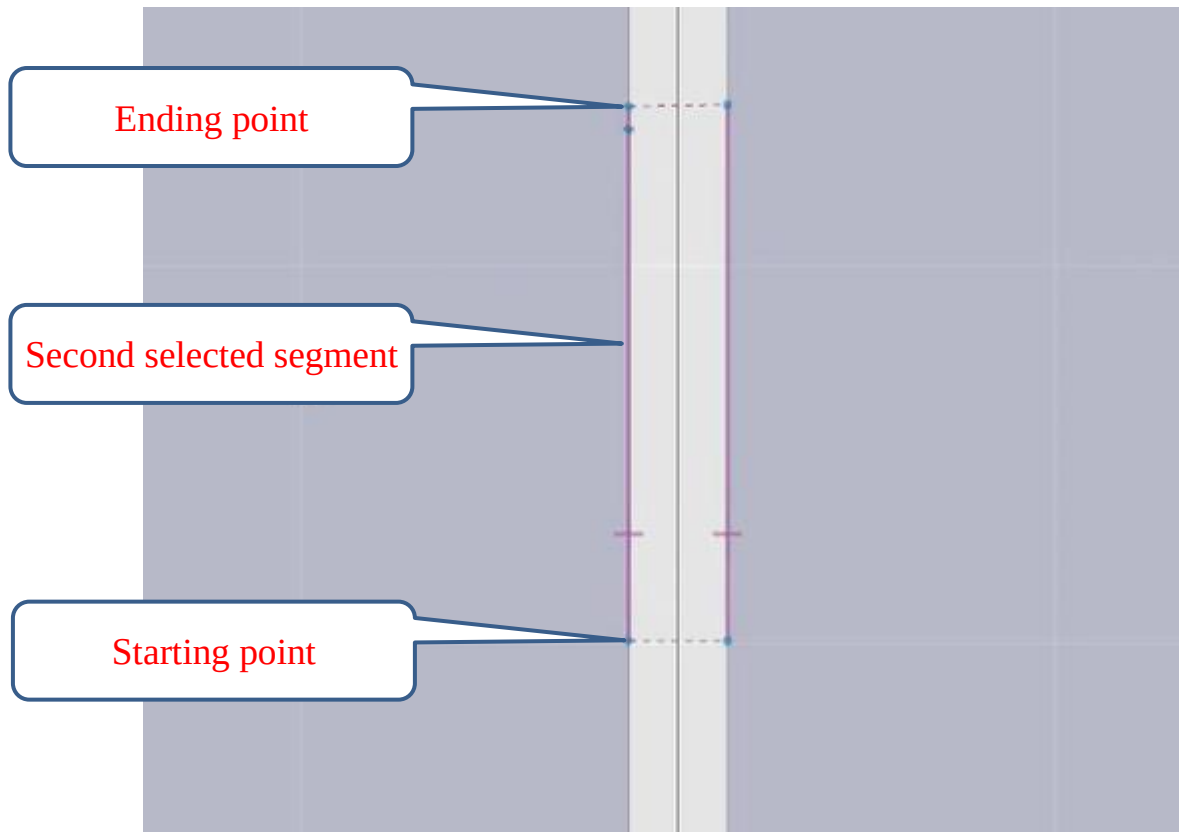
LINGDI-1004, 24:40-24:50. A POSITA would have recognized that the clicking sounds indicate user input in the form of pressing of a button on a mouse or other cursor controlling device.

82. Similarly, Corel confirms that the user selects the candidate end point as the end point of the second segment when the present point snaps to the candidate endpoint. For example, Corel describes that the user “[c]ontinue[s] to move the pointer along the dynamic guide until the perpendicular snap point is displayed and the line becomes straight. ***Release the mouse button to place the***

second point of the rectangle.” LINGDI-1005, 11. Thoemmes further confirms that the user provides user input to select the present point (now located at the candidate end point) as an ending point of the second segment. For example, Thoemmes discloses that when “the reference point 316 is within an extension line snap distance 320” from a candidate end point, “the second cursor 322 is placed in this position along the extension line 324.” LINGDI-1006, 4:25-32, *see also* 3:49-53 (describing selecting a point by “depressing a mouse button.”), 4:20-22 (“The user may then select a button on the mouse 116 to define the length of the extension line 324.”). Accordingly, the system resulting from the predictable combination of EZBRUSH with Corel, Thoemmes, and TUKATECH (described above) would have included functionality of selecting the present point as an ending point of the second selected segment, in response to a user input.

[1.10] setting, as the second selected segment, a section of the second segment between the starting point and the ending point.

83. EZBRUSH discloses setting, as the second selected segment, a section of the second segment between the starting point and the ending point. For example, the still screenshot from EZBRUSH below shows that the software sets a section of the second segment between the starting point and the ending point as the second selected segment:



LINGDI-1004, 2:30-2:45. The still screenshot from EZBRUSH below further shows that the software then digitally “sews” together the two panels along the selected segments, with the sewn together garment being displayed in the 3D design panel on the left, draped over the avatar:

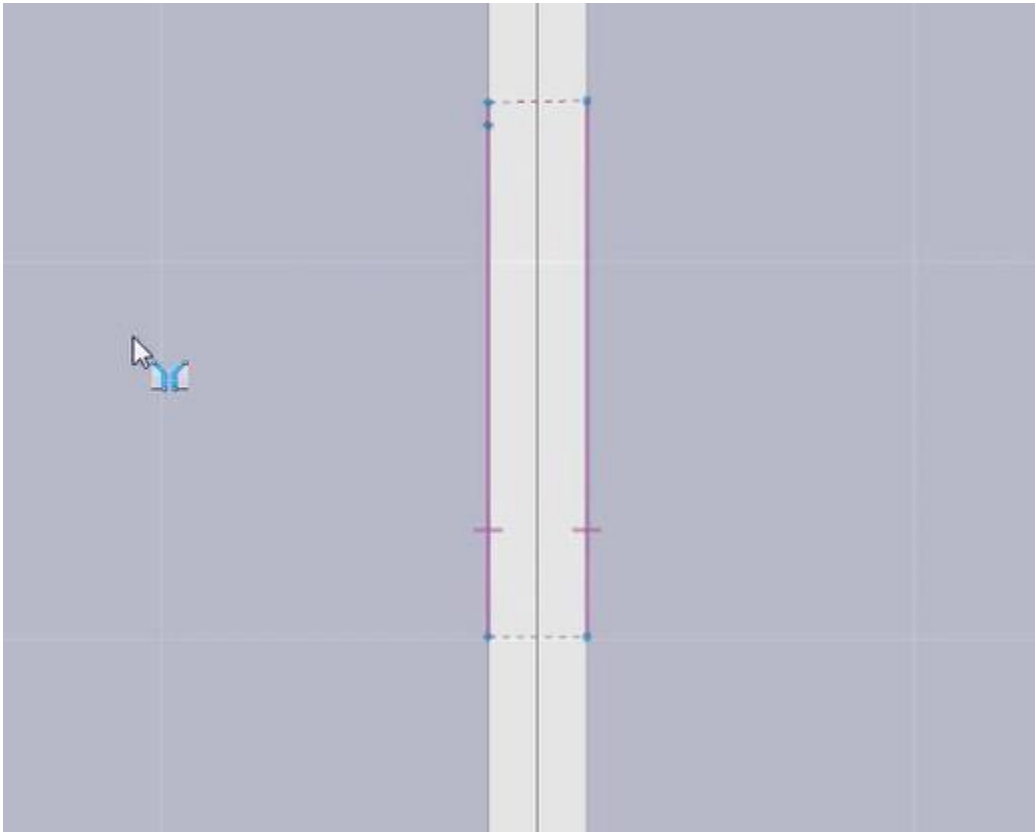


LINGDI-1004, 24:46-24:50.

(b) Claim 2

[2] The method of claim 1, wherein the first and second segments comprise any one or any combination of any two or more of a straight line, a curved line, a multi-branch line, and shapes that include polygons and circles.

84. EZBRUSH provides that the first and second segments comprise a straight line. For example, EZBRUSH shows that the first and second segments are straight lines:



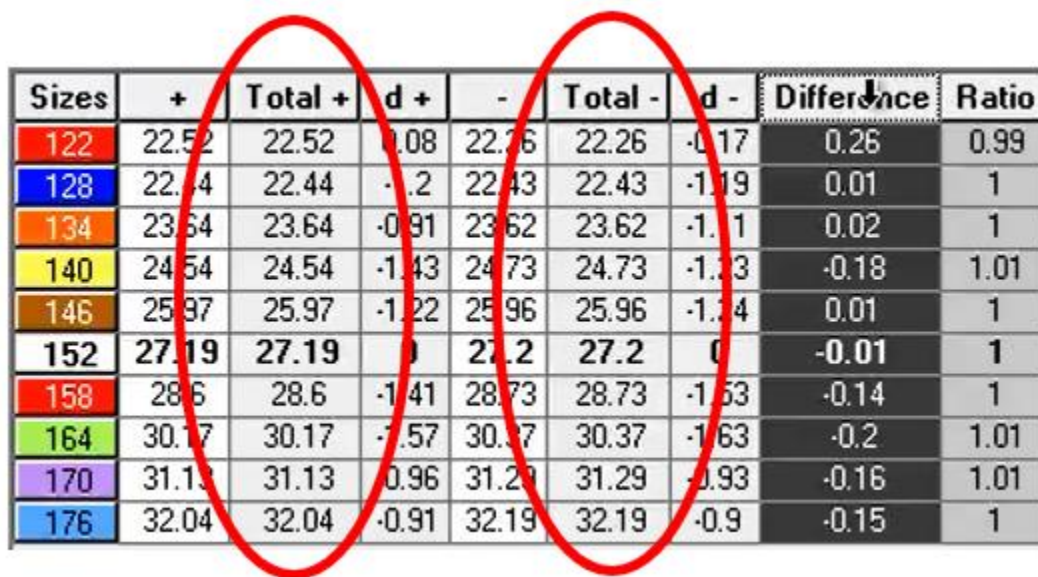
LINGDI-1004, 2:30-2:45.

(c) Claim 3

[3] The method of claim 1, wherein the setting of the second selected segment further comprises: calculating and displaying either one or both of the length of the first selected segment and the length of the line.

85. EZBRUSH in view of Corel, Thoemmes, and TUKATECH provides that the setting of the second selected segment further comprises calculating and displaying either one or both of the length of the first selected segment and the length of the line. As I discussed above in Sections X.A.4-X.A.5 (overview of TUKATECH and description of predictable combination) and in Element [1.8], a

POSITA would have been motivated to apply TUKATECH's suggested improvements to display to helpfully display a difference value between the lengths of two selected segments in the EZBRUSH CAD system (as modified by Corel and Thoemmes) to achieve known and predictable benefits. LINGDI-1007, 0:10-0:30. This application of TUKATECH's suggestion to the EZBRUSH CAD system would have provided the calculation and display of the length both selected segments and the differences between the lengths as disclosed by TUKATECH, as shown in the still screenshot below.



Sizes	+	Total +	d +	-	Total -	d -	Difference	Ratio
122	22.52	22.52	-0.08	22.76	22.26	-0.17	0.26	0.99
128	22.44	22.44	-0.2	22.43	22.43	-1.19	0.01	1
134	23.64	23.64	-0.91	23.62	23.62	-1.1	0.02	1
140	24.54	24.54	-1.43	24.73	24.73	-1.23	-0.18	1.01
146	25.97	25.97	-1.22	25.96	25.96	-1.24	0.01	1
152	27.19	27.19	0	27.2	27.2	0	-0.01	1
158	28.6	28.6	-1.41	28.73	28.73	-1.53	-0.14	1
164	30.17	30.17	-1.57	30.37	30.37	-1.63	-0.2	1.01
170	31.13	31.13	-0.96	31.29	31.29	-0.93	-0.16	1.01
176	32.04	32.04	-0.91	32.19	32.19	-0.9	-0.15	1

LINGDI-1007, 0:10-0:30. As such, the resulting system would have provided that the setting of the second selected segment further comprises calculating and displaying either one or both of the length of the first selected segment and the length of the line as disclosed by TUKATECH.

(d) Claim 6

[6] A non-transitory computer-readable storage medium storing instructions that, when executed by a processor, cause the processor to perform the method of claim 1.

86. EZBRUSH in view of Corel, Thoemmes, and TUKATECH provides a non-transitory computer-readable storage medium storing instructions that, when executed by a processor, cause the processor to perform the method of claim 1. As I discussed above, EZBRUSH teaches a method of creating digital clothing using “Marvelous Designer 2” computer software. LINGDI-1004, 0:16-0:25. EZBRUSH demonstrates creating digital clothing in both 3D space and 2D space in the computer’s onscreen interface. LINGDI-1004, 0:00-20:00 (“we’re going to do a shirt”). The express description of using ‘Marvelous Designer 2’ and the digital clothing patterns upon the onscreen interface amply demonstrated that the Marvelous Designer 2 software was executed by a computing device having a processor and memory. A POSITA would have recognized that EZBRUSH disclosed the use of “Marvelous Designer 2” software instructions on a storage medium that is executed by a processor to perform the disclosed processes.

87. Alternatively, even if EZBRUSH did not expressly disclose such features (which it does), a POSITA would have recognized that the predictable combination would have provided such a storage medium and processor for the resulting CAD system so that the software could actually be executed and used for

its intended purpose. For example, Thoemmes suggests the use of “an exemplary computer system 100 that could be used to implement” CAD software, which includes both a “processor” and “memory,” as shown in Thoemmes’ FIG. 1:

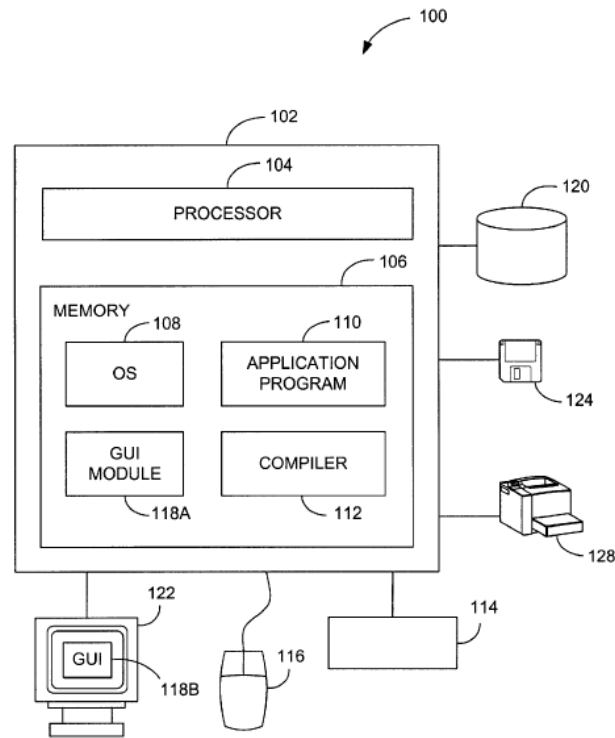


FIG. 1

LINGDI-1006, 2:52-63; FIG. 1.

88. As described in Thoemmes, Thoemmes’s computer includes “a compiler 112 which allows an application program 110 written in a programming language...to be translated into processor 104 readable code.” *Id.*, 2:52-3:32.

Thoemmes discloses that “instructions implementing the operating system 108, the computer program 110, and the compiler 112 are tangibly embodied in a computer-

readable medium” such as a hard drive or CD-ROM. *Id.* In Thoemmes, “the computer program 110 [is] comprised of instructions which, when read and executed by the computer 102, causes the computer 102 to perform the steps necessary” to execute the software. *Id.* As such, a POSITA would have been motivated to implement a resulting CAD system that would have included computer memory and a processor as suggested by Thoemme in order to execute to the method of the CAD system in the predictable combination (detailed above).

(e) Claim 7

[7.pre] An apparatus for creating digital clothing comprising a computing device storing patterns and draped digital clothing, the apparatus comprising:

89. As I discussed with respect to element [1.pre] and claim [6], above, the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides an apparatus for creating digital clothing and that the apparatus comprises a memory storing digital clothing patterns for draping simulation, draped digital clothing, and at least one processor. *Supra*, Elements [1.pre] and [5].

[7.1] a first selected segment setter configured to set a first selected segment by inputting the first selected segment to be sewn on a first segment on a pattern; and

90. As I discussed with respect to element [1.1], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides a first selected segment setter configured to set a first selected segment by inputting the

first selected segment to be sewn on a first segment on a pattern. *Supra*, Element [1.1]. A POSITA would have recognized that the software routine that sets the first selected segment (as I described above with respect to element [1.1]) is a first selected segment setter.

[7.2] a second selected segment setter configured to:

91. As I discussed with respect to element [1.2], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides a routine for setting a second selected segment. *Supra*, Element [1.2]. A POSITA would have recognized that the software routine that sets the second selected segment (as I described above with respect to element [1.2]) is a second selected segment setter.

[7.3] input a starting point of a second selected segment on a second segment,

92. As I discussed with respect to element [1.2], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the second selected segment setter inputs a starting point of a second selected segment on a second segment. *Supra*, Element [1.2].

[7.4] wherein the second selected segment is sewn to the first selected segment,

93. As I discussed with respect to element [1.3], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the

second selected segment is sewn to the first selected segment. *Supra*, Element [1.3].

[7.5] detect a current cursor position,

94. As I discussed with respect to element [1.4], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the second selected segment setter detects a current cursor position. *Supra*, Element [1.4].

[7.6] display a point on the second segment as a candidate ending point of the second selected segment to make a length of the second selected segment substantially equal to a length of the first selected segment,

95. As I discussed with respect to element [1.5], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the second selected segment setter displays a point on the second segment as a candidate ending point of the second selected segment to make a length of the second selected segment substantially equal to a length of the first selected segment. *Supra*, Element [1.5].

[7.7] connect the starting point to a present point on the second selected segment closest in distance to the current cursor position to form a line based on a difference between the cursor position and the present point being less than a first reference value,

96. As I discussed with respect to element [1.6], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the

second selected segment setter connects the starting point to a present point on the second selected segment closest in distance to the current cursor position to form a line based on a difference between the cursor position and the present point being less than a first reference value. *Supra*, Element [1.6].

[7.8] display a difference value between the length of the first selected segment and a length of the line,

97. As I discussed with respect to element [1.8], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the second selected segment setter displays a difference value between the length of the first selected segment and a length of the line. *Supra*, Element [1.8].

[7.9] move the present point to the candidate ending point, in response to the difference between the present point and the candidate ending point being less than a second reference value,

98. As I discussed with respect to element [1.7], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the second selected segment setter moves the present point to the candidate ending point, in response to the difference between the present point and the candidate ending point being less than a second reference value. *Supra*, Element [1.7].

[7.10] select the present point as an ending point of the second selected segment, in response to a user input, and

99. As I discussed with respect to element [1.9], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the

second selected segment setter selects the present point as an ending point of the second selected segment, in response to a user input, and. *Supra*, Element [1.9].

[7.11] set as the second selected segment, a section of the second segment between the starting point and the ending point

100. As I discussed with respect to element [1.10], the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides that the second selected segment setter sets as the second selected segment, a section of the second segment between the starting point and the ending point. *Supra*, Element [1.10].

(f) Claim 8

[8] The apparatus of claim 7, wherein the first and second segments comprise any one or any combination of any two or more of a straight line, a curved line, a multi-branch line, and shapes that include polygons and circles.

101. As I discussed with respect to claim 2, the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATEK provides the first and second segments comprise a straight line. *Supra*, claim 2.

(g) Claim 9

[9] The apparatus of claim 7, further comprising: a length display configured to calculate and display either one or both of the length of the first selected segment and the length of the line.

102. As I discussed with respect to claim 3, the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH provides a length display

configured to calculate and display either one or both of the length of the first selected segment and the length of the line. *Supra*, claim 3.

B. GROUND 2—Claim 8 is rendered obvious by EZBRUSH in view of Corel, Thoemmes, TUKATECH, and Niterra

103. For the reasons articulated in detail below, and based on my review of the '773 patent and the EZBRUSH, Corel, Thoemmes, TUKATECH, and Niterra references, I am confident that a POSITA would have readily understood that the predictable combination of EZBRUSH in view of Corel, Thoemmes, TUKATECH, and Niterra provides all elements of claims 4-5 and 10-11.

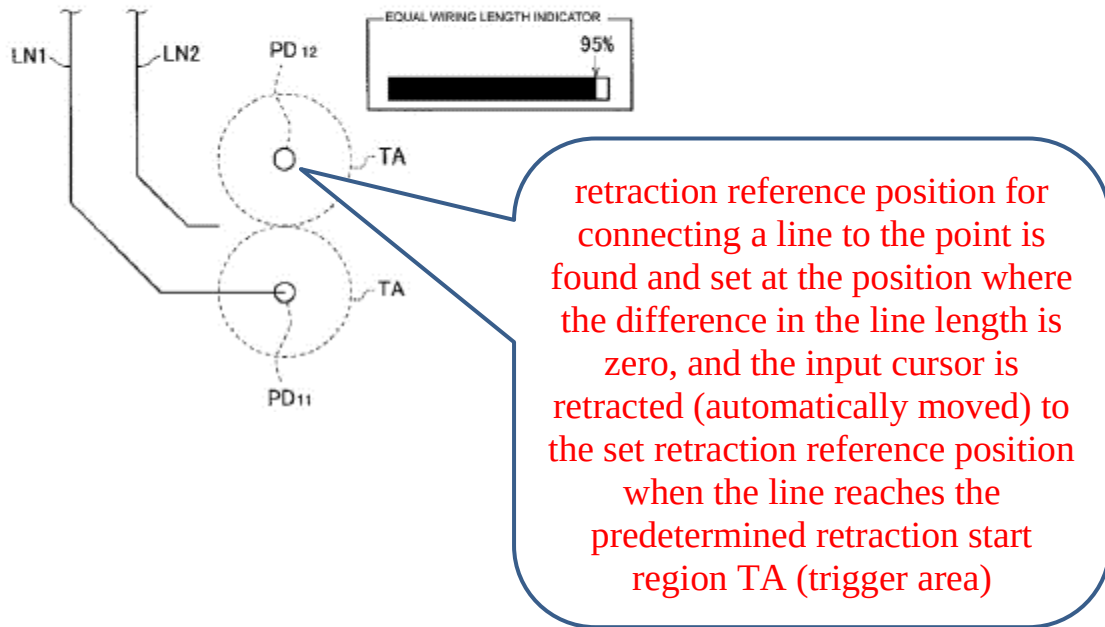
1. Overview of Niterra

104. Niterra is a Japanese patent publication that relates to “design systems using computer drafting processes, so-called computer-aided design (CAD) systems.” LINGDI-1009, [0002]. I note that Niterra’s CAD system is for “designing electronic circuit boards including differential wiring,” but Niterra describes general concepts relevant to other CAD systems, in particular, “a draw-type graphics software similar to a known CAD system” where “the drafting work proceeds by individually inputting the shapes” and where “it is important to make the difference in length between two [lines] as small as possible.” LINGDI-1009, [0029], [0005]-[0006], [0040].

105. As one example of general CAD concepts, Niterra teaches a

“retraction process.” LINGDI-1009, [0008], [0012], [0015], [0060], [0063], [0065], [0068]. The retraction process includes “a process of extending and connecting” a line to a point. LINGDI-1009, [0012]. Niterra teaches that “retracting to [a point] should be performed so that the amount of [line] length deviation is within a set range (preferably so that the [line] lengths are equal).” LINGDI-1009, [0012], [0008]. Niterra teaches that for each pair of lines, “the difference in [line] length of the portion already drafted is calculated, the retraction reference position used as the reference position for connecting each [line] to the [point] is found and set at the position where the difference in the [line] length is zero, and the input cursor is retracted (automatically moved) to the set retraction reference position.” LINGDI-1009, [0015], [0065]. Niterra teaches that “the retraction process may be started when [a line] reaches the predetermined retraction start region TA (trigger area).” LINGDI-1009, [0060], [0063]. The retraction start region is defined as “the region of radius R” from the point which is to be connected to the line. *Id.* Niterra teaches that this “configuration prevents large amount of [line] length deviation due to input errors, or the like, and thus enables accurate drafting” and “is expected to dramatically shorten the design period,” and thereby, the line “length can very easily be made uniform.” LINGDI-1009, [0008], [0015], [0068].

FIG. 29

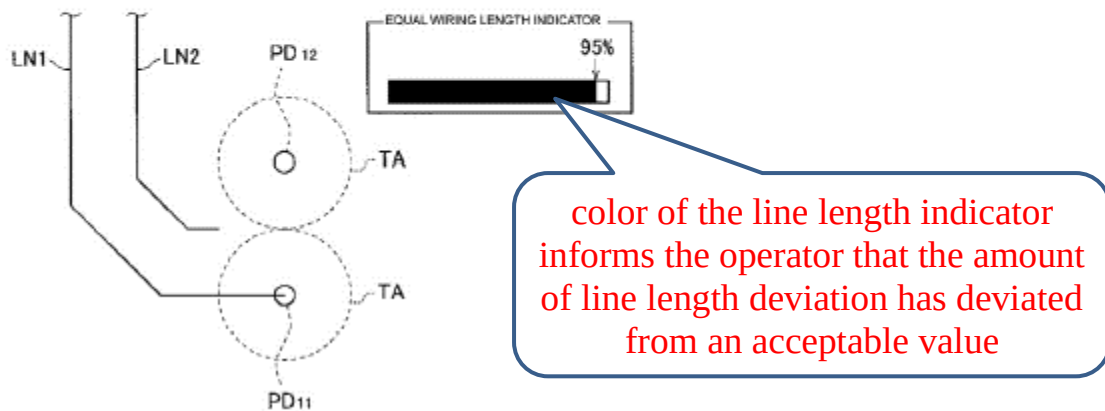


LINGDI-1009, FIG. 29 (annotated).

106. As another example of general CAD concepts, Niterra further teaches generating and outputting line “length deviation information related to the difference in length of the two [lines].” LINGDI-1009. [0016]. Niterra teaches that the length of two lines “can be expressed by an equal [line] length indicator or as a percentage” and that “the pattern or color of the [line] length indicator displayed on the monitor, or a combination of the two, may be used to inform the operator that the amount of [line] length deviation has deviated from an acceptable value.” LINGDI-1009, [0069]. “Furthermore, a determination is made as to

whether the calculated amount of [line] length deviation and the [line] length deviation rate are within the preset tolerance range and a warning (error indication) can be displayed.” LINGDI-1009, [0072]. Niterra teaches that in this manner, “the differences in length can easily be compared.” LINGDI-1009. [0016].

FIG. 29



LINGDI-1009, FIG. 29 (annotated).

2. The Combination of EZBRUSH with Corel, Thoemmes, TUKATECH, and Niterra

107. A POSITA would have been motivated to implement Niterra’s suggestion to display a retraction reference position for making a second segment equal in length to a first identified segment and segment length deviation information indicating a difference value between the lengths of two selected segments, including changing the color of the indicator to inform the user that the

amount of length deviation has deviated from an acceptable value in the resulting CAD system for purposes of achieving known benefits articulated below. A POSITA would have found it obvious and beneficial to helpfully display such information in the resulting system.

108. A POSITA would have known that when using the resulting CAD system (EZBRUSH as modified by Corel, Thoemmes, and TUKATECH (detailed above in Ground 1)) to digitally “sew” two garment patterns together, selecting the sewing segments to be equal in length would have been desirable when seeking a clean, smooth seam that prevents bunching or unintended stretching of the material. To this end, Niterra suggests the conventional practice in CAD systems where onscreen alerts regarding length difference information are provided, including alerts to users where “it is important to make the difference in length between two [lines] as small as possible.” LINGDI-1009, [0029], [0005]-[0006], [0040]. A POSITA would have been motivated to implement Niterra’s suggestions, for example, to display an equal line length indicator and “to inform the operator that the amount of [line] length deviation” between two indicated line segments “has deviated from an acceptable value” in the resulting CAD system (detailed above) for purposes of achieving known benefits articulated below. LINGDI-1009, [0069]. In doing so, the CAD system of EZBRUSH (as modified by Corel and Thoemmes) would have predictably included Niterra’s suggestion for

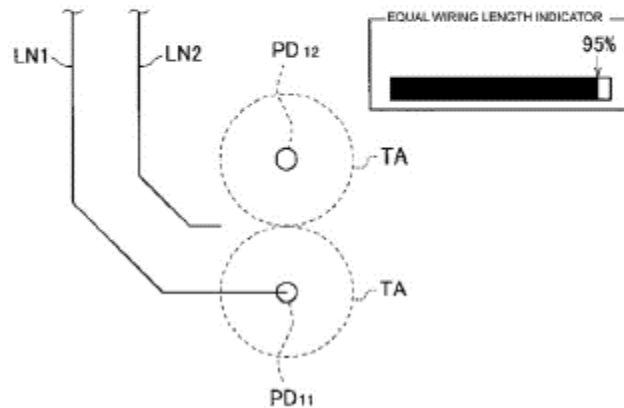
determining “whether the calculated amount of [line] length deviation...[is] within the present tolerance range” and if the deviation in line length of the two lines is outside of the tolerance range to issue “a warning (error indication).” LINGDI-1009, [0072]. For example, “the ***pattern or color of the [line] length indicator displayed on the monitor***, or a combination of the two, may be used to ***inform the operator that the amount of wiring length deviation has deviated from an acceptable value***. In this manner, the operator can easily perform drafting by manual input.” LINGDI-1009, [0069].

109. There are multiple reasons (including the seven I have articulated below) that would have prompted a POSITA to modify the CAD system of EZBRUSH (as modified by Corel, Thoemmes, and TUKATECH in Ground 1) to further include Niterra’s suggested improvements. As a first reason, a POSITA would have been motivated to implement such a modification to provide a convenient, automated, real-time indication of whether the difference in length of two indicated lines is within an acceptable range or outside of an acceptable range. As I discussed in Section X.A.5, above, a POSITA would have been prompted to apply TUKATECH’s teaching of comparing the lengths of two selected segments and displaying both the lengths of the selected segments and the length difference for two selected segments to the CAD system of EZBRUSH for multiple reasons. A POSITA would have recognized that further including Niterra’s suggested

improvements of providing a visual, conspicuous onscreen warning when two selected segments have a length difference that varies outside of an acceptable range would have further enhanced and improved the resulting system. LINGDI-1009, [0069]-[0072]. In the resulting combination that implements Niterra's suggested improvements, the CAD software would make such a length difference determination and alert the user to a potentially unacceptable length difference between the two segments. Such functionality would have improved the user experience by eliminating the need for the user to look elsewhere (in a table) at the displayed length differences and mentally calculating if those length differences outside of an acceptable range.

110. As a second reason, a POSITA would have been motivated to implement such a modification to provide more dimensional information for the user to allow for both greater precision and more prompt decision-making at the onscreen site of the selected objects. For example, a POSITA would have been motivated to apply Niterra's suggestion for the equal length indicator to the CAD system of EZBRUSH to provide an additional visual, easily digestible indicator of the ratio between the segment lengths in both bar graph and numeral form:

FIG. 29



LINGDI-1009, FIG. 29, [0069], [0073]. Similarly, changing “the pattern or color of the wiring length indicator displayed on the monitor” to indicate the line “length deviation has deviated from an acceptable value” would have provided an easily noticed alert to the user therefore providing additional useful information to the user in an easily recognizable manner when designing clothing using the resulting software. *Id.* A POSITA would have been motivated to provide such additional information to predictably improve the overall user experience of the CAD system and aide in creating precise seams by selecting sewing segments of equal or nearly equal length. For example, based on this additional information, “[i]f the line length deviation rate or parallel line rate deviates from the preset tolerance range,” this allows for such errors to be quickly “corrected manually or automatically.”

LINGDI-1009, [0073].

111. As a third reason, a POSITA would have been motivated to implement such a modification to eliminate “the need to check the wiring lengths on a graph or the like.” LINGDI-1009, [0068]. In doing so, the user experience would have improved in multiple ways, including “significantly reducing the time required for drafting.” *Id.* For example, “[i]f a warning is issued along with the [line] length deviation rate, time and effort can be saved when making drafting corrections.” LINGDI-1009, [0073].

112. As a fourth reason, a POSITA would have been motivated to implement such a modification to additionally provide “reliabl[e] guarantees” for achieving “equal [line] lengths” thereby improving “the quality” and precision of the resulting decision. LINGDI-1009, [0068].

113. As a fifth reason, a POSITA would have been motivated to show the line length ratio (and corresponding warnings) to provide the user with the ability for “equal-length [line drawing to] be performed so that the operator can specify the amount of [line] length deviation” where line segments of near equal, but not exactly equal length, are desired by the particular user of the clothing design software. LINGDI-1009, [0069] (“performed to facilitate equal-length drafting”).

114. As a sixth reason, a POSITA would have been motivated to implement such a modification because it would have allowed for greater user

control by allowing the user to set a specific “allowable amount of [line] length deviation” that is tailored to the specific design scenario. LINGDI-1009, [0071]. Including this functionality to increase the ability for user control in the resulting system would have prevented design errors by alerting the user to length differences out of the identified range, so that the user can correct such errors in a timely fashion, rather than noticing such errors later in the design process, which would have resulted in wasted work and additional work to correct such errors in many scenarios.

115. As a seventh reason, a POSITA would have been prompted to modify the garment design software of EZBRUSH (as modified by Corel, Thoemmes, and TUKATECH) based on the further teachings of Niterra because doing so would be merely the application of known techniques to a known system ready for improvement to yield predictable results. Here, EZBRUSH, Corel, Thoemmes, and Niterra are all directed toward CAD systems. As such, a POSITA would have recognized that applying the suggestions of Niterra to EZBRUSH’s CAD system would have led to predictable results with a reasonable expectation of success without significantly altering or hindering the functions performed by EZBRUSH’s software.

3. Analysis of the Combination of EZBRUSH, Corel, Thoemmes, TUKATECH, and Niterra with respect to claims 4-5 and 10-11 of the '773 patent

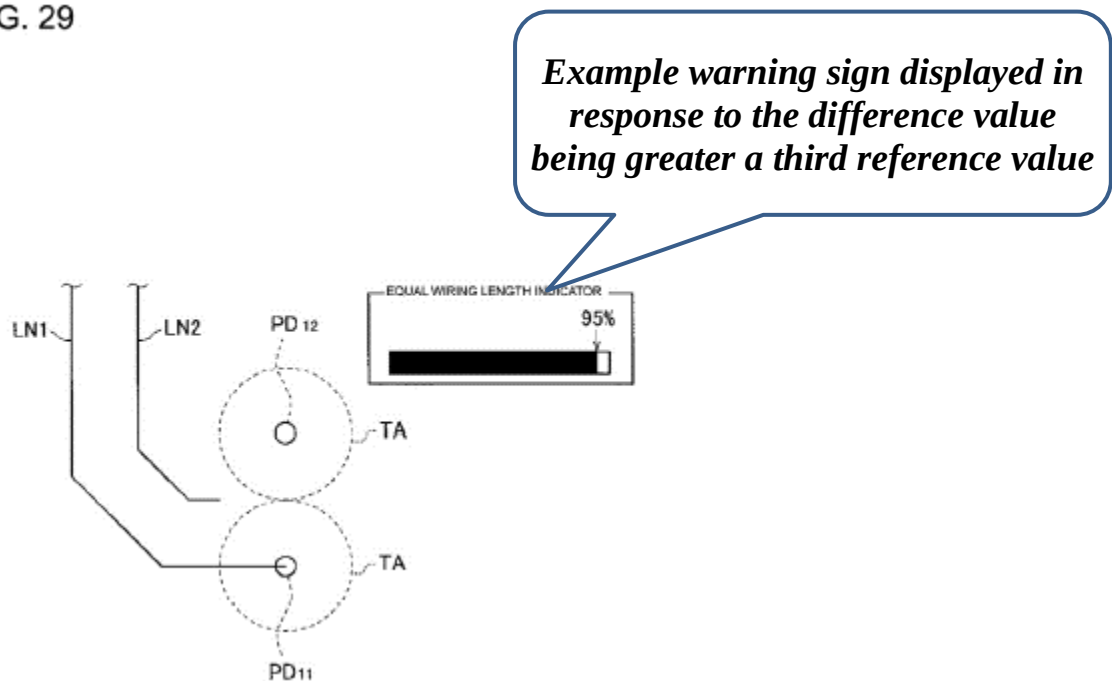
(a) Claim 4

[4] The method of claim 1, further comprising: displaying a warning sign, in response to the difference value being greater a third reference value.

116. EZBRUSH in view of Corel, Thoemmes, TUKATECH, and Niterra provides a length display configured to calculate either one or both of the length of the first selected segment and the length of the second selected segment. As I discussed above in Sections X.B.1-X.B.2 (overview of Niterra and description of predictable combination), a POSITA would have been motivated to apply, to the predictable combination of EZBRUSH, Corel, Thoemmes, and TUKATECH, Niterra's suggested improvements to display "a warning (error indication)" if "a determination is made as to whether the calculated amount of [line] length deviation" between the first and second segments is outside of "the preset tolerance range." LINGDI-1009, [0072]. Niterra further describes that "as in the case of the [line] length deviation...a warning may be displayed" and if "a warning is issued along with the wiring length deviation rate, time and effort can be saved when making drafting corrections." LINGDI-1009, [0073]. In another example, Niterra describes "issuing a warning or the like when drafting is performed in a manner that the amount of [line] length deviation deviates from the preset range" and "the

pattern or color of the wiring length indicator displayed on the monitor, or a combination of the two, may be used to inform the operator that the amount of wiring length deviation has deviated from an acceptable value.” LINGDI-1009, [0013]. In yet another example, Niterra describes that “the pattern or color of the wiring length indicator displayed on the monitor, or a combination of the two, may be used to inform the operator that the amount of wiring length deviation has deviated from an acceptable value.” [0069]. An example of this warning sign is shown in Figure 29 of Niterra:

FIG. 29



LINGDI-1009, FIG. 29 (annotated), [0069], [0073].

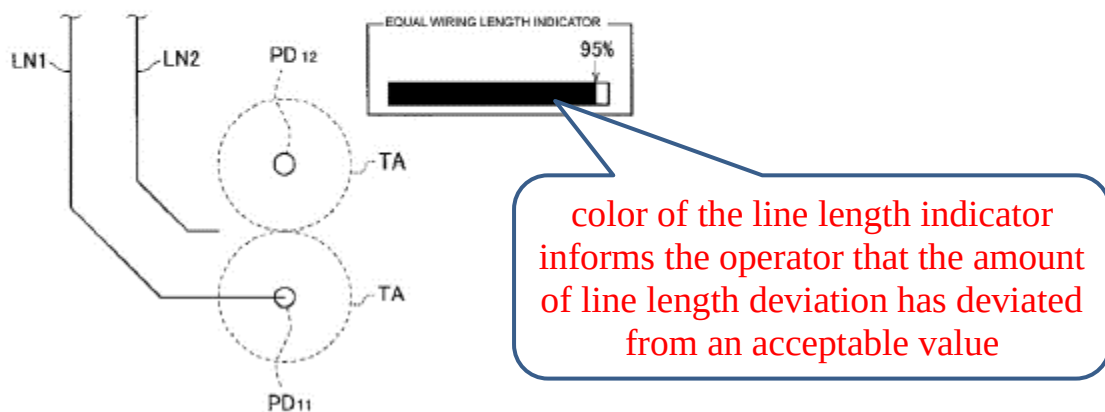
(b) Claim 5

[5] The method of claim 4, wherein the displaying of the warning sign comprises: displaying the warning sign by changing at least one of colors of the length of the line or the difference value.

117. EZBRUSH in view of Corel, Thoemmes, TUKATECH, and Niterra provides that displaying of the warning sign comprises: displaying the warning sign by changing at least one of colors of the length of the line or the difference value. As I discussed above in Sections X.B.1.-X.B.2 (overview of Niterra and description of predictable combination), a POSITA would have been motivated to apply Niterra's suggested improvements to display an equal line length indicator and "to inform the operator that the amount of [line] length deviation" between two indicated line segments "has deviated from an acceptable value" to the predictable combination of EZBRUSH, Corel, and Thoemmes. LINGDI-1009, [0072]. Niterra further describes generating and outputting line "length deviation information related to the difference in length of the two [lines]." LINGDI-1009. [0016]. Niterra teaches that the length of two lines "can be expressed by an equal [line] length indicator or as a percentage" and that "the ***pattern or color of the [line] length indicator displayed on the monitor***, or a combination of the two, may be used to inform the operator that the amount of [line] length deviation has deviated from an acceptable value." LINGDI-1009, [0069]. As shown in Niterra's FIG. 29 below, the line length indicator of Niterra includes a difference value in

the form of a ratio of the line lengths and an “Equal Wiring Length Indicator,” which changes color according to the value of the ratio:

FIG. 29



LINGDI-1009, FIG. 29 (annotated). Based on Niterra’s disclosures and the understanding that a POSITA would have had from those disclosures, a POSITA would have recognized that the displayed ratio between the two line lengths is an example of a “difference value” between the lengths of the first and second segment and therefore changing the color of the ratio satisfies this recitation of claim 5.

118. The system resulting from applying Niterra’s suggestion to the CAD system of EZBRUSH would have predictably included a line length indicator (as suggested by Niterra) that displays a line length deviation (a difference value

between the first length and the second length) in a first color when the second length is substantially equal to the first length and in a second color when the second length is substantially different from the first length (deviated from an acceptable value). Alternatively, a POSITA would have recognized that it would have been obvious and beneficial to apply Niterra's suggestion to the predictable combination of Ground 1 such that the segment length distance table displayed as part of the "compare length" functionality disclosed by TUKATECH in the predictable combination to change the color of the one or more entries in the length difference column when the length difference is outside of a specified acceptable range, based on the teaching from Niterra to change the color of an indicator as a warning when two line lengths differ by a specified threshold. LINGDI-1009, [0069], [0073], FIG. 29. Such a modification would have provided the same predictable benefits to the user, as articulated above in Section X.B.2.

(c) Claim 10

[10] The apparatus of claim 7, wherein the second selected segment setter is further configured to: display a warning sign, in response to the difference value being greater than a third reference value.

119. As I discussed with respect to claim 4, the predictable combination of EZBRUSH, Corel, Thoemmes, TUKATEK, and Niterra provides the second selected segment setter (the software routine for selecting the second segment in the resulting combination) displays a warning sign, in response to the difference

value being greater than a third reference value. *Supra*, claim 4.

(d) Claim 11

[11] The apparatus of claim 10, wherein the second selected segment setter is configured to display the warning sign by changing at least one of colors of the length of the line or the difference value.

120. As I discussed with respect to claim 5, the predictable combination of EZBRUSH, Corel, Thoemmes, TUKATEK, and Niterra provides the second selected segment setter (the software routine for selecting the second segment in the resulting combination) displays the warning sign by changing at least one of colors of the length of the line or the difference value. *Supra*, claim 5.

XI. ADDITIONAL REMARKS

121. I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

122. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Dated: 5/28/2024

By: 
Dan Perreault of Lake Mary, Florida

APPENDIX A

DAN PERREAULT

AERONAUTICAL ENGINEER,
ENTREPRENEUR

SUMMARY

I am an engineer with 30 years of professional experience, including 30+ years in 3D. I graduated from Embry Riddle Aeronautical University in 1989 with a bachelor's degree in Aeronautical Engineering. I started my 3D career as the first Applications Engineer at FARO Technologies, having evangelized 3D metrology in the manufacturing environment using the FARO Arm portable CMM. I started NeoMetrix Technologies, Inc. in 2003 in the metro Orlando, FL region as a Konica-Minolta 3D scanner sales representative, and engineering service provider. In 2008 NeoMetrix expanded into 3D printing by adding Objet 3D printers to the product portfolio. NeoMetrix currently represents Creaform, Geomagic, Markforged & BigRep and provides services such as 3D scanning, 3D printing, reverse engineering and rapid prototyping in Florida and throughout the United States.

SKILLS

Computer Aided
Design
3D Laser Scanning
Reverse Engineering
Computer Aided
Inspection
3D Printing
Rapid Prototyping
Engineering Project Management

EXPERIENCE

President & CEO 2003 - Present

NeoMetrix Technologies, Inc.

NeoMetrix provides solutions for rapid product development, including 3D scanning, 3D printing, rapid prototyping and reverse engineering. Our customers range from 1 person operations to world class companies such as Disney, Lockheed Martin, NBC Universal, & Northrop Grumman.

Sales Director 2002 - 2003

NeoMetrix Technologies, Inc.

Sale of FARO Arms, Perceptron & Minolta 3D Laser Scanners, Geomagic & Polyworks software. Promoting the use of non-contact laser scanning solutions for 3D measurement, reverse engineering, and computer aided inspection.

Director, Applications Engineering 1997 to 2002

FARO Technologies

Applications Engineer 1993 - 1997

FARO Technologies

Promote portable coordinate measuring machines as a real alternative to traditional CMM's and other measurement systems for reverse engineering and computer aided inspection. Traveled extensively throughout the U.S., Latin America and Europe to assist in the development of applications to solve real manufacturing related metrology issues in the automotive and aerospace industries. Helped FARO software and hardware engineers adapt a medical measurement tool for industrial applications.

Mechanical Engineer

ECC

Mechanical design of components for C17 jet engine maintenance trainer.

EDUCATION

Bachelor of Science Aerospace Aeronautical and Astronautical Engineering 1989

Embry-Riddle Aeronautical University

High School Diploma 1985

Mount Saint Charles Academy