

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Amazon Inc.

Petitioner

v.

LightGuide, Inc.

Patent Owner

Case IPR2024-00130

Patent No. 9,658,614

**EXPERT DECLARATION OF WILLIAM SINGHOSE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW**

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	SUMMARY OF OPINIONS	1
III.	BACKGROUND AND QUALIFICATIONS	2
IV.	MATERIALS CONSIDERED	8
V.	LEGAL STANDARDS	9
A.	Claim Construction.....	9
B.	Level of Ordinary Skill	10
C.	Anticipation	10
D.	Obviousness.....	11
VI.	THE '614 PATENT	13
A.	Specification.....	13
B.	Prosecution History	22
VII.	LEVEL OF ORDINARY SKILL IN THE ART	29
VIII.	CLAIM CONSTRUCTION	31
A.	“address identifier”	32
B.	“a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators”	34
IX.	THE CHALLENGED CLAIMS ARE UNPATENTABLE.....	39
A.	CHALLENGE 1A: Claims 1-2, 9, and 17 Are Rendered Obvious By Yokota	40
1.	Summary of Yokota (Japanese Unexamined Patent Application No. 2007-87251)	40
2.	Claim 1 Analysis	42

3.	Claim 2 Analysis.....	77
4.	Claim 9 analysis	81
5.	Claim 17 analysis	82
B.	CHALLENGE 1B: Claims 10-11 and 15-16 are rendered obvious by Yokota and Ramsager.....	85
1.	Summary of Ramsager.....	85
2.	Rationale for combining Yokota with Ramsager	88
3.	Claim 10 analysis	90
4.	Claim 11 analysis	95
5.	Claim 15 analysis	96
6.	Claim 16 analysis	101
C.	CHALLENGE 1C: Claims 12 and 23 are rendered obvious by the combination of Yokota and Pinhanez.	103
1.	Summary of Pinhanez	103
2.	Rationale for Combining Yokota with Pinhanez.....	104
3.	Claim 12 Analysis.....	106
4.	Claim 23 analysis	110
D.	CHALLENGE 1D: Claims 13-14 and 24-25 are rendered obvious by the combination of Yokota, Pinhanez, and Ryznar	110
1.	Summary of Ryznar (Ex. 1013).....	111
2.	Rationale for combining Yokota, Pinhanez, and Ryznar.	111
3.	Claim 13 analysis	113
4.	Claim 14 analysis	115
5.	Claim 24 analysis	117

6.	Claim 25 analysis	117
E.	CHALLENGE 2A: Claims 1, 3-8 and 17-22 are rendered obvious by Yokota in combination with Fontanot.....	118
1.	Summary of Fontanot	118
2.	Rationale for combining Yokota and Fontanot.....	122
3.	Claim 1 Analysis.....	126
4.	Claim 3 Analysis.....	129
5.	Claim 4 Analysis.....	132
6.	Claim 5 Analysis.....	134
7.	Claim 6 analysis	136
8.	Claim 7 analysis	137
9.	Claim 8 analysis	138
10.	Claim 17 analysis	139
11.	Claim 18 analysis.....	139
12.	Claim 19 analysis	139
13.	Claim 20 analysis	140
14.	Claim 21 analysis.....	140
15.	Claim 22 analysis	140
F.	CHALLENGE 2B: Claims 2, 9-16, and 23-25 are obvious based on the Yokota/Fontanot combination and the prior art of Challenges 1A-1D	140
G.	CHALLENGE 3A: Claims 1 and 17 are rendered obvious by the combination of Yokota and Machino.....	141
1.	Summary of Machino (Ex. 1007)	142
2.	Combination Rationale	146

3.	Analysis of Claims 1 and 17	147
a.	Obviousness of “creation of a dynamic, real time projection of visual indicators” limitations.....	148
H.	CHALLENGE 3B: Claims 2-16 and 18-25 are obvious based on the Yokota/Machino combination and the prior art of Challenges 1A-1D and Challenge 2A-2B	150

I. INTRODUCTION

1. I, William Singhose, have been retained as an independent expert by Amazon Inc. (“Petitioner” or “Amazon”) in connection with an *inter partes* review of U.S. Patent No. 9,658,614 (the “’614 patent”). I have prepared this declaration in connection with Amazon’s Petition for *Inter Partes* Review.
2. Specifically, this document contains my opinions about the technology at issue in claims 1-25 of the ’614 patent (the “Challenged Claims”) and the grounds against these claims that have been asserted by Amazon. The grounds are as follows:

<u>Challenge</u>	<u>Claims</u>	<u>Basis</u>	<u>References</u>
1A	1–2, 9, 17	103	Yokota
1B	10–11, 15–16	103	Yokota, Ramsager
1C	12, 13	103	Yokota, Pinhanez
1D	13–14, 24–25	103	Yokota, Pinhanez, Ryznar
2A	1, 3–8, 17–22	103	Yokota, Fontanot
2B	2, 9–16, 23–25	103	Yokota, Fontanot with Ramsager, Pinhanez, or Ryznar
3A	1, 17	103	Yokota, Machino
3B	2–16, 18–25	103	Yokota, Machino, with Fontanot, Ramsager, Pinhanez, or Ryznar

I was not asked to provide any opinions that are not expressed herein.

II. SUMMARY OF OPINIONS

3. Below, I set forth the opinions I have formed, the conclusions I have reached, and the bases for my opinions and conclusions. I believe the

statements contained in this declaration to be true and correct to the best of my knowledge.

4. Based on my experience, knowledge of the art at the time of the applicable priority date,¹ analysis of Petitioner's asserted grounds and references, and the understanding a person of ordinary skill in the art (POSITA) would have had of the claims, in light of the specification, as of the applicable priority date, it is my opinion that the Challenged Claims of the '614 patent would have been obvious based on the asserted grounds.
5. I am being compensated for my time at the rate of \$800 per hour. This compensation is in no way contingent upon the nature of my findings, the presentation of my findings in testimony, or the outcome of this proceeding.

III. BACKGROUND AND QUALIFICATIONS

6. I believe that I am well qualified to serve as a technical expert in this matter based upon my education and work experience. A copy of my curriculum vitae is attached as Exhibit 1004.
7. I am a Professor of Mechanical Engineering at the Georgia Institute of Technology ("Georgia Tech"). I received a B.S. in Mechanical Engineering from the Massachusetts Institute of Technology ("MIT") in 1990. I then

¹ I have been asked to assume the priority date for the '614 patent is February 11, 2011.

received an M.S. in Mechanical Engineering from Stanford University in 1992. Finally, I received a Ph.D. in Mechanical Engineering from MIT in 1997. After receiving my Ph.D., I was a postdoctoral researcher at MIT before becoming a professor at Georgia Tech in 1998.

8. Based on my work experience, described in my curriculum vitae and in more detail below, I am knowledgeable about the subject matter of the '614 patent, and the related prior art. Key elements of the subject matter and prior art include projectors, cameras, image processing, remote control, remote displays, data storage, and operational aids. I have experience working with each of these key elements, and combinations of these elements.
9. My qualifications as an expert in this subject matter stem from my industry work experience, as well as my experience as a Professor in the Woodruff School of Mechanical Engineering at Georgia Tech performing research, teaching, and consulting. I have several patents and hundreds of publications that are directed toward understanding and improving automation, control systems, and operator aids. Many of these publications include the use of smart cameras to achieve the desired outcomes.
10. In my current position at Georgia Tech, I teach courses in mechanical design, system dynamics, and controls. I also lead teams of professors, post-

docs, graduate students, and undergraduate students that conduct research in mechanical design, dynamics, controls, automation, robotics, spacecraft, and human-machine interfaces. During my 25 years at Georgia Tech, I have also had visiting academic appointments at MIT, Stanford, the Polytechnic University of Madrid, and the Tokyo Institute of Technology.

11. Throughout my engineering career, I have worked with automated systems. Before starting my teaching career at Georgia Tech, I worked as a full-time mechanical engineer for several companies, including Walt Disney World, Apple Computers, Inc., and Convolve, Inc. During my tenure at Georgia Tech, I have continued to actively work for companies as either a part-time consultant or as a full-time engineer. For example, from 2017-2020 I took a leave of absence from Georgia Tech to work at Google.
12. In my role at Walt Disney World, I designed and developed a number of structures and components for the parks' rides, including operational control procedures for the Body Wars simulators. These simulators were rooms that held about 40 people at a time. The entire rooms, and the guests seated within, were automatically moved up, down, side-to-side, and through a range of inclinations via a series of preprogrammed motions. At the front of the room was a large screen that displayed a projection of a video that was

coordinated with the motion of the room. The net result was a ride that simulated traveling through the human body.

13. For Apple Computers, I designed and developed computer monitors with built-in speakers and microphones. Part of my job responsibilities required me to use complex sensors and computer controllers to conduct performance testing on numerous design prototypes that were directed at measuring the effectiveness of the human-machine interaction. I also tested the quality of the displayed images under a variety of conditions.
14. For Convolve, Inc., I analyzed the dynamics of automated robots, satellites, and NASA high-altitude balloons. I also developed automated control systems for laser interferometers. These sensors emit laser beams using two different frequencies of coherent light. The beams both travel through, and reflect off, specialized mirrors that control the beam pathways such that nanometer-level measurements of a moving object can be obtained.
15. While working for Google, I designed several consumer electronic products and a shopping assistant that scanned clothing barcodes using the camera of a smartphone. The goal of the project was to guide users to select the most appropriate-sized article for purchase. During my years at Google I worked in both the Advanced Technology and Projects lab (ATAP), as well as the Google augmented reality division.

16. One of the primary focusses of my career at Georgia Tech has been developing technology to aid humans during the operation of machines. The operator-aiding technologies that I have developed decrease the required effort and skill, as well as help reduce operator errors. For example, I have developed technologies that help crane operators move payloads without inducing sway. This makes transferring payloads from one location to another much easier and with less chance of accidents.
17. An important aspect of the subject matter of this case is focused on sensors that detect user gestures. The summary of the invention of the '614 patent indicates that the invention can utilize a camera "...to image at least one of the actions of an individual guided by the visual indicator..." ['614 patent, 2:20-21.] I have published numerous papers covering the use of computer vision, such as [1-11 in the attached list of References]. I have also published papers describing research using visual guides to aid workers [12-14 in the attached list of References]. Furthermore, I have extensive experience using sensor systems that can accurately locate objects within large workspaces, such as VICON motion capture systems.²

² www.vicon.com

18. One of my research projects that is closely related to the technology described in the '614 patent involved mounting a laser on the top of a small-scale tower crane. The laser was directed toward the ground and was controlled such that its illumination spot indicated to the operator where the crane payload would be about 3 seconds in the future. The laser effectively helped guide the operator to move the crane payload through cluttered environments and arrive at the intended target location. Additionally, starting in 2006, I used a webcam in conjunction with the crane so that remote users could both observe the actions of a local operator and perform remote control of the crane as well. The webcam allowed users at both Stanford University and MIT to perform extensive tests on the crane while it was physically located at Georgia Tech in Atlanta. Additionally, student users in Japan and Spain also operated the crane to complete control experiments for their coursework. The webcam video stream allowed these remote users to better understand and control the motions that the crane was performing.
19. I have commercialized operator-aiding technologies by founding two companies: CAMotion Cranes and InVekTek. CAMotion Cranes designed and installed crane control systems that decrease payload sway, automatically avoid obstacles, and improve crane safety. These

improvements were achieved through sensor systems and control methods that my research group at Georgia Tech developed, patented, and deployed. CAMotion Cranes was acquired by PAR Systems in 2013. InVekTek develops and commercializes control systems for large robotic and industrial material-handling systems. InVekTek products include control systems that read sensor signals and accurately control machine actuators.

20. Most of the installations of my crane-operator aids that include an overhead camera for monitoring the crane payload and workspace use a DVT, or Cognex, smart camera. These cameras first became available in the early 1990's. They are essentially the combination of a digital camera, a processor, and specialized image processing software all in the same small package.
21. Finally, I have previously worked as a technical expert on cases involving warehouse automation equipment. I worked on two investigations at the International Trade Commission (ITC-1293 and ITC-1333), both of which involved warehouse automation equipment that helped store and retrieve items in warehouses.

IV. MATERIALS CONSIDERED

22. My opinions are based on my experience, knowledge of the relevant art, the patents and prosecution histories of the '036 patent, the '614 patent, and the

'981 patent, the documents identified as References at the end of my declaration, and the documents discussed in this declaration.

V. LEGAL STANDARDS

23. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration is based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents related to this proceeding. In preparing this declaration, I have tried to faithfully apply these legal standards to the Challenged Claims.

A. Claim Construction

24. I have been instructed that the terms appearing in the '614 patent should be interpreted in view of the claim language itself, the specification, the prosecution history of the patent, and any relevant extrinsic evidence. I understand that the words of a claim are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art at the time of the invention. While claim limitations cannot be "read in" from the specification, the specification is the single best guide to the meaning of claim terms. I have followed these principles in reviewing the claims of the '614 patent and forming the opinions set forth in this declaration.

B. Level of Ordinary Skill

25. I understand a person of ordinary skill in the art is determined by considering issues such as (i) the type of problems encountered in the art; (ii) prior art solutions to those problems; (iii) rapidity with which innovations are made; (iv) sophistication of the technology; and (v) educational level of active workers in the field. I understand that these factors are not the only criteria that can be applied while determining a level of ordinary skill. For example, the claimed subject matter can be compared to subject matter that is typically taught in the relevant engineering curricula to provide guidance of what would constitute appropriate educational requirements for a person of ordinary skill in the art.

C. Anticipation

26. I have been told that under 35 U.S.C. § 102, a patent claim is invalid if its subject matter was patented or described in a printed publication before the effective filing date of the claimed invention. I have been told that this is referred to as invalidity by anticipation. I have been told that a patent claim is anticipated under § 102 if a single prior art reference discloses all limitations of the claimed invention. I have been told that a disclosure may be either express or inherent. An express disclosure is one that is explicitly disclosed in a prior art reference. An element is inherently disclosed if it is

the natural result flowing from the explicit disclosure of the prior art. An element that is probably or possibly present is not inherently disclosed.

D. Obviousness

27. I have been told that under 35 U.S.C. § 103, a patent claim may be obvious if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a POSITA to which the subject matter pertains.
28. I have been told that a proper obviousness analysis involves:
 - a. Determining the scope and content of the prior art;
 - b. Ascertaining the differences between the prior art and the claims at issue;
 - c. Resolving the level of ordinary skill in the pertinent art; and
 - d. Considering evidence of secondary indicia of non-obviousness (if available).
29. I have been told that the relevant time for considering whether a claim would have been obvious to a POSITA is the time of invention.
30. I have been told that a reference may be modified or combined with other references, or with a POSITA's own knowledge, if the person would have found the modification or combination obvious. I have also been told that a

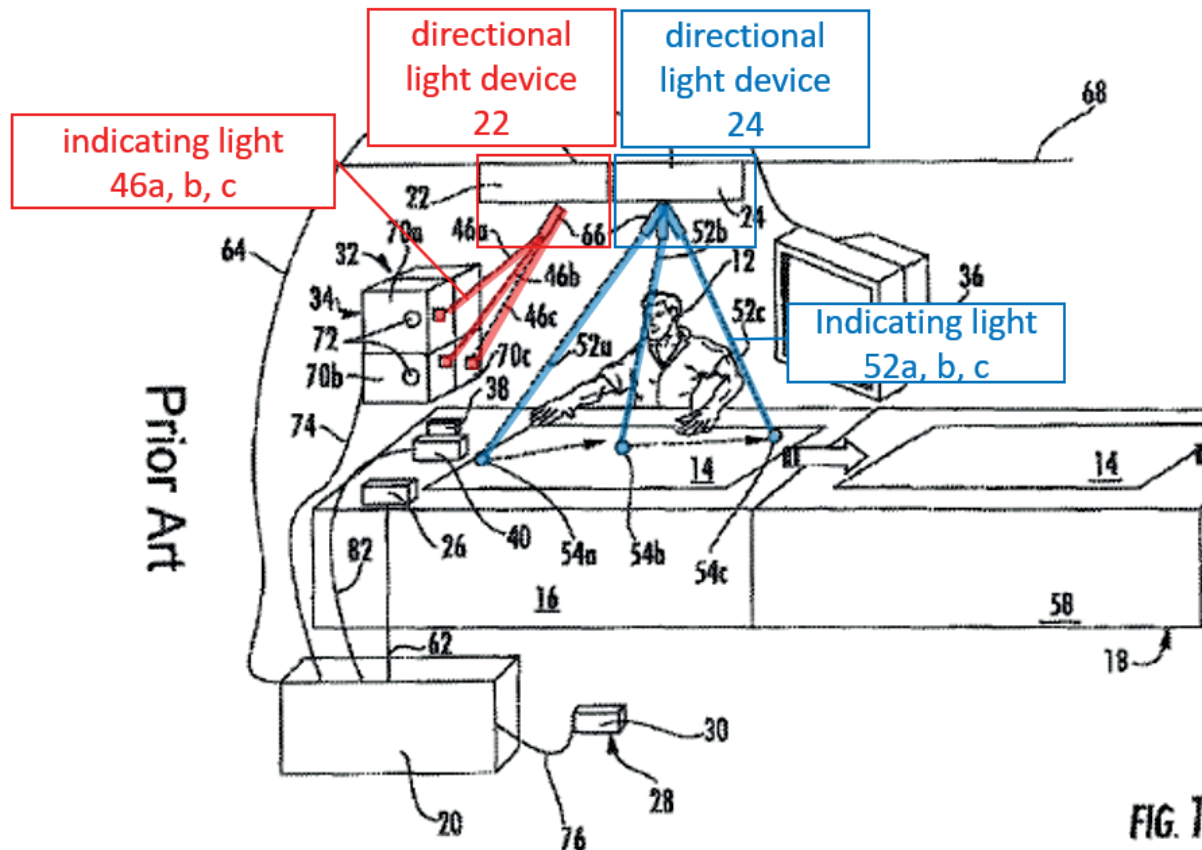
POSITA is presumed to know all the relevant prior art, and the obviousness analysis may take into account the inferences and creative steps that a POSITA would employ.

31. I have been told that whether a prior art reference renders a patent claim obvious is determined from the perspective of a POSITA. I have also been told that there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention. However, suggestions to combine known elements to achieve the claimed invention may come from the prior art as a whole, or individually, and may consider the inferences and creative steps that a POSITA would employ. I understand that obviousness grounds cannot be sustained by mere conclusory statements and must include some articulated reasoning, with some rational underpinning, to support the legal conclusion of obviousness.
32. I have been told that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. However, I also have been told that the “teaching, suggestion, or motivation” test can be used in establishing a rationale for combining elements of the prior art. I have also been told to be aware of distortions caused by hindsight bias, and that reading into the prior art the teachings of the patent at issue is improper.

VI. THE '614 PATENT

A. Specification

33. U.S. Patent No. 9,658,614 (“the ’614 patent”) was issued to Paul Ryznar and James Ryznar on May 23, 2017. The patent claims priority to a U.S. provisional application No. 61/441,897, that was filed on February 11, 2011.
34. The ’614 patent describes a guide system that projects visual indicators onto an object in a workspace to guide the actions of an individual. The ’614 patent “is directed toward advances in an operational light guide system that projects lights to guide actions by one or more individuals, such as the operational guide system disclosed in U.S. Pat. No. 7,515,981.” [’614 patent at 5:42-47.] The ’614 patent contains an extended discussion of the guide system disclosed in the ’981 patent. [’614 patent at 5:48-14-12.] Figure 1 of the ’614 patent, reproduced below for convenience, is an illustration of this prior art guide system.



'614 Patent, Fig. 1 (annotated).

35. The '614 patent explains that the system of the '981 patent includes a workstation and system for providing visual indicators to a person doing an assembly task. ['614 patent at 5:48-59.] The prior art guide system is described as having overhead directional light devices 22 and 24 that project light downward onto the workspace of the operator 12. The light devices provide indicating lights 46 and 52 to guide an operator in the selection and assembly of parts.

36. The '614 patent gives examples of prior art indicating lights including “a geometric shape . . . such as a circle, about a particular location to quickly attract the operator’s attention The indicating light may also be projected to produce alpha numeric characters.” [’614 patent at 8:60-67].
37. The '614 patent claims to present “an improved operational guide system” that “shares similar components or elements with [the '981 patent] guide system.” [’614 patent at 14:13-15.] Based on my analysis of the claims, there are three such elements claimed in the '614 patent.
38. The *first* purported modification to the '981 patent system concerns storing information describing visual indicators in a table or other addressed data storage. As shown below in an annotated version of Fig. 3A, the '614 patent provides an example of such a table.

287

	A	B	C	D	E	F	G	H
1	Select 1	Select 2	Select 3	Select 4	Select 5	Select 6	Select 7	Select 8
2	←	↑	↓	→	← Left	↑ Up	↓ Down	→ Right
3	Inspect	Align	Mask	Torque	Gage	Assemble	Rework	Pick
4	[Video 1]	[Video 2]	[Video 3]	[Video 4]	[Video 5]	[Video 6]	[Video 7]	[Video 8]
5	[Drawing 1]	[Drawing 2]	[Drawing 3]	[Drawing 4]	[Drawing 5]	[Drawing 6]	[Drawing 7]	[Drawing 8]
6	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8
7	Part 9	Part 10	Part 11	Part 12	Part 13	Part 14	Part 15	Part 16

'614 patent, Fig. 3A (annotated)

This figure shows an addressed table of visual indicators. Each cell in the above table has a unique address. For example, cell A1 shows the visual indicator “Select 1.” Cell E2 shows the visual indicator “← Left.” The use

of such a table or other addressed data source for storing visual indicators is required by all claims of the '614 patent. ['614 patent at 15:24-46; claims 1, 17.] The '614 patent also describes the use of a similar table to identify positions where a visual indicator should be displayed. ['614 patent, Fig. 3A (bottom portion); 15:47-16:2.]

39. The *second* purported modification involves input signals that direct the guide system to display visual display indicators (VDFs) based on the corresponding unique address. ['614 patent at 17:29-33 (“In the embodiment of FIG. 3, data inputs 207 are employed to coordinate the selection of VDFs based on the associated address identifier, as well as the positional location of where the VDF is to be projected based on the positional identifier.”)] For example, the guide system might be instructed to display visual indicator “A1”, in which case it would display the phrase “Select 1.” ['614 patent at 16:9-33.] The '614 patent explains that “in operation, guide system 200 may be prompted to project a particular [visual display feature] based on an address identifier 287 onto a surface of a particular object based on a positional identifier 288.” ['614 patent at 16:34-38.] The '614 patent makes the claim that its “guide system 200 may be dynamically used to project selected [visual display features] onto particular locations of an object by selecting a [visual display feature] via its associated

. . . address identifier 287 and directing a projector to project the selected [visual display feature]. [’614 patent at 17:20-24.] This process of using inputs to pick which visual indicators to display based on addresses is also a requirement of the Challenged Claims. [’614 patent claims 1, 17.]

40. The third purported modification over the ’981 patent system concerns the use of a “manufacturing execution system” or “MES” or other outside system controller to provide input signals. [’614 patent at 1:57-60.] The ’614 patent describes an MES as follows:

Guide system 200 is integrated or interfaced with an operational program system or operational software system or manufacturing execution system (MES) 205 whereby operational software system 205 may provide operational guide system 200 with input signals or data inputs 207 to create, control or cause the projector of operational guide system 200 to project specific display images 209 via the projected indicating light 252 and/or project in specific locations. Manufacturing, production, and/or assembly environments frequently employ operational software systems 205, which are sometimes referred to as enterprise resource planning (ERP) systems, used in association with product planning, production scheduling, inventory control, and the like. These systems are generally defined as control systems for managing and monitoring work-in-process in a

factory environment, such as on a factory floor.

Examples of such operational software systems include, but are not limited to, SAP® business software provided by SAP AG of Germany, PROPLANNER® business software provided by Proplanner Corp. of Iowa, USA, as well as systems such as General Motor Corporation's Global Enterprise Production Information and Control System (GEPICS). Such operational software systems 205 can include data that may be utilized by guide system 200 to assist in guiding the activities of an individual without the necessity of having such information separately programmed or pre-programmed into guide system 200. For example, operational software system 205 may include part or component information, such as bill of material (BOM) information, including information categorized by part or product for separate operational steps in an assembly operation or the like, including part numbers and/or part descriptors, that may be transmitted to guide system 200. Operational software system 205 may also include ordered operational process descriptions as used, for example, for time and cost analysis purposes, which information may also be transmitted to guide system 200. Operational software system 205 may still further include images of parts, components, decals, labels and the like that may be transmitted to guide system 200.

['614 patent at 14:17-56.]

41. The '614 patent has two independent claims – claims 1 and 17. Claim 1 is representative of the claimed technology. It is reproduced here for convenience.

1.0	A method of projecting visual indicators to guide actions of an individual for a particular guided operation, said method comprising:
1.1	providing a guide system having a guide system controller and a projector,
1.2	said guide system controller including a plurality of selectable addressed display features with each said addressed display feature having a unique pre-programmed individual address identifier within said guide system controller;
1.3	receiving a sequence of one or more input signals at said guide system controller, with the input signals being provided to said guide system controller by a separate computer system or controller to cause said guide system to project visual indicators for a particular guided operation;
1.4	selecting one or more particular addressed display features by said guide system controller from the plurality of said addressed display features based on said input signals, wherein said input signals control selection of said addressed display features based on the address identifier for the said addressed display feature; and
1.5	projecting one or more visual indicators corresponding to said selected particular addressed display features onto one or more physical objects associated with the particular guided operation, with said guide system controller configured to control operation of said projector to project said visual indicators based on said input signals;
1.6	wherein said guide system controller is operative to receive any sequence of input signals from the separate computer system or controller to dynamically control projection of any sequence of said visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the particular operation with a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.

42. The preamble and limitation 1.1 simply require projecting lights to guide individuals using a “guide system” and a “guide system controller.” This method was acknowledged to be part of the ’981 patent. [’614 patent at 5:48-49.]
43. Limitation 1.2 claims that the guide system controller stores “display features,” with each display feature being selectable via a unique address. This is nothing more than storing display features in a table or database.
44. Limitation 1.3 requires that the guide system controller receives a sequence of input signals from a separate computer and that those input signals cause the projector to display images. This is nothing more than stating that the guide system controller is itself controlled via a separate computer, such as a network computer. The ’614 patent acknowledges that these limitations are in the prior art. [’614 patent at 7:60-63 (describing the prior art as teaching that “a first input signal may be transmitted to a network computer system and, in response to the first input signal, the network system may provide the control module with the identification information.”)]]
45. Limitation 1.4 generally recites that the input signals control selection of display features “based on the address identifier” of that display feature. As a general concept, this is not new—it is just a specific application of

standard address-based lookups to a database or table to display feature information.

46. Limitation 1.5 recites that the guide system controller causes the projector to display visual indicators based on the input signals. For the same reasons discussed above for limitations 1.3 and 1.4, this concept is acknowledged to be within the prior art. [’614 patent at 8:6-9 (discussing a prior art system and stating: “In response to the first input signal 42 received, the control module 20 outputs command signals 44, 50 to directional light devices 22, 24 along link 64 to provide visual indicators to the operator.”)]
47. Limitation 1.6 states that the guide system controller “is operative to receive any sequence of input signals,” to “dynamically control projection of any sequence of said visual indicators,” “with a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.” This limitation essentially means that the sequence of input signals is not known in advance and that the projection of visual indicators is created dynamically and in real time in response to a sequence of input signals.
48. In short, claim 1 of the ’614 patent recites using the system of the prior art ’981 patent together with a table or database of display features, where what is displayed is determined by input signals. This combination of prior art

light-guidance technology with basic database features known in the art renders the claims obvious, as explained below.

B. Prosecution History

49. The '614 patent claims priority to a provisional application filed on February 11, 2011. ['614 patent, cover.] The '614 patent was also filed as a PCT application on February 10, 2012. ['614 patent, cover.] The non-provisional application was filed with the U.S. Patent and Trademark Office on August 9, 2013, and was assigned application no. 13/984,744. [Ex. 1002 at 169.]
50. On October 26, 2015, the USPTO examiner rejected the claims of the '744 application as being taught by the '981 patent. [Ex. 1002 at 195.] At that time, the '744 application claim 1 read as follows:

1. A method of projecting visual indicators onto a physical object to guide actions of an individual, said method comprising:

providing a guide system having a guide system controller and a projector, said guide system controller including a plurality of addressed display features;

providing an input signal to said guide system controller;

selecting an addressed display feature based on said input signal; and

projecting a visual indicator corresponding to said selected addressed display feature onto a physical object.

[Ex. 1002 at 148.]

The examiner explained how all of these limitations were disclosed by the '981 patent. [Ex. 1002 at 195-215.]

51. In response, on March 28, 2016, the patent applicants amended their claims to require (1) multiple input signals; (2) that those input signals were transmitted from a separate system or controller; and (3) that the system could “dynamically project any sequence of visual indicators. The amended ’744 application claim 1 is copied below:

1. (currently amended) A method of projecting visual indicators onto a physical object to guide actions of an individual, said method comprising:

providing a guide system having a guide system controller and a projector, said guide system controller including a plurality of addressed display features;
providing ~~an~~ input signals ~~to~~ said guide system controller;
selecting ~~an~~ addressed display features ~~to~~ based on said input signals~~;~~ and
projecting ~~a~~ visual indicators ~~to~~ corresponding to said selected addressed display features onto ~~a~~ the physical object, with said guide system controller configured to control operation of said projector to project said visual indicators;

said input signals being transmitted from a separate system or controller to said guide system controller and each said addressed display feature having a pre-programmed individual address within said guide system controller, and wherein said guide system controller is operative to dynamically project any sequence of said visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the physical object.

[Ex. 1002 at 233.]

The applicant argued that these claims were different than the ’981 patent because it included “dynamic selection and operation” and could “flexibly project any sequence of visual display features, thereby readily and rapidly

accommodating product changes without requiring the creation and/or editing of numerous programs.” [Ex. 1002 at 237.]

52. In addition, independent claim 15 was also amended to require that each display feature have a “pre-programmed individual address.” [Ex. 1002 at 235.] The applicant argued that this limitation also distinguished it from the ’981 patent. [Ex. 1002 at 240.]
53. On April 28, 2016, the patent examiner rejected these revised claims. [Ex. 1002 at 274.] The examiner found that these new limitations were still disclosed by the ’981 patent. [Ex. 1002 at 275-277.] For example, the examiner found that the description that “indicating light 52a is projected on operational step location 54a” was an example of “each said display feature having a pre-programmed individual address” and of dynamic projection. [Ex. 1002 at 276.]
54. On May 18, 2016 and June 28, 2016, the applicant and the examiner discussed this rejection. The examiner described these discussions as, “Applicant’s representative and Examiner discussed how the prior art was directed to pre-determined sequences of visual indicators and the technology can be programmed for dynamic sequences of visual indicators.” [Ex. 1002 at 315, 322.] The applicant and examiner agreed to a set of claim amendments that would be different than the ’981 patent because they could

“receive any sequence of input signals from the separate computer system.”

[Ex. 1002 at 324.]

55. On July 28, 2016, the applicants formally amended their claims to include additional limitations regarding sequences of input signals and resulting dynamic projections. They also incorporated the “unique pre-programmed individual address” limitation, which resulted in:

1. (currently amended) A method of projecting visual indicators ~~onto a physical object~~ to guide actions of an individual for a particular guided operation, said method comprising:

providing a guide system having a guide system controller and a projector, said guide system controller including a plurality of selectable addressed display features with each said addressed display feature having a unique pre-programmed individual address identifier within said guide system controller;

~~providing~~ receiving a sequence of one or more input signals to at said guide system controller, with the input signals being provided to said guide system controller by a separate computer system or controller to cause said guide system to project visual indicators for a particular guided operation;

selecting one or more particular addressed display features by said guide system controller from the plurality of said addressed display features based on said input signals, wherein said input signals control selection of said addressed display features based on the address identifier for the said addressed display feature; and

projecting one or more visual indicators corresponding to said selected particular addressed display features onto the one or more physical objects associated with the particular guided operation, with said guide system controller configured to control operation of said projector to project said visual indicators based on said input signals;

~~said input signals being transmitted from a separate system or controller to said guide system controller and each said addressed display feature having a pre-programmed individual address within said guide system controller, and wherein said guide system controller is operative to receive any sequence of input signals from the separate computer system or controller to dynamically control projection of any sequence of said visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the particular operation~~ physical object.

[Ex. 1002 at 334.]

The applicants stated that they believed after the interviews with the examiner that this claim language would distinguish over the '981. [Ex. 1002 at 340.]

56. However, on September 28, 2016, the examiner rejected the new claims. [Ex. 1002 at 351.] The examiner's rejection was based on the combination of the '981 patent with two new references: Sugden (US 5,406,176) and Wechter (U.S Patent Pub. No. 2011/0178627). [Ex. 1002 at 353-354.] The combination relied on Sugden as teaching the "unique pre-programmed address" and "based on the address identifier" limitations of application claim 1. [Ex. 1002 at 358.] The examiner's rejection relied on Wechter as teaching the limitation "any sequence of input signals . . . to dynamically control projection of any sequence of . . . visual indicators." [Ex. 1002 at 359.]
57. On October 27, 2016, the applicant's representative and the examiner held another interview. [Ex. 1002 at 414.] At the interview they discussed "how the prior art was directed to control based on an individual product selection (Wechter) and the technology can be programmed for dynamic control based on any sequence of input signals." [Ex. 1002 at 414.] However, they did not agree on any claim amendments that would be adequate to make such a distinction over the prior art. [Ex. 1002 at 414 ("No agreement was reached with respect to claim amendments.")]
58. On November 14, 2016, a further examiner interview was held in which proposed claims were considered and agreed upon. [Ex. 1002 at 417.]

59. On December 13, 2016, claim 1 was formally amended to read as follows:

This listing of claims will replace all prior versions and listings of claims in the present application:

1. (currently amended) A method of projecting visual indicators to guide actions of an individual for a particular guided operation, said method comprising:

providing a guide system having a guide system controller and a projector, said guide system controller including a plurality of selectable addressed display features with each said addressed display feature having a unique pre-programmed individual address identifier within said guide system controller;

receiving a sequence of one or more input signals at said guide system controller, with the input signals being provided to said guide system controller by a separate computer system or controller to cause said guide system to project visual indicators for a particular guided operation;

selecting one or more particular addressed display features by said guide system controller from the plurality of said addressed display features based on said input signals, wherein said input signals control selection of said addressed display features based on the address identifier for the said addressed display feature; and

projecting one or more visual indicators corresponding to said selected particular addressed display features onto one or more physical objects associated with the particular guided operation, with said guide system controller configured to control operation of said projector to project said visual indicators based on said input signals;

wherein said guide system controller is operative to receive any sequence of input signals from the separate computer system or controller to dynamically control projection of any sequence of said visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the particular operation with a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.

[Ex. 1002 at 426.]

60. On January 17, 2017, this and the other claims of the '744 application received a notice of allowability. [Ex. 1002 at 454.] The patent was issued on May 23, 2017. [Ex. 1001 at 1.]

VII. LEVEL OF ORDINARY SKILL IN THE ART

61. In my opinion, a person of ordinary skill in the art (“POSITA”) pertinent to the '614 patent would have had at least a four-year degree in electrical engineering, mechanical engineering, computer science, or a closely related field, and a year of experience working in interactive computer applications. Additional education could substitute for professional experience, and significant work experience — such as designing or implementing interactive computer applications with integrated cameras — could substitute for formal education.
62. I arrived at this definition by considering the various factors listed above in Section V.B, as well as the claims themselves. For example, the types of problems encountered in developing a guide system controller would be similar to problems encountered while developing the controller for many other types of automated systems. Practitioners would need to solve the problem of controlling the position of the projected light. The field of controls is interdisciplinary; however, the fundamentals of the field are taught in mechanical engineering, electrical engineering, and aerospace

engineering curriculums. Therefore, people educated in these fields and who worked to integrate light projection into automated or semi-automated environments would be prepared to understand and address the control challenges.

63. Prior art solutions to problems addressed by the '614 patent include the use of databases or tables to look up stored information. Again, this subject matter would be understandable to a variety of engineering disciplines, and a POSITA would have an understanding of the fundamentals of database organization and usage (as described below related to [1.2]).
64. Although the main components claimed by the '614 patent are straightforward technologies, the specific arrangement of components claimed in the '614 patent would obviously not be taught in undergraduate curriculums. Therefore, some amount of practical work experience in automation and/or camera equipment would be beneficial for understanding the full scope of the claimed invention.
65. The educational requirements of a POSITA are also tied closely to the claimed subject matter. The operating principles of projectors and database systems are relatively straightforward concepts that would be covered in introductory college-level physics classes and in a variety of engineering disciplines. A central feature of the claims include control actions that

project visual indicators. Such controllers are common within the field of automation. In order to function, they must receive information, such as from sensor apparatuses or manual inputs, and then provide command signals in response to the inputs they receive. The command signals effectively drive the directional light device that guides operator actions. Such control systems (controller, sensors, controlled objects, and the code executing on the controller processor) are interdisciplinary technology, but they are generally taught at the undergraduate level in mechanical engineering, electrical engineering, and aerospace engineering. Similarly, the use of pre-programmed address identifiers to store and retrieve data used by controllers is also a common technique that is taught in many engineering disciplines.

66. I was at least a POSITA as of the priority date of the '614 patent because I received an undergraduate degree in mechanical engineering in 1990 and I had worked for more than ten years on automation-related applications, many of which included the use of database systems or projected light.

VIII. CLAIM CONSTRUCTION

67. I have been instructed that the terms appearing in the '614 patent should be interpreted in view of the claim language itself, the specification, the prosecution history of the patent, and any relevant extrinsic evidence. I

understand that the words of a claim are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art at the time of the invention. While claim limitations cannot be “read in” from the specification, the specification is the single best guide to the meaning of claim terms. I have followed these principles in reviewing the claims of the ’614 patent and forming the opinions set forth in this declaration.

68. It is my opinion that the prior art presented in this IPR presents two issues of claim construction where claim interpretation may be helpful.³

A. “address identifier”

69. The first term for construction is “address identifier.” The ’614 patent uses the term “address identifier” in the context of identifiers associated with the location of “visual display features” or “VDFs” as shown in the table below from Fig. 3A.

³ I understand that construction may be required as to the application of these claim terms under LightGuide’s infringement allegations or as to other prior art references. I reserve the right to respond to any proposed claim constructions that LightGuide may offer in the future.

287

	A	B	C	D	E	F	G	H
1	Select 1	Select 2	Select 3	Select 4	Select 5	Select 6	Select 7	Select 8
2	←	↑	↓	→	← Left	↑ Up	↓ Down	→ Right
3	Inspect	Align	Mask	Torque	Gage	Assemble	Rework	Pick
4	[Video 1]	[Video 2]	[Video 3]	[Video 4]	[Video 5]	[Video 6]	[Video 7]	[Video 8]
5	[Drawing 1]	[Drawing 2]	[Drawing 3]	[Drawing 4]	[Drawing 5]	[Drawing 6]	[Drawing 7]	[Drawing 8]
6	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8
7	Part 9	Part 10	Part 11	Part 12	Part 13	Part 14	Part 15	Part 16

'614 Patent – Fig. 3A (upper portion, annotated)

70. In the table above, the address identifiers are combinations of columns and row headings, such “A1” or “B2.” These entries are each associated with the location of a particular visual display feature or “VDF,” such as “Select 1” in location A1 or “↑” in location B2. [’614 patent at 15:33-36 (“the textual VDF ‘Select 1’ is associated with the address identifier A1, and the textual VDF ‘Part 6’ is associated with the address identifier F6.”); *see generally* ’614 patent at 16:34-17:9.] Aside from what can be learned from these examples, the ’614 patent and the file history do not define the term “address identifier” in any special way.
71. The example of “address identifiers” given in Figure 3 of the ’614 patent and the associated text reflects the standard practice of using an identifier to look up the location of an associated data element. In such scenarios, which is common in computer programming, the identifier is often called an “address” (although it may have other names, such as a “key” or a “variable”

or a “pointer.”)⁴ In such a scenario, the identifier corresponds to a location in memory of a data element, and allows a computer program to retrieve the data element from that location in memory by accessing the location. Thus, in the context of the ’614 patent, the term “address identifier” refers to an identifier that provides the location of a data element.

B. “a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators”

72. The ’614 patent independent claims include the phrase: “a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.” As discussed below, when read in the context of the claims, the specification, and the file history, this phrase means that a projection of visual indicators must be *created* dynamically and in real time in response to a sequence of input signals.
73. This claim limitation appears as part of a larger element defining how projections are dynamically created:

wherein said guide system controller is operative to receive any sequence of input signals from the separate computer system or controller to dynamically control projection of any sequence of said visual indicators

⁴ In the context of looking up information, the term “address” is more frequently used to refer to a specific location in memory, as opposed to a specific piece of data in a data set. See https://en.wikipedia.org/wiki/Memory_address [Ex. 1023].

corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the particular operation **with a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.**

[’614 patent claims 1, 17 (emphasis added).] This element contains 4 sub-limitations:

- The guide system controller must be “operative to receive any sequence of input signals from the separate computer system or controller”;
- The sequence of input signals must “dynamically control projection of any sequence of said visual indicators corresponding to respective said addressed display features”;
- The dynamic projection control must be “based on said input signals corresponding to desired visual indicators for the particular operation”; and
- “a combination of the sequence of input signals” must “result[] in a creation of a dynamic, real time projection of visual indicators.”

74. The first three limitations above specify that the claimed system must (1) use input signals to control what is projected; (2) be capable of receiving any order of input signals; (3) the guide system controller must dynamically

control projection of any sequence of visual indicators; (4) the input signals used to control the projection must correspond to an addressed display feature. What remains, is the language that “a combination of the sequence of input signals” must “result[] in a creation of a dynamic, real time projection of visual indicators.” This language must require something different than points 1-4 above. In particular, the text of this element requires “a creation of a dynamic, real time projection of visual indicators.” On its face, this language requires that the projection be *created* dynamically and in real time in response to input signals.

75. This construction is supported by the specification, which contains two passages that discuss dynamic projections. First, the '614 patent states:

[G]uide system 200 **may be dynamically used to project selected VDFs [visual display features] onto particular locations of an object** by selecting a VDF via its associated VDF address identifier 287 and directing a projector 266 to project the selected VDF by a positional identifier 288.

[’614 patent at 17:20-28.] This passage explains how visual display features can be dynamically projected onto an object. By using a “VDF address identifier 287” (i.e., the address of the claimed “addressed display features.”), the system directs the projector as to what to display. The system also uses positional identifier 288 (i.e., one of the” positional

identifiers of claim 2) to identify *where* the display feature should be projected. Overall, this passage describes dynamically creating a projection using address identifiers.

76. The second discussion of “dynamic” projections appears in the specification a few paragraphs later:

“As previously noted, operational systems 205 may include detailed information regarding production processes, including the location and status of particular objects being assembled, as well as the parts required to be assembled. For example, operational software systems 205 can track the model and location of a vehicle on an assembly line and thereby interact with guide system 200 in the manner described above to coordinate the providing of the appropriate components and assembly actions. Interfacing guide system 200 with operational software system 205 reduces the amount of separate programming required for guide system 200, as well as **enables real time or dynamic creation of visual indicators** or display images 209 for guiding the activities of an individual.”

[’614 patent at 17:60-18:10 (emphasis added).] This passage refers to a system that works in a manufacturing environment, and keeps track of objects being assembled. This allows the system to identify what components to use and what images to project at the appropriate time. Such

a system dynamically creates projections because it uses information such as the “model and location of a vehicle” to identify the necessary assembly actions, which are then converted in real time into a projection of visual indicators at the appropriate locations.

77. The prosecution history also supports my construction. As discussed above in the section describing the file history, during prosecution, LightGuide repeatedly argued that its invention was different than the prior art because it could handle “any sequence” of input signals to dynamically control projection. [*See, e.g.*, Ex. 1002 (’614 file history) at 226-230, 298, 304, 311-312, 314, 396.] However, this distinction was not enough to permit the claims to be allowed. Rather, the examiner required the additional limitation of the “creation of a dynamic, real time projection of visual indicators.” [Ex. 1002 at 398-400, 405-412, 445-449.]
78. This limitation was added to specifically distinguish the claims from U.S. Patent Application No. 2011/0178627 (Ex. 1017, “Wechter”). [Ex. 1002 at 396, 398.] Wechter uses part numbers to identify and display manufacturing instructions. During prosecution, the examiner found that Wechter disclosed the dynamic “any sequence” limitation; however, the claims were allowed once the dynamic “creation” limitation was added. [Ex. 1002 at 366-368 (discussing Wechter ¶¶ 32-34); at 396-404.] Wechter in fact had the ability

to receive any sequence of part numbers and to, in response, display any sequence of instructions. [Wechter ¶¶ 32-34.] However, Wechter did not *create* instructions (let alone projections); rather, it simply displayed pre-set instructions similar to what LightGuide's previous patent already taught to display on a monitor. [Compare Wechter ¶¶ 8-10 with Ex. 1013 ('981 patent) Fig. 5.] In other words, Wechter disclosed the dynamic ordering of instructions based on receiving input signals in any order. But Wechter did not disclose the dynamic *creation* of instructions, and thus did not render obvious the dynamic, real time creation of projections that reflect such instructions.

79. Thus, the prosecution history and the teachings of Wechter inform the meaning of “a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators” and confirms that the projection of visual indicators must be *created* dynamically and in real time in response to a sequence of input signals.

IX. THE CHALLENGED CLAIMS ARE UNPATENTABLE

80. In my opinion, the challenged claims are all unpatentable, for the following reasons.

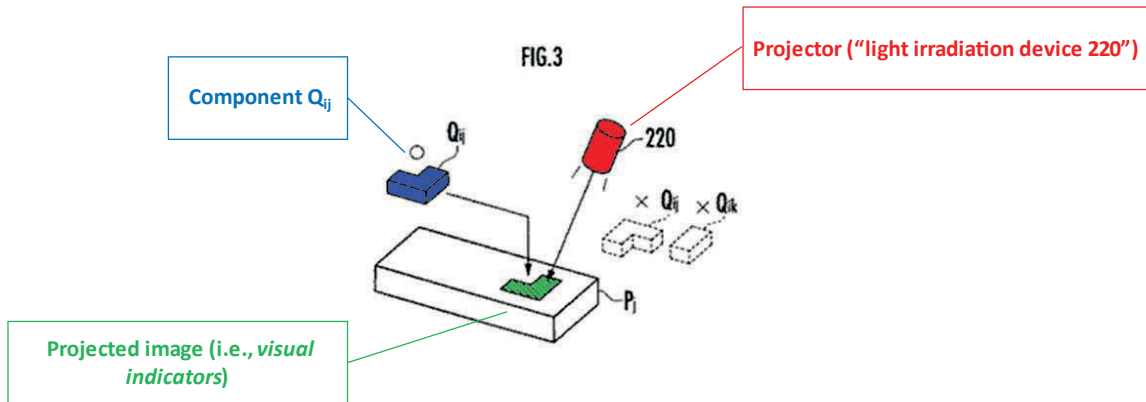
A. CHALLENGE 1A: Claims 1-2, 9, and 17 Are Rendered Obvious By Yokota

81. Independent claims 1 and 17 and dependent claims 2, 9, and 17 are rendered obvious by Yokota when read with a POSITA's general knowledge of conventional database practices (as described in, for example, Kroenke, Ex. 1008).

1. Summary of Yokota (Japanese Unexamined Patent Application No. 2007-87251)

82. Yokota⁵, a Japanese patent application assigned to Honda Motor Co. Ltd., discloses an “assembly management system” for providing light-guided assembly instructions. [Yokota ¶ 5.] Yokota shows how to assemble a “semi-finished product Pj” by projecting light from “light irradiation device 220” to show the assembler where to place component Qij. Those elements of Yokota's invention are shown below in an annotated version of Yokota Fig. 3.

⁵ Yokota was originally published in Japanese. [Ex. 1005.] My opinions rely on a certified translation of Yokota. [Ex. 1006 (“Yokota”).]



Yokota Fig. 3 (annotated)

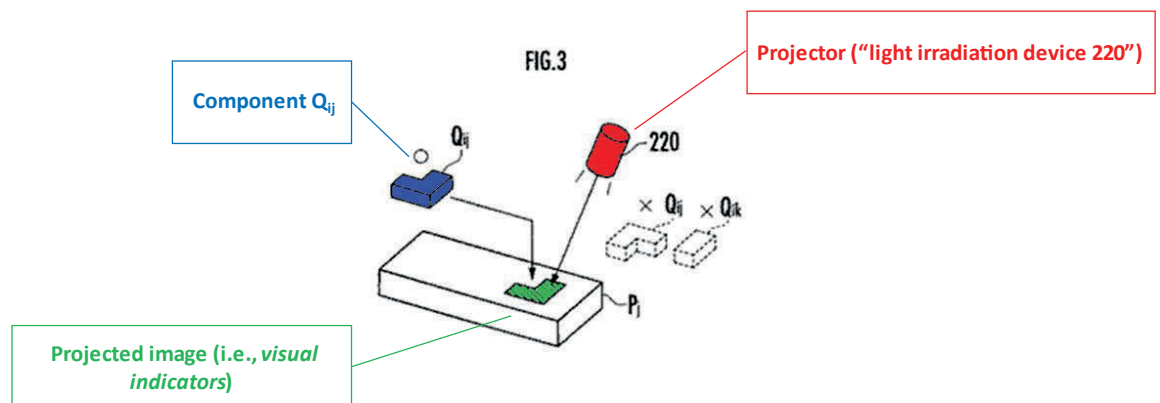
83. Yokota provides appropriate light-guided instructions by reading an RFID or IC tag that is attached to the semi-finished product. [See, e.g., Yokota ¶ 23.] Yokota uses information from the RFID/IC tag as part of a database for “the ‘assembly position,’ ‘weight,’ ‘assembly order,’ etc. of the part Q_i to be assembled to this semi-finished product P at Area A_i .” [Yokota ¶ 23.] The database query also captures the “shape” of the component. [Yokota ¶ 8.] Then, a “second processing unit” of the Yokota “assembly management system” projects the desired light, based on “the ‘part Q_{ij} ’ for the semi-finished product P_j recognized by the first processing unit 110 and its ‘assembly location’ and ‘assembly posture,’ etc.” [Yokota ¶ 29.]
84. Yokota explains that its invention is useful for assembling automobiles and motorcycles, for which “various variations and combinations of options are specified by the user.” [Yokota ¶ 2.] It further explains that this invention

reduces production time and prevents the “misassembly of parts to semi-finished products.” [Yokota ¶ 3.]

2. Claim 1 Analysis

[1.0] A method of projecting visual indicators to guide actions of an individual for a particular guided operation, said method comprising:

85. To the extent the preamble is limiting, Yokota discloses *a method of projecting visual indicators to guide actions of an individual for a particular guided operation*. Specifically, Yokota discloses that “visible light is irradiated onto the assembly location of a component to be assembled . . . so the person in charge of the operation can reliably assemble the component to the appropriate assembly location.” [Yokota ¶ 6.] The projected image created by the irradiated visible light is shown below on annotated Fig. 3.

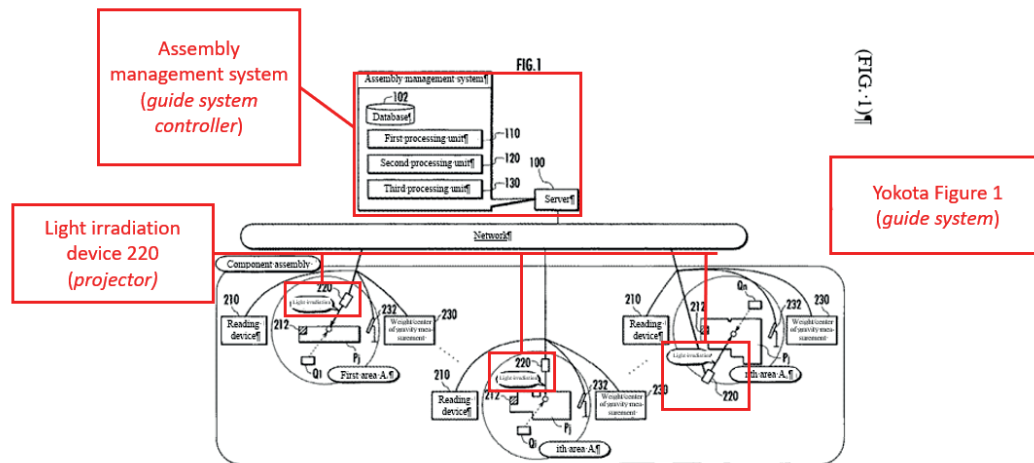


Yokota Fig. 3 (annotated)

86. Thus, Yokota discloses [1.0].

[1.1] providing a guide system having a guide system controller and a projector,

87. Yokota discloses a guide system having a guide system controller and a projector, as shown below in an annotated version of Yokota Figure 1:



Yokota Fig. 1 (annotated).

The entire system of Yokota Figure 1 is a *guide system* because it provides projected instructions to a worker on how to assemble components together.

88. Yokota’s “assembly management system” is a *guide system controller*. The assembly management system includes database 102 and at least three processing units (first, second, and third processing units) that may each have a CPU. [Yokota, ¶ 21.] In Yokota, the assembly management system provides the information that the projector uses to display the component shape. Yokota’s assembly management system first looks up the identity of a semi-finished product to determine information regarding the next

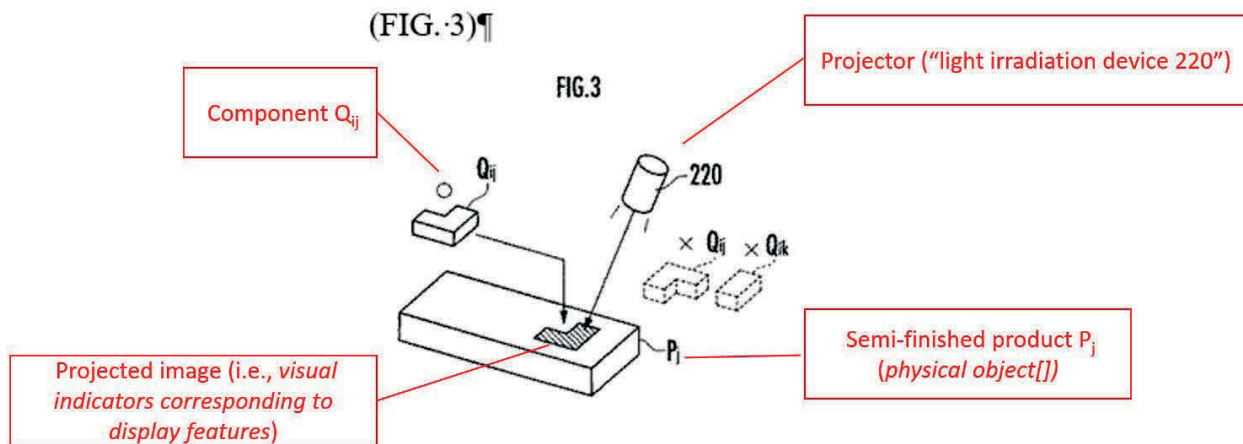
component to add. [Yokota ¶ 28 (“first processing unit 110 recognizes the component Q_{ij} to be assembled onto the semi-finished product P_j in the ith area A_i, the assembly location thereof, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.”).] As a result of that lookup step, “visible light is irradiated onto the assembly location of a component to be assembled onto a semi-finished product . . . so the person in charge of the operation can reliably assemble the component to the appropriate assembly location for the given component.” [Yokota ¶ 6; *see also* Yokota ¶ 29 (“the second processing unit 120 transmits, to the light irradiation device 220 installed in the ith area A_i, a ‘light irradiation instruction signal’ corresponding to the ‘component Q_{ij}’ and its ‘assembly position’ and ‘assembly orientation,’ etc. in relation to the semi-finished product P_j, which were recognized by the first processing unit 110 (FIG. 2/arrow A2).”).]

89. Yokota also discloses a *projector*, namely light irradiation device 220. [See Yokota Figs. 1-4; ¶¶ 20, 25, 29, 30, etc.] Thus, Yokota discloses [1.1].

[1.2] said guide system controller including a plurality of selectable addressed display features with each said addressed display feature having a unique pre-programmed individual address identifier within said guide system controller;

90. Yokota discloses that its *guide system controller* (assembly management system) *includ[es] a plurality of selectable . . . display features*, specifically,

the “component identification information [and] component shape” that are disclosed as being part of the database of the Yokota assembly management system. [Yokota ¶ 8.] These are *display features* because they are later projected by the system so that the operator can see them. [Yokota ¶ 9 (“[T]he second processing means causes the light irradiation device to adjust the irradiation state of visible light so **that the part identification information, the part shape or the assembly posture** recognized by the first processing means **is projected** onto the semi-finished product in the area i.”); Yokota ¶ 29 (“[A]n identification number (component identification information) of component Q_{ij} may . . . be projected onto the semi-finished product P_j .”).] An example of this projected image is shown in the annotated version of Yokota Fig 3 provided below.



Yokota Fig. 3 (annotated)

91. These *display features* (i.e., component ID and shape) are selectable addressed display features because they are accessed via a lookup in a

database. In Yokota, the RFID reader, “reading device 210”, identifies “product identification information (serial number, etc.).” [Yokota ¶ 28.] This product identification information is used to selectively retrieve the corresponding component information including the *display features* discussed above. [Yokota ¶ 28 (“[T]he first processing unit 110 recognizes the component Qij to be assembled onto the semi-finished product Pj in the ith area Ai, the assembly location thereof, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.”); *id.* ¶ 8 (“first processing means recognizes component identification information, component shape or assembly orientation for identifying a component to be assembled onto a semi-finished product in an ith area through lookup in a database on the basis of information read from an information element.”).] Thus, the *display features* are *selectable* based, e.g., on the product identification information.

92. Moreover, by using the “product identification information” to look up component information in database 102, Yokota discloses the use of *selectable addressed display features*. [Yokota ¶ 28.] That is, because the *display features* (i.e., component identification information or shape information) are looked up on the basis of “product identification information,” the product identification information is being used as an

address identifier—i.e., to identify the location of the component information. Thus, the component identification and shape information in Yokota constitute *selectable addressed display features* because they are stored and retrieved in a database (i.e., are *selectable*) using the product identification information as part of an *address identifier* (discussed below) and are using *display features* that determine what the projector shows.

93. These *selectable addressed display features* (i.e., Yokota’s component identification and shape information) reside within the *guide system controller* (Yokota’s assembly management system). As noted above, Yokota’s *guide system controller* (assembly management system) includes database 102. This database 102 “stores and retains ‘product identification information’ for identifying a finished product or semi-finished product.” [Yokota ¶ 22.] This includes information about “the component . . . to be assembled onto the semi-finished product . . . , the assembly location thereof, the assembly orientation, weight, etc.” [Yokota ¶ 28.] Yokota discloses that this information “causes the light irradiation device 220 to irradiate visible light . . . such that the ‘shape’ and ‘assembly orientation’ of this component . . . are projected thereon.” [Yokota ¶ 29.]
94. Yokota, read in light of the general knowledge of a POSITA regarding databases, also renders obvious *each said addressed display feature having a*

unique pre-programmed individual address identifier within said guide system controller. Yokota explains that “[t]he database 102 stores and retains ‘product identification information’ for identifying a finished product or semi-finished product in association with an ‘assembly location,’ etc. of components to be assembled onto the semi-finished product in the i th area A_i ($i = 1, 2, \dots, n$) on a component assembly line.” [Yokota ¶ 22.] This means that information in the database is *pre-programmed*. Additionally, because Yokota’s database 102 is part of the assembly management system (*guide system controller*, see [1.1] above), Yokota discloses the *within the guide system controller* limitation. [Yokota ¶ 21 (“The assembly management system comprises a database 102.”)] Yokota also teaches that its system “recognizes component identification information, component shape or assembly orientation for identifying a component to be assembled onto a semi-finished product in an i th area through lookup in a database on the basis of information read from an information element, attached to the semi-finished product.” [Yokota ¶ 8.] The information read from this information element is “product identification information (serial number, etc.)” [Yokota ¶ 28.] Thus, in Yokota, “the first processing unit 110 recognizes the component Q_{ij} to be assembled onto the semi-finished product P_j in the i th area A_i , the assembly location thereof, the assembly

orientation, weight, etc., through lookup in a database 102 based on the product identification information.” [Yokota ¶ 28.]

95. Yokota’s process described above corresponds closely to a process that was later described as a preferred embodiment in the ’614 patent. [’614 patent at 19:18-24 (“For example, system controller 296 may receive signals 297 from a sensor apparatus, . . . as described above in connection with system 10, and in turn provide an input signal 207 to guide system controller 220 to prompt the projection of a VDF based on an address identifier 287, at a particular physical location based on a positional identifier 288.”)]
96. A POSITA reading Yokota would consider it in light of well-known database principles and conventional practices. For example, in 2011, mechanical engineering undergraduates typically used databases to store, retrieve, and evaluate design concepts in their introductory design course. Such courses were typically taken at the sophomore or junior level (I taught these types of courses during this timeframe). Moreover, by early 2011, POSITAs would have been aware of, and likely would have used, products or programs that stored and retrieved data using conventional database principles (e.g., storing data in tables). For example, Microsoft Excel and many relational database programs were widely used and available by 2011. For purposes of this Declaration, I have relied on specific examples from

Kroenke & Auer, *Database Processing Fundamentals, Design, and*

Implementation (2009) (Ex. 1008) as reflecting the general knowledge of a POSITA regarding conventional database practices.

97. Although a POSITA would not be a database expert, every POSITA would have an understanding of the elementary database concepts used and claimed in the '614 patent. A POSITA would have been able to use conventional and widely available programs (including without limitation Microsoft Excel) to implement what is described in Yokota, either as a conventional database or even a simple spreadsheet such as shown in Fig. 3A of the '614 patent, which is reproduced below for convenience.

220

287								
	A	B	C	D	E	F	G	H
1	Select 1	Select 2	Select 3	Select 4	Select 5	Select 6	Select 7	Select 8
2	←	↑	↓	→	← Left	↑ Up	↓ Down	→ Right
3	Inspect	Align	Mask	Torque	Gage	Assemble	Rework	Pick
4	[Video 1]	[Video 2]	[Video 3]	[Video 4]	[Video 5]	[Video 6]	[Video 7]	[Video 8]
5	[Drawing 1]	[Drawing 2]	[Drawing 3]	[Drawing 4]	[Drawing 5]	[Drawing 6]	[Drawing 7]	[Drawing 8]
6	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8
7	Part 9	Part 10	Part 11	Part 12	Part 13	Part 14	Part 15	Part 16

289

286

Canvas A	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9								
Canvas B	PB1	PB2	PB3	PB4	PB5	PB6	PB7	PB8	PB9	PB10	PB11	PB12	PB13	PB14	PB15	PB16	
Canvas C	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13	PC14	PC15	PC16	

288

FIG. 3A

'614 patent, Figure 3A

Furthermore, a POSITA would be familiar with the basic principles as disclosed in a source such as Kroenke regarding how Yokota's database lookup would conventionally be implemented.⁶ Among the conventional database practices and principles disclosed by Kroenke are:

- “[T]he most commonly used type of database is the relational database.”
[Kroenke at 3.]
- A relational database “stores data in tables” of “rows and columns, like those in a spreadsheet.” [Kroenke at 3.]
- “Each row of a table has data about a particular occurrence or instance of the thing of interest.” [Kroenke at 3.]
- “Each row in a table is uniquely identified by a primary key.” [Kroenke at 5.]
- “Each column of a table stores a characteristic common to all rows.”
[Kroenke at 3.]
- A column name is a *unique* identifier because “each column has a unique name.” [Kroenke at 97.]

⁶ Although I do not believe a POSITA would need to know exactly how Yokota's database 102 works to implement the system of Yokota, I have provided an explanation in Appendix A of one obvious way to implement Yokota's database lookup using the conventional database principles as described in Kroenke.

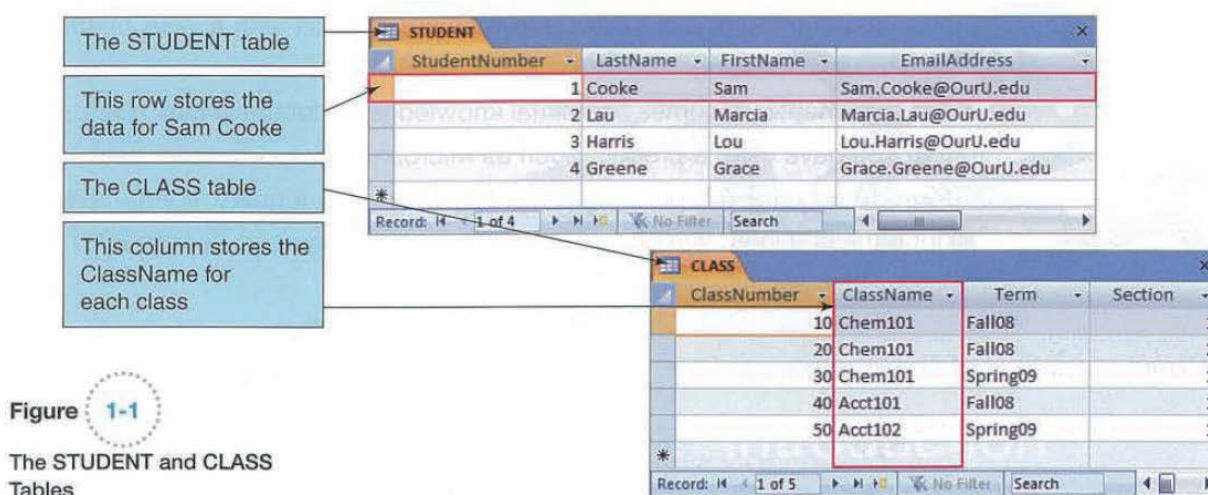
- “A database usually has multiple tables, and each table contains data about a different type of thing.” [Kroenke at 3.]

These are all fundamental database principles and reflect the conventional way that data was stored, organized, and queried at the time of the alleged invention.

98. Based on these principles, a POSITA would understand that when data is stored in one or more tables of rows and columns, that data is accessible via a *unique pre-programmed individual address identifier*. This is shown, by way of example, from the existence of the claimed *address identifiers* in both Figure 3A of the '614 patent and, for example, Figure 1-1 of Kroenke:

	A	B	C	D	E	F	G	H
1	Select 1	Select 2	Select 3	Select 4	Select 5	Select 6	Select 7	Select 8
2	←	↑	↓	→	← Left	↑ Up	↓ Down	→ Right
3	Inspect	Align	Mask	Torque	Gage	Assemble	Rework	Pick
4	[Video 1]	[Video 2]	[Video 3]	[Video 4]	[Video 5]	[Video 6]	[Video 7]	[Video 8]
5	[Drawing 1]	[Drawing 2]	[Drawing 3]	[Drawing 4]	[Drawing 5]	[Drawing 6]	[Drawing 7]	[Drawing 8]
6	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6	Part 7	Part 8
7	Part 9	Part 10	Part 11	Part 12	Part 13	Part 14	Part 15	Part 16

'614 patent, Fig. 3A (excerpted and annotated)



Kroenke at 4 (Figure 1-1).

99. As shown in these figures, when data is stored in a structured table of rows and columns (e.g., in a database (Yokota/Kroenke) or spreadsheet ('614 patent)), that data is, at least conventionally, addressed and accessible using traditional row/column identifiers. In the '614 patent, data is accessible via a *unique pre-programmed individual address identifier* via a combination of a column name (A, B, C, etc.) and a row identifier (1, 2, 3, etc.). ['614 Patent at Fig. 3A, 15:24-46.] Similarly, in a conventional database, as reflected in Kroenke Fig. 1-1, data is accessible via a *unique pre-programmed individual address identifier* via one or more column names (StudentNumber, LastName, FirstName, etc.) and a row identifier (1, 2, 3, 4 for the STUDENT table and 10, 20, 30, 40 for the CLASS table). Thus, in the Kroenke example above, the last name of student number 2 is "Lau,"

which can be easily determined by looking at the “StudentNumber” columns for the number 2, and then identifying the corresponding name in the LastName column. The row number “2” and the column identifier “LastName” are a *unique pre-programmed individual address identifier* for the data value “Lau” because they uniquely identify where “Lau” is located within the table. In other words, a POSITA would understand based on their general knowledge that a database is just a collection data stored in rows and columns. When data is stored in this conventional manner, it is accessible via a *unique pre-programmed individual address identifier*. Such identifier can either be sequential (A, B, C / 1, 2, 3) or descriptively named (StudentNumber). However, the result is the same—they are a *unique pre-programmed individual address identifier* for data stored at the column/row location specified by the unique identifier combination.

100. A POSITA would have this general knowledge of databases and apply that knowledge to understand Yokota’s teachings of data stored in database 102. Specifically, the following would be obvious from Yokota based on a POSITA’s general understanding of databases.

- A POSITA would understand that Yokota’s “database 102” would, conventionally, be a relational database, since “the most commonly used type of database is the relational database.” [Kroenke at 3.]

- Because Yokota's database 102 would, conventionally, be a "relational database," Yokota also renders obvious that its database 102 "stores data in tables" of "rows and columns, like those in a spreadsheet." [Kroenke at 3.]
- It would have been obvious to a POSITA from their general knowledge that Yokota teaches storing data in rows and columns. Yokota teaches that "database 102 stores and retains 'product identification information' for identifying a finished product or semi-finished product in association with an "assembly location," etc. of components to be assembled onto the semi-finished product in the i th area A_i ($i = 1, 2, \dots, n$) on a component assembly line." [Yokota ¶ 22.] A POSITA would interpret this passage as referring to the conventional practice of storing this information in one or more tables having addressable rows and columns.
- As illustrated in Kroenke Fig. 1-1, the table(s) would conventionally include separate columns for the different types of data listed in Yokota, including "product identification information," "assembly location," (Yokota ¶ 22) as well as columns for "component" information. Other passages of Yokota indicate that the table would also include columns for "component identification information,"

“component shape,” or “assembly orientation” (Yokota ¶ 8),
“assembly position,” “weight,” or “assembly sequence” (Yokota
¶ 23).

- The table(s) would include a “primary key” that uniquely identifies each row. [Kroenke at 5.] It would have been obvious to a POSITA that Yokota’s disclosure of “product identification information (serial number, etc.),” would have been a good candidate to serve as a primary key. [Yokota ¶ 28; Kroenke at 194 (“[T]here are good data keys, such as ProductID.”).]

101. Yokota discloses that its system “recognizes the component Q_{ij} to be assembled onto the semi-finished product P_j in the ith area A_i, the assembly location thereof, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.” [Yokota ¶ 28.] A POSITA would view this as referring to a database lookup or “query.” Kroenke provides the conventional definition of a “query” as “[a] request for database data that meets specific criteria. This can be thought of as asking the database a question and getting an answer in the form of the data returned.” [Kroenke at 583 (Glossary).]
102. A POSITA would, therefore, read Yokota’s “lookup” as requesting specific data about “Component Q_{ij}” from a row in database 102 that matches the

“product identification information” criteria read by the RFID reader and any other applicable criteria. Among the information that such a lookup/query would return for “component Qij” are the specific columns that would exist in Yokota’s database corresponding to the claimed *display features*, i.e., “component identification information,” and “component shape.” See [Yokota ¶ 8 (“the first processing means recognizes component identification information, component shape or assembly orientation”), ¶ 29 (displaying such information using light irradiation device 220).]

103. Thus, based on the POSITA’s general knowledge of database principles, Yokota renders obvious the limitation of *each said addressed display feature having a unique pre-programmed individual address identifier*. As noted above, the *display feature[s]* are Yokota’s component shape and component identification information. In a conventional database, component shape and component identification information would be organized in a table of rows and columns, with each column uniquely named according to what type of information it contains, and each row having a unique primary key, as discussed above. The combination of a column name and a unique row name is a *unique pre-programmed individual address identifier*. Yokota thus renders obvious that its database would conventionally have *a unique pre-programmed individual address identifier* for each of its *display features*

(component identification information and component shape) because that is the conventional way that data is stored and accessed in a database.

104. More specifically, the POSITA's general knowledge of databases relative to storing data in tables would lead a POSITA to consider it obvious that Yokota's database used tables of structured rows and columns. It would have been obvious that one column of Yokota would include product identification information, because that column is needed as the lookup criteria described in Yokota. [Yokota ¶¶ 8, 28.] It would also have been obvious that each row in the table or tables being used for the lookup would include other data in columns for the row matching the lookup criteria (i.e., product identification information), such as component identification information, component shape, and other information relating to the same assembly operations. [Yokota ¶¶ 8, 28.] The product identification information would conventionally be the primary key (or part of the primary key) for such a table. [Kroenke at 194 (“[T]here are good data keys, such as ProductID.”).] This data (and database 102) would be *within the guide system controller* (the assembly management system, as discussed in [1.1]). [Yokota ¶ 21 (“The assembly management system comprises a database 102.”)]

105. The row/column arrangement would allow Yokota’s database to look up the *display* features using row and column information that is unique to those features. As noted, both column name and product identification information would, conventionally, be unique data values that were stored and thus *pre-programmed* in database 102. [Yokota ¶ 22.] Thus, Yokota read in light of the conventional knowledge of a POSITA renders obvious *each said addressed display feature* (component shape and component identification information) *having a unique pre-programmed individual address identifier* (i.e., a row/column address based on a conventional column name and Yokota’s product identification information, which would conventionally be a unique primary key).⁷
106. A POSITA would also understand that conventional database practices would permit Yokota’s database to be implemented with different table structures. Regardless of which table structure was selected, however, it

⁷ Yokota’s reference to “product identification information (serial number, etc.)” is further evidence that it is unique. The American Heritage Dictionary defines “serial number” as “A number that is **one of a series** and is used for identification, as of a machine, weapon, or motor vehicle.” [Ex. 1014 (*serial number*, Am. Heritage Dictionary (3rd ed. 1992)).] Similarly, the Wikipedia entry for “serial number” states “A serial number is a unique number assigned for identification which varies from its successor or predecessor by a fixed discrete integer value.” [Ex. 1015 (*serial number*, Wikipedia (January 10, 2011)).] Thus, the term “serial number” further suggests that product identification information is both *unique* and suitable for use as a unique primary key.

would still conventionally have a column and row format that permitted identifying component shape or component identification information using the process described above.⁸ One conventional structure would be to include component identification information and component shape in one table with product identification information in a separate table allowing for a query of both tables. This type of database structure is obvious (in fact, it appears throughout Kroenke, including on p. 33). This structure would also have been easily achievable using programs like Microsoft Excel or a relational database program.

107. As discussed in the above paragraph, because column name uniquely identifies a column, and a primary key uniquely identifies a row, a table containing a column for component identification information and component shape would also provide an example of *each said addressed display feature* (component shape) *having a unique pre-programmed individual address identifier* (the column name and component identification

⁸ Accordingly, I do not believe a POSITA would need to know exactly how the tables of Yokota are structured to implement the system of Yokota. For example, a POSITA using Microsoft Excel would not need to know the code behind Excel's functions (e.g., a lookup or a match function) in order to use them. Although Yokota could easily be structured so that all data is located on a single table, it would have been obvious to a POSITA that databases are usually broken into a structure of multiple tables. [Kroenke at 3 ("A database usually has multiple tables, and each table contains data about a different type of thing.")]

information corresponding to a specific component shape). Additionally, in the original table, the *each said addressed display feature* (component identification information) also has *a unique pre-programmed individual address identifier* (i.e., column name and the unique primary key for that table.) This is another way in which Yokota, read in view of the general knowledge of a POSITA regarding databases, would disclose and render obvious [1.2].

108. The information described above for *unique pre-programmed individual address identifier* is stored in Yokota's database 102 and thus is *within said guide system controller* (which includes Yokota's database 102 as discussed for [1.1]). [Yokota ¶¶ 21-22.] Therefore, Yokota discloses and renders obvious [1.2].

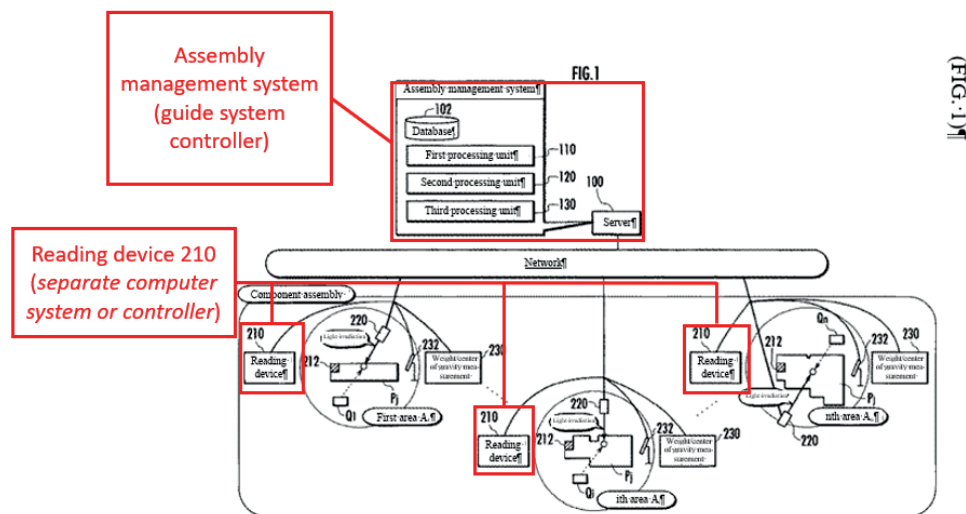
[1.3] receiving a sequence of one or more input signals at said guide system controller, with the input signals being provided to said guide system controller by a separate computer system or controller to cause said guide system to project visual indicators for a particular guided operation

109. Yokota's assembly management system is a *guide system controller* as discussed above for [1.1]. The assembly management system *receive[s] a sequence of input signals* when it receives product identification information as *input signals* based on information from an RFID tag. Specifically, Yokota's reading device 210 reads the RFID tag on a semi-finished device.

[Yokota ¶ 28 (“First, ‘product identification information (serial number, etc.)’ is read through a non-contact scheme (wireless scheme) from the RFID tag 212, attached to the semi-finished product P_j, by means of a reading device 210.”).]

110. Then, the product identification information collected from the RFID tag is received by Yokota’s assembly management system, which allows “first processing unit 110” to perform a query on database 102. [Yokota ¶ 28 (“[T]he first processing unit 110 recognizes the component Q_{ij} to be assembled onto the semi-finished product P_j in the ith area A_i, the assembly location thereof, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.”).]
111. Yokota also discloses a *guided operation* composed of multiple steps and multiple visual indicators. [Yokota ¶ 34 (“Furthermore, in cases where multiple components Q_{i(m)j} are to be assembled onto the semi-finished product P_j in one area A_i, visible light is irradiated successively onto the assembly location of each product Q_{i(m)j} on the semi-finished product P_j in accordance with the assembly sequence thereof (see FIG. 4 (a) through FIG. 4 (c)).”); *see also* Yokota Fig. 4.]
112. Notably, the RF reader (reading device 210) is the *separate computer system or controller* because such systems use computers or controllers to read

information from an RF tag and transmit it using networking techniques to a separate computer. Yokota shows that its assembly management system (*guide system controller*) is separated from reading device 210 by, at least, a network. This separation is shown in the annotated version of Fig. 1 provided below. The guide system controller is shown in the top of the figure, the network is shown in the middle, and the reading devices with the separate computer systems are shown below the network.

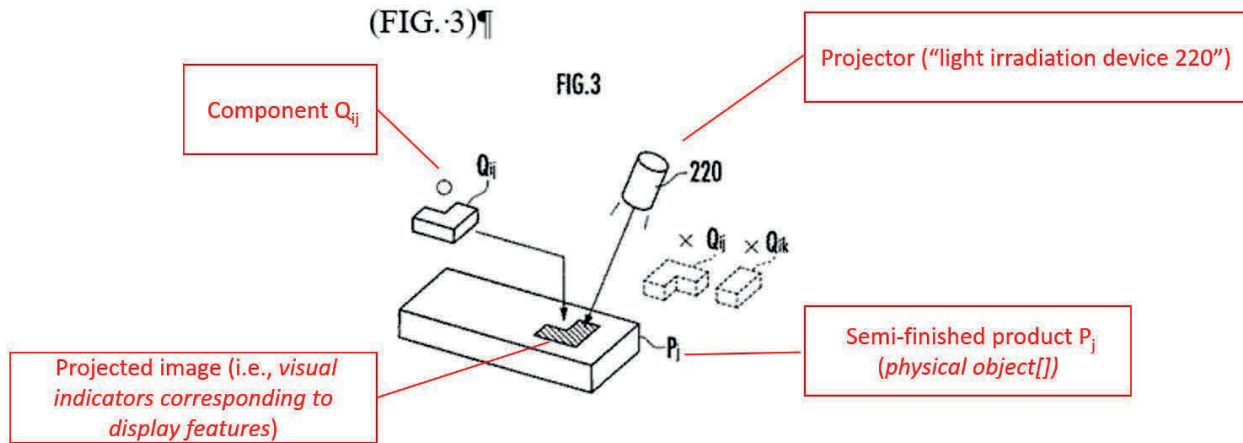


Yokota, Fig. 1 (annotated)

Thus, Yokota satisfies this claim element because *input signals* (product identification information) are *receiv[ed]* by Yokota's *guide system controller* (assembly management system) from a *separate computer system or controller* (reading device 210).

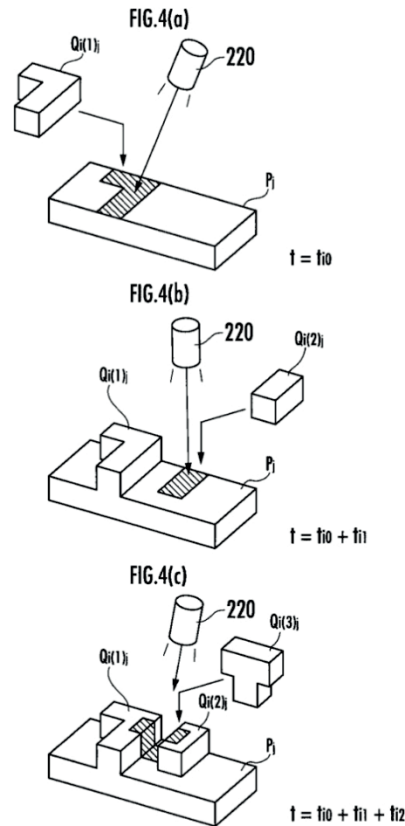
113. Yokota further discloses that the input signals are provided as a *sequence*, i.e., as different products move through the various areas of the assembly line, a sequence of product identification information is read by reading device 210 and received by the assembly management system. [Yokota ¶ 20 (“The assembly management system shown in FIG. 1 is intended for managing the assembly of a component Q_i onto a semi-finished product P_j ($j = 1, 2, \dots$) on a component assembly line (finished product production line) composed of a first area A_1 through an n th area A_n .”)].
114. After the *input signals* (product identification information) are used to query Yokota’s database 102, the query results are used to create projected *visual indicators*. Specifically, Yokota’s second processing unit 120 (part of the *guide system controller*) “transmits, to the light irradiation device 220 installed in the i th area A_i , a ‘light irradiation instruction signal’ corresponding to the ‘component Q_{ij} ’ and its ‘assembly position’ and ‘assembly orientation,’ etc. in relation to the semi-finished product P_j , which were recognized by the first processing unit 110 (FIG. 2/arrow A2).” [Yokota ¶ 29.] This “causes the light irradiation device 220 to irradiate visible light toward the assembly location of the component Q_{ij} on the semi-finished product P_j such that the ‘shape’ and ‘assembly orientation’ of this component Q_{ij} are projected thereon, as illustrated, for example, by the

diagonal lines in FIG. 3 (FIG. 2/arrow B).” [Yokota ¶ 29.] Illustrations of such projected shapes and assembly orientations are shown below in annotated Fig. 3.



Yokota Fig. 3 (annotated).

115. Yokota shows how its system responds to a *sequence of one or more input signals* by projecting a sequence of projected visual indicators in Fig. 4, which has been reproduced below for convenience.



Yokota Fig. 4

116. The projected information is *for a guided operation* because it shows the operator which component to place and exactly where it should go, for a series of multiple assembly steps. [Yokota ¶ 6 (“visible light is irradiated onto the assembly location of a component to be assembled . . . so the person in charge of the operation can reliably assemble the component to the appropriate assembly location.”).] Additionally, Yokota discloses “that an identification number (component identification information) of component Q_{ij} may also be projected onto the semi-finished product P_j .” [Yokota ¶ 29.] In this manner, Yokota uses *input signals* (from the RFID reader) to

cause said guide system to project visual indicators for a particular guided operation.

117. Thus, Yokota discloses [1.3].

[1.4] selecting one or more particular addressed display features by said guide system controller from the plurality of said addressed display features based on said input signals, wherein said input signals control selection of said addressed display features based on the address identifier for the said addressed display feature; and

118. This limitation references several previously-identified claim elements:

(addressed display features, input signals, guide system controller, address identifier). Aside from the already-identified elements, [1.4] merely requires using the *input signals* to *control selection of an addressed display feature[] based on the address identifier*. Yokota discloses this element.

119. As discussed above for [1.3], Yokota's *input signals* are the product identification information used to query database 102, which is part of the *guide system controller* and contains a *plurality of said addressed display features* as discussed above. And as discussed above for [1.2], the component information and component shape identified during the database lookup are *one or more particular addressed display features* that are *select[ed]* by the *guide system controller* (including database 102) based on the "product identification information" *input signals*. [Yokota ¶¶ 28-29.]

The concept of addressed display features is disclosed because Yokota's

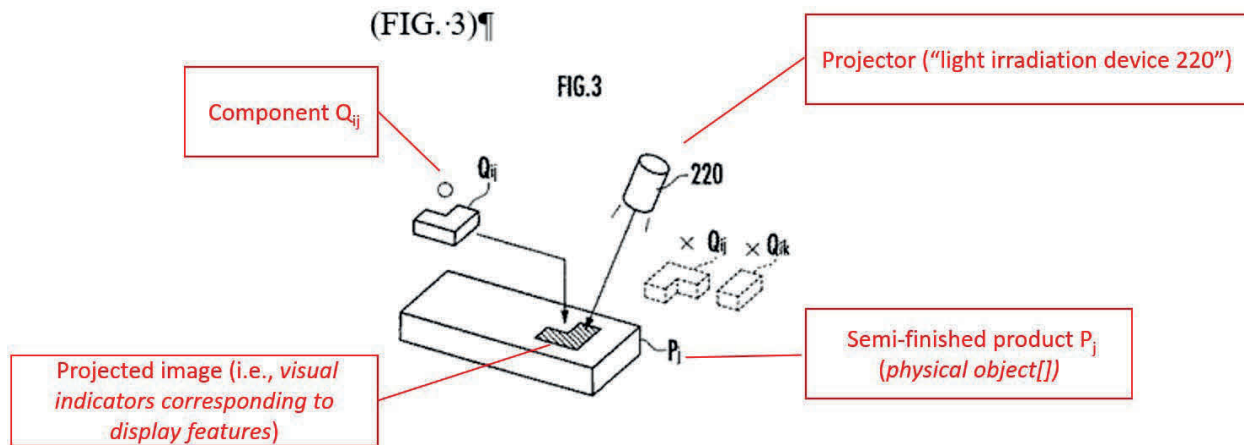
database uses part information to look up the location of corresponding component information (and thus uses the part number as an *address identifier*).

120. Yokota discloses that its *input signals control selection* and projection of *display features based on the address identifier for the said addressed display feature*. As discussed in [1.2], it would have been obvious in view of the general knowledge of a POSITA that Yokota's database would conventionally include product identification information as part of a *unique pre-programmed individual address identifier* for the *addressed display feature* (i.e., component identification or shape information). It is this *address[]* information (including product identification information) that controls which component IDs and shapes are selected. Accordingly, in Yokota, the *input signals* (e.g., semi-finished product identification information) *control selection of the display features* (as discussed in this section 1.3) *based on the address identifier for the said addressed display feature* (that is, the production identification information is used as part of an *address identifier* to access the component numbers and component shape information that are later projected).
121. Thus, Yokota discloses [1.4].

[1.5] projecting one or more visual indicators corresponding to said selected particular addressed display features onto one or more physical objects associated with the particular guided operation, with said guide system controller configured to control operation of said projector to project said visual indicators based on said input signals;

122. Yokota discloses *projecting one or more visual indicators corresponding to said selected particular addressed display features onto one or more physical objects associated with the particular guided operation.*

Specifically, Yokota explains that “the second processing unit 120 causes the light irradiation device 220 to irradiate visible light toward the assembly location of the component Q_{ij} on the semi-finished product P_j such that the ‘shape’ and ‘assembly orientation’ of this component Q_{ij} are projected thereon, as illustrated, for example, by the diagonal lines in FIG. 3 (FIG. 2/arrow B).” [Yokota ¶ 29; see also id. ¶ 8 (“The feature is that the second processing means causes the light irradiation device to adjust the irradiation state of visible light so that the part identification information, part shape or assembly posture recognized by the first processing means is projected onto the semi-finished product in area i.”).] The following annotated version of Yokota Figure 3 illustrates how these limitations are satisfied.



Yokota, Fig. 3 (annotated).

123. As the figure above shows, Yokota projects a *visual indicator* at a location on *physical object* P_j (which is a semi-finished part). The projected *visual indicator* corresponds to the shape, location, and orientation of the component Q_i that is to be added as part of *the particular guided operation*. Yokota also states that “an identification number (component identification information) of component Q_{ij} may also be projected onto the semi-finished product P_j .” [Yokota ¶ 29.]
124. The projected *visual indicators* correspond to the *selected particular addressed display features*. For example, as discussed above for [1.1], Yokota’s *display features* include the “component identification information [and] component shape” that are disclosed as being part of the database of

the Yokota assembly management system. [Yokota ¶ 8.] These are exactly the information that is projected. [Yokota ¶¶ 28-29.]

125. Yokota also describes a *guide system controller*, specifically the assembly management system including first processing unit 110 and second processing unit 120. As discussed above, the assembly management system / processing units working together are *configured to control operation of said projector to project said visual indicators based on said input signals*. For example, as discussed above and in Yokota ¶¶ 28-29, first processing unit 110 receives input signals and queries database 102. Second processing unit 120 uses the results of those queries to determine what is projected by light irradiation device 220. Thus, Yokota discloses [1.5].

[1.6] wherein said guide system controller is operative to receive any sequence of input signals from the separate computer system or controller to dynamically control projection of any sequence of said visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the particular operation with a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.

126. Yokota's *guide system controller* (i.e., assembly management system) is *operative to receive any sequence of input signals from the separate computer system or controller* because the semi-finished products can arrive at the location in any order and with various customizations required:

Products of high enthusiast interest, such as automobiles and motorcycles, may be specified to have different variations or combinations of options depending on the user. **Thus, the components that need to be assembled for each finished product on the product assembly line become different.** In this connection, a technique has been proposed, whereby a light emitting element attached to a storage box of components to be assembled onto a semi-finished product is caused to emit light in order to increase the efficiency of the operation of assembly components into a finished product.

[Yokota ¶ 2 (emphasis added).] Because the assembly line requires operators to assemble custom products (such as vehicles), the light illumination system must be adapted to display whatever components happen to be required for the custom product currently being assembled. A POSITA would understand that such customization is not known in advance. Indeed, if the sequence of light illumination signals were known in advance, then the Yokota system would not require a reading device to identify the semi-finished product being assembled. Nor would it require a database lookup to “recognize[] component identification information, component shape or assembly orientation for identifying a component to be assembled onto a semi-finished product in an ith area through lookup in a database on the basis of information read from an information element, attached to the

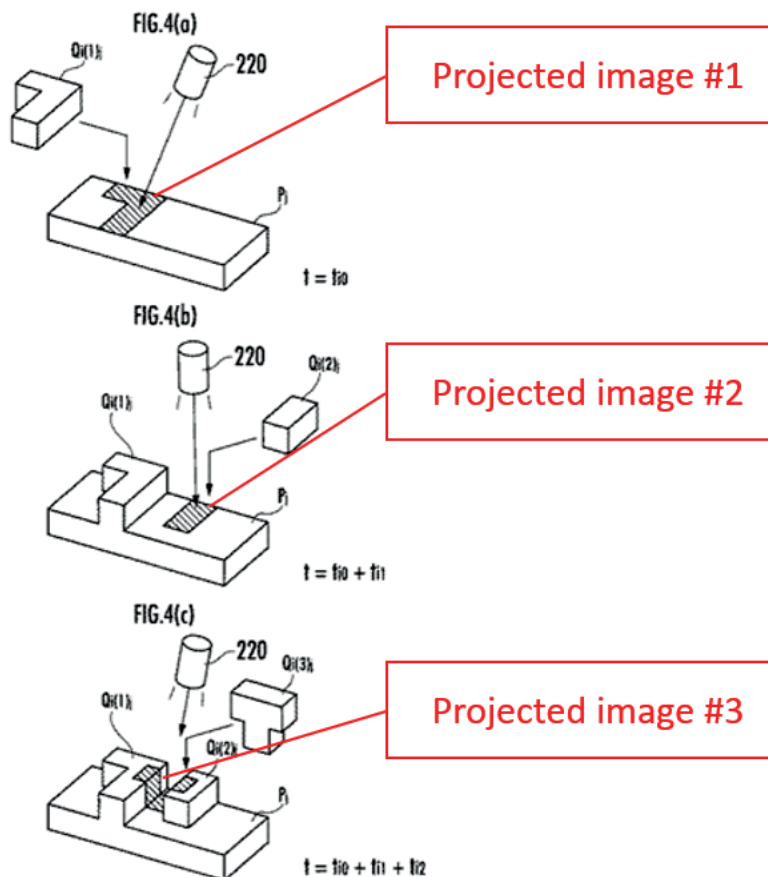
semi-finished product.” [Yokota ¶ 2.] As noted above, the *input signals* are the product identification information read by reading device 210.

127. Because Yokota’s system allows any sequence of semi-finished products to arrive at the work location, it permits the assembly management system (*guide system controller*) to dynamically control projection of any sequence of said visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators for the particular operation. That is, in Yokota, the order in which products P_j arrive at the station determines the order of the *input signals* (i.e., product identification information). Yokota’s system does not know beforehand what order of custom semi-finished products P_j will pass through the assembly line, or in what order the database will be queried. Thus, Yokota discloses a *guide system controller* [assembly management system including database 102 and second processing unit 120] that is *operative to receive any sequence of input signals* (i.e., any sequence of product identification information) *from the separate computer system or controller* (including the RFID reader 210) *to dynamically control projection* (by the second processing unit 120) *of any sequence of said visual indicators* (i.e., component identification information or the shaded sections shown in Figures 2 and 3) *corresponding to respective said addressed display features*

(i.e., component identification information or component shape information) based on said input signals corresponding to desired visual indicators for the particular operation (i.e., the corresponding component identification, and component shapes).

128. Yokota gives an example of an input signal (i.e., a product ID) leading to a sequence of projections required for that specific product, as shown below in an annotated version of Fig. 4.

(FIG. 4)¶



Yokota Fig. 4

Yokota uses the above figure to explain that “visible light is irradiated successively onto the assembly location of each product $Q_i(m)_j$ on the semi-finished product P_j in accordance with the assembly sequence thereof.

[Yokota ¶ 34.] Thus, Yokota Figure 4 and the accompanying text show a *sequence of one or more input signals* (here, a single product ID) leading to *projection of [a] sequence of said visual indicators*. And a sequence of multiple *input signals* (i.e., multiple product IDs read as products travel along a component assembly line, Yokota ¶ 2) would result in a different sequence of projections, each one corresponding to the various shapes of the required components.

129. Yokota also discloses the element with *a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators*. As discussed above relative to claim construction, this limitation requires that a projection of visual indicators be created dynamically and in real time in response to a sequence of input signals.

Yokota creates projections dynamically and in real time using its database to look up information on component shape, component location, and component orientation. It then uses that information to create “light irradiation instruction signal[s].” [Yokota ¶ 29 (“the second processing unit 120 transmits, to the light irradiation device 220 installed in the i th area A_i , a

‘light irradiation instruction signal’ corresponding to the ‘component Qij’ and its ‘assembly position’ and ‘assembly orientation,’ etc. in relation to the semi-finished product Pj, which were recognized by the first processing unit 110 (FIG. 2/arrow A2).)”] The component ID and the color (“wavelength of visible light”) of the projection may be added to the projection in real time. [Yokota ¶ 20.] The amount of time that the projection is displayed is also assessed in real time based on a database lookup. [Yokota ¶ 35.] These data elements (shape, location, position, color, and length of time) are thus used to create projections, dynamically and in real time, in response to reading a product ID from a semi-finished product being assembled.

130. Even if the proper construction, discussed above, is not applied and the plain language of the claim is applied instead, Yokota still discloses the element. Yokota’s system creates a new set of *input signals* regardless of the combination of products that is moving down the assembly line. Yokota’s system also dynamically and in real time creates a projection of visual indicators in response to each new set of *input signals*. Thus, Yokota discloses [1.6].
131. Accordingly, for the reasons stated above, Yokota, read using the general knowledge of a POSITA regarding conventional database practices (as disclosed in Kroenke), renders obvious claim 1 of the ’614 patent.

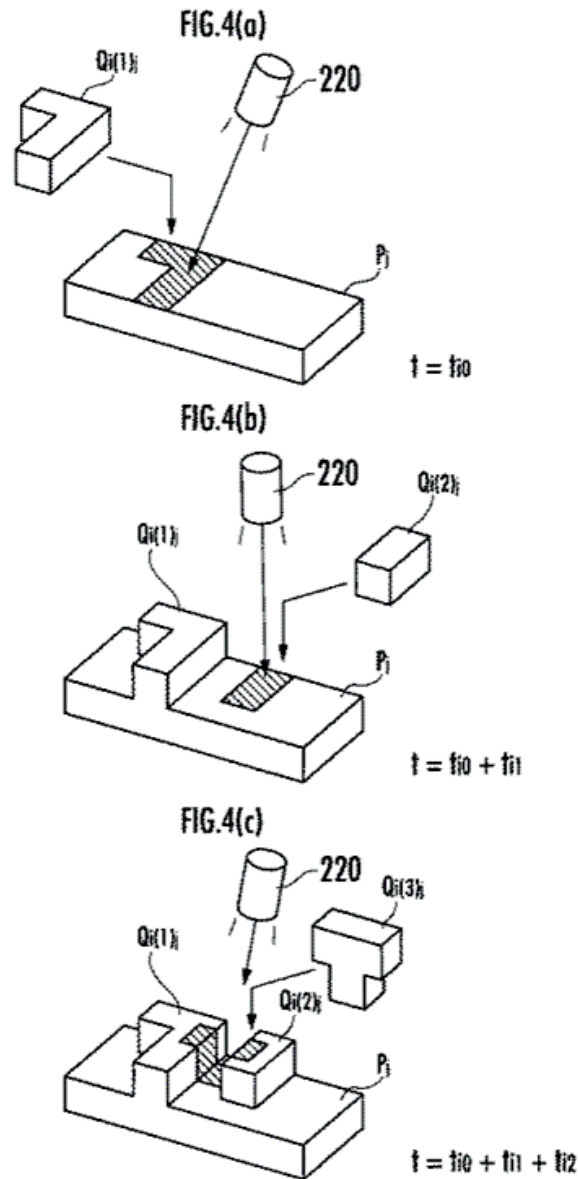
3. Claim 2 Analysis

[2.0] The method of claim 1, wherein said guide system controller further includes a plurality of positional identifiers and said method further comprises selecting positional identifiers based on said input signals, and

132. Yokota discloses that the guide system controller further includes a plurality of positional identifiers and selecting positional identifiers based on said input signals. Specifically, the Yokota database (which is part of the *guide system controller*) contains, among other things, “the component Qij to be assembled onto the semi-finished product Pj in the ith area Ai, **the assembly location thereof**, the assembly orientation, weight.” [Yokota ¶ 28 (emphasis added); *see also id.* ¶ 22 (“database 102 stores and retains ‘product identification information’ for identifying a finished product or semi-finished product in association with an ‘assembly location,’ etc. of components to be assembled.”); *see also id.* ¶ 23 (“The ‘assembly position,’ ‘weight,’ ‘assembly sequence, etc. of a component Qi to be assembled onto a semi-finished product P in the ith area Ai are recognized through lookup in a database 102”).] Because Yokota’s database (which is part of the *guide system controller*) contains assembly-location information for each of the components at issue, it contains a *plurality of positional identifiers*. This is confirmed by Yokota Figure 4, which shows component-specific light

illuminations at different locations. As shown below, those positional identifiers are identified by shaded regions in Yokota Figure 4.

(FIG. 4)



Yokota – Fig. 4.

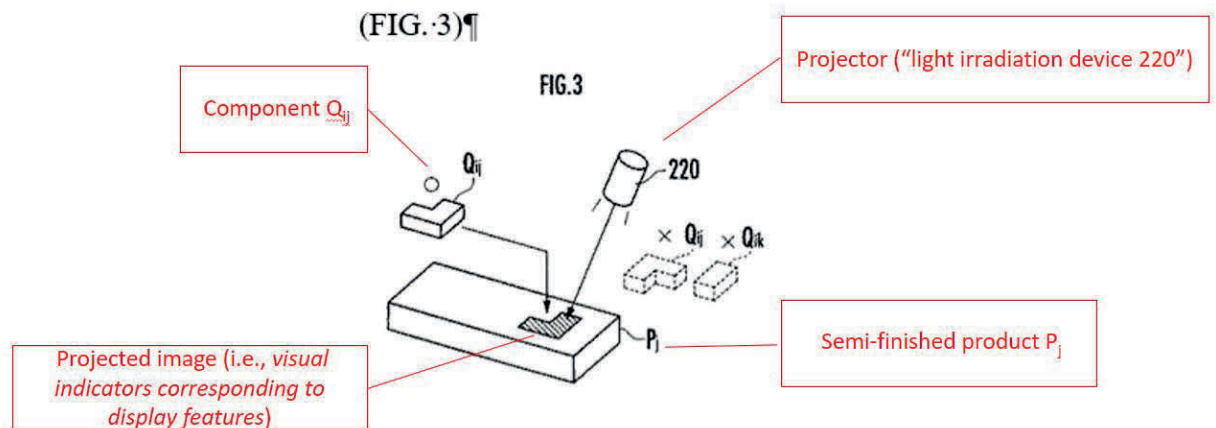
133. Yokota’s system performs the step of *selecting positional identifiers* (Yokota’s “assembly location” for component Q_{ij}) *based on said input signals* (i.e., database lookups based on product identification information) as follows:

[T]he ‘product identification information’ is transmitted from the reading device 210 to the . . . first processing unit 110 [which] recognizes the component Q_{ij} to be assembled onto the semi-finished product P_j in the ith area A_i, the assembly location thereof, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.

[Yokota ¶ 28.] Further positional information comes from the RFID reader, which identifies where the semi-finished product is located. [*Id.* ¶ 28 (“Adjustment of the range in which information is readable from the RFID tag 212 by the reading device 210 makes it **possible to determine the location of the semi-finished product** P_j relative to the reading device 210 at the time of the reading.”). (emphasis added).] A POSITA would recognize that this additional positional information permits Yokota’s system to more precisely target the semi-finished product for illumination at the proper location using the “assembly location” information from database 102. Thus Yokota discloses [2.0].

[2.1] wherein said projecting visual indicators further comprises projecting visual indicators corresponding to said selected addressed display features onto a physical object at a location corresponding to said selected positional identifiers.

134. As discussed above in [1.2] and [1.5], Yokota discloses projecting visual indicators corresponding to said selected addressed display features.
135. Yokota discloses *projecting visual indicators . . . onto a physical object at a location corresponding to said selected positional identifiers*. Specifically, Yokota discloses that after the assembly location is identified, “the second processing unit 120 transmits, to the light irradiation device 220 installed in the i th area A_i , a ‘light irradiation instruction signal’ corresponding to the ‘component Q_{ij} ’ and its ‘assembly position’ and “assembly orientation,” etc. **in relation to the semi-finished product P_j** . [Yokota ¶ 29 (emphasis added).] This projection process is illustrated below in an annotated version of Figure 3.



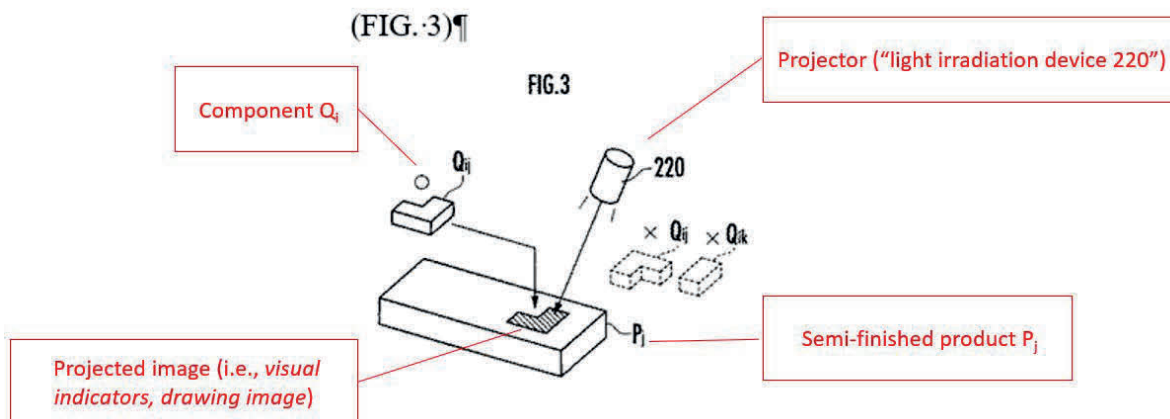
Yokota – Fig. 3 (annotated).

136. The process illustrated above is an example of *projecting visual indicators* (by the light irradiation device 220) *corresponding to said addressed display features* (i.e., in the shape of the component) *onto a physical object* (semi-finished product P_j) *at a location corresponding to said selected positional identifiers* (i.e., at the “assembly position” identified from database 102.).
137. Accordingly, Yokota discloses [2.1] and renders obvious claim 2.

4. Claim 9 analysis

[9.0] The method of claim 1, wherein said visual indicators comprise at least one selected from the group consisting of numbers, words, alphanumeric characters, a drawing image and a video image

138. Yokota discloses that the visual indicators comprise at least one selected from the group consisting of numbers, words, alphanumeric characters, a drawing image and a video image. For example, as shown below in annotated Figure 2, Yokota discloses visual indicators that comprise a drawing image.



Yokota – Fig. 3 (annotated).

Yokota also discloses displaying *numbers, words, and alphanumeric characters* by displaying component identification information on the workstation:

It should be noted that an identification number (component identification information) of component Qij may also be projected onto the semi-finished product Pj.

[Yokota ¶ 29; *see also id.* ¶ 8.]

139. Accordingly, Yokota renders obvious claim 9.

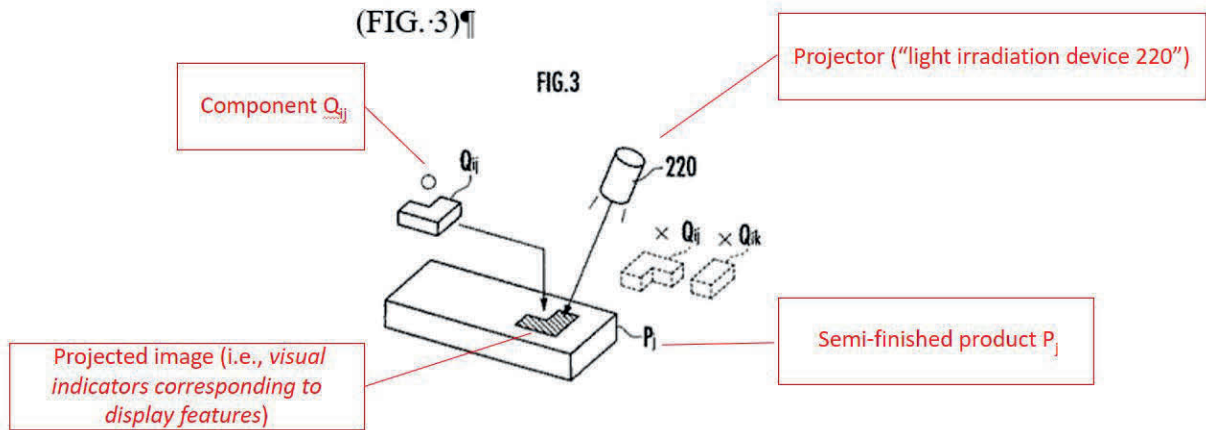
5. Claim 17 analysis

[17.0] A guide system adapted to provide visual indicators to an individual to guide actions, said guide system comprising:

140. This limitation is disclosed for the reasons stated in [1.0].

[17.1] at least one directional light device, said at least one directional light device being selectively operable to project and target at least one indicating light;

141. Yokota discloses at least one directional light device, specifically light irradiation device 220. [Yokota ¶ 29.] This directional light device is selectively operable to project and target at least one indicating light, as illustrated in annotated Figure 3 below.



Yokota – Fig. 3 (annotated).

[See also Yokota ¶ 29.] Thus, Yokota discloses [17.1]. I note that Yokota's directional light device is described as a laser (Yokota ¶ 25), indicating that it must be aimed (i.e., *target[ed]*) at the proper location.

[17.2] a guide system controller, said guide system controller including a plurality of programmed selectable addressed display features and a plurality of programmed positional identifiers with each said addressed display feature having a unique pre-programmed individual address identifier within said guide system controller;

142. As discussed above for claims 1 and 2, Yokota discloses or renders obvious each limitation of this element. [See [1.1] (guide system controller); [1.2] (said guide system controller including a plurality of programmed selectable addressed display features . . . with each said addressed display feature having a unique pre-programmed individual address identifier within said guide system controller; and [2.0] (a plurality of programmed positional identifiers).] Notably, the positional identifiers in Yokota's database 102 are

programmed because they are stored in database 102. [Yokota ¶ 28 (“the first processing unit 110 recognizes the component Qij to be assembled onto the semi-finished product Pj in the ith area Ai, **the assembly location thereof**, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.”) (emphasis added).]

[17.3] said guide system controller configured to receive a sequence of one or more input signals from a separate computer system or controller to cause said guide system to project visual indicators for a particular guided operation,

143. Yokota discloses [17.3] for the reasons stated above for [1.3].

[17.4] wherein said guide system controller is configured to select one or more particular addressed display features from the plurality of addressed display features based on the input signals, and wherein the input signals control selection of said addressed display features based on the address identifier for the said addressed display feature,

144. Yokota discloses [17.4] for the reasons stated above for [1.4].

[17.5] with said guide system controller causing said directional light device to project visual indicators corresponding to an addressed display feature onto one or more physical objects at a location corresponding to a positional identifier based on said input signals,

145. Yokota discloses [17.5] for the reasons stated above for [2.1].

[17.6] wherein said guide system controller is operative to receive any sequence of input signals from the separate computer system or controller to dynamically project any sequence of visual indicators corresponding to respective said addressed display features based on said input signals corresponding to desired visual indicators with a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators.

146. Yokota discloses [17.6] for the reasons stated above for [1.6].

147. Based on the above analysis, Yokota renders obvious claim 17.

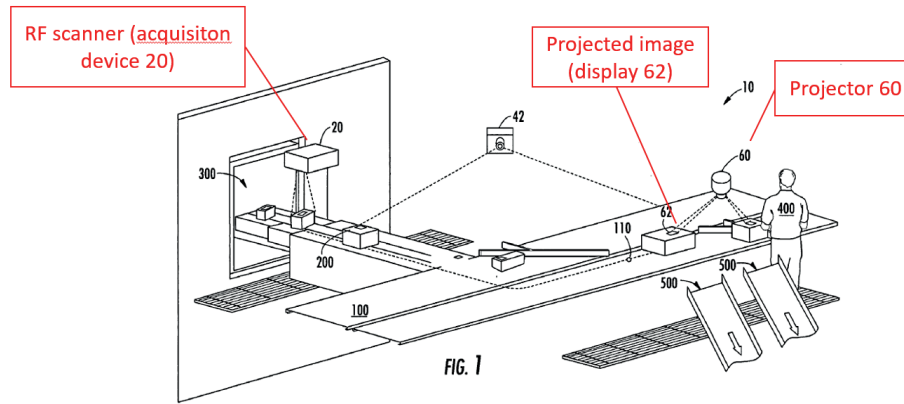
B. CHALLENGE 1B: Claims 10-11 and 15-16 are rendered obvious by Yokota and Ramsager

1. Summary of Ramsager

148. Ramsager (U.S. Patent Application Publication No. 2004/0195320, Ex.

1009) is a U.S. patent application filed by United Parcel Service (UPS) that was published on October 4, 2004.

149. Ramsager discloses a light-guided package-processing system that includes many of the dependent claim elements of the '614 Patent. In particular, to the extent it is argued that Yokota does not disclose *providing a confirmation signal to said guide system controller*, as required by claim 10, Ramsager discloses it. Ramsager describes how to use laser projection systems to guide operators in package handling. Ramsager is similar to Yokota in that it discloses a system for using RFID and light-guided

Petition for *Inter Partes* Review of U.S. Patent No. 9,658,614

Ramsager Fig. 1 (annotated).

150. As shown in the above figure, packages enter Ramsager’s work area via a conveyer belt. The packages are scanned by an acquisition device 20, such as an RFID reader, that identifies the packages using “indicia 30.”

[Ramsager ¶¶ 61-63.] As the packages travel down the conveyer, projector 60 displays information on the packages (display 62). [Ramsager ¶ 78.]

The projected image may include “a handling instruction 130 correlated to or specifically tailored for a particular parcel 200.” [Ramsager ¶ 75.]

Computer system 45 is responsible for “match[ing] . . . the appropriate display 62 to the particular parcel 200 being processed.” [Ramsager ¶ 75.]

Computer system 45 is also responsible for controlling the projector and is thus a *guide system controller*. The role of the computer 45 in controlling the projector is illustrated below in an annotated version of Ramsager Fig. 5.

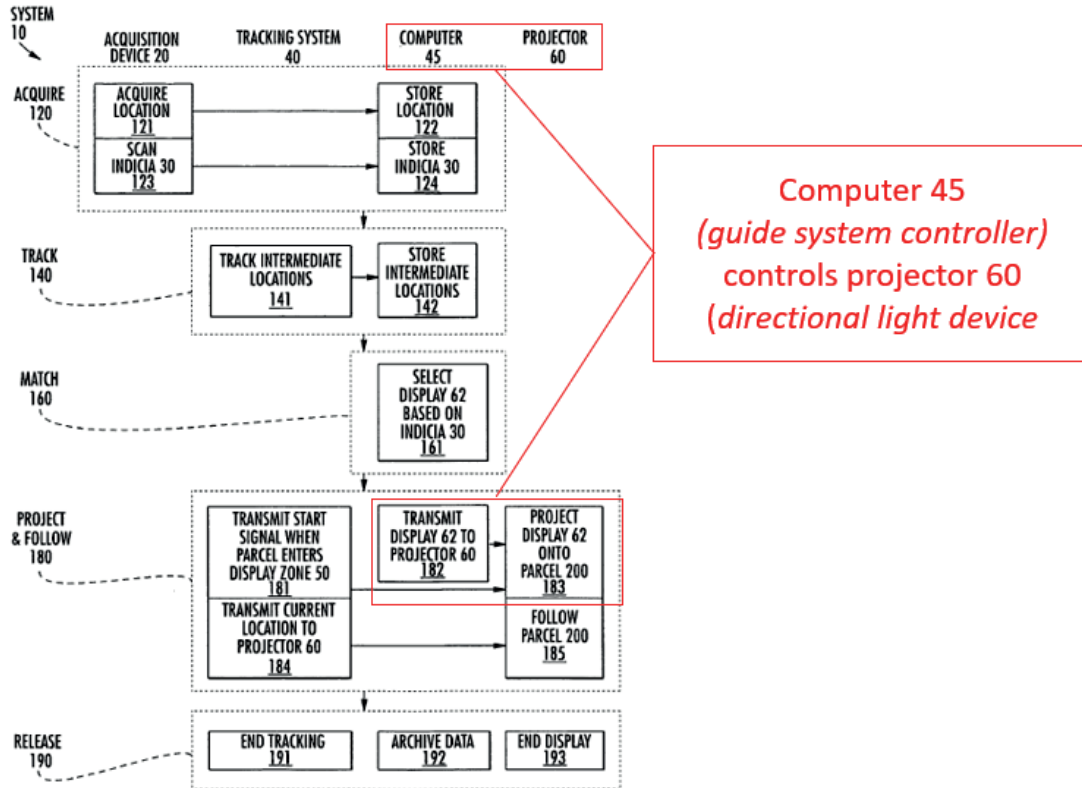


FIG. 5

Ramsager – Fig. 5 (annotated).

Ramsager also discloses *providing confirmation signals to the guide system controller* as part of a “release task” after a parcel has been processed.

Specifically:

In one embodiment, the system 10 of the present invention **may be configured to release each parcel 200 (task 190) when it has been processed.** The release task 190 may include ending the active tracking of each parcel 200 (task 191), archiving or **clearing the data stored in the computer 45** (task 192), and/or ending the active projection of the display 62 (task 193).

[Ramsager ¶ 94, (emphasis added).] In order for the computer 45 to clear stored data, it must receive a confirmation signal that the parcel 200 has been processed.

2. Rationale for combining Yokota with Ramsager

151. It would have been obvious to a POSITA to incorporate the teachings of Ramsager into Yokota. Both Ramsager and Yokota disclose similar systems for displaying instructions to human operators. In particular, both systems involve tracking materials using RFID information and then projecting instructions for workers operating on those materials. It would have been obvious to substitute or supplement Yokota's confirmation system (which sends confirmation information to the operator) with Ramsager's confirmation system (i.e., the release process that sends confirmation information to various components including computer 45 (which is a *guide system controller*)).
152. Such a combination would be nothing more than combining prior art elements (Yokota with Ramsager's confirmation system) according to known methods to achieve predictable results (i.e., a confirmation system used by an assembly system). Indeed, a POSITA would know how to substitute or supplement Yokota's confirmation system with the confirmation system of Ramsager, as Ramsager discloses steps that

Yokota's system would need to undertake to prepare for the next assembly operation (e.g., instructing the projector to stop displaying the current image).

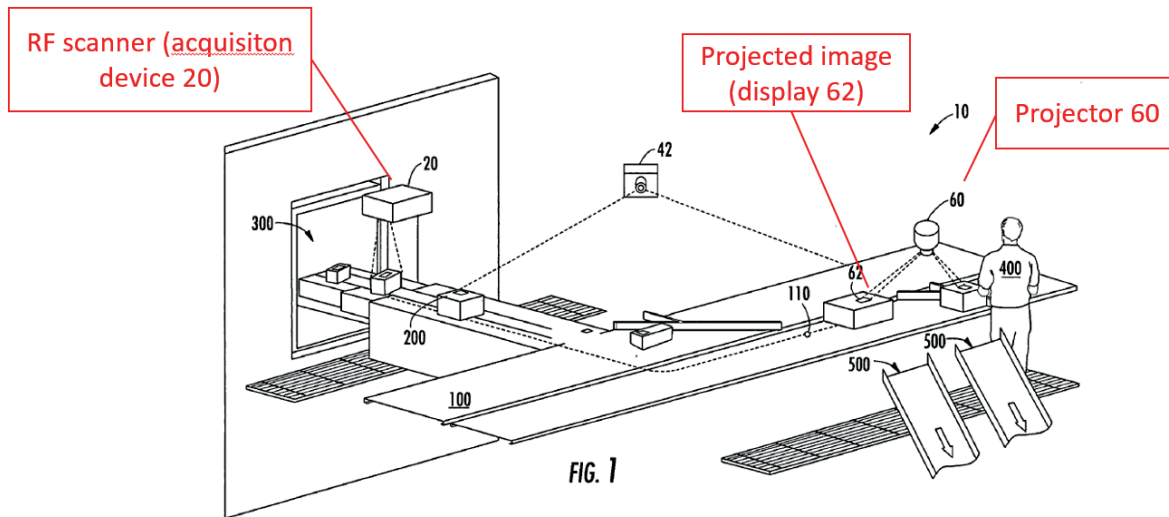
153. The combination of Yokota and Ramsager is also the use of a known technique (Ramsager's release task 190) to improve a similar device (Yokota's assembly system) in the same way. Additionally, like Ramsager, Yokota also discloses "[reading] information [] from an information element, attached to the semi-finished product," and a POSITA would, therefore, have a reasonable expectation of success in implementing this combination. Thus, a POSITA would have a rationale for combining Ramsager with Yokota in the manner claimed.
154. A POSITA would have a reasonable expectation of success with this combination given that Yokota's system already had the capabilities provided by Ramsager; Ramsager merely teaches putting those capabilities in different components within the system.
155. Yokota is analogous art to the '614 patent because it concerns the projection of assembly instructions using input signals and stored shapes for projection. Ramsager is also analogous to the '614 patent because it concerns the projection of instructions to workers performing manual manipulation tasks.

3. Claim 10 analysis

[10.0] The method of claim 1 further comprising providing a confirmation signal to said guide system controller in response to completion of an action by an individual based on one or more of said visual indicators.

156. In Yokota, after the time has passed for an assembly action, the system's "third processing unit checks whether the assembly action was properly performed, based on weight or center of gravity. [Yokota ¶ 31 ("The third processing unit 130 recognizes the 'weight' or 'center of gravity' of the semi-finished product Pj measured by the weight measurement device 230 (FIG 2/arrow A3).] The third processing unit 130 then determines if the error between the two weights or centers of gravity is within an allowable range, and causes the determination result to be displayed on the image displaying device installed in the ith area Ai, etc. (FIG. 2/arrow A4).").] After the information is displayed, "the worker can be prompted to recheck for assembly error, misplaced and forgotten tool, etc.") [Yokota ¶ 36.] This system is similar to what is claimed by the '614 patent because it provides a *confirmation signal* when an action is properly performed. However, in Yokota, the *confirmation signal* is provided by the guide system controller (assembly management system), whereas the claims of the '614 patent require *providing a confirmation signal to said guide system controller*. [’614 claim 10 (emphasis added).]

157. Like Yokota, Ramsager projects images to guide processing of package, as illustrated below in annotated Fig. 1.



Ramsager – Fig. 1 (annotated).

Ramsager’s system detects package information via “acquisition device 20.”

[Ramsager ¶ 61 (“an acquisition device 20 may acquire, capture, scan, or otherwise read a label or indicia 30 ... on each of one or more parcels

200.”)] Ramsager teaches that its “acquisition device 20 may be ... an RFID

reader,” as in Yokota. [Ramsager ¶ 62.] Ramsager then uses the information

scanned by acquisition device 20 to “project a display 62 adjacent or near a parcel 200 or directly onto a surface of parcel 200.” [Ramsager ¶ 81].

Ramsager’s projection may “include a handling instruction 130 correlated to or specifically tailored for a particular parcel 200.” [Ramsager ¶ 75].

158. Ramsager’s system discloses the “confirmation signal” limitation as claimed. In Ramsager, computer 45 is a *guide system controller* because it is responsible for determining what information to display on the package and for instructing the projector to display that information, as illustrated in the annotated version of Fig. 5 provided below.

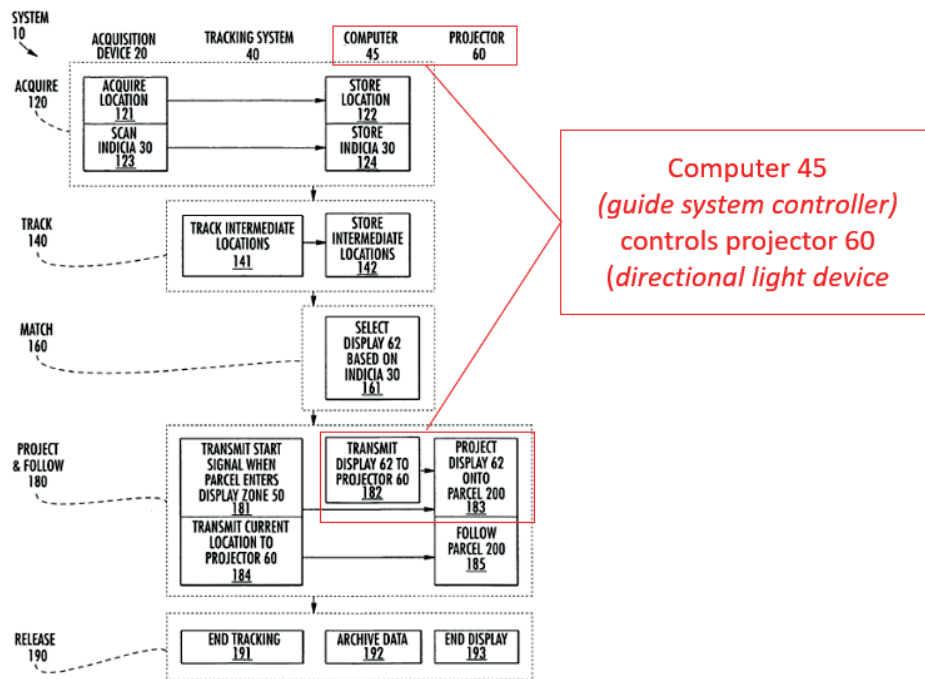


FIG. 5

Ramsager – Figure 5 (annotated).

[See also id. ¶ 75.]

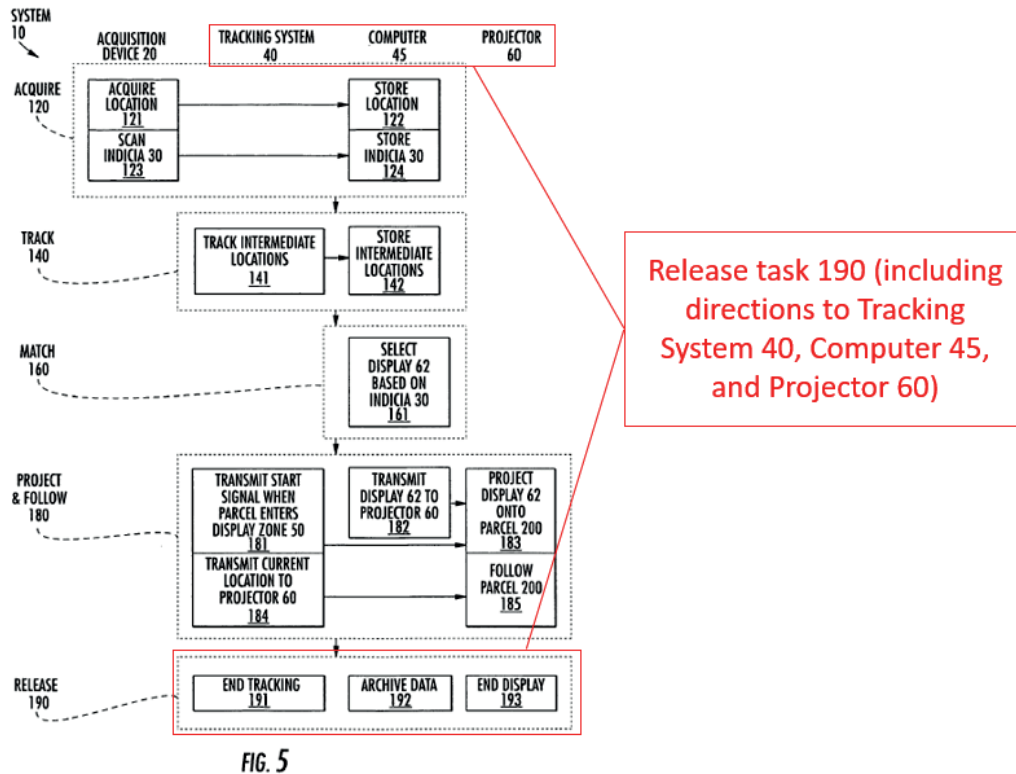
159. Ramsager discloses *providing a confirmation signal to said guide system controller* as part of a “release task 190.” Ramsager teaches using a “bar code scanner or other sensors to confirm the correct selection and packing of each item.” [Ramsager ¶ 99]. The *confirmation signal* is provided to the *guide system controller* (computer 45) because Ramsager’s system “is

configured to release each parcel 200 (task 190) when it has been processed.” Specifically, Ramsager states:

In one embodiment, the system 10 of the present invention may be configured to release each parcel 200 (task 190) when it has been processed. The release task 190 may include ending the active tracking of each parcel 200 (task 191), archiving or clearing the data stored in the computer 45 (task 192), and/or ending the active projection of the display 62 (task 193).

[Ramsager ¶ 94.]

160. As shown in annotated Figure 5 below, during “release task 190” a signal for “clearing the data stored in computer 45” is sent to computer 45, the *guide system controller*.



Ramsager – Figure 5 (annotated).

161. Ramsager discloses that “Release task 190” (which includes a *confirmation signal*) is a step that occurs *in response to completion of an action by an individual based on one or more of said visual indicators* because it occurs after a parcel is “processed,” i.e., after the parcel has been handled by an individual (viewer 400 in Ramsager):

In general, the system tasks are complete when each parcel 200 has been processed or otherwise handled by a viewer 400 who may move the parcel 200 to a next particular segment 500 according to the handling instruction 130 included or understood within the display 62. The release task 190 for a group of parcels may be

performed at different times, of course, when each parcel 200 has been processed.

[Ramsager ¶ 94.] Display 62 is a projected *visual indicator* as discussed above. Notably, one of Ramsager’s embodiments discloses hardware for sending such a confirmation signal. [Ramsager ¶ 99. (“The projection system 10 may include a bar code scanner or other sensors to confirm the correct selection and packing of each item.”).]

162. As discussed above in section IX.B.2, it would have been obvious to modify Yokota’s system to use Ramsager’s confirmation for several reasons. Thus, Ramsager discloses [10.0] and the combination of Yokota with Ramsager renders obvious claim 10.

4. Claim 11 analysis

[11.0] The method of claim 10 further comprising providing a sensor apparatus, wherein said sensor apparatus is operable to detect completion of the action and wherein said sensor apparatus generates said confirmation signal.

163. As explained above with regard to Claim 10, Ramsager discloses that “a bar code scanner or other sensors [are used] to confirm the correct selection and packing of each item.” [Ramsager ¶ 99]. In this way, Ramsager *provid[es] a sensor apparatus* (its bar code scanner or other sensors) that *is operable to detect completion of the action and generates said confirmation signal*.

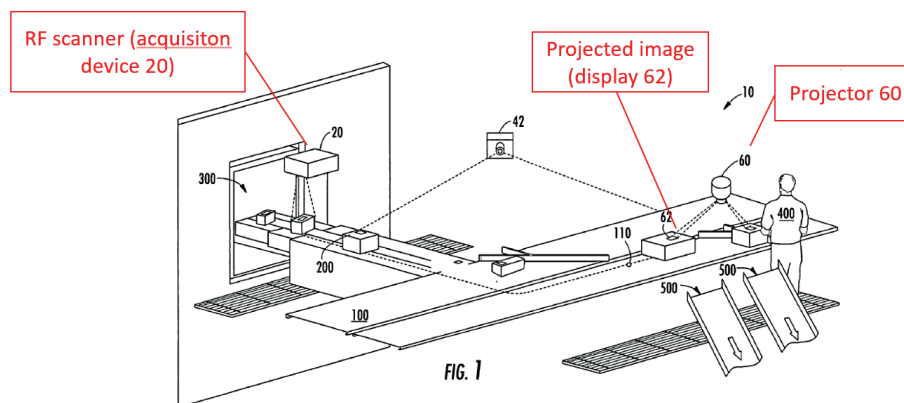
164. Thus, the Yokota/Ramsager combination discloses all elements of [11.0] and renders claim 11 obvious.

5. Claim 15 analysis

[15.0] The method of claim 1, further comprising receiving a display feature input signal at said guide system controller provided by said separate computer system or controller,

165. Yokota discloses receiving a display feature input signal at said guide system controller provided by said separate computer system or controller, specifically, the product identification information (display feature input signal) that is transmitted as a query to database 102 (which is part of the guide system controller). [Yokota ¶ 28; see also [1.2.1] above.]

166. As discussed above, Ramsager describes using laser projection systems to guide operators in package handling, such as in the annotated version of Fig. 1 provided below.



Ramsager Fig. 1 (annotated).

Ramsager discloses the act of *receiving a display feature input signal at a guide system controller*. Specifically, when a parcel goes through Ramsager's system, it is identified by acquisition device 20, which reads "indicia 30" from the parcel. [Ramsager ¶ 61. ("In one embodiment, an acquisition device 20 may acquire, capture, scan, or otherwise read a label or indicia 30 (task 123) on each of one or more parcels 200.".)] Indicia 30 is a *display feature input signal* because it provides the information to display on the parcel at the next step:

Each item or parcel 200 may include a label or other indicia 30. In one embodiment, the display 62 chosen to be projected onto each parcel 200 is correlated to the data contained in the indicia 30, **so the display 62 matches the indicia 30 for each particular parcel 200.**

[Ramsager ¶ 54 (emphasis added)].

167. Ramsager's indicia 30 (*display feature input signal*) is received by a *guide system controller*, namely Ramsager's computer 45:

The indicia 30 read by the acquisition device 20 may be transmitted to a computer 45 and stored (task 124) in memory such as a database 80 for processing and later retrieval. In one embodiment, for each one of a plurality of parcels 200, the **computer 45 may receive and store a scan of the indicia 30**, and one or more fields for storing the data contained in the indicia 30.

[Ramsager ¶ 61, (emphasis added).] Ramsager’s computer 45 is a *guide system controller* because it controls how the entire guide system functions, including both the scanners and the projectors. [Ramsager ¶ 52 (“The system 10 may include a controller or computer 45 linked to one or more scanners or acquisition devices 20, tracking systems 40, and projectors 60.”).]

168. As shown above in the annotated version of Ramsager Figure 1, the *display feature input signal* (indicia 30) comes from scanner/acquisition device 20, which is a *separate computer system or controller*. Thus, Ramsager also discloses [15.0].

169. In addition to the combination rationales described above, it would have been obvious to combine the teachings of Ramsager with the teachings of Yokota specifically with respect to claim 15 because both systems use RFID scanners to identify which items are passing through the workspace.

[*Compare* Yokota ¶ 28 (“First, “product identification information (serial number, etc.)” is read through a non-contact scheme (wireless scheme) from the RFID tag 212”) *with* Ramsager ¶ 16 (“The indicia may include an RFID tag and the acquisition device may include an RFID reader.”).] Because Yokota and Ramsager both describe very similar systems, it would have been obvious that techniques from Ramsager could be predictably applied to

Yokota. These obvious techniques include Ramsager's step of reading "indicia 30" from the parcel and displaying it on or near the parcel itself, as described more fully below in my analysis of both [15.1] and [16.0].

[Ramsager ¶ 54. ("In one embodiment, the display 62 chosen to be projected onto each parcel 200 is correlated to the data contained in the indicia 30, so the display 62 matches the indicia 30 for each particular parcel 200.").]

[15.1] said display feature input signal including information to be projected by said projector with said guide system controller operatively receiving said display feature input signal and controlling said projector to project a visual indicator including the information to be projected that is included in said display feature input signal.

170. Ramsager discloses [15.1]. As noted above for [15.0], Ramsager's *display feature input signal* (indicia 30) *includ[es] information to be projected by said projector*. [Ramsager ¶ 54. ("In one embodiment, the display 62 chosen to be projected onto each parcel 200 is correlated to the data contained in the indicia 30, so the display 62 matches the indicia 30 for each particular parcel 200.").]
171. In Ramsager, the *guide system controller* (computer 45) *operatively receives said display feature input signal* (indicia 30). [Ramsager ¶ 61. ("**The indicia 30 read by the acquisition device 20 may be transmitted to a computer 45 and stored (task 124) in memory such as a database 80 for processing and later retrieval.**")].]

172. Ramsager further discloses that the *guide system controller* (computer 45) *control[s] said projector* (projector 60) *to project a visual indicator* (display 62), as shown in the annotated version of Ramsager Figure 5 below.

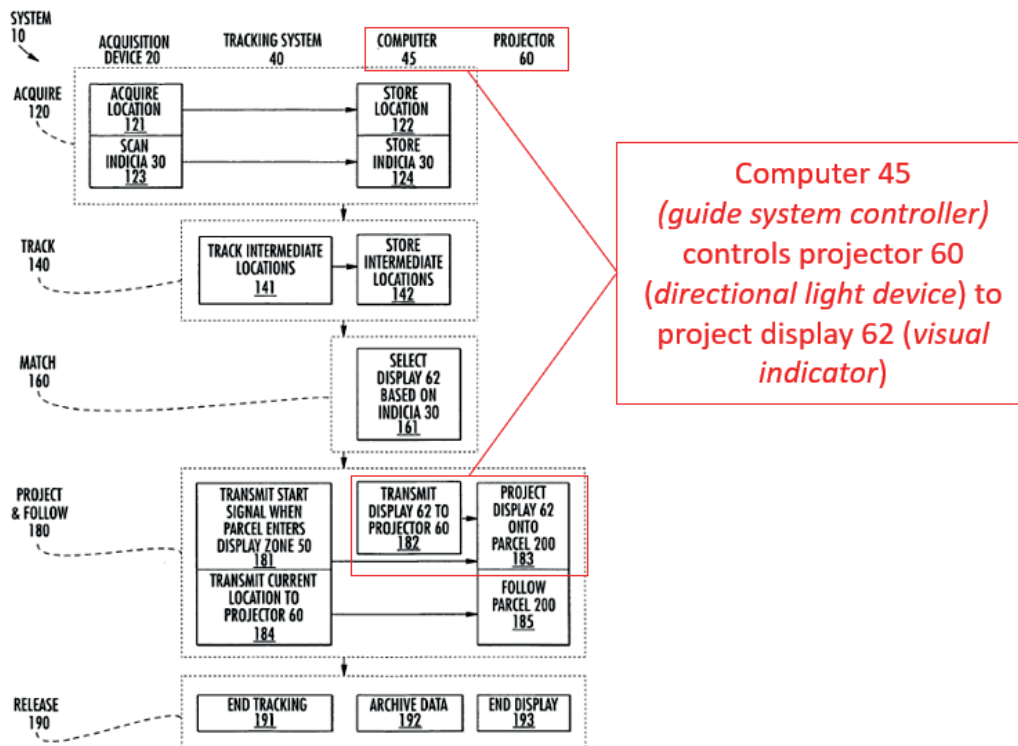


FIG. 5

Ramsager Fig. 5 (annotated).

[See also *id.* ¶ 58 (“In FIG. 5, the column headings show the device or system that may be used to accomplish a particular task.”).]

173. Ramsager further discloses displaying a *visual indicator* (display 62) *including the information to be projected that is included in said display feature input signal* (indicia 30). Specifically, Ramsager discloses that the display 62 may match the information received from indicia 30. [Ramsager ¶ 54. (“In one embodiment, the display 62 chosen to be projected onto each

parcel 200 is correlated to the data contained in the indicia 30, so the display 62 matches the indicia 30 for each particular parcel 200.”), 56 (“The display 62 may be selected to match the indicia 30 for each particular parcel 200.”).]

174. Thus, Ramsager discloses [15.1]. As noted above, it would have been obvious to adapt the display techniques of Ramsager to the teachings of Yokota, as both systems involve identifying objects using RFID readers and projecting information onto those objects. Accordingly, it would have been obvious to use the improvement of Ramsager (displaying information from indicia 30) directly onto the semi-finished workpiece of Yokota, as that would have been nothing more than using the improvement in a similar device, and in the same way.

175. Thus, the Yokota/Ramsager combination renders obvious claim 15.

6. Claim 16 analysis

[16.0] The method of claim 15, wherein the information to be projected included in said display feature input signal comprises at least one selected from the group consisting of numbers, words, alphanumeric characters and a drawing image.

176. Ramsager discloses [16.0]. In Ramsager, *the information to be projected included in said display feature input signal comprises at least one selected from the group consisting of numbers, words, alphanumeric characters and a drawing image.*

177. Ramsager discloses that the information on a package label (indicia 30) may include “text, icon, symbol, or combinations thereof,” to be projected:

The projector 60 may also include software to read and convert legible data (such as **symbols, text, or other indicia**) into a traced laser pattern for the display 62. The task of matching or correlating the indicia 30 on each parcel 200 to a particular display 62, as described above, will generally produce a display 62 (**text, icon, symbol, or combinations thereof**) which may be converted into a pattern to be traced by the laser beam in order to produce a visible display 62 on each parcel 200.

[Ramsager ¶ 86.] This fully satisfies the requirement of *numbers, words, alphanumeric characters [or] a drawing image*.

178. As noted above, it would have been obvious to adapt the techniques from Ramsager into the system of Yokota because it is nothing more than using a technique (displaying read characters) in a similar device (Yokota) in the same way (as disclosed in Ramsager).
179. Accordingly, Ramsager discloses [16.0] and the Yokota/Ramsager combination renders obvious claim 16.

C. CHALLENGE 1C: Claims 12 and 23 are rendered obvious by the combination of Yokota and Pinhanez.

1. Summary of Pinhanez

180. Pinhanez *et al.*, Ubiquitous Interactive Graphics, IBM Research Report, May 17, 2002 (Ex. 1011, “Pinhanez”) discloses a system that combines a camera and a projector to direct and sense human movements, including in assembly tasks.
181. Pinhanez describes a device called an “Everywhere Displays Projector” or “ED-projector.” [Pinhanez at Abstract.] This ED-projector projects information/images on real-world objects and then uses a camera to detect how a user interacts with the projected information. Photographs of the ED-projector are shown below in Pinhanez Fig. 3.



Figure 3. Prototype of the ED-projector: a) ED-projector without the camera mounted; b) a detail of a complete prototype, including the pan/tilt camera.

Pinhanez, Fig. 3

Pinhanez describes using projected lights to guide a user through an assembly task. [Pinhanez at 8-9.] It also describes using a combination of projected lights and a camera to detect typical human interactions. For example, Pinhanez describes projecting images, and detecting human interaction with those images, such as detecting when a person “presses” a projected image of a button. This process is shown below in Pinhanez Fig. 6.

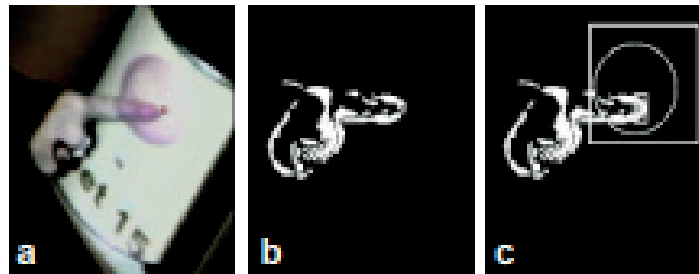


Figure 6. Detecting a touch: a) camera view of an interaction with a bucket; b) image difference data; c) overlay of search region (square), button active area (circle), and the fingertip template shown at the pointing location.

Pinhanez Fig. 6.

[Pinhanez at 5.]

2. Rationale for Combining Yokota with Pinhanez.

182. It would have been obvious to use the Pinhanez camera arrangement with Yokota’s assembly system because both documents describe light-guided assembly operations. Furthermore, a POSITA would realize that using a camera with Yokota would assist in: (1) determining when an action had been completed; (2) assessing whether an operation was completed

correctly, and (3) achieving reliability improvements from studying repeated operations. Additionally, the Pinhanez computer vision technology would be a useful way for an operator to signal, via a “button press,” that an action has been completed. Thus, using Pinhanez’s camera technology with Yokota would be nothing more than combining two prior art elements (Pinhanez’s camera and computer vision system with Yokota’s projection system) according to known methods to yield predictable results. It would also be the use of a known technique (Pinhanez’s camera and computer vision system) to improve a similar device (Yokota’s assembly system) in the same way. The combination would further be applying a known technique (Pinhanez’s camera and computer vision) to a known system (Yokota) ready for improvement (i.e., Pinhanez’s camera and computer vision).

183. A POSITA would have a reasonable expectation of success with this combination given that Pinhanez shows that the combination of a projector with a camera works very well to aid assembly tasks.
184. Yokota is analogous art to the ’614 patent because it concerns the projection of assembly instructions using input signals and stored shapes for projection. Pinhanez is also analogous to the ’614 patent because it concerns the projection of instructions to individuals to guide their actions.

3. Claim 12 Analysis

[12.0] The method of claim 1 wherein said guide system further includes a camera operable to image at least one of actions of an individual guided by said visual indicators and said visual indicators, and wherein said method comprises recording images while an operator is guided by said guide system.

185. The use of cameras along with projection systems, like Yokota's, was well known in the art. As an initial matter, pointing a camera towards a manufacturing operation was hardly a new or non-obvious concept at the time of the claimed invention. In fact, simply pointing a security camera at the manufacturing operation in Yokota would satisfy this claim element.
186. Moreover, Pinhanez specifically discloses a system that combines a *camera* and a projector in relation to guiding and detecting the actions—including assembly actions—of an individual. As discussed above, Pinhanez describes a device called an “Everywhere Displays Projector” or “ED-projector.” [Pinhanez at Abstract.] This device projects light images onto real-world objects and then detects how a user interacts with them. To sense how a user interacts with the projected image, the ED-projector uses a *camera*, as shown below.



Figure 3. Prototype of the ED-projector: a) ED-projector without the camera mounted; b) a detail of a complete prototype, including the pan/tilt camera.

Pinhanez, Fig. 3.

187. Pinhanez discloses that its *camera [is] operable to image at least one of actions of an individual guided by said visual indicators and said visual indicators*. Specifically, in Pinhanez, “the ED-projector employs a pan/tilt/zoom camera and a motion-based computer vision system **to track the user’s hand and touch-like gestures.**” [Pinhanez at Abstract (emphasis added).] This camera captures both the *actions of an individual guided by . . . visual indicators* and the *visual indicators* themselves, as shown in the pictures below that appear in Pinhanez figures 5 and 6.

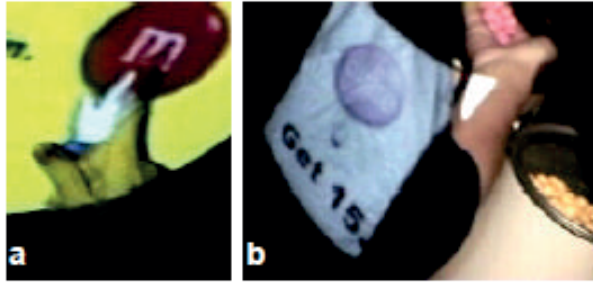


Figure 5. Difficulties faced by the vision system: a) the user's hand is partially hidden by the strong projection; b) the interactive surface is occluded by the user's shoulder as he moves to gather objects from inside a bucket.

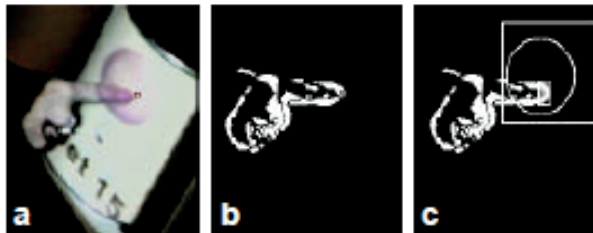


Figure 6. Detecting a touch: a) camera view of an interaction with a bucket; b) image difference data; c) overlay of search region (square), button active area (circle), and the fingertip template shown at the pointing location.

Pinhanez, Figs. 5 and 6.

The above figures show a user being guided by light indicators in Figures 5b and 6a, which reflect the projected instruction to “get 15” of the items in the supply bucket. These images show both the hand of an individual performing the guided operation and the light indicator itself. For example, Figure 5b shows the person with the items retrieved from the supply bucket in her hand and the “Get 15” instruction displayed on the bucket.

188. Pinhanez further discloses *recording images while an operator is guided by said guide system*. As shown above in Pinhanez Figures 6a-6c, Pinhanez records images while a user is being guided so that it can determine what the operator is doing. For example, in Figure 6a-6c, the Pinhanez system

records images so that it can determine when a user touches the virtual button over the words “Get 15.” [Pinhanez at p. 6, § 3.2 (“by looking at the differences between adjacent images in the video stream, we can still detect the shape of a moving object as shown in Figure 6.a and b.”).]⁹

189. Thus, Pinhanez discloses a camera (as shown in Figure 3) operable to image at least one of the actions of an individual guided by said visual indicators and said visual indicators, (as shown in figures 5b and 6a) and wherein said method comprises recording images while an operator is guided by said guide system (as shown in figures 6a-6c).
190. As noted above, it would have been obvious to combine Pinhanez with Yokota because it is nothing more than using a known technique (Pinhanez’s camera/vision system) in a similar device (Yokota) in the same way (as disclosed in Pinhanez).
191. Thus, Pinhanez discloses [12.0] and the Yokota/Pinhanez combination renders obvious claim 12.

⁹ A video taken by the camera on the ED-projector is attached as Exhibit B to the Petition’s Exhibit 1020 (Declaration of Nathaniel E. Frank-White of the Internet Archive.)

4. Claim 23 analysis

[23.0] The guide system of claim 17 further including a camera operable to image at least one of actions of an individual guided by said visual indicators and said visual indicators.

192. Pinhanez discloses this element for the reasons stated above for claim 12.

Specifically, Pinhanez discloses *a camera* (the ED-projector camera) *operable to image at least one of actions of an individual guided by said visual indicators* (as discussed above for claim 12) *and said visual indicators* (as also discussed above for claim 12).

193. Thus, Pinhanez discloses [23.0] and the Yokota/Pinhanez combination renders obvious claim 23.

D. CHALLENGE 1D: Claims 13-14 and 24-25 are rendered obvious by the combination of Yokota, Pinhanez, and Ryznar

194. Claims 13-14 depend from claim 12 and require displaying or recording information such as time duration or recorded images. Claims 24-25 depend from claim 23 and contain similar requirements. The elements of claims 13-14 and 24-25 were previously disclosed in U.S. Patent No. 7,515,981 to Ryznar. [Ex. 1013 “Ryznar”].

195. The Ryznar patent is also owned by Lightguide. It is my understanding that Amazon has or will file an IPR petition against the claims of Ryznar. In any event, Ryznar, which issued in April 2009, is prior art to the ’614 patent, whose earliest application date is February 2011.

1. Summary of Ryznar (Ex. 1013)

196. Ryznar (Ex. 1013) describes the same prior art system described in the '614 patent. [’614 patent at Fig. 1, 1A-1L, 2, and 5:42-15:23.] Generally speaking, it describes a generic system for projecting lights to guide assembly actions. Among the features of this system are the ability to record how long an operator is guided by the system and to display information like a recorded image or a recorded time duration on a display device. Notably, the '614 patent itself describes these features in its section discussing the prior art. [’614 patent at 13:20-25 (referencing “prior art” Figure 1 and stating “Cycle time measurements of given operations or steps may be recorded and statistically reviewed. Such as based on longest to shortest duration, and may be viewed remotely from guide system 10. Such as by connecting guide system 10 with a networked computer system.”)]

2. Rationale for combining Yokota, Pinhanez, and Ryznar.

197. It would have been obvious to combine Ryznar with Yokota. Both systems concern the same basic subject matter—using light-guided cues to aid in assembly. Yokota has a display screen and thus is prepared for, and could benefit from, the techniques disclosed in Ryznar. [see Yokota Figs. 1, 2 and ¶ 20 (describing image displaying device 232).] Thus, the combination of Ryznar and Yokota would be nothing more than combining prior art

elements (Yokota with Ryznar's time recording) according to known methods to achieve predictable results (e.g., the ability to display productivity statistics (as in Ryznar) as part of Yokota's system. Similarly, the combination would be the use of a known technique (Ryznar's elementary time-tracking technique) to improve a similar device (Yokota's light guided assembly system) in the same way that Ryznar's technique was used with Ryznar's assembly system. The combination is also an example of using a known technique (Ryznar's time-tracking) on a known device (Yokota's assembly system) that is ready for the improvement (e.g., because Yokota already keeps track of time within its system to maintain assembly rhythm, but it does not necessarily record the time that an operator spends on an operation). [Yokota ¶¶ 30, 35.]

198. A POSITA would have a reasonable expectation of success with this combination given that Yokota and Ryznar disclose similar systems and because Yokota already kept track of how long an operation was expected to take. [Yokota ¶ 35 (“the irradiation location is switched upon each expiry of the required assembly time for each component $Q_i(m)_j$ recognized through lookup in the database 102 by the first processing unit 110.”)] There is also no conflict in combining Yokota with Pinhanez and Ryznar at the same time. Pinhanez discloses the use of a camera to capture image information.

Ryznar discloses the use of a computer to capture different kinds of information. There is no conflict of functionality between the two that would render the combination impossible or even difficult.

199. Yokota is analogous art to the '614 patent because it concerns the projection of assembly instructions using input signals and stored shapes for projection. Ryznar is cited as prior art in the '614 patent and is thus analogous art.

3. Claim 13 analysis

[13.0] The method of claim 12 further comprising recording the time duration while an operator is guided by said guide system.

200. Yokota discloses keeping track of the time that a product is at a location and changing the light indicators at pre-defined intervals. [Yokota ¶ 30, (explaining how Yokota tracks time).]
201. Ryznar additionally discloses *recording the time duration while an operator is guided by said guide system*. Ryznar states that its “control module 20 may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station 16 for system productivity reporting, or the like.” [Ryznar at 5:16-19.] Ryznar further explains that such time recording may be put on a display:

Display screen also includes cycle time monitoring display fields 148a and 148b which may be used to display to an operator the running time associated with performance of an operational step, previous running

times, average running times, and/or target times for completion of the operational steps. For example, cycle time monitoring display field 148a may show the cycle time to perform one or more previous or completed operational steps, while cycle time monitoring display field 148b may show the cycle time of the preceding and current operational step. A cycle time measurement may, for example, be initiated upon receipt of a first input signal 42 from sensor apparatus 26, and completed upon detection of a confirmation signal 48, 56, 84.

[Ryznar at 15:24-36.]

202. The examples above (and at least the previous running time, average running time, and previous cycle time) involve *recording the time duration while an operator is guided by said guide system*. Another example of this element appears in the following passage:

[C]ontrol module 20 may record cycle times of the individual operational steps at a work station 16 and/or the combined cycle time of operations at a work station 16. Such information is beneficial for balancing cycle times on the assembly line 18 to provide even workflow and for monitoring operator performance.

[Ryznar at 15:58-63.]

203. Yet another express teaching of *recording the time duration while an operator is guided by said guide system* appears when Ryznar states that

“control module 20, or another such computational device, may record and provide charts or reports regarding recorded error data, such as on misperformed steps, and/or cycle times.” [Ryznar at 16:8-11.]

204. Thus, based on all of the above evidence, Ryznar discloses [13.0], and the combination of Yokota with Pinhanez and Ryznar renders obvious claim 13.

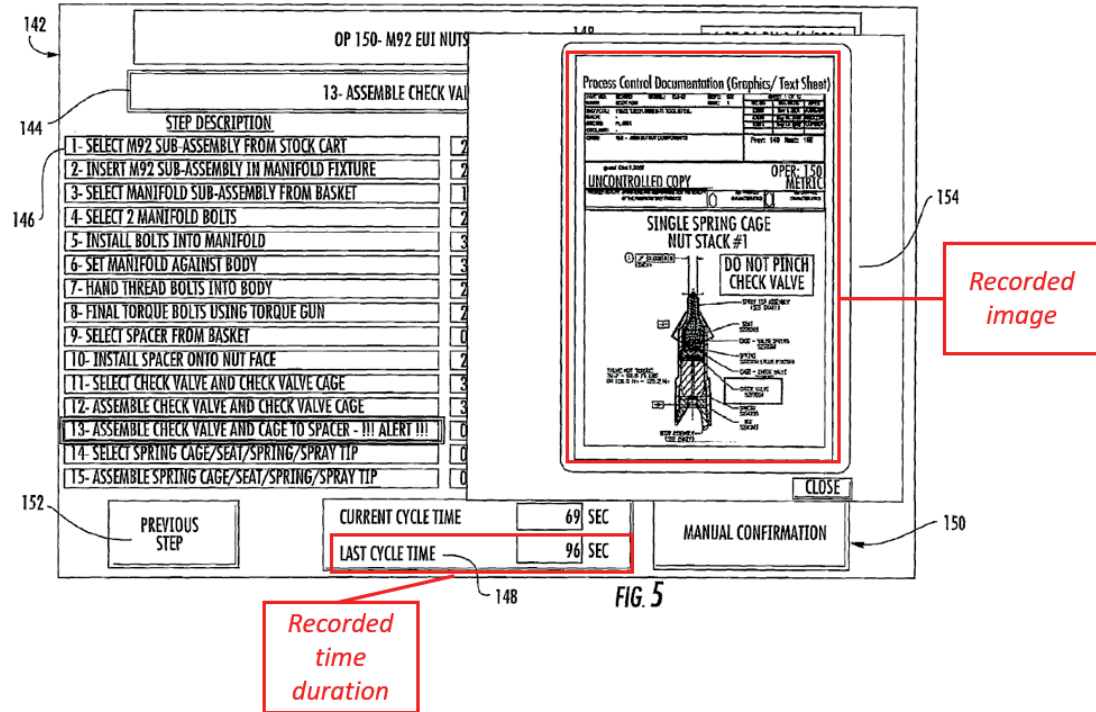
4. Claim 14 analysis

[14.0] The method of claim 13 further comprising displaying a recorded image and recorded time duration on a display device.

205. Yokota discloses a *display device*. [Yokota Figs. 1, 2 and ¶ 20 (describing image displaying device 232).]

206. Ryznar, like Yokota, discloses a *display device*, namely “display device 36.” Ryznar discloses a “display device 36 that is able to receive display signals 78 (FIG. 2) along link 80 (FIG. 1) from control module 20 and to relay information to the operator 12. Display device 36 may be constructed as a television, LCD, LED device, or other type of viewable display mechanism.” [Ryznar at 11:15-20.] Ryznar further discloses *displaying a recorded image and recorded time duration on a display device*. Ryznar explains that “[t]he display device may also be used to show or provide instructional videos, display running cycle times, desired cycle times, and/or alerts, or the like.” [*Id.* At 11:35-38.] For example, Ryznar Figure 5, shown

below in annotated form, demonstrates displaying a “recorded image” and “recorded time duration” simultaneously on a single display.



Ryznar Fig. 5 (annotated).

207. This combination of Ryznar and Yokota would have been obvious to a POSITA for the reasons stated above for claim 13. In addition, displaying a recorded image and recorded time duration on a display would be nothing more than applying the known technique from Ryznar to a device ready for the improvement (Yokota). Similarly, the combination is nothing more than combining prior art elements (Ryznar’s displaying of a recorded image and recorded time) with Yokota’s assembly station according to known methods to yield predictable results (of using Rynar’s display exactly as it is

disclosed in Ryznar). The combination is also use of a known technique (Ryznar's display of a recorded image and a recorded time duration) to improve a similar device (Yokota's workstation) in the same way.

208. Thus, Ryznar discloses [14.0] and the Yokota/Pinhanez/Ryznar combination renders obvious claim 14.

5. Claim 24 analysis

[24.0] The guide system of claim 23 wherein said guide system controller records images and time durations while an operator is guided by said guide system.

209. This element is disclosed by Ryznar and Pinhanez for the reasons stated above for claims 12 and 13. Specifically, Pinhanez discloses a system that *records images . . . while an operator is guided by said guide system*, as discussed above for claim 13. And Ryznar discloses a system that *records . . . time durations while an operator is guided by said guide system*.
210. Thus, Pinhanez and Ryznar disclose [24.0] and the Yokota-Pinhanez-Ryznar combination renders obvious claim 24.

6. Claim 25 analysis

[25.0] The guide system of claim 24 further comprising a monitor interfaced with said guide system controller, and wherein recorded images and time durations are viewable on said monitor.

211. This element is disclosed by Ryznar for the reasons stated above for claim 14. Specifically, Ryznar discloses *a monitor* (display device 36) *interfaced*

with said guide system controller (control module 20), and wherein recorded images and time durations are viewable on said monitor (as discussed above for claim 14).

212. Thus, Ryznar discloses [25.0] and the Yokota/Pinhanez/Ryznar combination renders obvious claim 25.

E. CHALLENGE 2A: Claims 1, 3-8 and 17-22 are rendered obvious by Yokota in combination with Fontanot

213. This challenge explains why it would have been obvious to combine the teachings of Yokota with teachings regarding a Manufacturing Execution System or a similar system, and why such a combination renders obvious claims 1, 3-8, and 17-22. Yokota describes a workstation that is designed to work in a manufacturing environment, but does not identify a specific manufacturing environment. Fontanot, U.S. Patent Application No. 2009/0105866 describes a manufacturing environment having a series of workstations or other assembly locations that coordinates actions through a Manufacturing Execution System.

1. Summary of Fontanot

214. Fontanot (Ex. 1010) “relates to the technical field of controlling a production process with a manufacturing execution system.” [Fontanot ¶ 2.] Fontanot is concerned with “complex manufacturing cases with bill of materials often made by hundreds of different sub-assemblies and components.” [Fontanot

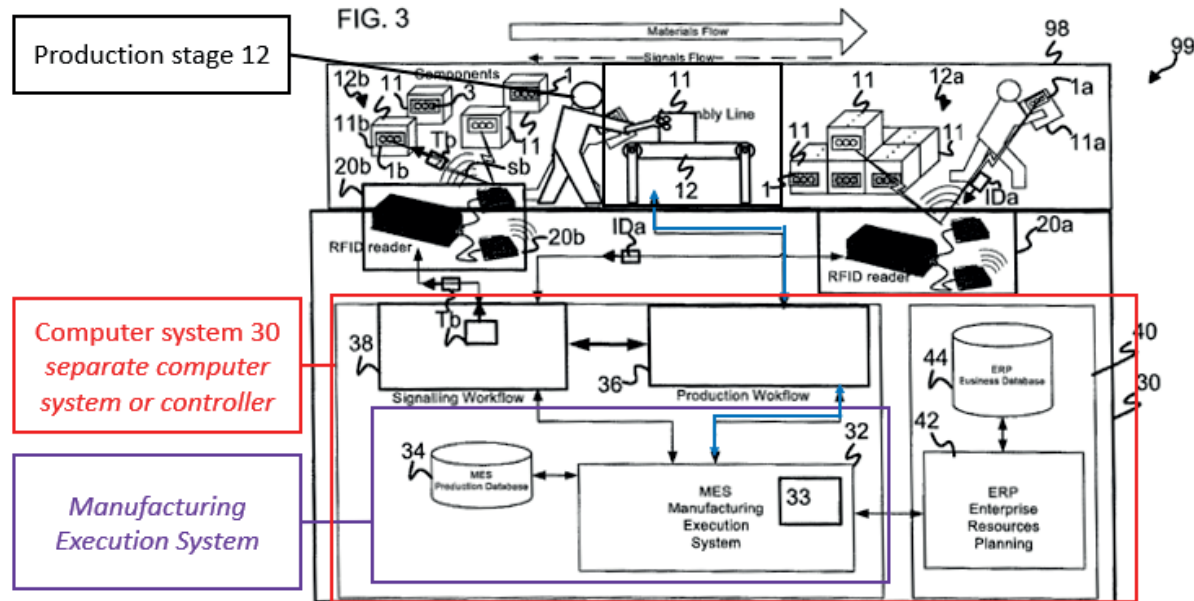
¶ 15.] For such cases, Fontanot addresses a particular way of: (1) attaching RFID trackers to the various parts and materials used in the manufacturing process; and (2) using a “manufacturing execution system” (“MES”) to manage the flow of items in the production system. Fontanot recognizes that “manufacturing execution systems” had been traditionally used to coordinate production activities and collect information about the flow of materials in a material-handling process. [Fontanot ¶ 20.] Fontanot proposes a more active role for the MES in “steering the flow of items in the production system.” [Fontanot ¶ 28.]

215. Fontanot describes its MES as follows:

[T]he MES 32 is responsible for the overall production control and the data collection tasks related to all activities involved in the manufacturing process. It is also responsible for the connection with the business-level information system 40. The MES 32 contains a production workflow 36 and a signaling workflow 38. The signaling workflow 36 controls the flow of information and the production workflow 38 controls the material processing and the flow of materials.

[Fontanot ¶ 46.] The MES is able to perform these tasks by gathering information from, and sending information to, the RFID devices attached to each of the items to be handled in the Fontanot manufacturing process.

[Fontanot ¶ 35; *see also* Fontanot ¶ 48 (“A software module of the MES 32 is dedicated to manage, under control of the appropriate workflow, the data I/O from/to the RFID reader units 20.”).] Fontanot depicts its system as shown below in an annotated version of Figure 3.



Fontanot Figure 3 (annotated).

216. In particular, Fontanot describes a way to gather the components required for a particular manufacturing step. Fontanot's system allows the recognition of a particular item (by RFID) at one workstation to set the "transport status" (authorization or prohibition to process an item) of an item at a different workstation. [Fontanot ¶¶ 49, 21.]

When some specific item 11*a* is requested for processing (e.g. an assembly operation) by a downstream production stage 12*b*, the system 99 identifies at an upstream

production stage 12*a* the just requested item 11*a* due to an RFID tag of an electronic device 1*a* that is attached to the item 11*a* and sends to the device 1*a* an authorizing signal indicating authorization for further processing the item.

[Fontanot ¶ 53.]

217. In Fontanot, “[t]he underlying MES infrastructure hosts both the control workflows and the basic services for the interconnection and communication with the RFID layer and the shop floor automation.” [Fontanot ¶ 58.] Fontanot uses its MES together with RFID readers 20*a* and 20*b* to supervise and control a manufacturing process. [Fontanot ¶ 48, (“A software module of the MES 32 is dedicated to manage, under control of the appropriate workflow, the data I/O from/to the RFID reader units 20.”).] In Fontanot, when the RFID reader system detects a product or item at one stage of production, the MES uses that information to cause a product or items (such as components for the first product or item) at another stage to be processed. This includes identifying the necessary components and providing a visual cue so that a worker can know which ones to select. Fontanot explains this process as follows:

According to a preferred embodiment the identification ID*a* of the first electronic device 1*a* is read out, by the wireless communication unit 20*a*. The identification ID*a* is forwarded to the computer system 30. Due to a

reception of the identification IDa by the computer system 30, a transport status Tb for a second item 11b is set. The transport status Tb indicates authorization to process the second item 11b. The transport status Tb is transmitted to the second electronic device 1b with an authorizing signal sb that is sent from the computer system 30 to the second electronic device 1b. The second device 1b then indicates the transport status by a visual signal, for example a green light, indicating authorization for personnel to process the second item 11b.

Alternatively, or in addition to the visual signal, due to the receiving of the transport status Tb the second item 11b is processed automatically, e.g. by a transportation system (see FIG. 4).

...

Visual signals authorizing or prohibiting item movements and/or processing are directly displayed on a visual signaling unit 3 of the device 1, 1a, 1b that is attached to an item 11, 11a, 1b, under MES supervision via RFID identification.

[Fontanot ¶¶ 49-50.]

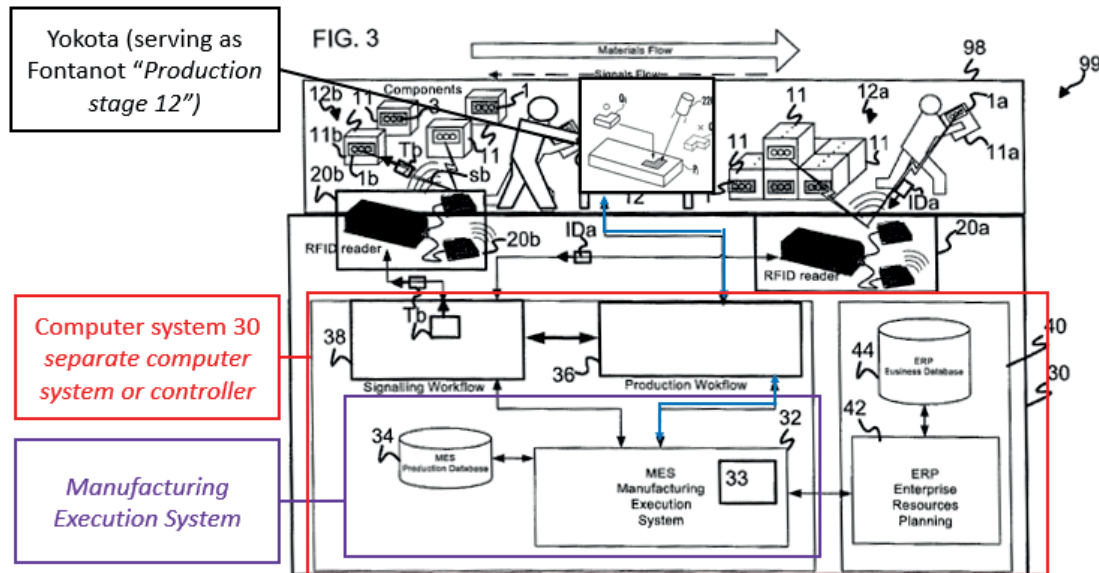
2. Rationale for combining Yokota and Fontanot

218. A POSITA would recognize that incorporating Yokota's assembly workstation into the Fontanot system would improve Yokota's assembly workstation by making it more suitable for use in a complicated

manufacturing process, in which the various components for each assembly task may also need to be manufactured via other assembly tasks. A POSITA would recognize that adding the Fontanot MES system to Yokota would also add more control and visibility into the system, including by tracking, for planning purposes, parts and components used. Fontanot also addresses a portion of the Yokota system that Yokota does not expressly address: the gathering of the components to be added to the semi-finished product.

219. Fontanot describes a system where “each production stage ... in a shop floor is capable to produce a great number of different items.” [Fontanot ¶ 52.] Furthermore, Yokota provides a workstation (production stage) that is designed specifically for that purpose. [Yokota ¶ 2, (explaining how products “such as automobiles and motorcycles, may be specified to have different variations or combinations of options depending on the user.”)] Using Fontanot’s MES to provide *input signals* to Yokota’s workstation would also have been obvious, because Fontanot’s MES sends signals to its production stages. [Fontanot ¶ 54, (“signals are backward propagated by the MES to all the upstream production stages.”); *see also id.*, ¶ 57-58]. Thus, Yokota’s flexible workstation is suitable for use as one of Fontanot’s production stages, as illustrated below in an annotated version of Fontanot

Fig. 3 that includes a portion of Yokota Fig. 3 inserted into its proper position in the assembly line.



Fontanot Fig. 3 and Yokota Fig. 3 (combined and annotated).

220. As noted above in Challenge 1A, Yokota uses product ID information to look up corresponding *visual display indicator* information. [Yokota ¶¶ 28-29.] It would also have been obvious that the messages sent by Fontanot’s MES to Yokota’s workstation would include the product ID for the material being produced. Each product in Fontanot contains an “electronic device 1” that “is equipped with an RFID transponder (also called an RFID tag).” [Fontanot ¶ 45.] “Each RFID transponder contains an identification in order to identify the electronic device and with it the item the electronic device is

attached to.” [*Id.*] Moreover, “a software module of the MES 32 is dedicated to manage, under control of the appropriate workflow, the data I/O from/to the RFID reader units 20.” [*Id.* ¶ 48.]

221. It would have been obvious to a POSITA that Fontanot would benefit from Yokota’s projected instructions. Fontanot’s MES can identify *which* components are needed for an assembly operation. [Fontanot ¶ 54; ¶ 58 steps 10-15.] However, Fontanot does not provide the worker with information on how the components should be assembled, whereas Yokota’s workstation has that capability using its projector and assembly management system. Notably, Fontanot’s MES could be configured to use Yokota’s database 102 to provide information such as “material requirements and information of the routing between production stages for each item” or vice-versa. [Fontanot ¶ 28; *compare* with Yokota ¶¶ 22-23.] In fact, Fontanot’s MES “preferably includes a workflow management system and retrieves information from a data base or from an external system for coordinating the flow of items.” [Fontanot ¶ 28.]
222. Thus, using Yokota’s workstation as a Fontanot production stage 12 is an obvious substitution of Yokota’s workstation in place of Fontanot’s generic production stage. The combination uses Fontanot’s MES and overall manufacturing environment with Yokota’s workstation to yield predictable

results (i.e., Fontanot's system, using Yokota's workstation exactly the way it was intended). The combination is the use of a known technique (Yokota's workstation) to improve a similar system (Fontanot's production stage 12) in the same way. Furthermore, it would have been obvious to try one of Yokota's workstations as a Fontanot production stage, as there are a finite number of production stages in the world and Yokota's production stage is suitable for that purpose. Accordingly, a POSITA would have been motivated to make this combination.

223. A POSITA would have a reasonable expectation of success with this combination given that Yokota's assembly station was designed to be used in the computerized manufacturing context (such as described in Fontanot).
224. Yokota is analogous art to the '614 patent because it concerns the projection of assembly instructions using input signals and stored shapes for projection. Fontanot is analogous to the '614 patent because it concerns a manufacturing execution system, which is a key element of many of the dependent claims of the '614 patent.

3. Claim 1 Analysis

225. The combination of Yokota and Fontanot discloses the elements of claim 1. As discussed above for claim 1 in Challenge 1A, Yokota renders claim 1 obvious. However, for purposes of this combination, the integration of

Yokota's workstation into Fontanot's system also impacts the requirement of element [1.3] that input signals are provided to the guide system controller by a separate computer system or controller. Therefore, I will discuss [1.3] in view of the Yokota/Fontanot combination.

[1.3] receiving a sequence of one or more input signals at said guide system controller, with the input signals being provided to said guide system controller by a separate computer system or controller to cause said guide system to project visual indicators for a particular guided operation

226. In the Yokota/Fontanot combination, the *input signals* to Yokota's workstation are provided by Fontanot's "computer system 30," which is a *separate computer system* containing the MES and the production workflow components. [Fontanot ¶ 46.] The separate nature of Fontanot's computer system 30 is shown below in an annotated version of Fontanot Fig. 3 that includes a portion of Yokota Fig. 3 inserted into its proper position in the assembly line.

228. The remaining elements of claim 1 are disclosed by Yokota as discussed in Challenge 1A above. Thus, the Yokota/Fontanot combination renders claim 1 obvious.

4. Claim 3 Analysis

[3.0] The method of claim 1, wherein the separate computer system or controller comprises a manufacturing execution system, and wherein said guide system controller is interfaced with said manufacturing execution system, and wherein said input signals are provided to said guide system controller from said manufacturing execution system.

229. The combination of Yokota and Fontanot discloses the elements of claim 3. Claim 3 requires that *the separate computer system or controller comprises a manufacturing execution system*. The '614 patent says that an MES is an example of an “operational program system 205.”

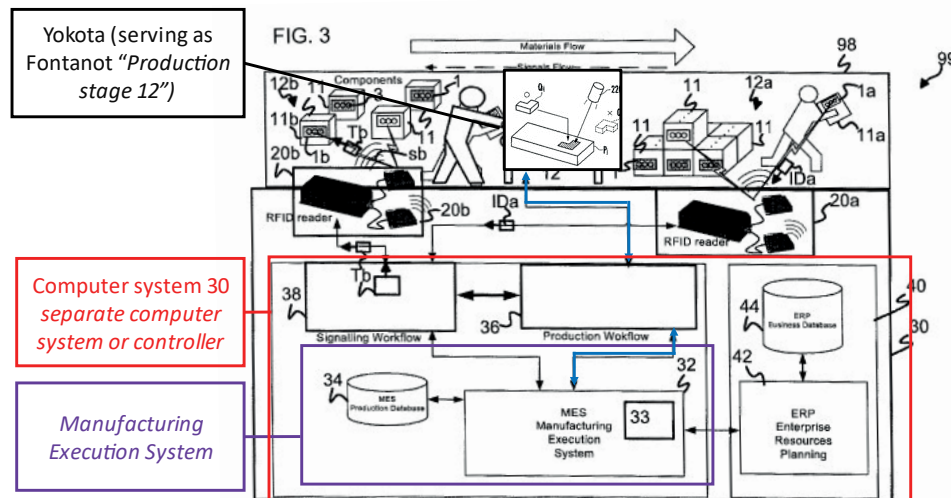
Guide system 200 is integrated or interfaced with an operational program system or operational software system or manufacturing execution system (MES) 205 whereby operational software system 205 may provide operational guide system 200 with input signals or data inputs 207 to create, control or cause the projector of operational guide system 200 to project specific display images 209 via the projected indicating light 252 and/or project in specific locations. Manufacturing, production, and/or assembly environments frequently employ operational software systems 205, which are sometimes referred to as enterprise resource planning (ERP)

systems, used in association with product planning,
production scheduling, inventory control, and the like.”

[’614 Patent at 14:18-24.] In other words, an MES is a type of software
system used for monitoring and directing a manufacturing process.¹⁰

230. Fontanot discloses that its *separate computer system or controller* (computer system 30) *comprises a manufacturing execution system* (MES 32), as illustrated below in an annotated version of Fontanot Fig. 3 that includes a portion of Yokota Fig. 3.

¹⁰ Not every piece of software that plays a role in monitoring or directing a manufacturing process is clearly a “manufacturing execution system.” For example, ERP software is considered operational software in the ’614 Patent but is not considered a “manufacturing execution system.” *See* https://en.wikipedia.org/wiki/Manufacturing_execution_system (“The idea of MES might be seen as an intermediate step between, on the one hand, an enterprise resource planning (ERP) system, and a supervisory control and data acquisition (SCADA) or process control system on the other; although historically, exact boundaries have fluctuated.”).



Fontanot Fig. 3 / Yokota Fig. 3, (combined and annotated).

As shown above in Figure 3, Fontanot’s computer system (including its Manufacturing Execution System) is separate from its production system.

[Fontanot ¶ 43 (“The system 99 contains a production system 98 and a computer system 30.”).]

231. Using the Yokota workstation as one of Fontanot’s “production stages 12” would also result in a system in which *said guide system controller is interfaced with said manufacturing execution system*. Specifically, in the combination, the Yokota assembly management system (*guide system controller*) would receive its product identification information via the manufacturing execution system. [Fontanot ¶ 46. (“MES32 is responsible for the overall production control and the data collection tasks related to all activities involved in the manufacturing process.”).] The resulting system

would also satisfy the limitation that *said input signals are provided to said guide system controller* (Yokota's assembly management system) *from said manufacturing execution system* (Fontanot's MES), because Fontanot's MES would be providing instructions to Yokota's system just as Fontanot does with other production stages. [Fontanot ¶ 54 ("Following the same principle, signals are backward propagated by the MES to all the upstream production stages 12, 12 a of the supply chain.").]

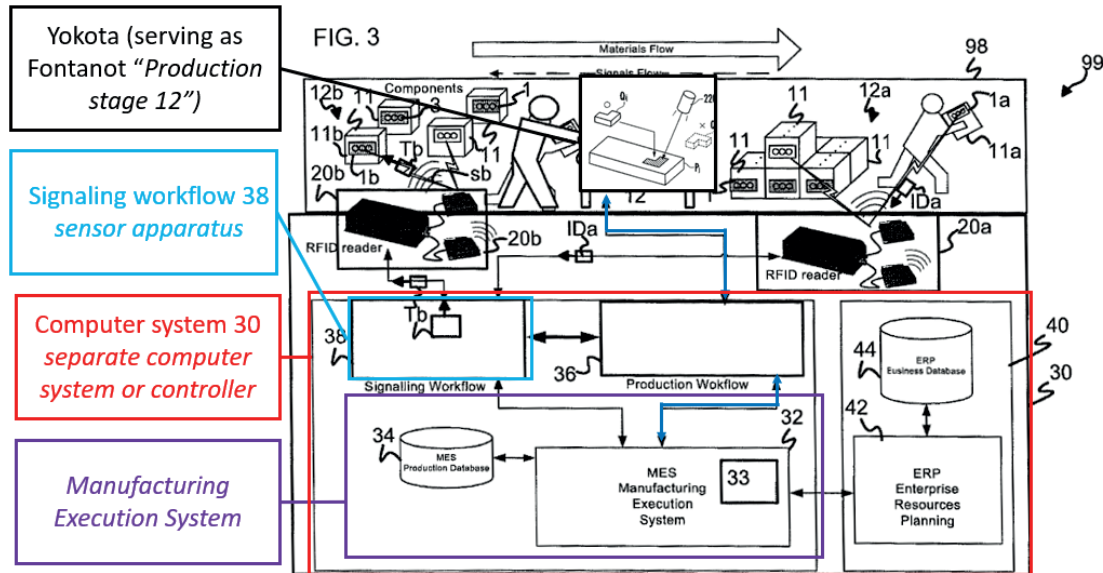
232. Thus, Yokota and Fontanot together disclose and render obvious all elements of claim 3.

5. Claim 4 Analysis

[4.0] The method of claim 3, wherein said manufacturing execution system receives signals from a sensor apparatus, and wherein said input signals are provided to said guide system controller based on said signals received by said manufacturing execution system from said sensor apparatus.

233. In Yokota, the assembly management system receives signals from a sensor apparatus, wherein said input signals are provided to said guide system controller (assembly management system) based on signals received ... from said sensor apparatus. [See, e.g., Yokota ¶ 8.] Yokota does not disclose those signals passing through a manufacturing execution system.
234. Fontanot, however, discloses that its *manufacturing execution system receives signals from a sensor apparatus* (signaling workflow 38) and uses

those signals to control manufacturing activities, as described above and as illustrated in the annotated figure below.



Fontanot Figure 3 / Yokota Fig. 3, combined and annotated.

235. In Fontanot, “[w]hen some specific item 11 a is requested for processing (e.g. an assembly operation),” [*id.* ¶ 53], the system (1) processes that specific item; and (2) replaces the processed item with another. [Fontanot ¶¶ 53-54.] As part of that chain of events, “signals are backward propagated by the MES to all the upstream production stages 12, 12 a of the supply chain, on the basis of the JIT [just in time] ‘pull’ requests coming from the downstream production stages.” [Fontanot ¶ 54.]
236. Thus, in the Yokota/Fontanot combination, when Fontanot’s MES *receives signals* regarding the need to process a new item, the result is that *input signals are provided* (“backward propagated by the MES”) to [the] guide

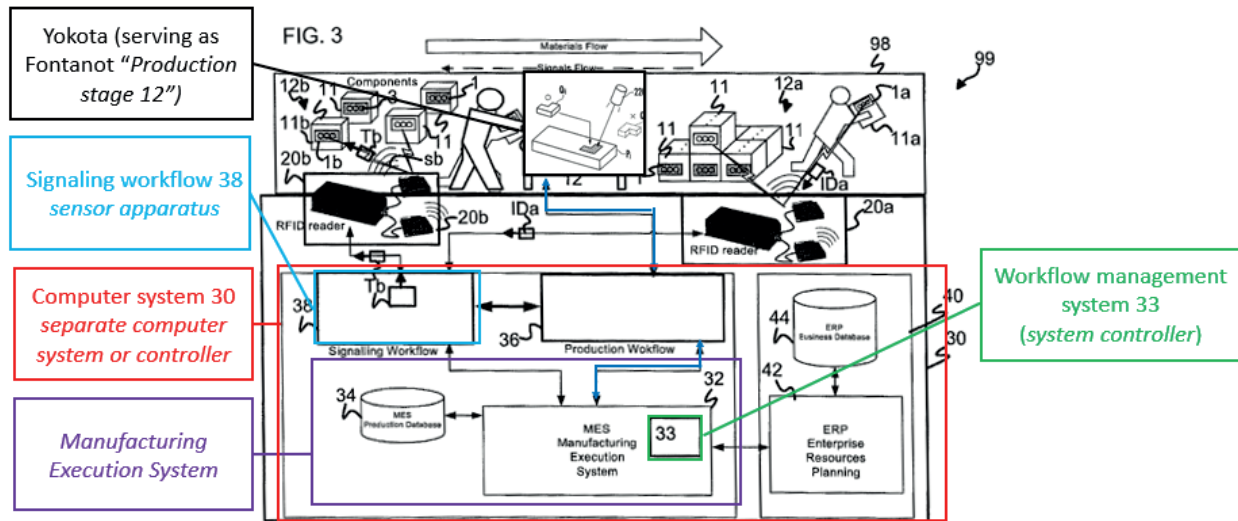
system controller (Yokota’s assembly management system) *based on [the] signals received by said manufacturing execution system from said sensor apparatus* (signaling workflow). [Fontanot ¶ 54.]

237. Thus, Yokota and Fontanot together disclose and render obvious all elements of claim 4.

6. Claim 5 Analysis

[5.0] The method of claim 1, wherein the separate computer system or controller comprises a system controller that controls the operation of an automated process, and wherein said guide system controller is interfaced with said system controller, and wherein said input signals are provided to said guide system controller from said system controller.

238. As discussed above for Challenge 2A, [1.3], Fontanot’s computer system 30 is a *separate computer system*. This computer system 30 *comprises a system controller* because it includes the “workflow management system 33”—that *controls the operation of an automated process* because it “provides the execution logic for the workflows for production and for signaling.” [Fontanot ¶ 47.] In the Yokota/Fontanot combination, the *guide system controller* (Yokota’s assembly management system) *is interfaced with said system controller* (workflow management system 33) via the MES and the production workflow, as illustrated in the annotated figure below.



Fontanot Fig. 3/Yokota Fig. 3, (combined and annotated).

239. Additionally, in Fontanot/Yokota, *said input signals are provided to said guide system controller from said system controller* for the reasons discussed above for claim 3. The “workflow management system 33” is “embedded in the MES layer provides the execution logic for the workflows for production and for signaling” and thus is responsible for the *input signals* sent by the MES. [Fontanot ¶ 47.]
240. Thus, Yokota and Fontanot together disclose and render obvious all elements of claim 5.

7. Claim 6 analysis

[6.0] The method of claim 5, wherein said system controller receives signals from a sensor apparatus, and wherein said input signals are provided to said guide system controller based on said signals received by said system controller from said sensor apparatus.

241. As discussed above for claim 5, Fontanot’s workflow management system 33 is a *system controller*. As discussed further discussed for claim 4, Fontanot has a *sensor system*, namely signaling workflow 38. Fontanot’s workflow management system 33 *receives signals from a sensor apparatus* because it “is used for coordinating and synchronizing both, the material flow and the signal flows.” [Fontanot ¶ 47.] In addition, because “workflow management system 33 [is] embedded in the MES layer [and] provides the execution logic for the workflows,” *input signals are provided to said guide system controller* (Yokota workstation) *based on said signals received by said system controller* (Fontanot workflow managements system 33) *from said sensor apparatus* (Fontanot signaling workflow 38) for the reasons stated above for claim 4.
242. Thus, Yokota and Fontanot together disclose and render obvious all elements of claim 6.

8. Claim 7 analysis

[7.0] The method of claim 5, wherein said system controller comprises a programmable logic controller.

243. The '614 patent does not define what a programmable logic controller is.

LightGuide has taken the position that a programmable logic controller is an industrial computer that has been ruggedized and adapted for the control of manufacturing processes. This position appears to be based on, or at least synonymous with, the 2023 definition from Wikipedia shown in:

https://en.wikipedia.org/wiki/Programmable_logic_controller. The September 30, 2010 version of this Wikipedia page defines a programmable logical controller as “a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or lighting fixtures.” [Ex. 1022 (*available at*

https://en.wikipedia.org/w/index.php?title=Programmable_logic_controller&oldid=387868860).]

244. Under this 2010 definition, Fontanot’s computer system 30 *comprises a programmable logic controller* because, among other things, it includes workflow management system 33 and thus is a computer adapted to control a manufacturing process. [Fontanot at ¶ 47 (“A workflow management system 33 embedded in the MES layer provides the execution logic for the

workflows for production and for signaling. The workflow management system 33 is used for coordinating and synchronizing both, the material flow and the signal flows.”); Fontanot at ¶ 46 (“The computer system 30 contains an MES 32, an MES production database 34, a business-level information system 40 including a system for enterprise resources planning 42 and an enterprise resources planning database 44. According to a preferred embodiment the MES32 is responsible for the overall production control and the data collection tasks related to all activities involved in the manufacturing process.”).]

245. Thus, Yokota and Fontanot together disclose and render obvious all elements of claim 7.

9. Claim 8 analysis

[8.0] The method of claim 5, wherein said system controller is interfaced with a manufacturing execution system.

246. Fontanot discloses that “[a] workflow management system 33 embedded in the MES layer provides the execution logic for the workflows for production and for signaling.” [Fontanot ¶ 47.] Thus, the *system controller* (workflow management system 33) *is interfaced with a manufacturing execution system* and the Yokota/Fontanot combination renders claim 8 obvious.
247. Thus, Yokota and Fontanot together disclose and render obvious all elements of claim 8.

10. Claim 17 analysis

248. The Yokota/Fontanot combination renders claim 17 obvious for the reasons discussed above as to claim 1. [17.3] is disclosed by Yokota/Fontanot for the reasons discussed above for Yokota/Fontanot [1.3]. The remaining elements are disclosed by Yokota alone as discussed for Challenge 1A. Thus, claim 17 is obvious.

11. Claim 18 analysis

[18.0] The guide system of claim 17, wherein the separate computer system or controller comprises a manufacturing execution system, and wherein said guide system controller is interfaced with said manufacturing execution system, and wherein said input signals are provided to said guide system controller from said manufacturing execution system.

249. The Yokota-Fontanot combination discloses these limitations as set forth above for claim 3. Thus, claim 18 is obvious.

12. Claim 19 analysis

[19.0] The guide system of claim 17, wherein the separate computer system or controller comprises a system controller that controls the operation of an automated process, and wherein said guide system controller is interfaced with said system controller, and wherein said input signals are provided to said guide system controller from said system controller.

250. The Yokota-Fontanot combination discloses these limitations as set forth above for claim 5. Thus, claim 19 is obvious.

13. Claim 20 analysis

[20.0] The guide system of claim 19, wherein said system controller receives signals from a sensor apparatus, and wherein said input signals are provided to said guide system controller based on said signals received by said system controller from said sensor apparatus.

251. The Yokota-Fontanot combination discloses these limitations as set forth above for claim 6. Thus, claim 20 is obvious.

14. Claim 21 analysis

[21.0] The guide system of claim 20, wherein said system controller comprises a programmable logic controller.

252. The Yokota-Fontanot combination discloses these limitations as set forth above for claim 7. Thus, claim 21 is obvious.

15. Claim 22 analysis

[22.0] The guide system of claim 21, wherein said system controller is interfaced with a manufacturing execution system.

253. The Yokota-Fontanot combination discloses these limitations as set forth above for claim 8. Thus, claim 22 is obvious.

F. CHALLENGE 2B: Claims 2, 9-16, and 23-25 are obvious based on the Yokota/Fontanot combination and the prior art of Challenges 1A-1D

254. As discussed in Challenges 1A – 1D, claims 2, 9-16, and 23-25 are either rendered obvious by Yokota (claims 2, 9) or rendered obvious by Yokota in combination with Ramsager (claims 10-11, 15-16), Pinhanez (claims 12, 23) or Pinhanez/Ryznar (claims 13-14, 24-25). Pinhanez and Ryznar's

disclosures also apply to the Yokota/Fontanot combination. The dependent claims' additional elements only impact the Yokota workstation and would not be affected by the workstation receiving input signals from an MES instead of an RFID reader.

255. In particular, of the claims at issue in this Challenge:

- Claim 2 concerns how an input signal is used, but is not affected by where the input signal comes from;
- Claim 9 concerns what the workstation displays; and
- Claims 10-16 and 23-25 concern additional equipment, such as cameras, displays, or confirmation signal equipment that could be used at a workstation. Such equipment could easily be integrated with an MES, but that is not required by these claims.

256. Thus, none of the claim limitations of claims 2, 9-16, and 23-25 are impacted by the further combination with Fontanot. The claims are thus obvious when the art of Challenges 1A – 1D is further combined with Fontanot.

G. CHALLENGE 3A: Claims 1 and 17 are rendered obvious by the combination of Yokota and Machino

257. I have also been asked to determine whether the combination of Yokota and Machino (Ex. 1007) renders claims 1 and 17 obvious. In my opinion, this combination of references also shows that these claims are obvious.

258. In particular, it would have been obvious to implement Machino's remote supporter functionality as part of Yokota, which would have provided Yokota's workstation with a new dimension of dynamic projection capabilities.

1. Summary of Machino (Ex. 1007)

259. *Remote-Collaboration System Using Mobile Robot with Camera and Projector* (Ex. 1007, "Machino") concerns "a remote-collaboration system called SCOPE (sight collaboration by projection effect) featuring image projecting and capturing capabilities." [Machino at Abstract.] Machino was presented at the IEEE International Conference on Robotics and Automation in May 2006. I have been informed that it is prior art to the '614 patent.
260. Figure 11 of Machino, which is reproduced below for convenience, shows an example of the kind of remote collaboration enabled by SCOPE. The photograph shows a projector and camera on the lower right side. The projected light is shown on the wall behind the kneeling worker located on site. The projection also shows a boundary that indicates the region of space that the camera is capturing and transmitting back for display on the monitor of the remote support person.

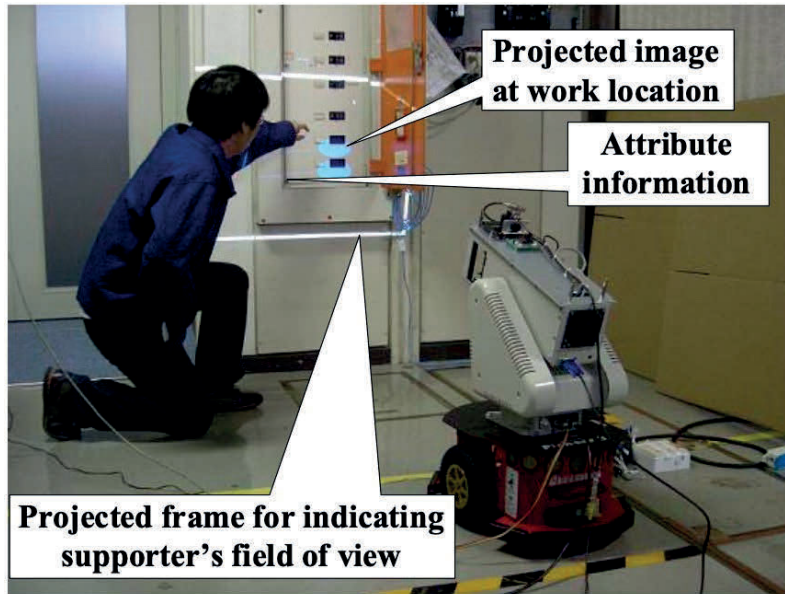


Fig. 11 Mobile SCOPE (on-site location).

Machino, Fig. 11.

261. Figure 12 of Machino, which is reproduced below for convenience, shows a screen shot of the monitor that is located remotely with the remote support person. The remote monitor displays the camera feed of the “on-site image” on the left side.

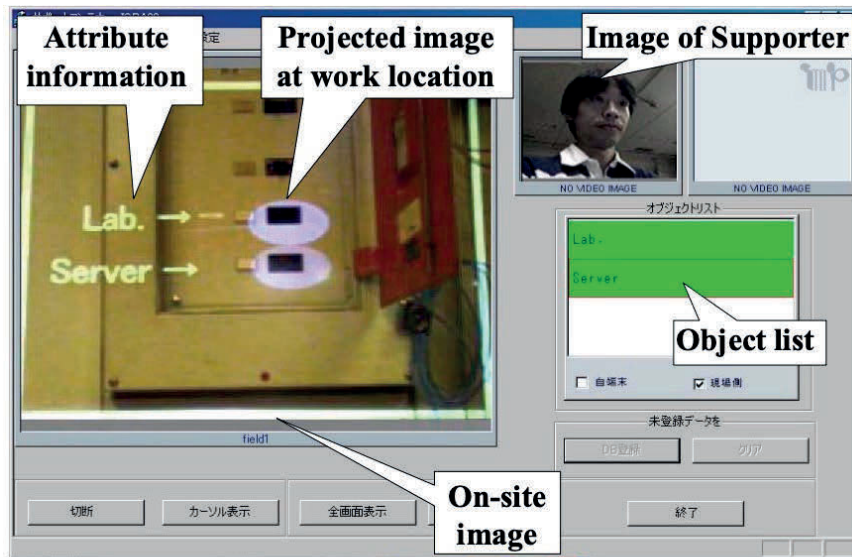


Fig. 12 Screen shot (supporter's location).

Machino, Fig. 12.

262. In Machino, both projector and camera are connected to an on-site, network-enabled PC, allowing video and other information to be shared with a remote user, as illustrated below in Machino Fig. 3.

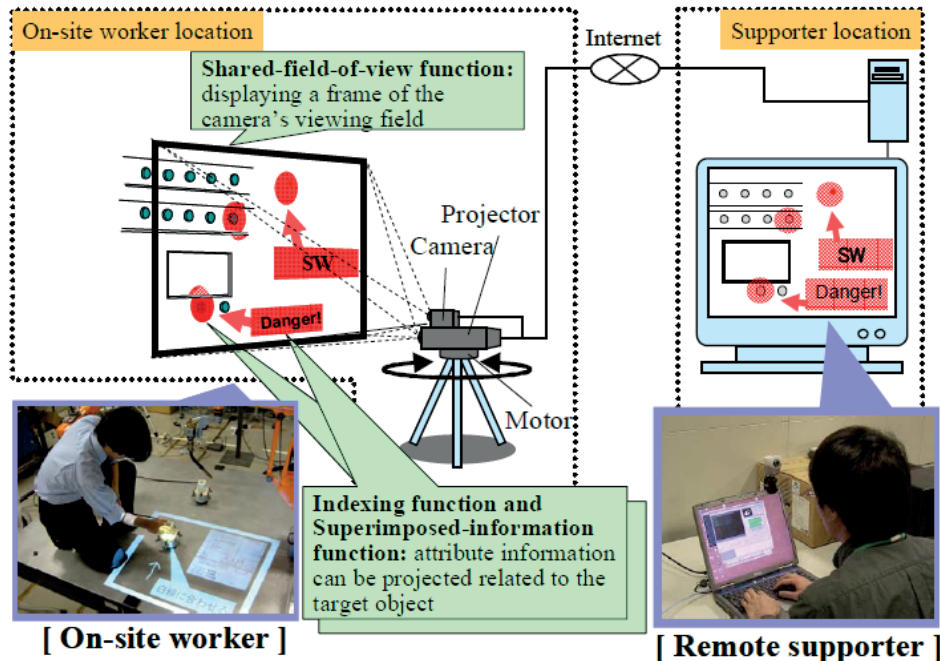


Fig. 3 SCOPE system.

Machino Fig. 3.

263. As the above figure shows, Machino combines a projector and a camera so that both the local and the remote worker can see the same information. The projector superimposes information on the real-world scene so that the on-site worker can see it. The camera relays the scene (including the projections) to the remote supporter. The projections can be manipulated by the on-site worker using “a laser pointer as an input interface.” [Machino at 2-3.] “At the supporter’s location, the projected image is shown on a communication screen, which displays images transmitted from the on-site worker’s location, and manipulated using the PC’s mouse.” [Machino at 3.] Thus, the projection of images in the SCOPE system are “dynamic” because

the on-site work and the remote worker choose, via an interface, what information to project and when to project it.

2. Combination Rationale

264. It would have been obvious to a POSITA to combine Yokota and Machino for several reasons.
265. First, Yokota already provides the ability to display information to an on-site worker based on a database. Machino provides the additional ability for “veteran” workers to provide guidance to “on-site worker[s].” [Machino at 1.] Adding Machino’s functionality to Yokota would have benefited Yokota by permitting a remote support person to assist on-site workers if they encountered problems that they (or the existing computer system) could not resolve. Moreover, Machino discloses that a remote collaborator can select what information to display to the local worker. [Machino at 3 (“At the supporter’s location, the projected image is shown on a communication screen, which displays images transmitted from the on-site worker’s location, and manipulated using the PC’s mouse.”) (emphasis added).]
266. Yokota’s database would further enable the remote worker to select what shapes to project using an address identifier (or a user input that is converted into an address identifier) rather than transmitting the entire shape from the remote worker’s computer. Additionally, adding Machino’s remote support

technology involves simply applying a known improvement (Machino's remote support capabilities) to a known system (Yokota) ready for the improvement (because Yokota already projected instructions to guide workers). The combination is also obvious to try, as a finite number of ways exist to provide real-time remote instructions to a local worker—i.e., telephone, traditional flat-panel display, or projection.

267. Finally, in consideration of the above evidence, a POSITA would have had a reasonable expectation of success in combining Yokota and Machino to achieve the '614 patent's intended purpose of providing a more dynamic light-guide projection technique. Moreover, the references are analogous to the '614 patent because they are within the same field of invention and are reasonably pertinent to the problem the inventors intended to solve: using visual indicators to guide actions of individuals performing actions. ['614 patent at 1:15-18.]

3. Analysis of Claims 1 and 17

268. My analysis of the Yokota/Machino combination incorporates fully my explanation in Challenge 1 of the reasons why claims 1 and 17 are obvious over Yokota. Additionally, the *dynamic creation* limitations are further rendered obvious by Machino, as discussed below.

a. Obviousness of “creation of a dynamic, real time projection of visual indicators” limitations

269. The Yokota/Machino combination renders obvious *creation of a dynamic real time projection of visual indicators*. Machino’s projections are controlled by its remote user, resulting in *creation of a dynamic real time projection of visual indicators*. For example, an on-site worker is shown below in Machino Fig. 11 working with a projected image.

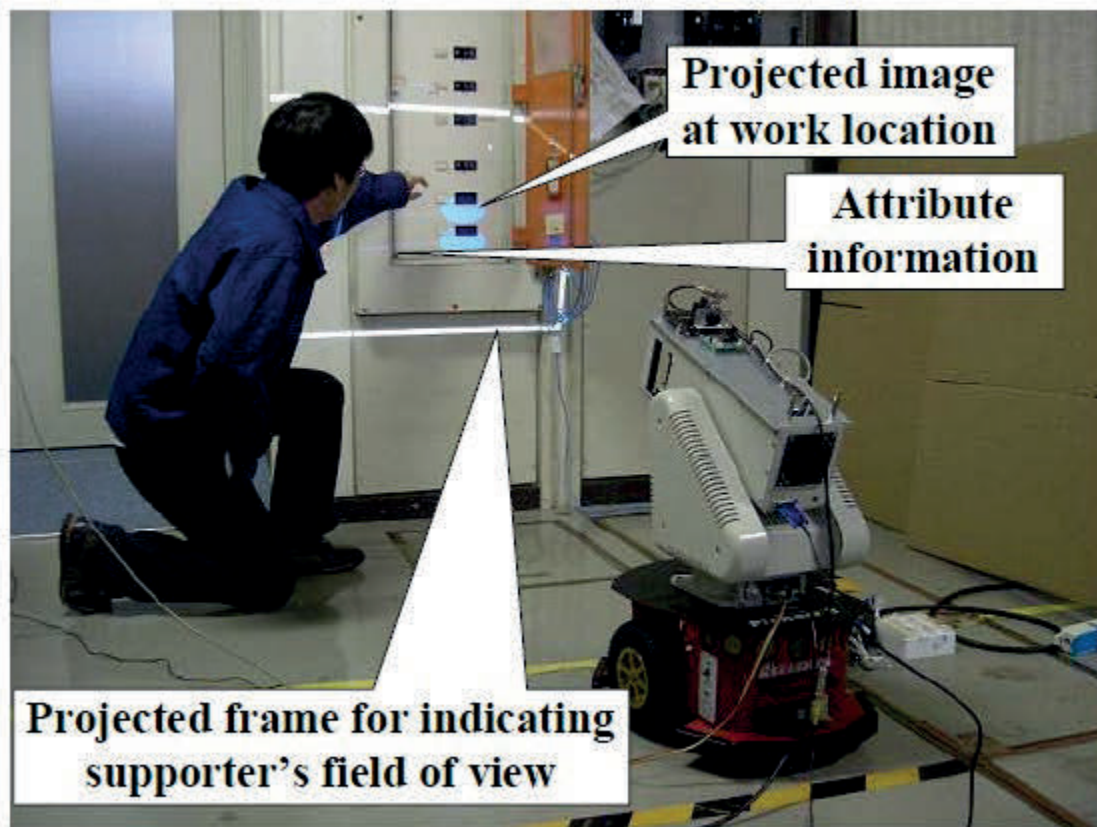


Fig. 11 Mobile SCOPE (on-site location).

Machino, Fig. 11.

270. This projection is created using information from a remote user, who watches the local workspace and provides instructions to the projector using the interface below in Machino Fig. 12.

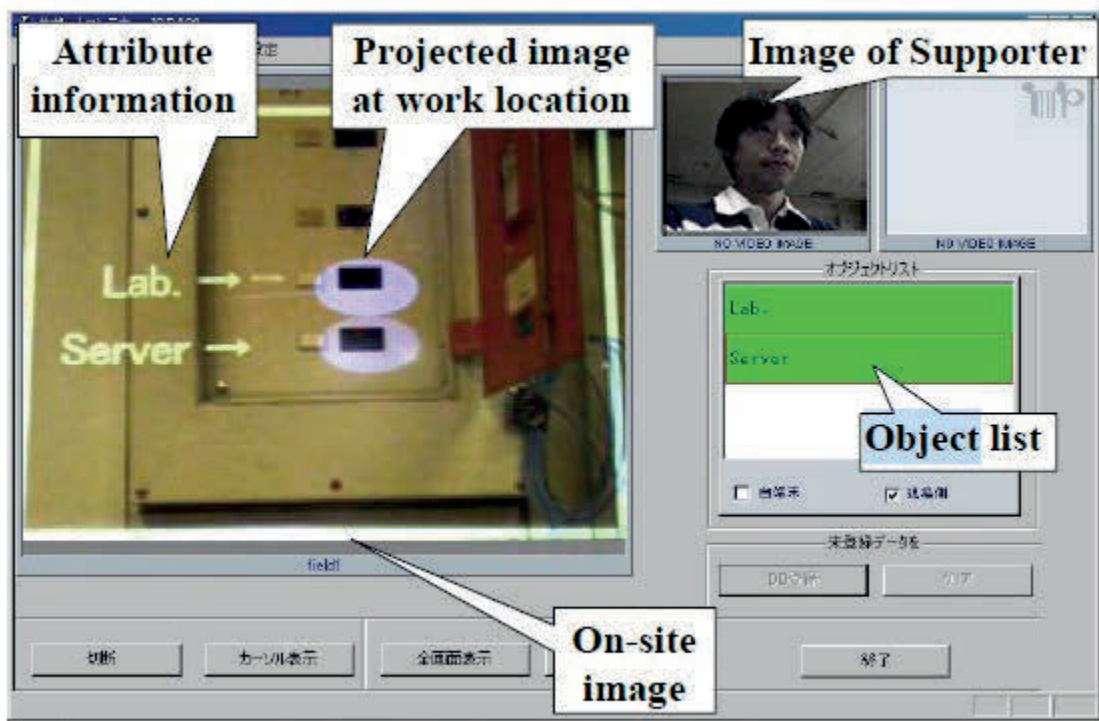


Fig. 12 Screen shot (supporter's location).

Machino Fig. 12.

271. This is *creation of a dynamic, real time projection of visual indicators*. The on-site worker and the remote supporter can both manipulate the projection, causing SCOPE to create a projection dynamically and in real time.
- [Machino at 3 (“At the on-site worker’s location, the laser pointer is used to manipulate the projected image. At the supporter’s location, the projected image is shown ... and manipulated using the PC’s mouse.”).] Additionally,

a POSITA would recognize that common shapes, such as the oval highlighting or arrows, would be stored in the computer at the on-site workers' location, and invoked by *input signals* sent from the remote user's computer to the workstation (i.e., to make the system more responsive by reducing download latency). Thus, in the Yokota/Machino combination, *creation of a dynamic, real time projection of visual indicators* occurs both as a result of Yokota's own functionality and due to the dynamic functionality disclosed in Machino as projections and instructions are created on the fly by the remote supporter.

272. The remaining claim elements are disclosed or rendered obvious by Yokota for the reasons stated above for Challenge 1. For clarification as to Challenge 3A claim 17, the *creation of a dynamic, real time projection of visual indicators* limitation is disclosed as set forth in both Challenge 1 and this Challenge 3A and the remaining limitations are disclosed as set forth for Challenge 1. Accordingly, claims 1 and 17 are rendered obvious by the combination of Yokota and Machino.

H. CHALLENGE 3B: Claims 2-16 and 18-25 are obvious based on the Yokota/Machino combination and the prior art of Challenges 1A-1D and Challenge 2A-2B

273. As discussed above, claims 2-16 and 18-25 are obvious as stated in my analysis for Challenges 1A-1D and 2A-2B. However, if Machino is required

to satisfy the limitation *a combination of the sequence of input signals resulting in a creation of a dynamic, real time projection of visual indicators*, then the dependent claims are unpatentable based on

Yokota/Machino in combination with the other references discussed above.

Adding Machino solely impacts Yokota's internal workings and does not interfere with Yokota's combination with Fontanot, Ramsager, Pinhanez, or Ryznar. For example, use of Machino only adds additional information that would be rendered by Yokota's projector. That information would only supplement what was being displayed from other sources, such as Yokota's database 102 or Fontanot's MES-related hardware. In particular, none of the dependent claims recite or invoke the *a creation of a dynamic, real time projection of visual indicators* limitations.

* * *

274. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.
275. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.
276. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Date: October 31, 2023

By: 
William Singhose

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Appendix A

277. This Appendix describes specific database principles that would conventionally be used to query and structure Yokota’s database 102, as that process is described in Yokota. I note that what is described in this Appendix is not the only way that Yokota’s database could be conventionally structured or queried. However, these principles do represent an obvious application of traditional and conventional database practices to the teachings of Yokota, and how Yokota’s database could generally be implemented behind-the-scenes.
278. As Kroenke teaches, conventionally, a database query is written in “Structured Query Language (SQL)—the universal query language of relational [database] products.” [Kroenke at 32.] “SQL is ubiquitous and SQL programming is a critical skill.” [Kroenke at 36.] The “basic form of SQL queries uses the SQL SELECT/FROM/WHERE framework,” which retrieves one or more specific column/table/row combinations from a database. [Kroenke at 36.] More specifically:
- “The SQL SELECT clause specifies which columns are to be listed in the query results.” [Kroenke at 36.]
 - “The SQL FROM clause specifies which tables are to be used in the query.” [Kroenke at 36.]

- “The SQL WHERE clause specifies which rows are to be listed in the query results.” [Kroenke at 36.]

279. Yokota discloses that its system “recognizes the component Q_{ij} to be assembled onto the semi-finished product P_j in the ith area A_i, the assembly location thereof, the assembly orientation, weight, etc., through lookup in a database 102 based on the product identification information.” [Yokota ¶ 28.] Conventionally, this functionality would be implemented using a SQL database query or a more user friendly form that generates a SQL database query. [Kroenke at 32] (explaining that “Structured Query Language (SQL) [is] the universal query language of relational [database] products.”) Such a database query would seek out the row or rows corresponding to the component Q_{ij} that is to be assembled at a given production location. The query would search for rows having matching production identification information and then return the corresponding columns for the requested information regarding component Q_{ij}, including “assembly location,” “assembly orientation,” and “weight, etc.” [Yokota ¶ 8.] Other teachings of Yokota disclose that Yokota’s query would also return the columns corresponding to the *display features*, i.e., “component identification information,” and “component shape.” [See Yokota ¶ 8 (“the first processing means recognizes component identification information,

component shape or assembly orientation”), ¶ 29 (displaying such information using light irradiation device 220).]

280. A POSITA would therefore read Yokota’s description of a database lookup as, conventionally, referring to a lookup such as the following (using SQL queries and conventional descriptive column naming conventions):

- SELECT Component_Shape, Component_ID, Assembly_Location, Assembly_Orientation, Component_Weight
- FROM Assembly_Table
- WHERE Product_ID = [information read from RFID tag 212]¹¹

281. In this way, the SELECT/FROM/WHERE statement would use column name information and product identification information to identify the column and row location of a particular component shape or component information within the database. As discussed above for [1.2], a query such as this would involve *each display feature* (component shape or component identification information) having *a unique pre-programmed individual address identifier* (e.g., based on row information that matched the product

¹¹ An additional WHERE operand might include the assembly location A_i , which corresponds to the location of the workstation within the assembly line and is stored in database 102, as described in Yokota ¶ 22.

identification information read by Yokota's RFID reader and column names that corresponds to the *display feature* being sought).