

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner

v.

FACETOFACE BIOMETRICS, INC.,
Patent Owner

Inter Partes Review Case No. IPR2023-00833
U.S. Patent No. 11,042,623

DECLARATION OF BENJAMIN B. BEDERSON

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I, Benjamin B. Bederson, hereby declare the following:

I. INTRODUCTION

1. My name is Benjamin B. Bederson, and I am over 21 years of age and otherwise competent to make this Declaration. I make this Declaration based on facts and matters within my own knowledge and on information provided to me by others, and, if called as a witness, I would competently testify to the matters set forth herein. I have been retained by counsel for the Petitioner Apple Inc. (“Apple” or “Petitioner”) to provide my independent opinions on certain issues requested by Counsel for Petitioner relating to the accompanying Petition for Inter Partes Review of U.S. Patent No. 11,042,623 (“the ’623 Patent”). I understand that the Challenged Claims are claims 1-20. My opinions are limited to those Challenged Claims.

2. My compensation in this matter is not based on the substance of my opinions or the outcome of this matter. I have no financial interest in Petitioner. I am being compensated at an hourly rate of \$600 for my analysis and testimony in this case.

A. Background and Qualifications

3. I have summarized in this section my educational background, career history, and other qualifications relevant to this matter. I have also included a current version of my curriculum vitae attached herein as Appendix A.

4. I received a Bachelor of Science degree in Computer Science with a

minor in Electrical Engineering from Rensselaer Polytechnic Institute (“RPI”) in 1986. I received a Master of Science degree and a Ph.D. in Computer Science from New York University (“NYU”) in 1989 and 1992, respectively.

5. Since 1998, I have been a Professor of Computer Science at the University of Maryland (“UMD”), where I have joint appointments at the Institute for Advanced Computer Studies and the College of Information Studies (Maryland’s “iSchool”) and am currently Professor Emeritus. I was also Associate Provost of Learning Initiatives and Executive Director of the Teaching and Learning Transformation Center from 2014 to 2018. I am a member and previous director of the Human-Computer Interaction Lab (“HCIL”), the oldest and one of the best known Human-Computer Interaction research groups in the country. Last year, I co-founded the J.S. Bryant School, a therapeutic high school to open to students in 2025. I was also co-founder and Chief Scientist of Zumobi, Inc. from 2006 to 2014, a Seattle-based startup that is a publisher of content applications and advertising platforms for smartphones. I am also co-founder and co-director of the International Children’s Digital Library (“ICDL”), a web site launched in 2002 that provides the world’s largest collection of freely available online children’s books from around the world with an interface aimed to make it easy for children and adults to search and read children’s books online. I was also co-founder and Chief Technology Officer of Hazel Analytics from 2014-2023, a data analytics company whose

product sends alerts in warranted circumstances. In addition, I have for more than 15 years consulted for numerous companies in the area of user interfaces, including EPAM, Hillcrest Labs, Lockheed Martin, Logitech, Microsoft, NASA Goddard Space Flight Center, the Palo Alto Research Center, and Sony.

6. For more than 30 years, I have studied, designed, and worked in the field of computer science and human-computer interaction. My experience includes 30 years of teaching and research, with research interests in human-computer interaction and the software and technology underlying today's interactive computing systems. This includes the design and implementation of software applications on mobile devices, including smart phones and PDAs, such as my work on DateLens, LaunchTile, and StoryKit described below.

7. At UMD, my research is in the area of Human-Computer Interaction ("HCI"), a field that relates to the development and understanding of computing systems to serve users' needs. Researchers in this field are focused on making universally usable, useful, efficient, and appealing systems to support people in their wide range of activities. My approach is to balance the development of innovative technology that serves people's practical needs. Example systems following this approach that I have built include PhotoMesa (software for end users to browse personal photos), DateLens (2002 software for end users to use their mobile devices efficiently access their calendar information), LaunchTile

(2005 “home screen” software for mobile devices to allow users to navigate apps in a zoomable environment), SpaceTree (2001 software for end users to efficiently browse very large hierarchies), ICDL (International Children’s Digital Library I co-founded in 2001), and StoryKit (a 2009 iPhone app for children to create stories).

8. LaunchTile led to my creation of Zumobi in 2006, where I was responsible for investigating new software platforms and developing new user interface designs that provide efficient and engaging interfaces to permit end users to access a wide range of content on mobile platforms (including the iPhone and Android-based devices). For example, I designed and implemented software called “Ziibii,” a “river” of news for iPhone, software called “ZoomCanvas,” a zoomable user interface for several iPhone apps, and iPhone apps including “Inside Xbox” for Microsoft and Snow Report for REI. At the International Children’s Digital Library (ICDL), I have since 2002 been the technical director responsible for the design and implementation of the web site, www.childrenslibrary.org (originally at www.icdlbooks.org). In particular, I have been closely involved in designing the user interfaces as well as the software architecture for the web site since its inception in 2002. I developed a mobile version of the ICDL for iPhone in 2007 that was publicly available in Apple’s App Store. I then developed a mobile app called StoryKit that allowed children to create and tell stories using an iPhone and its touch

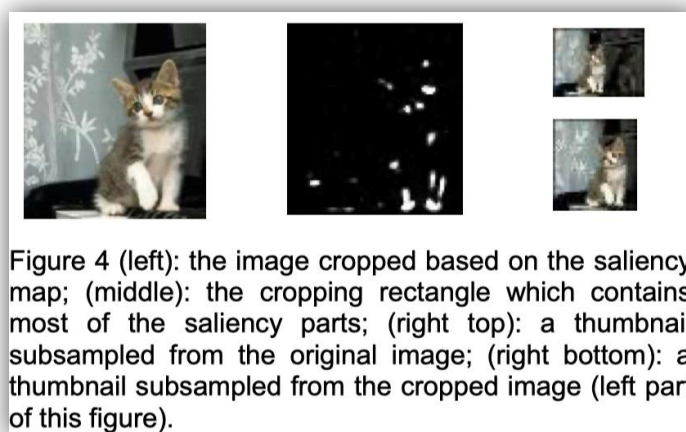
screen. It was publicly available in Apple's App Store starting in 2009.

9. Beginning in the mid-1990s, I have been responsible for the design and implementation of numerous other web sites in addition to the ICDL. For example, I designed and built my own professional web site when I was an Assistant Professor of Computer Science at the University of New Mexico in 1995 and have continued to design, write the code for, and update both that site (which I moved to the University of Maryland in 1998, currently at <http://www.cs.umd.edu/~bederson/>) as well as numerous project web sites, such as Pad++, <http://www.cs.umd.edu/hcil/pad++/>. I received the Janet Fabri Memorial Award for Outstanding Doctoral Dissertation for my Ph.D. work in robotics and computer vision. I have combined my hardware and software skills throughout my career in Human-Computer Interaction research, building various interactive electrical and mechanical systems that couple with software to provide an innovative user experience.

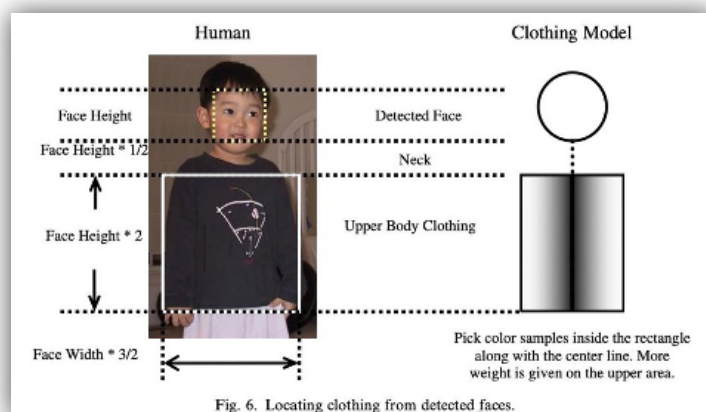
10. One of my projects involved image processing as it related to personal photo management. For example, I wrote a 2003 paper¹ describing the use of image processing to analyze image content and automatically crop away portions of the

¹ Bongwon Suh, Haibin Ling, Benjamin B. Bederson, and David W. Jacobs. 2003. Automatic thumbnail cropping and its effectiveness. In Proceedings of the 16th annual ACM symposium on User interface software and technology (UIST '03). Association for Computing Machinery, New York, NY, USA, 95–104. <https://doi.org/10.1145/964696.964707>

photo leaving the salient parts which would be easier to see in small thumbnails.



11. In 2007, I wrote a paper that continued that line of work, describing further image processing to organize photos based on identifying the clothes that people were wearing to group them.



12. My work has been published extensively in more than 160 technical publications, and I have given about 100 invited talks, including 9 keynote lectures. I have won numerous awards including the Brian Shackel Award for “outstanding contribution with international impact in the field of HCI” in 2007, and the Social

Impact Award in 2010 from Association for Computing Machinery's ("ACM") Special Interest Group on Computer Human Interaction ("SIGCHI"). ACM is the primary international professional community of computer scientists, and SIGCHI is the primary international professional HCI community. I have been honored by both professional organizations. I am an "ACM Distinguished Scientist," which "recognizes those ACM members with at least 15 years of professional experience and 5 years of continuous Professional Membership who have achieved significant accomplishments or have made a significant impact on the computing field." I am a member of the "CHI Academy," which is described as follows: "The CHI Academy is an honorary group of individuals who have made substantial contributions to the field of human-computer interaction. These are the principal leaders of the field, whose efforts have shaped the disciplines and/or industry and led the research and/or innovation in human-computer interaction." The criteria for election to the CHI Academy are: cumulative contributions to the field; impact on the field through development of new research directions and/or innovations; and (3) influence on the work of others.

13. I have appeared on radio shows numerous times to discuss issues relating to user interface design and people's use and frustration with common technologies, web sites, and mobile devices. My work has been discussed and I have been quoted by mainstream media around the world over 120 times, including by

the New York Times, the Wall Street Journal, the Washington Post, Newsweek, the Seattle Post-Intelligencer, the Independent, Le Monde, NPR's All Things Considered, New Scientist Magazine, and MIT's Technology Review.

14. I have designed, programmed, and publicly deployed dozens of user-facing software products that have cumulatively been used by millions of users. My work is cited in patents by several major companies, including Amazon, Apple, Facebook, Google, and Microsoft.

15. I am the co-inventor of 14 U.S. patents and 20 U.S. patent applications which are generally directed to user interfaces/experience.

16. Based on my experiences described above, and as indicated in my Curriculum Vitae, I am qualified to provide the following opinions with respect to the patents in this case. Additionally, I was at least a person having ordinary skill in the art as of the priority date of the '623 Patent as described herein.

17. In writing this declaration, I have considered my own knowledge and experience, including my work experience in the fields of computer science and human-computer interaction; my experience in teaching those subjects; my experience in developing companies and products in those subjects; and my experience in working with others involved in those fields, my experience in designing and implementing software systems, and user interfaces. In reaching my opinions in this matter, I have focused on the following references and materials:

Exhibit	Description
Exhibit 1001	U.S. Patent No. 11,042,623 (“’623 Patent”)
Exhibit 1002	File History of U.S. Patent No. 11,042,623 (“’623 File History”)
Exhibit 1004	U.S. Patent Publication No. 2013/0235045 to Corazza et al. (“Corazza”)
Exhibit 1005	U.S. Patent 8,620,850 to Brown et al. (“Brown”)
Exhibit 1006	U.S. Patent No. 9,256,748 to Gates et al. (“Gates”)
Exhibit 1007	FaceToFace Complaint
Exhibit 1008	Carnegie Mellon’s website memorializing Scott Fahlman’s original post, http://www.cs.cmu.edu/~sef/Orig-Smiley.htm .
Exhibit 1009	U.S. Patent Publication No. 2006/0015812 to Cunningham et al. (“Cunningham”)
Exhibit 1010	U.S. Patent Publication 2004/0018858 to Nelson (“Nelson”)
Exhibit 1011	U.S. Patent Application No. 2010/0177116 to Dahllof et al. (“Dahllof”)
Exhibit 1012	U.S. Patent Application No. 2005/0195927 to Solonen (“Solonen”)
Exhibit 1013	Eudora Email 6.2, pages 47-50
Exhibit 1016	U.S. Patent No. 9,425,974 to Tucker et al. (“Tucker”)
Exhibit 1017	Yu Zhong, Pierre J. Garrigues, and Jeffrey P. Bigham. 2013. <u>Real Time Object Scanning Using a Mobile Phone and Cloud-based Visual Search Engine</u> , Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '13). Association for Computing Machinery, New York, NY, USA, Article 20, 1–8 (“Zhong”)

18. I have considered these materials from the viewpoint of a PHOSITA as of the priority date of the ’623 Patent. For the purposes of this declaration, I have been asked to assume that the priority date of the ’623 Patent is March 10, 2014. I note that my opinions provided in this Declaration are made from the perspective of a PHOSITA as of this priority date of the ’623 Patent, unless expressly stated otherwise. To the extent that I use any verb tense in this Declaration that is present

tense (e.g., “a PHOSITA would understand” instead of “a PHOSITA would have understood”), such verb tense should be understood to be my opinion as of the ’623 Patent’s priority date. I merely use the present verb tense for ease of reading.

II. LEGAL FRAMEWORK

19. I am a technical expert and do not offer any legal opinions. However, counsel has informed me as to certain legal principles regarding patentability and related matters under United States patent law, which I have applied in performing my analysis and arriving at my technical opinions in this matter.

20. I have been informed that the Patent Trial and Appeal Board (“PTAB”) now applies the claim construction standard applied by Article III courts (e.g., the Phillips standard) regardless of whether a patent has expired. I have been informed that under the Phillips standard, claim terms are to be given the meaning they would have to a person having ordinary skill in the art at the time of the invention, taking into consideration the patent, its file history, and, secondarily, any applicable extrinsic evidence (e.g., dictionary definitions). For any claim language, I have applied its plain meaning as instructed by Phillips.

21. I have been informed that the express or inherent disclosures of a prior art reference may anticipate the claimed invention. Specifically, if a person having ordinary skill in the art at the time of the invention would have known that the claimed subject matter is necessarily present in a prior art reference, then the prior

art reference may “anticipate” the claim. In other words, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates. There is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the time of invention, but only that the subject matter is in fact inherent in the prior art reference. Therefore, a claim is “anticipated” by the prior art if each and every limitation of the claim is found, either expressly or inherently, in a single item of prior art.

22. I have also been informed that a person cannot obtain a patent on an invention if the differences between the invention 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 person having ordinary skill in the art. I have been informed that a conclusion of obviousness may be founded upon more than a single item of prior art. I have been further informed that obviousness is determined by evaluating the following factors: (1) the scope and content of the prior art, (2) the differences between the prior art and the claim at issue, (3) the level of ordinary skill in the pertinent art, and (4) secondary considerations of non-obviousness. In addition, the obviousness inquiry should not be done in hindsight. Instead, the obviousness inquiry should be done through the eyes of a person of ordinary skill in the relevant art at the time the patent was filed.

23. In considering whether certain prior art renders a particular patent claim

obvious, counsel has informed me that I can consider the scope and content of the prior art, including the fact that one of skill in the art would regularly look to the disclosures in patents, trade publications, journal articles, industry standards, product literature and documentation, texts describing competitive technologies, requests for comment published by standard setting organizations, and materials from industry conferences, as examples. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be “analogous art” to the claimed invention. I have been informed that a reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention). In order for a reference to be “reasonably pertinent” to the problem, it must logically have commended itself to an inventor’s attention in considering his problem. In determining whether a reference is reasonably pertinent, one should consider the problem faced by the inventor, as reflected either explicitly or implicitly, in the specification. I believe that all of the references that my opinions in this IPR are based upon are well within the range of references a person of ordinary skill in the art would consult to address the type of problems described in the Challenged Claims.

24. I have been informed that, in order to establish that a claimed invention was obvious based on a combination of prior art elements, a clear articulation of the reason(s) why a claimed invention would have been obvious must be provided. Specifically, I am informed that, under the U.S. Supreme Court's KSR decision, a combination of multiple items of prior art renders a patent claim obvious when there was an apparent reason for one of ordinary skill in the art, at the time of the invention, to combine the prior art, which can include, but is not limited to, any of the following rationales: (A) combining prior art methods according to known methods to yield predictable results; (B) substituting one known element for another to obtain predictable results; (C) using a known technique to improve a similar device in the same way; (D) applying a known technique to a known device ready for improvement to yield predictable results; (E) trying a finite number of identified, predictable potential solutions, with a reasonable expectation of success; (F) identifying that known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; or (G) identifying an explicit teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine the prior art references to arrive at the claimed invention.

25. I am informed that the existence of an explicit teaching, suggestion, or

motivation to combine known elements of the prior art is a sufficient, but not a necessary, condition to a finding of obviousness. This so-called “teaching suggestion-motivation” test is not the exclusive test and is not to be applied rigidly in an obviousness analysis. In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. Instead, the important consideration is the objective reach of the claim. In other words, if the claim extends to what is obvious, then the claim is invalid. I am further informed that the obviousness analysis often necessitates consideration of the interrelated teachings of multiple patents, the effects of demands known to the technological community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art. All of these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent.

26. I also am informed that in conducting an obviousness analysis, a precise teaching directed to the specific subject matter of the challenged claim need not be sought out because it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. The prior art considered can be directed to any need or problem known in the field of endeavor at the time of invention and can provide a reason for combining the elements of the prior art in the manner claimed. In other words, the prior art need not be directed towards solving

the same specific problem as the problem addressed by the patent. Further, the individual prior art references themselves need not all be directed towards solving the same problem. I am informed that, under the KSR obviousness standard, common sense is important and should be considered. Common sense teaches that familiar items may have obvious uses beyond their primary purposes.

27. I also am informed that the fact that a particular combination of prior art elements was “obvious to try” may indicate that the combination was obvious even if no one attempted the combination. If the combination was obvious to try (regardless of whether it was actually tried) or leads to anticipated success, then it is likely the result of ordinary skill and common sense rather than innovation. I am further informed that in many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature or knowledge, will drive the design of an invention. I am informed that an invention that is a combination of prior art must do more than yield predictable results to be non-obvious.

28. I am informed that for a patent claim to be obvious, the claim must be obvious to a person of ordinary skill in the art at the time of the invention. I am informed that the factors to consider in determining the level of ordinary skill in the art include (1) the educational level and experience of people working in the field at the time the invention was made, (2) the types of problems faced in the art and

the solutions found to those problems, and (3) the sophistication of the technology in the field.

29. I am informed that it is improper to combine references where the references teach away from their combination. I am informed that a reference may be said to teach away when a person of ordinary skill in the relevant art, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the patent applicant. In general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the patentee. I am informed that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the patentee. I also am informed, however, that a reference does not teach away if it merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into the invention claimed.

30. I am informed that even if a prima facie case of obviousness is established, the final determination of obviousness must also consider "secondary considerations" if presented. In most instances, the patentee raises these secondary considerations of non-obviousness. In that context, the patentee argues an invention

would not have been obvious in view of these considerations, which include: (a) commercial success of a product due to the merits of the claimed invention; (b) a long-felt, but unsatisfied need for the invention; (c) failure of others to find the solution provided by the claimed invention; (d) deliberate copying of the invention by others; (e) unexpected results achieved by the invention; (f) praise of the invention by others skilled in the art; (g) lack of independent simultaneous invention within a comparatively short space of time; (h) teaching away from the invention in the prior art.

31. I am further informed that secondary considerations evidence is only relevant if the offering party establishes a connection, or nexus, between the evidence and the claimed invention. The nexus cannot be based on prior art features. The establishment of a nexus is a question of fact. While I understand that the Patent Owner here has not offered any secondary considerations at this time, I will supplement my opinions in the event that the Patent Owner raises secondary considerations during the course of this proceeding.

III. OVERVIEW AND LEGAL STANDARDS

A. Level of a Person of Ordinary Skill in the Art

32. In formulating my opinions, I have been instructed to apply certain legal standards. I am not a lawyer. I do not expect to offer any testimony regarding what the law is. Instead, the following sections summarize the law as I have been

instructed to apply it in formulating and rendering my opinions found later in this declaration. I understand that, in an inter partes review (“IPR”) proceeding, patent claims may be deemed unpatentable if it is shown that they were anticipated or rendered obvious in view of the prior art. I understand that prior art in an IPR review is limited to patents or printed publications that predate the priority date of the patent at issue. I understand that questions of claim clarity (definiteness) and enablement cannot be considered as a ground for considering the patentability of a claim in these proceedings.

33. I was asked to provide my opinion as to the level of skill of a person having ordinary skill in the art (“PHOSITA”) of the ’623 Patent at the time of the claimed invention, which counsel has told me to assume is March 10, 2014. In determining the characteristics of a hypothetical person of ordinary skill in the art of the ’623 Patent, I considered several factors, including the type of problems encountered in the art, the solutions to those problems, the rapidity with which innovations are made in the field, the sophistication of the technology, and the education level of active workers in the field. I also placed myself back in the time frame of the claimed invention and considered the colleagues with whom I had worked at that time.

34. I understand that a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the

factors above. This hypothetical person has knowledge of all prior art in the relevant field as if it were arranged on a workshop wall and takes from each reference what it would teach to a person having the skills of a PHOSITA.

35. In my opinion, a PHOSITA at the time of the claimed invention of the '623 Patent, would have had at least a bachelor's degree in computer engineering or computer science, electrical engineering, or a related field with at least two years of experience in the fields of image processing and graphical user interfaces. A person with more direct industry experience may accommodate having less formal education, and more formal education in the field, such as a master's degree with relevant specialization, can accommodate less direct industry experience. Such a PHOSITA would have been capable of understanding the '623 Patent and the prior art references discussed herein.

36. Based on my education, training, and professional experience in the field of the claimed invention, including teaching the requisite skills necessary for a PHOSITA during the relevant time period, I am familiar with the level and abilities of a person of ordinary skill in the art at the time of the claimed invention. Additionally, as noted above, I met at least these minimum qualifications to be a person having ordinary skill in the art as of the time of the claimed invention of the '623 Patent.

B. Claim Construction

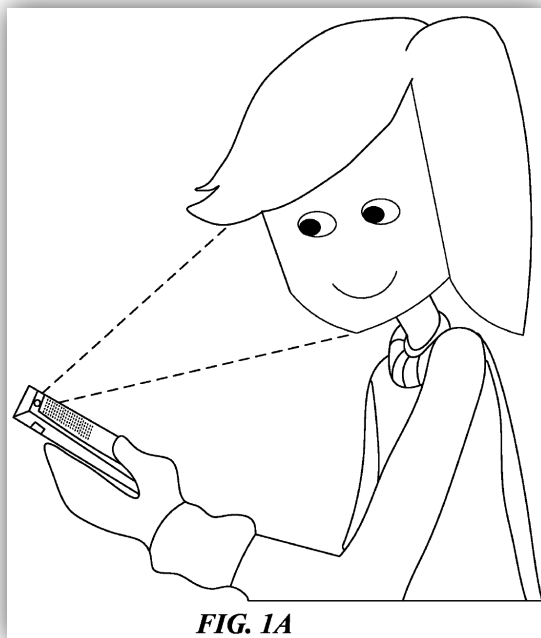
37. I understand that the claim terms in this IPR will be construed according to their ordinary and customary meaning as understood in light of the claim language, the patent's description, and the prosecution history viewed from the perspective of a PHOSITA. I further understand that where a patent defines claim language, the definition in the patent controls, even if there are other definitions that might be understood by those working in the art.

C. Claimed Invention in the '623 Patent

38. The '623 Patent generally describes a messaging system running on a computing device that is capable of both facial recognition and recognizing a user's facial expressions. "For example, the messaging system monitors a camera feed from a camera of the computing device to detect a biometric signature when a messaging interface of the messaging application is actively being used. The messaging system can match the detected biometric signature against a known profile using a facial recognition process to authenticate an operating user to use the messaging application." '623 Patent (Ex.1001) at Abstract. The '623 Patent discloses "the biometric recognition process may be based on facial recognition, ear recognition, silhouette recognition, speaker recognition, fingerprint recognition, device motion pattern recognition, contact pattern recognition" and "biometric security mechanism can detect biometric patterns utilizing a sensor, such as a

camera, a microphone, an accelerometer, a touch sensor, a gyroscope.” *Id.* at 2:63-3:3.

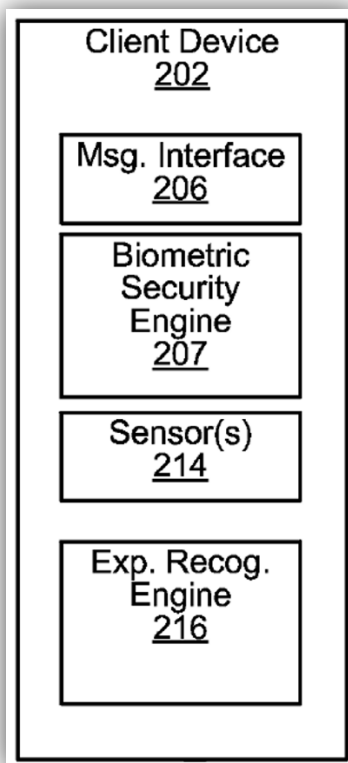
39. “The biometric security mechanism uses the one or more types of biometric recognition processes to ensure that an operator using the messaging application matches a biometric profile of the messaging system account.” *Id.* at 3:26-30. Thus, ensuring that “a third party (e.g., a brother or a classmate) cannot send messages on behalf of the user.” *Id.* at 3:30-32. Figure 1A illustrates the ’623 Patents mobile device performing biometric recognition of a user:



Id. at Figure 1A, 5:61-64 (“FIGS. 1A through 1C illustrate an example of the biometric security mechanism that implements a facial recognition process to protect the privacy of both a sender of a message and a recipient of the message.”).

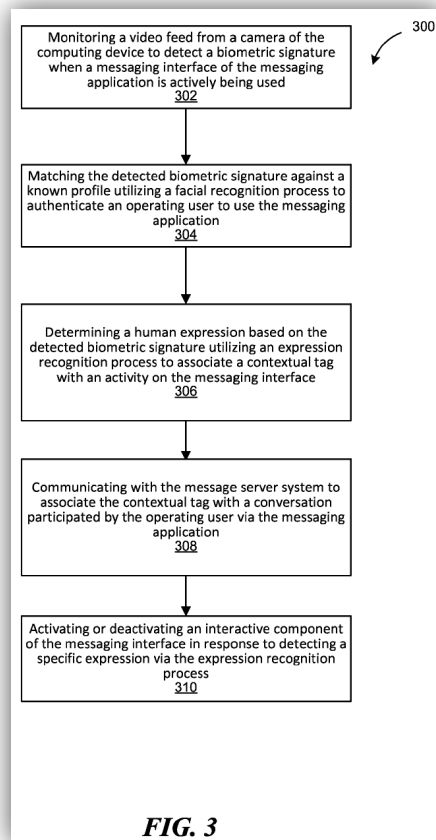
40. In addition to the biometric security/facial recognition capabilities, the '623 Patent discloses that the computing device “can implement expression recognition process ... to provide additional contextual information associated with a user’s emotional/mood state when using a messaging application.” *Id.* at 4:32-36. Particularly, “the messaging application can use the expression recognition process to add context to conversations between users of the messaging system. In some cases, the recognized expression of a sender user can be added as an emoticon to a message.” *Id.* at 5:4-8.

41. Figure 2 depicts the computing device (e.g., client device 202) as containing both the biometric security engine (which performs facial recognition) and the expression recognition engine (which performs expression recognition) as described above.



Id. at Figure 2 (showing a client device 202 containing the biometric security and expression recognition engines), 6:41-44 (“the messaging interface 206 and/or the biometric security engine 207 can be embodied as a mobile application running on operating systems of some of the client devices 202.”), 7:60-64 (“the client devices 202 can each also include an expression recognition engine 216. The expression recognition engine 216 can configure a client device 202 to execute the disclosed expression recognition process.”).

42. In particular, the '623 Patent discloses the processing steps taken by the messaging application on the client device 202 that implements both the biometric security and facial expression recognition mechanisms in Figure 3:



Id. at Figure 3, 8:31-36 (“FIG. 3 is a flow chart of a method 300 of operating a messaging application (e.g., the expression recognition engine 216 of FIG. 2) on a computing device (e.g., one of the client devices 202 of FIG. 2) that implements the expression recognition process, in accordance with various embodiments”).

43. Figure 3 illustrates the processing steps 302 and 304 where the computing device monitors a video feed from a camera to detect a biometric signature and matches the detected biometric signature “against a known profile utilizing a facial recognition process to authenticate an operating user to use the messaging application.” *Id.* at 8:37-48 (discussing the same and further disclosing

that the “known profile can be stored in the computing device” and that in “some embodiments, the biometric signature is a facial profile and the biometric recognition process is a facial recognition process”).

44. Figure 3 also shows the processing steps of 306 and 308. With respect to processing step 306, the '623 Patent discloses that the computing device “can determine a human expression based on the detected biometric signature utilizing an expression recognition process to associate a contextual tag with an activity on the messaging interface.” *Id.* at 8:49-52. Then at processing step 308 “the computing system can communicate with the message server system to associate the contextual tag with a conversation involving or participated by the operating user (e.g., where the operating user engaged in the conversation through the messaging application).” *Id.* at 8:53-57. Particularly with respect to processing step 308 where the messaging interface is being used to compose a message, the '623 Patent discloses that when communicating with the messaging server the contextual tag can be included “as an emoticon embedded as part of the message.” *Id.* at 8:58-64.

D. OVERVIEW OF THE TECHNOLOGY

45. I was asked to summarize the background of the technology from the standpoint of a PHOSITA prior to March 10, 2014.

46. Visually communicating one's emotions within electronic communication between two parties was well known before the priority date of the

'623 Patent. For example, in 1982 Scott Fahlman suggested the use of the textual character sequences of :-)) and :-(be used to distinguish messages on online bulletin boards (Bboards) as being either a joke or not a joke.

Original Bboard Thread in which :-)) was proposed

Here is the original message posted by Scott Fahlman on 19 September, 1982:

19-Sep-82 11:44 Scott E Fahlman :-))
From: Scott E Fahlman <Fahlman at Cmu-20c>

I propose that the following character sequence for joke markers:

:-))

Read it sideways. Actually, it is probably more economical to mark things that are NOT jokes, given current trends. For this, use

:-(

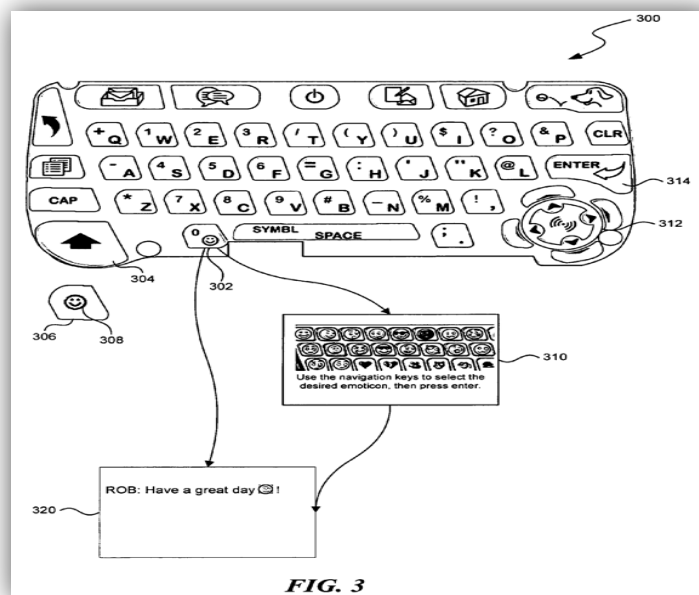
Screen capture from Carnegie Mellon's website memorializing Scott Fahlman's original post, <http://www.cs.cmu.edu/~sef/Orig-Smiley.htm>. (Ex. 1008).

47. Another example is *U.S. Patent Publication No. 2006/0015812* to Cunningham et al. ("*Cunningham*" "Ex. 1009") which teaches including emoticons to describe emotions. For example, in ¶3, *Cunningham* teaches using emoticons as a way to compensate for some of the limitations of written communication.

Emoticon:	Description:
:-) or :))	Smile
:~) or :)	Wink
:D or :D	Big smile
:~) or :~)	Very happy
:D)	Big nose smiley
)	Cool!
>:-) or >:-)	Evil grin
>:-> or >:->	Evil grin with a wink
:X or :X	My lips are sealed
:~:~) or :~:~)	Devilish
:~) or :~)	Tongue in cheek
:P or :P	Sticking out tongue
:~& or :~&	Tongue tied
:op	Puppy face
0:-) or 0:-)	Saint
:~)8 or :~)8	Happy wearing a bow tie
8:-) or 8:-)	Happy with glasses
#-)	I partied all night
%-) or %-)	Drunk
:~###.. or :~###..	Being sick
%-(or %-(	Confused
:0 or :0	Shocked
:o or :o	Surprised
: or :	Indecision
:~-(or :~-(	Crying
:~-) or :~-)	Crying of happiness
:-(or :-(	Sad

Id. Before the ‘623 patent, it was well-known for emoticons to appear in email, chat, text messaging, and other forms of written, electronic communication to express moods or tone. *Id.*

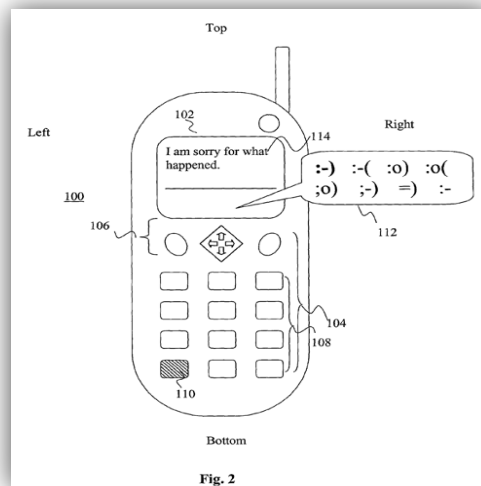
48. *Cunningham* also teaches including graphic emoticons in messages.



Id. at Figure 3; ¶13 (the sequence of characters is automatically converted into a

graphic); ¶¶42-44 (a dedicated emoticon key 306 included in the keypad 300, and once the user selects key 306 the device will display a collection of emoticons on a palette or menu as shown on screen 310 which the user may scroll through and ultimately select an appropriate emoticon for inclusion in a text message to be sent as shown in screen 320).

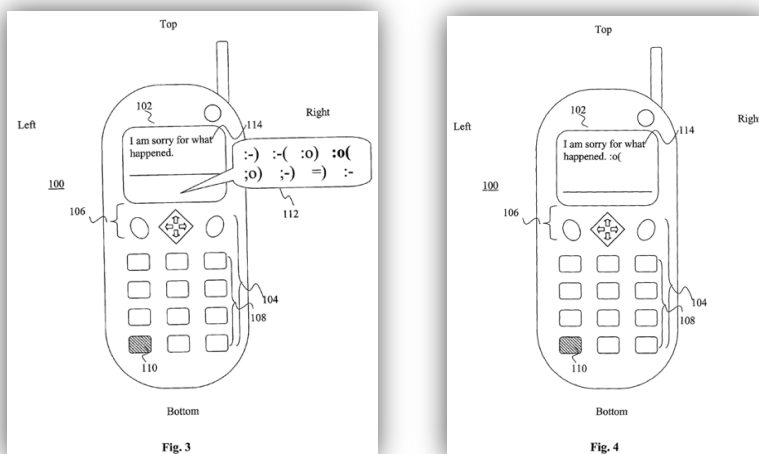
49. Additional devices also incorporated emotions into messages. For example, U.S. Patent Publication 2004/0018858 to Nelson (“*Nelson*” “Ex. 1010”) including a button within the keypad so when a user pressed the button, a list of reactions would be displayed on the mobile device’s display from which a user would simply select the desired one that they wished to include in their message.



Nelson, Figure 2, ¶30 (illustrated in FIG. 2, in response to an initial selection of input key 110 (while phone 100 is operating in the text mode, e.g., when a textual message is being composed), a list of emoticons 112 is displayed on display 102 for

user selection).

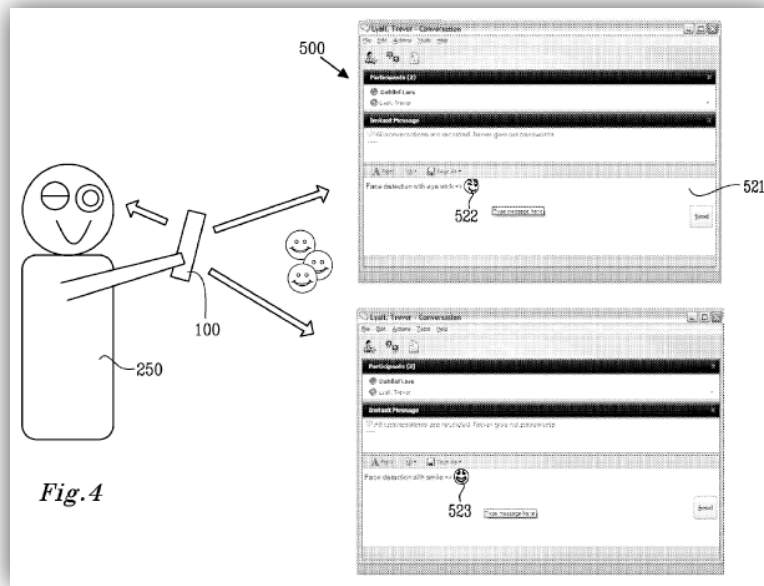
50. *Nelson's* Figures 3 and 4 further show the user selecting one of these, and including them text message currently being composed:



Id., Figures 3 and 4 (showing the selection of the “:o(” emoticon and its inclusion into the text message to be sent). *Nelson* teaches using graphical symbols (e.g., 😊) may be used as well. *Id.* at ¶30.

51. In other example, U.S. Patent Application No. 2010/0177116 to Dahllof et al. (“Dahllof”) (“*Dahllof*” “Ex. 1011”), used a camera along with face detection and analysis to generate an emoticon on behalf of the user with “little or no manual input on the part of the user.” *Id.*, ¶¶6, 17, 18 (“facial feature detection application 110, implemented as hardware and/or an instruction set (e.g., program) may be executed by processor.”)

52. *Dahllof's* Figure 4 depicts this simplified method by which emoticons are input into a message by using a camera to detect a user's facial expressions:



Id., Figure 4, *see also* Figures 2a-2c. And further used graphical emoticons, for example, ‘smileys,’ in connection with its invention. *Dahllof*, ¶4.

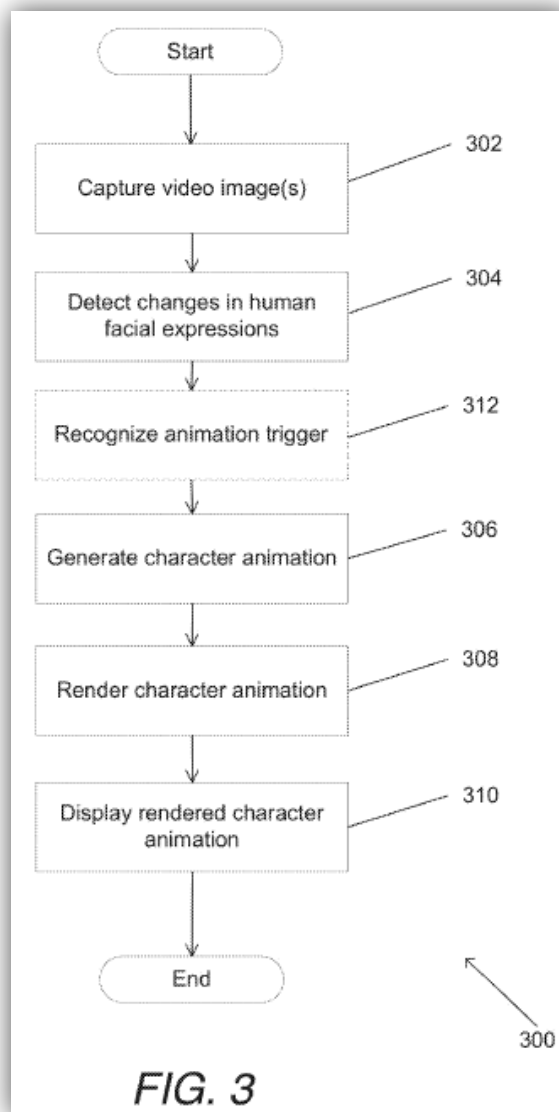
IV. OVERVIEW OF THE PRIOR ART

A. Overview of Corazza

53. U.S. Patent Publication No. 2013/0235045 to Corazza et al. (“*Corazza*”) was filed on March 6, 2013, and published on September 12, 2013. *Corazza* (“Ex. 1004”). *Corazza* describes systems and methods for enabling the “collaborative creation, transmission, sharing, non-linear exploration, and modification of animated video messages.” *Corazza* (Ex. 1004) at ¶6.

54. *Corazza* teaches a “networked computing device can send animated video messages to other networked computing devices over a network.” *Id.* at ¶54, *see also* ¶61 (teaching the networked computing device may be that of “a mobile

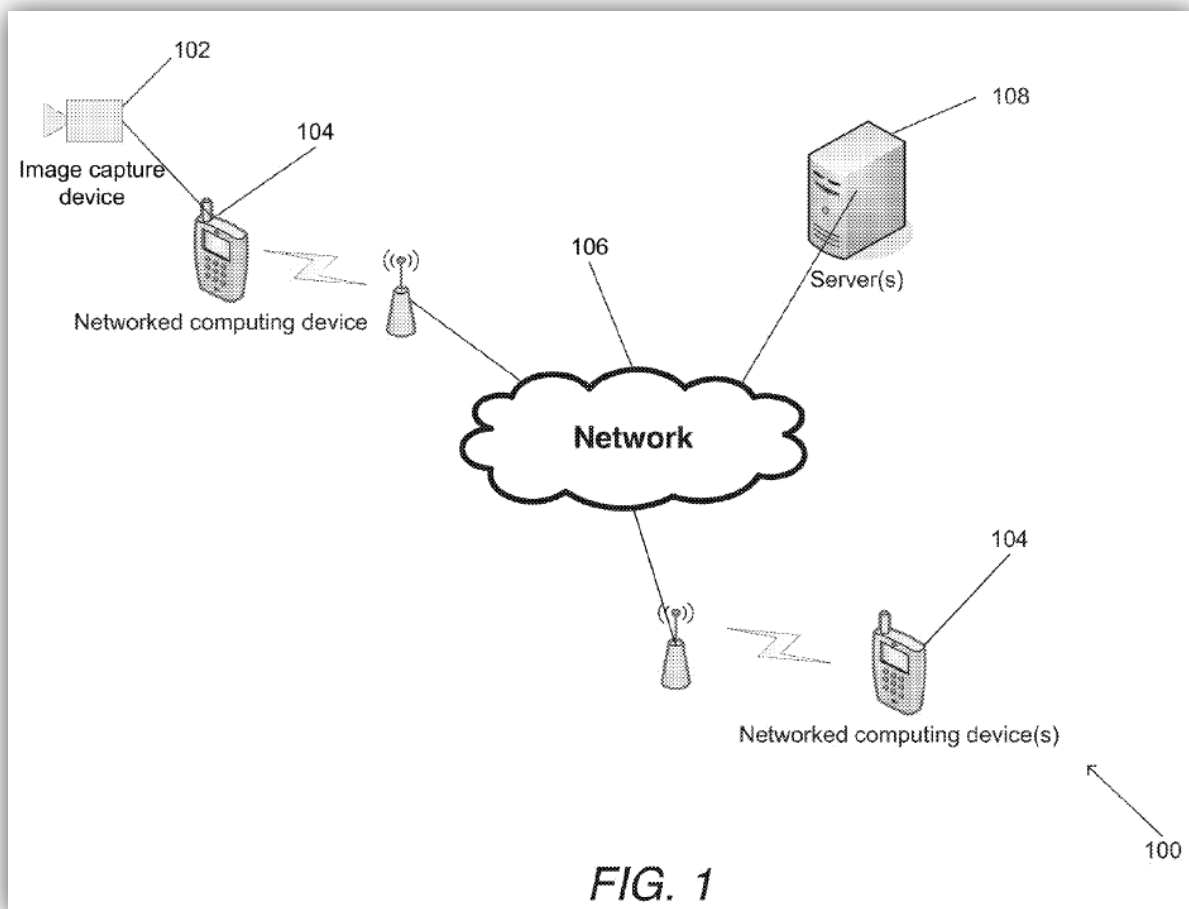
phone, tablet computer or personal computer”). The computing device contains a “processor configured via an appropriate software application [to] generate animated video messages using video images captured by a video camera and/or any of a variety of other sources of input including (but not limited to) sensors, touch screens, and/or microphones.” *Id.* at ¶53 (further teaching the processor is resident upon the computing device and “perform[s] a variety of functions related to generation of animated video messages, including (but not limited) to detecting changes in human facial expressions, generating character facial animations from detected changes in human facial expressions, applying character animations upon recognizing an animation trigger and rendering character animations.”). *Corazza’s* Figure 3 depicts the processing steps performed by the computing device’s processor to generate animated video messages:



Id., Figure 3 at ¶61 (describing the same).

55. *Corazza*’s animated “video messages can be rendered as video image data that can be displayed on a networked computing device and/or encoded for storage, transmission and/or decoding on another networked computing device.” *Id.* at ¶¶80, 60 (animated video messages in accordance with many embodiments of the invention can be generated and transmitted across a system of networked computing

devices and servers). *Corazza's* Figure 1 depicts such a network of computing devices over which an animated video message may be sent from a first computing device to a second computing device:



Id., Figure 1, *see also* ¶58 (teaching that the “networked computing devices can be connected to a cellular data network that can transfer multimedia files via MMS.”).

56. *Corazza*, like the '623 Patent, is directed to systems and methods for creating and distributing messages between users wherein those messages contain non-verbal expressions of a user's current emotions or mood. *Compare Corazza* at

¶45 (describing a computing device generating an animated video message by “tracking human facial expressions in captured video images and using the tracked expressions to drive animation of a facial model of a character,” which may then be displayed on a second computing device, with the *'623 Patent* at 5:4-8, (“the messaging application can use the expression recognition process to add context to conversations between users of the messaging system. In some cases, the recognized expression of a sender user can be added as an emoticon to a message.”), 5:14-16 (“The disclosure above pertains to the specific example of an electronic messaging system for delivery of text, images, audio clips, or video clips.”). Both *Corazza* and the *'623 Patent* create and distribute messages using a messaging application that further makes use of an expression recognition process.

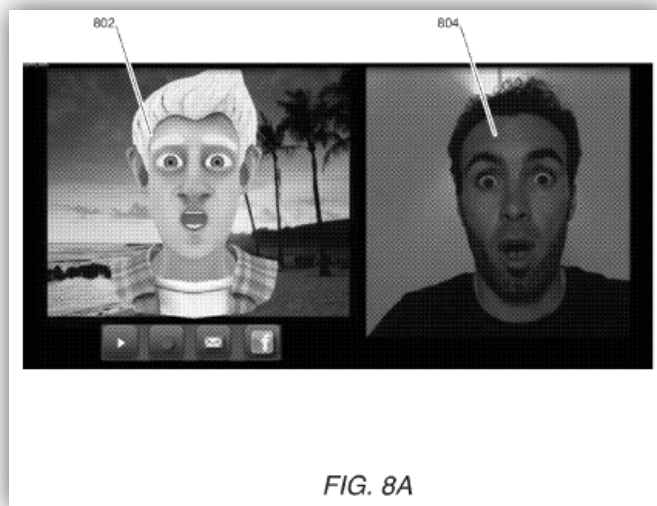
57. *Corazza* is also similar to the *'623 Patent* in that *Corazza* teaches the networked computing device (e.g., networked computing device 104) can receive a selection of a 3D character (emoticon) and further animate the facial features of said character utilizing facial expressions detected within a sequence of images captured by a camera. Compare *Corazza* at ¶48; see also *Id.*, 56 (“a networked computing device 104 can receive a selection of a 3D character via a user interface, capture video images using an image capture device 102 such as (but not limited to) a video camera, detect the changes in human facial expressions in the captured video images,” and “generate character animation from tracking the changes in the human

facial expressions.”), with the ’623 Patent at Claim 1 (disclosing “receive a selection of an emoticon; monitor a sensor feed provided by one or more sensors of the computer device to detect a plurality of human facial expression states;” and “automatically generate a dynamic emoticon that simulates the detected plurality of human facial expression states”).

58. *Corazza* and the ’623 Patent both relate to computing devices that receive a selection of an emoticon and detect a user’s facial expressions utilizing a camera for the purpose of animating the selected emoticon and sends a message that further contains an animated emoticon. *Corazza* at Figures 8A-8C, ¶¶9-10, 45, 56; ’623 Patent at Claim 1, 5:4-8, 8:4-13, 8:49-64. Given these similarities, a PHOSITA would have considered *Corazza* in the same field of endeavor as the ’623 Patent.

59. A PHOSITA would have understood that the ’623 Patent was attempting to solve or improve a computing devices capability to: (1) obtain contextual information associated with a user’s emotional/mood state when using a messaging application by implementing an expression recognition process, and also (2) transmit that contextual information with a message to another user/computing device. A PHOSITA would have looked to known methods for tracking and determining a user’s facial expressions, as well as incorporating those expressions into a message, using known methods such as *Corazza*’s animated video messages that include an animated character model whose facial expressions were driven by

the detected facial expressions of a user. For example, *Corazza's* method for detecting a human's expression and driving the facial expression of a corresponding character model is shown in Figure 8A below, where a user's detected expression of surprise is used to cause a character model to also have the expression of surprise:



Corazza at Figure 8A, *see also* Figures 8B and 8C (similarly depicting the detected user's facial expressions of “angry” and “neutral” driving the character model's facial expressions), ¶82 (discussing the Figures 8A-8C).

60. A PHOSITA would have understood *Corazza* was reasonably pertinent to the issues being solved by the '623 Patent and would have looked to its teachings for solving those issues.

V. GROUND I – CORAZZA DISCLOSES ALL THE LIMITATIONS OF CLAIMS 1, 4-6, 8, 11, AND 14-20

A. Claim 1

1(Pre) A computer device comprising at least one processor in communication with at least one memory device, wherein the at least one processor is programmed

61. I have been informed that a preamble is generally not a patentably distinct limitation of a claim, especially where that preamble does not recite a limitation of the claim, and where it is not referred to in the body of the claim, as is the case here. However, to the extent the preamble is a limitation of the claim, it is my opinion that this limitation was present in *Corazza*.

62. In my opinion, *Corazza* discloses a device with a processor that communicates with the device's storage, which is the memory. *Corazza* at ¶53 (“processor configured via an appropriate software application can generate animated video messages,” such a processor being “resident upon a networked computing device.”); ¶6, Abstract (The networked computing device (104) includes a processor and storage containing an animated message application); ¶53 (“animated message application configures the processor to: capture a video sequence using the video camera; detect a human face within a sequence of video frames... apply motion data to animate the 3D character model... and transmit the encoded video to a remote device via the network interface”); *see also* Figure 1; ¶¶27, 53-55, Abstract.

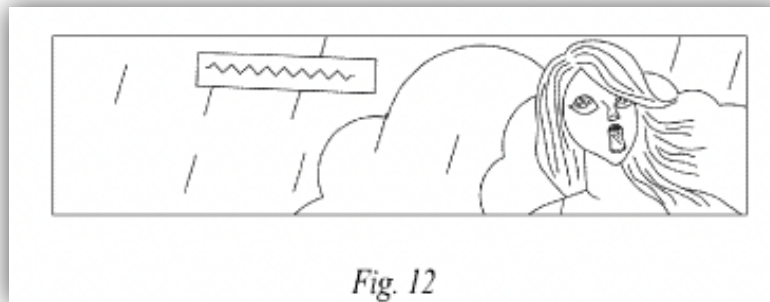
1(a) receive a selection of an emoticon

63. It is my opinion that this limitation was disclosed in *Corazza*. Notably, *Corazza* has a processor programmed to receive a selection of 2D/3D characters via a user interface. *Id.* at ¶56 (“the process of generating an animated message includes selecting a character from a library of multiple characters” and this also “includes a 2D or a 3D facial model”); ¶56 (“generation of an animated video message can take place on the networked computing device 104,” which “can receive a selection of a 3D character via a user interface”). *See also Id.* at ¶¶47, 48, 56.

64. A PHOSITA would have recognized that *Corazza*’s 2D/3D characters representing emotions in electronic communications teach the claimed emoticons. For example, a user manual for the widely-used and well-known messaging software named Eudora (“*Eudora Manual*” or “Ex. 1013”) discusses emoticons, specifically explaining that “emoticons are **characters** used to indicate emotion or expression.” *Eudora Manual*, 47 (emphasis added). The Eudora Manual explains that emoticons can “add an extra level of context” to electronic communications. *Id.* Thus, a PHOSITA would have recognized that the 2D/3D **characters** taught by *Corazza* that indicate emotion and expression to add a level of context to electronic communications teach the claimed emoticons.

65. Similarly, U.S. Patent No. 9,425,974 to Tucker et. al (“*Tucker*” or “Ex. 1016”) teaches text messaging system for enhanced mobile communication. *Tucker*

teaches emoticons, such as that illustrated below in Fig. 12, may specifically include 2D/3D characters or avatars included as “conversation embellishments used to convey expressive elements of the communication between users.”



Tucker, 5:27-47, Fig. 12. Again, *Tucker* shows that PHOSITAs prior to the '623 Patent would have understood that 2D or 3D characters used to convey expression in communications teach the claimed emoticons of claim 1.

1(b) monitor a sensor feed provided by one or more sensors of the computer device to detect a plurality of human facial expression states;

66. It is my opinion this limitation is disclosed by *Corazza*. The processor in *Corazza* is programmed to monitor a sensor feed to detecting changes in human facial expressions. *Corazza* at ¶53 (processor is “configured via an appropriate software application” to “generate animated video messages using video images captured by a video camera and/or any of a variety of other sources of input including (but not limited to) sensors, touch screens, and/or microphone”), Abstract (“the animated message application configures the processor to: capture a video sequence using the video camera; detect a human face within a sequence of video frames; track

changes in human facial expression of a human face detected within a sequence of video frames”). *See also Id.* at ¶¶51, 55, 56, 61, 82, Figure 3 (specifically 302 and 304).

1(c) automatically generate a dynamic emoticon that simulates the detected plurality of human expression states on the selected emoticon based on the sensor feed of the plurality of human facial expression states; and

67. I understand Patent Owner’s own interpretation² of a “dynamic emoticon” appears to include graphics, symbols, emojis, videos, characters, avatars, or the like, that reflect the expressions a sender captured and apply those in a message to give emotional context. I also read the ’623 Patent to describe “the recognized expression of a sender user can be added as an emoticon to a message.” ’623 *Patent* at 5:6-8. Additionally the ’623 Patent states, “the message server system can include sending the contextual tag as an emoticon.” *Id.* at 8:60-64. Based on Patent Owner’s statements, the background of the technology, and the ’623 Patent, a PHOSITA would have understood a dynamic emoticon includes graphics, symbols, characters, emojis, videos, avatars, or the like, that reflect the expression a sender uses to help explain the context of the message.

² Patent Owner contends Petitioner’s “Memoji[s]” are a “dynamic emoticon that simulates a detected human facial expression.” Ex. 1007, Complaint at ¶¶4-5; *10X Genomics, Inc.*, IPR2020-00086, Paper 8, at 20 (35 U.S.C. § 301(a)(2) “expressly permits Petitioner to cite ‘at any time’ a Patent Owner’s statements filed in a Federal court in which patent owner took a position on the scope of a patent claim”).

68. With this understanding, it is my opinion that this limitation was disclosed in *Corazza*. Notably, the processor in *Corazza*'s is programmed to create a dynamic emoticon by animating the selected 2D/3D character, which is an emoticon, with motion data to simulate the detected plurality of human facial expressions captured in the video images. *Corazza* at Abstract (processor is programmed to "map tracked changes in human facial expression to motion data, where the motion data is generated" to animate the 2D/3D character model and "apply motion data to animate the 3D character model"); ¶47 ("enable the mapping of feature vectors from the PCA space of human faces and facial expressions to the PCA space of the 2D or 3D character's facial expression," and this creates the animation of the 2D/3D facial model of the selected character). *See also Id.* at ¶¶37, 40-42, 61, 66, 69- 70, 82; Figure 3 (steps 306-310), Figure 5, Figures 8A-8C.

1(d) route a message with the dynamic emoticon to a second computer device.

69. It is my opinion that this limitation is disclosed by *Corazza*. In *Corazza* the processor is programmed to route a rendered animation of the 2D/3D character, which is the dynamic emoticon, encoded as a video to a remote device via a network interface. *Corazza* at ¶54 ("animated video messages can be generated by a networked computing device and sent to another networked computing device directly" or "can also be sent indirectly utilizing any method, including (but not limited to) generating, rendered, and/or storing a character animation, including

character facial animation, on a server accessible to a networked computing device”); ¶¶55-56 (“send the rendered character animations to another networked computing device 104 over the network 106.”). *See also Id.* at ¶¶6, 18, 21, 25, 29, 45, 58; Figure 1.

B. Claim 4

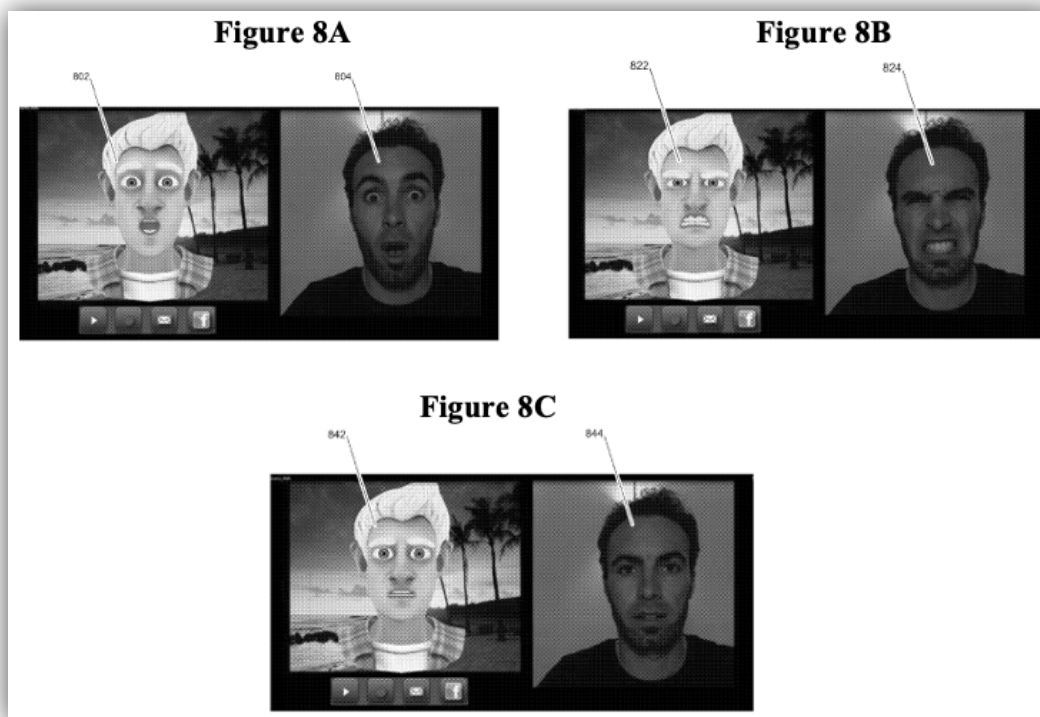
4. The computer device of claim 1, wherein the detected plurality of human facial expression states includes a smile, a laugh, a grimace, a frown, a pout, or any combination thereof.

70. It is my opinion that this claim was disclosed in *Corazza. Id.*, at ¶73 (“facial expressions can be any facial expressions that can be detected such as a smile or a frown”). *See also Id.* at ¶¶47, 61, 69, Figure 3.

C. Claim 5

5. The computer device of claim 1, wherein the detected plurality of human facial expression states includes an expression corresponding to a mood or an emotion, a micro expression, a stimulated expression, a neutralized expression, a masked expression, or any combination thereof.

71. It is my opinion that this claim was disclosed in *Corazza. Corazza’s* device detected a plurality of facial expressions, including surprise, anger, or a neutral state. *Id.* at Figures 8A-8C.



Id. at Figs 8A-8C, ¶¶40-42 (teaching “FIG. 8A is a screen shot illustrating a pose of a surprised human facial expression mirrored by a frame of character facial animation”, “FIG. 8B is a screen shot illustrating a pose of an angry human facial expression mirrored by a frame of character facial animation”, and “FIG. 8C is a screen shot illustrating a pose of a neutral human facial expression mirrored by a frame of character facial animation”); *see also Id.* at ¶82.

D. Claim 6

6. The computer device of claim 1, where the at least one processor is further programmed to analyze a human facial expression using an expression recognition process to detect the human facial expression state.

72. It is my opinion that this claim was disclosed in *Corazza*. The *Corazza*

processor is additionally programmed to analyze a human facial expression by using a process to detect human facial expression states by performing Principal Component Analysis (“PCA”) to analyze human facial expressions and detect the human facial expression states. *Corazza* at ¶10, *see also* ¶¶47, 62, 64-66, 70, Figure 4.

E. Claim 8

8. The computer device of claim 1, wherein a human facial expression is captured in real-time from the one or more sensors.

73. It is my opinion that this claim was disclosed in *Corazza*. The *Corazza* processor is programmed to capture human facial expression in real-time via a camera. *Id.* at ¶46 (“video rendered using an animated facial model of a character can be translucently overlaid in **real time** on the video of the human face used to drive the animation so that the composite video images of the human face and the animated character generate an effect similar to that of an animated mask or makeup overlaid on the human face”). *See also Id.* at ¶¶6, 45-48, 51, 56, 60-61, 80-82.

F. Claim 11

11(Pre) A computer-implemented method of operating a messaging application, the method comprising:

74. I have been informed that a preamble is generally not a patentably distinct limitation of a claim, especially where that preamble does not recite a limitation of the claim, and where it is not referred to in the body of the claim, as is the case here. However, to the extent the preamble is a limitation of the claim, it is

my opinion that this limitation was disclosed in *Corazza*.

75. *Corazza* taught a computer-implemented animated messaging application that controls the processor to create and distribute modifiable animated video messages. *Corazza* at ¶¶6, 45, 53, 55-56, Abstract.

11(a) receiving a selection of an emoticon;

76. *Corazza* disclosed this limitation. *See* Claim 1(a).

11(b) monitoring a sensor feed provided by one or more sensors of a computer device to detect a plurality of human facial expression states;

77. *Corazza* disclosed this limitation. *See* Claim 1(b).

11(c) automatically generating a dynamic emoticon that simulates the detected plurality of human facial expression states on the selected emoticon based on the sensor feed of the plurality of human facial expression states; and

78. *Corazza* disclosed this limitation. *See* Claim 1(c).

11(d) route a message with the dynamic emoticon to a second computer device.

79. *Corazza* disclosed this limitation. *See* Claim 1(d).

G. Claim 14

14. The computer-implemented method of claim 11, wherein the detected plurality of human facial expression states includes a smile, a laugh, a grimace, a frown, a pout, or any combination thereof.

80. *Corazza* disclosed this claim. *See* Claim 4.

H. Claim 15

15. The computer-implemented method of claim 11, wherein the

detected plurality of human facial expression states includes an expression corresponding to a mood or an emotion, a micro expression, a stimulated expression, a neutralized expression, a masked expression, or any combination thereof.

81. *Corazza* disclosed this claim. *See* Claim 5.

I. Claim 16

16. The computer-implemented method of claim 11, further comprising analyzing a human facial expression using an expression recognition process to detect the human facial expression state.

82. *Corazza* disclosed this claim. *See* Claim 6.

J. Claim 17

17. The computer-implemented method of claim 11, wherein a human facial expression is captured in real-time from the one or more sensors.

83. *Corazza* disclosed this limitation. *See* Claim 8.

K. Claim 18

18. The computer-implemented method of claim 11, further comprising continuously detecting human facial expression states using one or more sensors of the computer device after detecting a first human facial expression state.

84. It is my opinion that this claim was disclosed in *Corazza*. The *Corazza* processor is programmed to detect the changes in human facial expressions of a user's face detected within a sequence of video frames. *Supra* Elements 1(Pre)-1(d). The facial expressions are continuously detected in real time, such that a composite video of an animated facial model of a character, driven by the detected facial expressions, is "translucently overlaid in real time on the video of the human face

used to drive the animation” is rendered. *Supra* Claim 8, *Corazza*, ¶46; *see also Id.* at ¶¶6, 45-48, 51, 53, 55-56, 60-61, 80-82. *Corazza* continuously tracks facial expression changes after a human face having a first facial expression are identified and extracted from a video image. *Id.* at ¶47 (“...techniques including (but not limited to) a cascade of classifiers can be utilized to identify and extract a human face from a video image. A facial expression can be tracked by obtaining the feature vector of the human face and its expression within the PCA space of human facial expressions.”).

L. Claim 19

19(Pre) At least one non-transitory computer-readable storage media having computer-executable instructions embodied thereon, wherein when executed by a computer device having at least one processor in communication with at least one memory device, the computer-executable instructions cause the processor to:

85. I have been informed that a preamble is generally not a patentably distinct limitation of a claim, especially where that preamble does not recite a limitation of the claim, and where it is not referred to in the body of the claim, as is the case here. However, to the extent the preamble is a limitation of the claim, it is my opinion that this limitation was disclosed in *Corazza*.

86. *Corazza* taught a containing an animated video messaging application non-transitory computer-readable storage media (e.g., storage) having computer-executable instructions embodied thereon (e.g., the animated video messaging

application) that cause the processor to perform functions related to the generation and sending of animated video messages. *Supra* Element 1(Pre) and 11(pre), *Corazza* at ¶¶6, 45, 53, 55-56, Abstract.

19(a) receive a selection of an emoticon;

87. *Corazza* disclosed this limitation. *See* Claim 1(a).

19(b) monitor a sensor feed provided by one or more sensors of the computer device to detect a plurality of human facial expression state;

88. *Corazza* disclosed this limitation. *See* Claim 1(b).

19(c) automatically generate a dynamic emoticon that displays the selected emoticon changing to the plurality of detected human facial expression states based on the sensor feed of the plurality of human facial expression states; and

89. *Corazza* disclosed this limitation. *See* Claim 1(c).

19(d) route a message with the dynamic emoticon to a second computer device,

90. *Corazza* disclosed this limitation. *See* Claim 1(d).

19(e) wherein the second computer device displays the selected emoticon changing to the detected plurality of human facial expression states.

91. It is my opinion that this claim was disclosed in *Corazza*. *Corazza* taught creating an animated video message on a first networked computing device that is displayed on a second networked computing device. *Corazza*, ¶45

M. Claim 20

20. The at least one non-transitory computer-readable storage

media of claim 19, wherein the detected plurality of human facial expression states includes a smile, a laugh, a grimace, a frown, a pout, or any combination thereof.

92. *Corazza* disclosed this limitation. *See* Claim 4.

VI. GROUND II – CORAZZA IN VIEW OF BROWN TEACH ALL THE LIMITATIONS OF CLAIMS 1-2, 4-8, 11-12, AND 14-20

93. With respect to *Corazza*, I incorporate by reference my opinions in ¶¶61-92.

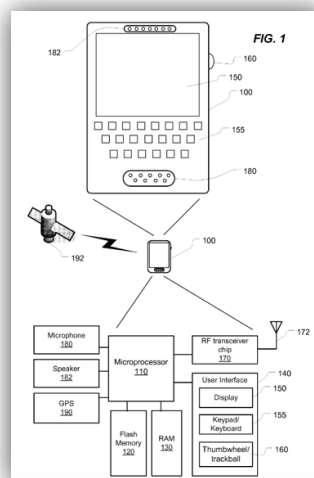
A. Overview of Brown

94. U.S. Patent No. 8,620,850 to Brown et al. (“*Brown*”) was filed on September 7, 2010, and issued on December 31, 2013. *Brown* (“Ex. 1005”). *Brown* describes graphical user representations like those of emoticons and avatars used to convey mood and emotions that are capable of being dynamically modified to “tailor an existing emoticon to better reflect the user’s current mood or emotion.” *Brown* (Ex. 1005) at Abstract.

95. *Brown* provides “a method, computer-readable medium and device for dynamically manipulating or modifying graphic user representations, such as emoticons or avatars used during an electronic mail conversation, instant message chat or other such dialogue” which “enables the user to convey nuances of mood and feeling rather than be confined to selecting an appropriate emoticon or avatar from a palette of predetermined emoticons or avatars.” *Brown* at 2:10-20. *Brown* describes emoticons as “small, typically simplistic, images representing a user’s facial

expression or current mood” and the similar concept of an avatar as “a graphical image, icon or picture which the user selects to represent himself or herself online.” *Id.* at 1:18-30 (“a smiley face such as 😊 is an emoticon used to signal that the writer of the message is smiling or happy” while “emoticon ☹ is conventionally used to signal that the writer of the message is unhappy or displeased.”).

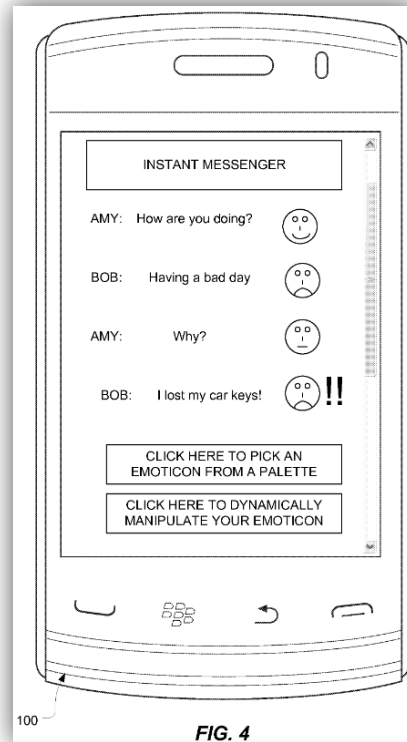
96. *Brown* teaches using its methods of including an emoticon to better reflect a current mood or emotion being implemented on a mobile communication device such as the one illustrated in Figure 1:



Id. at Figure 1, 2:46-49. *Brown*’s mobile device may be a “portable, handheld or mobile electronic devices such as smart phones, cell phones, satellite phones, PDA’s or Pocket PCs, computing tablets, laptops, etc. that have communication capabilities for exchanging textual messages.” *Id.* at 3:3-14. *Brown* further teaches its computing device “has a processor coupled to memory for executing a communication

application that enables composition and transmission of messages.” *Id.* at 2:32-42.

97. *Brown* “depicts a touch-screen mobile device executing an instant messaging application that enables the user to utilize emoticons and to dynamically manipulate the emoticons.” *Id.* at 1:55-57. As seen in Figure 4 below, *Brown*’s mobile device includes an instant messaging application that may present “dynamic” emoticons.



Id. at Figure 4, 5:29-37.

98. Both *Brown* and the ’623 Patent are directed to electronic devices that implement messaging applications that allow a user to send messages to a recipient wherein the message contains animations (emoticons) that add context with respect

to a user's emotions or mood. *See, e.g.,* '623 Patent at 5:14-16 (disclosing "an electronic messaging system for delivery of text, images, audio clips, or video clips"), 5:4-8 (disclosing "the messaging application can use the expression recognition process to add context to conversations between users of the messaging system. In some cases, the recognized expression of a sender user can be added as an emoticon to a message."); *Brown* at 5:22-29 ("FIG. 4 depicts a touch-screen mobile device executing an instant messaging (IM) application. The display shows an IM conversation between Amy and Bob. Each user has chosen to incorporate emoticons after their respective messages."). As both *Brown* and the '623 Patent are related to communication devices implementing messaging applications that allow animations reflecting the user's emotion (emoticons) to be included with messages being sent to another device, a PHOSITA would have understood *Brown* and the '623 Patent to be in the same field of endeavor.

99. A PHOSITA would have understood that the '623 Patent was attempting to solve or improve a computing device's capability to: (1) obtain contextual information associated with a user's emotional/mood state when using a messaging application, and (2) transmit that contextual information via an emoticon included in a message to another user/computing device. Specifically, as will be discussed below regarding limitation 1(a), a PHOSITA would have recognized that *Brown* provides convenient "emoticons" requiring relatively lower computing resources

that would have been advantageously used to improve the system of *Corazza* for simplicity as well as reduced memory consumption and processor and bandwidth requirements. A PHOSITA would have looked to *Brown's* instant messaging application implemented on mobile computing devices that included simple emoticons and avatars as part of its sent messages to convey mood and emotion.

100. For these reasons, a PHOSITA would have understood *Brown* was reasonably pertinent to the issues being solved by the '623 Patent.

B. Claim 1

1(Pre) A computer device comprising at least one processor in communication with at least one memory device, wherein the at least one processor is programmed to

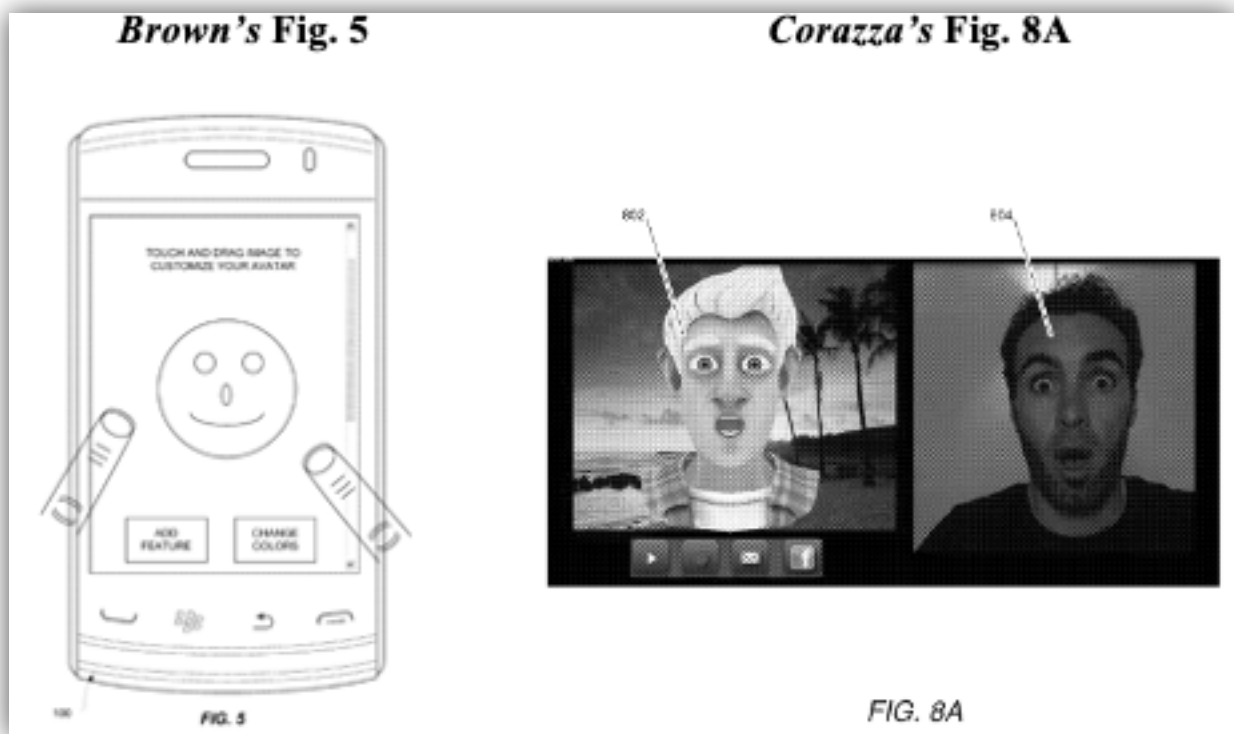
101. As I discussed above for Ground I, claim element 1(Pre), *Corazza* teaches this claim element. Thus *Corazza*, in view of *Brown* teaches claim element 1(b).

1(a) receive a selection of an emoticon

102. *Brown* teaches emoticons. Particularly, *Brown* describes emoticons as “small, typically simplistic, images representing a user’s facial expression or current mood” and the similar concept of an avatar as “a graphical image, icon or picture which the user selects to represent himself or herself online.” *Brown* at 1:18-30 (“a smiley face such as 😊 is an emoticon used to signal that the writer of the message is smiling or happy” while the “emoticon ☹ is conventionally used to signal that the

writer of the message is unhappy or displeased”), 2:21-26 (graphic user representations of emoticons are dynamically modifiable utilizing a method that “entails displaying the graphic user representation, receiving user input, and modifying a visual appearance of the graphic user representation to indicate a current user mood in response to the user input.”). *Brown*’s Figure 4 includes an instant messaging application that may provide “dynamic” emoticons to be sent with a text message to “convey nuances in mood or feeling.” *Id.* at 1:55-57, 1:31-37, 5:29-35, Abstract; Figures 4-6.

103. When compared to *Corazza*, *Brown* teaches a more straightforward, simpler style of emoticons such as the smiley. For example, compare *Brown*’s smiley emoticon shown in Figure 5 at left, with *Corazza*’s more sophisticated emoticon shown in Figure 8A at right:



104. A PHOSITA would have found it obvious to include one or more simpler emoticons per *Brown*, such as familiar, simple smileys, within *Corazza's* library of characters. In this way, the combined system of *Corazza* and *Brown* would contain a library of 2D/3D character models (that not only included the human style of character models (e.g., like the one shown above at right above in *Corazza's* Figure 8A) but also a more traditional emoticon/smiley face style emoticon (above at left) from which a user would choose from. Like *Corazza's* original more human-styled character models, this traditional emoticon/smiley face style character model would also be capable of simulating a plurality of human facial expressions detected by the camera and added to an SMS or MMS message for the purpose of allowing a

recipient to “better understand the tenor of the writer’s message” by conveying nuances of mood and feeling as taught by *Brown*. *Brown* at 1:23-25, 2:15-20.

105. There would have been multiple reasons why a PHOSITA would have been motivated to include the more traditional/simpler style of emoticon taught by *Brown* within *Corazza*’s messaging system. For example, prior to the ’623 Patent, a PHOSITA would have recognized the desirability of maximizing transmission rates of messages and maintaining a low amount of storage required to store messages as well as using less computational resources, motivating the combination of *Brown*’s simple emoticons into *Corazza*’s communication system. For example, U.S. Patent Application No. 2015/0195927 to *Solonen* (“*Solonen*”) (Ex. 1012) published in 2005 teaches a similar method and apparatus for communication using a camera to generate emoticons, which are then transmitted via a wireless network. *Solonen* at ¶¶3, 7, 14, Abstract. *Solonen* explains that communicating wirelessly using large files may “slow down network traffic and place a burden on the memory capacity of the receiving terminal. Heaviness and slowness of operation are characteristics that are undesirable in interactive conversation because the real-time feel and interactivity of chatting suffer if participants have to wait for prolonged times before messages are displayed on their terminals.” *Id.* at ¶6 (emphasis added).

106. Accordingly, an option for reduced file size of the emoticons (per *Brown*) transmitted via the *Corazza* communication system would have allowed for

faster transmission between networked devices while simultaneously reducing the burden of the memory capacity of the receiving terminal, improving the “real-time feel and interactivity of chatting” by reducing the delay time before messages are displayed.

107. Additionally, *Brown*’s style of emoticons was of a more traditional style that users would have already been familiar with, motivating a PHOSITA to include this more traditional/simpler style of emoticon character alongside *Corazza*’s more visually rich graphical animations, in order to help a device’s user adapt and accept the new technology regarding the use of animated character models for conveying a user’s emotions/mood within a message. *Solonen* explains that “emoticons are popular because they are available to all, they can be easily modified, and they do not require special hardware or software, nor do they significantly consume capacity when saved or transferred.” *Solonen* at ¶9. The simplicity and availability of *Brown*’s accessible, familiar emoticons would have led a PHOSITA to combine *Brown*’s style of emoticons into *Corazza*’s system.

108. A PHOSITA would have understood that some users may have been intimidated or confused by *Corazza*’s more sophisticated human-style character models, but that some might prefer a more simplistic representation of a face for conveying expressions and moods to a recipient. A PHOSITA would have understood that providing *Corazza*’s networked computing device with additional

character model options such as a character model having the style of *Brown's* smiley emoticon would have provided those users who desired a less complex representation of a facial expression with a more preferable option. Further, per *Solonen*, some lower-end hardware devices may have functioned better using *Brown's* emoticons, motivating a PHOSITA to include these while maintaining the option of selecting *Corazza's* more complex emoticon style for those with the hardware and desire to do so.

109. Both *Corazza* and *Brown* teach networked devices that perform messaging and the transmission of emoticons for the purpose of providing contextual information regarding a user's expressions/moods (*Corazza's* animated characters and *Brown's* emoticons). A PHOSITA would have understood that *Corazza* and *Brown* were directed to similar devices. *Corazza* at ¶6 (generating an animated message via tracking changes in human facial expression of a human face detected within a sequence of video frames and transmitting the animated message to a remote device via a network interface); *Brown* at 2:32-42 (a device with a processor coupled to memory for composition and transmission of dynamically animated "emoticons").

110. A PHOSITA would have understood it would have been obvious to combine the teachings of *Brown* regarding the transmission of simple dynamic emoticons as part of a message between users with those of *Corazza*, requiring only

a combination of known prior art elements (the system and programming of *Corazza* with the simple smiley emoticons of *Brown*) according to known methods to yield predictable results without fundamentally changing the overall operation of *Corazza*. As shown by *Solonen*, it was well known prior to the '623 Patent to include a dynamically modified emoticon within a message (e.g., a text message) sent to another device. *Solonen* at ¶¶3-4, 7.

111. Because emoticons were so well-known and widely used prior to the '623 Patent, a PHOSITA would have had a reasonable expectation of success in adding *Brown's* simple emoticons to *Corazza's* emoticon messaging system, requiring only simple reprogramming according to known methods within the skill of a PHOSITA using hardware already present in *Corazza*. See, e.g., *Solonen* at ¶7 (“Short, quick messages are often enlivened with so called emoticons”), ¶8 (“Emoticons are used in Japan with even more enthusiasm than in Western countries.”). *Corazza's* system would have been improved as the inclusion of an emoticon-style character model provided a simpler (less complex) character model that resulted in improved processing speeds, a decrease in file size, easier transmission between devices, and an improved selection of character models for those who desire a less complex representation of a facial expression.

1(b) monitor a sensor feed provided by one or more sensors of the computer device to detect a plurality of human facial expression states;

112. As I discussed above for Ground I, claim element 1(c), *Corazza* teaches this claim element. Thus *Corazza*, in view of *Brown* teaches claim element 1(b).

1(c) automatically generating a dynamic emoticon that simulates the detected plurality of human facial expression states on the selected emoticon based on the sensor feed of the plurality of human facial expression states; and

113. As I discussed above for Ground I, claim element 1(c), *Corazza* teaches this claim element. Thus *Corazza*, in view of *Brown* teaches claim element 1(c).

1(d) route a message with the dynamic emoticon to a second computer device.

114. As discussed in Ground I, *Corazza* alone teaches routing a message with a dynamic emoticon to a second computer device. *See* Ground I, Claim 1(d).

115. To the extent it is argued that *Corazza* does not teach that a dynamic emoticon is routed with the message to a second computer device, *Brown* teaches such a process. *Brown* describes a process in which the user “causes the device to incorporate an emoticon into a text message, e-mail, etc.” such that the user may “incorporate emoticons after their respective messages.” *Brown* at 3:37-38 and 5:22-29, respectively. *Brown*’s emoticons are directly sent alongside a message to a second computer device, as illustrated in Fig. 4 below.

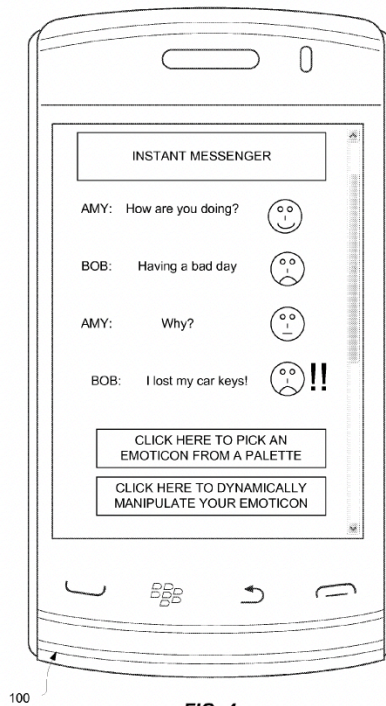


FIG. 4

Brown, Fig. 4. Here, we can see a conversation between two users of two devices, Amy and Bob, with emoticons generated by each of the devices appearing on the other (second) device. Thus, *Corazza* in view of *Brown* teaches routing a message with the dynamic emoticon to a second computer device, rendering Claim 1(d) obvious.

116. A PHOSITA would have recognized the convenience and simplicity taught by routing messages to a second device pursuant to *Brown* would have been desirable in the messaging system of *Corazza* in view of *Brown* to maximize the likelihood that users would see and use the emoticon functions by removing any additional required effort to follow a link to the emoticon. A PHOSITA would have expected that some users, out of haste, laziness, or discomfort with technology, may

have not followed the link to view the emoticon, losing the value of the added emotional context in some instances. Further, as described by *Solonen*, a PHOSITA would have recognized the desire to maintain real-time interactivity in the communication, which would have been improved by routing the emoticons with the message as taught by *Brown* in the system of *Corazza and Brown*. *Solonen*, ¶ [0006].

117. A PHOSITA would have recognized that it would have been a simple substitution to send emoticons with messages as taught by *Brown* instead of indirectly via links as taught by *Corazza*, requiring only reprogramming of the communication devices using hardware already present. The linking functionality would be substituted with software instructions for transmitting the emoticons directly from one device to a second device. Additionally, this modification would have been recognized by a PHOSITA as applying a known technique (transmitting an emoticon alongside a message, per *Brown*) to a known system (*Corazza's* communication system, transmitting emoticons indirectly via links). Further, For these reasons, in my opinion, a PHOSITA would have had a reasonable expectation of success for the combination, accomplished without undue experimentation. The resulting modified communication system would have used dynamic emoticons to convey context and emotion in a convenient, operable manner that would have increased the desirability of the system to users.

C. Claim 2

2. The computer device of claim 1, wherein a messaging interface is used to compose the message, and wherein the dynamic emoticon is embedded as part of message.

118. *Corazza* teaches Claim 2. *See* Ground I, Claim 2. Additionally, *Corazza* in view of *Brown* further teaches the claimed emoticon. *See*, Ground II, Claim 1(a).

Thus, *Corazza* in view of *Brown* teaches Claim 2.

D. Claim 4

4. The computer device of claim 1, wherein the detected plurality of human facial expression states includes a smile, a laugh, a grimace, a frown, a pout, or any combination thereof.

119. *Corazza* teaches Claim 4. *See* Ground I, Claim 4. Thus, *Corazza* in view of *Brown* teaches Claim 4.

E. Claim 5

5. The computer device of claim 1, wherein the detected plurality of human facial expression states includes an expression corresponding to a mood or an emotion, a micro expression, a stimulated expression, a neutralized expression, a masked expression, or any combination thereof.

120. *Corazza* teaches Claim 5. *See* Ground I, Claim 5. Thus, *Corazza* in view of *Brown* teaches Claim 5.

F. Claim 6

6. The computer device of claim 1, where the at least one processor is further programmed to analyze a human facial expression using an expression recognition process to detect the human facial expression state.

121. *Corazza* teaches Claim 6. *See* Ground I, Claim 6. Thus, *Corazza* in view

of *Brown* teaches Claim 6.

G. Claim 7

7. The computer device of claim 1, wherein the dynamic emoticon is embedded at a displayable portion of the message.

122. *Corazza* teaches Claim 7. *See* Ground I, Claim 7. Thus, *Corazza* in view of *Brown* teaches Claim 7.

H. Claim 8

8. The computer device of claim 1, wherein a human facial expression is captured in real-time from the one or more sensors.

123. *Corazza* teaches Claim 8. *See* Ground I, Claim 8. Thus, *Corazza* in view of *Brown* teaches Claim 8.

I. Claim 11

11(Pre) A computer-implemented method of operating a messaging application, the method comprising:

124. *Corazza* teaches this limitation. *See* Ground I, Claim 11(Pre).

11(a) receiving a selection of an emoticon;

125. *Corazza* teaches Claim 11(a). *See* Ground I, Claim 11(a). Additionally, *Corazza* in view of *Brown* further teaches the claimed emoticon. *See* Ground II, Claim 1(a). Thus, *Corazza* in view of *Brown* teaches Claim 11(a).

11(b) monitoring a sensor feed provided by one or more sensors of a computer device to detect a plurality of human facial expression states;

126. *Corazza* teaches Claim 11(b). *See* Ground I, Claim 11(b). Thus, *Corazza* in view of *Brown* teaches Claim 11(b).

11(c) automatically generating a dynamic emoticon that simulates the detected plurality of human facial expression states on the selected emoticon based on the sensor feed of the plurality of human facial expression states; and

127. *Corazza* teaches Claim 11(c). *See* Ground I, Claim 11(c). Additionally, *Corazza* in view of *Brown* further teaches the claimed emoticon. *See* Ground II, Claim 1(a). Thus, *Corazza* in view of *Brown* teaches Claim 11(c).

11(d) route a message with the dynamic emoticon to a second computer device.

128. *Corazza* teaches Claim 11(d). *See* Ground I, Claim 11(d). Additionally, *Corazza* in view of *Brown* further teaches routing a message with the claimed emoticon. *Supra*, Ground II, Claim 1(a), 1(d). Thus, *Corazza* in view of *Brown* teaches Claim 11(d).

J. Claim 12

12. The computer-implemented method of claim 11, wherein a messaging interface is used to compose the message, and wherein the dynamic emoticon is embedded as part of the message.

129. *Corazza* teaches Claim 12. *See* Ground I, Claim 12. Additionally, *Corazza* in view of *Brown* further teaches the claimed emoticon. *Supra*, Ground II, Claim 1(a). Thus, *Corazza* in view of *Brown* teaches Claim 12.

K. Claim 14

14. The computer-implemented method of claim 11, wherein the detected plurality of human facial expression states includes a smile, a laugh, a grimace, a frown, a pout, or any combination thereof.

130. *Corazza* teaches Claim 14. *See* Ground II, Claim 4. Thus, *Corazza* in view of *Brown* teaches Claim 14.

L. Claim 15

15. The computer-implemented method of claim 11, wherein the detected plurality of human facial expression states includes an expression corresponding to a mood or an emotion, a micro expression, a stimulated expression, a neutralized expression, a masked expression, or any combination thereof.

131. *Corazza* teaches Claim 15. *See* Ground II, Claim 5. Thus, *Corazza* in view of *Brown* teaches Claim 15.

M. Claim 16

16. The computer-implemented method of claim 11, further comprising analyzing a human facial expression using an expression recognition process to detect the human facial expression state.

132. *Corazza* teaches Claim 16. *See* Ground II, Claim 6. Thus, *Corazza* in view of *Brown* teaches Claim 16.

N. Claim 17

17. The computer-implemented method of claim 11, wherein a human facial expression is captured in real-time from the one or more sensors.

133. *Corazza* teaches Claim 17. *See* Ground II, Claim 8. Thus *Corazza*, in view of *Brown* teaches Claim 17.

O. Claim 18

18. The computer-implemented method of claim 11, further comprising continuously detecting human facial expression states using one or more sensors of the computer device after detecting a

first human facial expression state.

134. *Corazza* teaches Claim 18. *See* Ground I, Claim 18. Thus *Corazza* in view of *Brown* teaches Claim 18.

P. Claim 19

19(Pre) At least one non-transitory computer-readable storage media having computer-executable instructions embodied thereon, wherein when executed by a computer device having at least one processor in communication with at least one memory device, the computer-executable instructions cause the processor to:

135. *Corazza* teaches this limitation. *See* Ground I, Claim 19(Pre).

19(a) receive a selection of an emoticon;

136. *Corazza* teaches this limitation. *See* Ground I, Claim 19(a). Further, *Corazza* in view of *Brown* teaches this limitation. *See* Ground II, Claim 1(a). Thus, *Corazza* in view of *Brown* teaches Element 19(a).

19(b) monitor a sensor feed provided by one or more sensors of the computer device to detect a plurality of human facial expression state;

137. *Corazza* teaches this limitation. *See* Ground I, Claim 19(b). Thus, *Corazza* in view of *Brown* teaches Element 19(b).

19(c) automatically generate a dynamic emoticon that displays the selected emoticon changing to the plurality of detected human facial expression states based on the sensor feed of the plurality of human facial expression states; and

138. *Corazza* teaches this limitation. *See* Ground I, Claim 19(c). Further, *Corazza* in view of *Brown* teaches this limitation. *See* Ground II, Claim 1(c). Thus,

Corazza in view of *Brown* teaches Element 19(c).

19(d) route a message with the dynamic emoticon to a second computer device,

139. *Corazza* teaches this limitation. *See* Ground I, Claim 19(d). Further, Additionally, *Corazza* in view of *Brown* further teaches routing a message with the claimed emoticon. *See* Ground II, Claim 1(a), Claim 1(d). Thus, *Corazza* in view of *Brown* teaches Element 19(d).

19(e) wherein the second computer device displays the selected emoticon changing to the detected plurality of human facial expression states.

140. *Corazza* teaches this limitation. *See* Ground I, Claim 19(e). Further, *Corazza* in view of *Brown* teaches this limitation. *See* Ground II, Claim 1(d). Thus, *Corazza* in view of *Brown* teaches Element 19(e).

Q. Claim 20

20. The at least one non-transitory computer-readable storage media of claim 19, wherein the detected plurality of human facial expression states includes a smile, a laugh, a grimace, a frown, a pout, or any combination thereof.

141. *Corazza* teaches Claim 20. *See* Ground I, Claim 20. Thus, *Corazza*, in view of *Brown* teaches Claim 20.

VII. GROUND III – CORAZZA IN VIEW OF BROWN AND GATES TEACHES ALL THE LIMITATIONS OF CLAIMS 3, 9-10, AND 13

142. With respect to *Corazza*, I incorporate by reference my opinions above in ¶¶61-92.

143. With respect to *Brown*, I incorporate by reference my opinions above in ¶¶93-141.

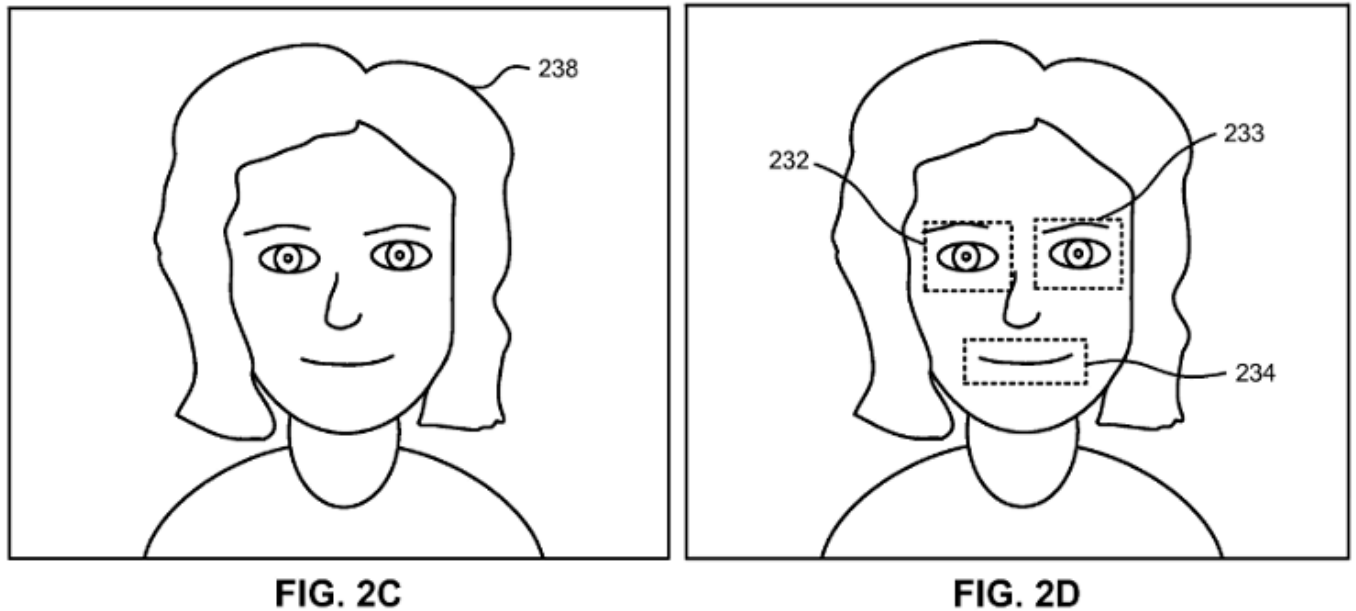
A. Overview of Gates

144. U.S. Patent No. 9,256,748 to Gates et al. (“*Gates*”) was filed on March 14, 2013, and issued on February 9, 2016. *Gates* describes recognizing an authorized end user’s identity from captured images and detecting an end user’s emotions or mood from the captured images. *Gates* (Ex. 1006) at 2:8-16, 1:11-14.

145. *Gates* provides “a computer program product comprising a computer readable storage medium having computer readable program code... configured to determine an identification of an end user of a computing device connected to a network,” by capturing “images of the end user while the end user is operating the computing device.” *Gates* at 2:8-20. *Gates* depicts a networked computing environment including a mobile device 140 in Figure 1. *Id.* at Figure 1, 5:62-66. Mobile device 140 is “running a client application” and includes a front-facing camera. *Id.* at 8:5-9. The front-facing camera is “used to capture images of the end user for determining the identity of the end user and for detecting facial expressions performed by the end user.” *Id.* at 8:26-29.

146. *Gates* uses the front-facing camera for both facial recognition and facial expression recognition. Figures 2C and 2D illustrate image capture and analysis of an end user to “identify the end user 238 using facial recognition techniques and to

detect particular facial expressions performed by the end user (e.g., smiling) using facial expression recognition techniques.” *Id.* at 9:46-10:1.



147. When the identification of the user is determined “by applying facial recognition techniques to the images,” the “facial recognition techniques may be used to identify the end user based on a database of employee images.” *Id.* at 11:1-4. Such facial recognition may be used by a client application that requires biometric identification of the end user, such as when establishing a VPN connection. *Id.* at 8:30-42. The client application may also “require continuous biometric identification (e.g., facial recognition) of the end user of a mobile device while a secure connection is established. The continuous identification of the end user may be used to detect when a person different from the end user (e.g., a child or stranger) is operating the mobile device while the secure connection is established, in which case the client

application may close or terminate the secure connection.” *Id.* at 8:43-51. Once a server is provided with authentication information, the server “may transmit to the mobile device security protected data accessible by the end user.” *Id.* at 7:29-31.

148. *Gates* also uses the front-facing camera to capture images for “detecting facial expressions performed by the end user.” *Id.* at 8:26-29. *Gates* teaches a multitude of benefits associated with detecting and tracking an end user’s facial expression over time, including determining the end user’s emotions or moods.

149. “Facial expressions may provide cues to emotions or moods experienced by a person during a real-time conversation (e.g., during a video conferencing session) or while the person is reading or composing an email message or other form of written communication. Facial expression recognition systems may be used to identify a person or characteristics of the person (e.g., the age and gender of the person), recognize facial expressions performed by the person over time (e.g., by matching selected facial features or expressions with images stored in a facial expressions database), and determine (or infer) an emotional state of the person based on the facial expressions performed by the person over time. A facial expression recognition system may detect expressions associated with facial features (e.g., eyes, eyebrows, nose, or mouth) and changes in facial feature expressions (e.g., changes in the geometric relationships between the eyes and eyebrows or nose and mouth) using machine-learning based techniques. As movement of facial muscles

that lead to particular facial expressions may be involuntarily or unintentionally performed by a person in a particular emotional state, the particular facial expressions may be a reliable indicator of the person's particular emotional state.” *Id.* at 1:22-34.

150. Both *Gates* and the '623 Patent are directed to “protecting messages through a messaging system via a biometric security mechanism” implemented on end-user devices. '623 Patent at 2:25-28. In the '623 Patent, such end-user devices include “personal computers, smart phones, tablets, desktop computers, laptops” on which a messaging application is installed. *Id.* at 2:30-32. The biometric security mechanism “implements a biometric recognition process to verify one or more identities as authorized by the message senders.” *Id.* at 2:60-3:13; 3:26-30; 3:37-45. Similarly, *Gates* implements security measures on networked computing devices, including “a mobile phone, laptop computer, desktop computer, or tablet computer.” *Gates* at 6:5-7. Such a device provides authentication information to a server, which “may be automatically determined by the mobile device based on the identification of various biometric characteristics of the end user.” *Id.* at 7:23-36. The biometric characteristics are determined from “images of an end user of the computing device” that are acquired “as the end user performs work-related tasks such as drafting emails.” *Id.* at 10:59-66. Upon authenticating the user, a secure connection is established. *Id.* at 8:30-37. In this way, both *Gates* and the '623 Patent are related to

communication devices implementing biometric authentication security measures, and a PHOSITA would have understood both *Gates* and the '623 Patent to be in the same field of endeavor.

151. A person of ordinary skill also would have understood that the '623 Patent was attempting to solve various problems, including ensuring that only an authenticated user can use the client device and recognizing an end user's expression to determine a user's emotional state when using applications on the device. '623 *Patent* at 3:26-30 and 4:32-36. *Gates* is reasonably pertinent to both problems as *Gates* teaches identifying the end user “using facial recognition techniques” and detecting “particular facial expressions performed by the end user (e.g., smiling) using facial expression recognition techniques.” *Gates* at 9:46-10:1.

152. Specifically, one problem sought to be solved by the '623 Patent is “whether the people who have access to the end-user device (e.g., looking at the screen of the end-user device) are consistent with the privacy settings of the sender account,” to “ensures that a third party (e.g., a brother or a classmate) cannot send messages on behalf of the user.” '623 *Patent* at 3:18-32. As mentioned above, *Gates* is similarly concerned with maintaining the integrity of a secure connection established for an authorized user. *Gates* at 11:5-12, *see also* 8:30-51. To achieve this, some embodiments in *Gates* “require continuous biometric identification (e.g., facial recognition) of the end user of the mobile device while a secure connection is

established” to “detect when a person different from the end user (e.g., a child or stranger) is operating the mobile device while the secure connection is established.” *Id.* at 8:43-51. Facial recognition techniques compare images acquired while the end user is operating the computing device, such as while drafting emails, and compare the images to “a database of employee images” to identify the user. *Id.* at 11:1-4. The secure connection is maintained unless a person different from the end user is detected, in which case the computing device “may close or terminate the secure connection.” *Id.* at 11:7-12, *see also* 8:43-51. *Gates* is reasonably pertinent to the problem of device security using facial recognition sought to be solved by the ’623 Patent.

153. Another problem sought to be solved by the ’623 Patent is that of expression recognition capable of determining an expression state that “can correspond to an emotion, a mood, or other patterns recognizable across the biometric signatures of various people.” ’623 *Patent* at 8:9-13. The ’623 Patent suggests integrating the expression recognition with the biometric security engine, allowing the biometric signature detected in captured images to be used to determine an expression state. *Id.* at 7:66-8:11. Like the ’623 Patent, *Gates* also employs a front-facing camera to “capture images of the end user for determining the identity of the end user and for detecting facial expressions performed by the end user.” *Gates* at 8:26-29, *see also* 9:46-53, 10:59-61. *Gates* detects facial expressions that

“provide cues to emotions or moods experienced by a person during a real-time conversation (e.g., during a video conferencing session) or while the person is reading or composing an email message or other form of written communication.” *Id.* at 1:22-26. By employing facial expression detection techniques to the captured images, *Gates* classifies an end user’s reaction captured during a relatively short period of time (e.g., five seconds) and an end user’s mood over a relatively longer period. *Id.* at 29:1-9; 32:33-40. *Gates* is reasonably pertinent to the problem of recognizing an end user’s facial expressions within images captured for biometric authentication to determine the end user’s emotional state or mood.

154. A PHOSITA would have looked to known methods for performing facial expression recognition capable of determining an end user’s identity and emotional state or mood, such as *Gates*’s facial recognition and facial expression recognition implemented on mobile computing devices. A PHOSITA would have understood *Gates* was reasonably pertinent to the issues being solved by the ’623 Patent and would have looked to its teachings for solving those issues.

B. Claim 3

3. The computer device of claim 1, wherein the at least one processor is further programmed to detect a facial profile and to match the facial profile against a known facial profile utilizing a facial recognition process to authenticate an operating user.

155. As discussed above, *Corazza* teaches a computing device having a processor and memory containing a messaging application that configures the

processor to “capture a video sequence using the video camera; detect a human face within a sequence of video frames; and track changes in human facial expressions of a human face detected within a sequence of video frames for the purpose of animating a 3D character.” *Corazza* at Abstract, ¶6. *Corazza*’s messaging application detects a human face (e.g., facial profile) from images captured by a camera for the purpose of tracking changes in facial expressions. However, neither *Corazza* nor *Corazza* in view of *Brown* suggests matching *Corazza*’s detected human face detected against a known facial profile using a facial recognition process to authenticate a user currently operating the device.

156. Nevertheless, facial recognition techniques that compare a captured image with a database of known profiles was well known in the art. One such example is described by *Gates*. *Gates* uses a front-facing camera “to capture images of the end user for determining the identity of the end user and for detecting facial expressions performed by the end user.” *Gates* at 8:26-29, *see also* 9:46-53, 10:59-63. As shown in Figure 3B, in “step 306, an identification of the end user is determined based on the images” of the detected end user “by applying facial recognition techniques to the images” to “identify the end user based on a database of employee images.” *Id.* at 10:66-11:4; *see also* 6:46-55, 7:23-38, 4:37-5:3, 8:37-42, 10:59-11:4, 13:42-50, 18:38-46 13:42-50, 18:38-46; Figures 3B, 4A.

157. One of ordinary skill in the art would have recognized *Gates*’s teaching

that “authentication information may be automatically determined by the mobile device based on biometric characteristics of the end user,” (*Id.* at 7:29-33) and statement that the end user captured in an image is identified “based on a database of employee images” (*Id.* at 10:66-11:4) requires matching biometric characteristics of the end user in the captured image with images associated with authorized employees stored in the database of employee images. *Id.* at 11:1-4; 7:29-33, 10:66-11:4. This is supported by *Gates*’s description of known facial expression recognition systems that “may be used to identify a person or characteristics of the person” and to “recognize facial expressions performed by the person over time (e.g., by matching selected facial features or expressions with images stored in a facial expressions database).” *Id.* at 1:26-31. A skilled artisan would have understood that identifying a person in an image would also require matching facial features in captured images with images stored in a database of employee images in the same way that recognizing facial expressions requires matching facial features or expressions with images stored in a facial expression database.

158. The matching process is in *Gates*’s teaching that a person different from the end user, such as a child or stranger, can be detected during a secure connection session that uses continuous biometric identification (e.g., facial recognition). *Id.* at 8:43-51. Since the image of the child or stranger would not match any of the existing employee images in a database, the authentication process would fail, and the secure

connection would be terminated. A person of ordinary skill would have understood that *Gates* teaches matching the detected facial profile against a known facial profile.

159. In my opinion, it would have been obvious to have implemented biometric user authentication using the images of a user captured in the *Corazza/Brown* method/system, as taught by *Gates*. In the combined *Corazza/Brown/Gates* system, *Corazza's* captured video in which a “region of a video image identified as representing a human face” (*Corazza*, ¶63) would be processed with *Gates's* “facial recognition techniques” (*Gates*, 10:59-11:4) to, for example, establish “a secure connection to a secure network” for a user of *Corazza/Brown* who is identified as an authorized end user of the device. *Gates*, 8:30-51, 7:44-56. Since this implementation would be applied to the existing images of the user captured by *Corazza*, such implementation would not fundamentally change the principle of operation *Corazza/Brown* method/system, and such authentication would not interfere with sending messages “to other networked computing devices over a network,” as suggested by the *Corazza/Brown* method/system.

160. A person of ordinary skill in the art would have considered recognizing and authenticating an end user, as taught by *Gates*, based on detected biometric characteristics captured by the image capturing and messaging system of *Corazza*, in view of *Brown*, to be an obvious combination of known elements according to

known methods, predictably resulting in at least one processor is further programmed to detect a facial profile and to match the facial profile against a known facial profile utilizing a facial recognition process to authenticate an operating user. *Gates*, 1:26-43. Implementing the user authentication of *Gates* with the messaging system of *Corazza*, in view of *Brown*, would have been within the capabilities of the ordinarily skilled artisan.

C. Claim 9

9. The computer device of claim 1, wherein the at least one processor is further programmed to detect a plurality of human facial expression states on a periodic basis based on a predetermined period of time.

161. As explained above, *Corazza*'s computing device includes a processor configured by a messaging application stored in memory to detect a plurality of human facial expression states by capturing a video sequence using the video camera, detecting a human face within a sequence of video frames, and tracking changes in human facial expressions of a human face detected within a sequence of video frames for the purpose of animating a 3D character. *Corazza* at Abstract; ¶6. *Corazza* also renders a composite video of "an animated facial model of a character can be translucently overlaid in real time on the video of the human face used to drive the animation[.]" *Id.* at ¶46. This is consistent with the '623 Patent that monitors a video feed to detect a biometric signature. '623 Patent, Figure 4, Steps 402 and 404, 9:26-34, (emphasis added).

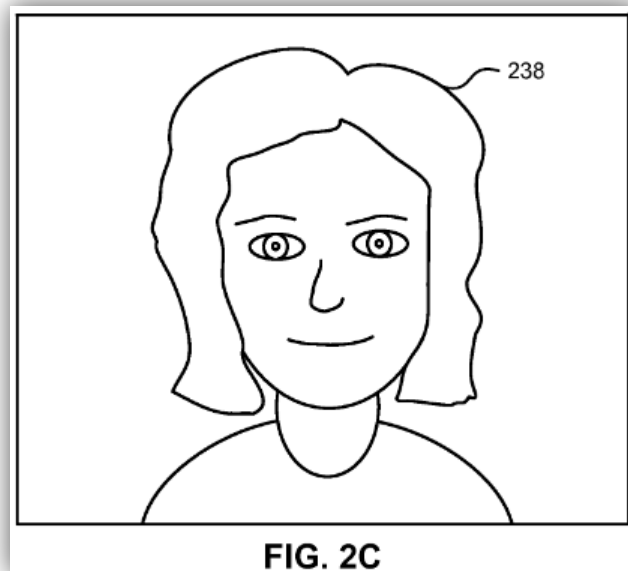
162. It is well known to a person of ordinary skill that a video frame is a single, still image, and that “a sequence of video frames” is a series of still images captured at a particular frequency. This frequency is known as the “frame rate,” for which the units are frames per second (fps). For example, in an ASSETS article by *Zhong et al.* (“*Zhong*”) (Ex. 1017) published in 2013 entitled “Real Time Object Scanning Using a Mobile Phone and Cloud-based Visual Search Engine” explains that “Most mainstream phones now have a camera that can capture frames at a rate of 30 fps.” *Zhong*, § 3.2.1. In other words, 30 frames are captured every second.

163. *Corazza* tracks changes in human facial expressions across video images using various methods, such as tracking “landmark points, edges, colors or any aspect of video images from which changes in human facial expressions can be tracked.” *Corazza*, ¶61. Similarly, the ’623 Patent monitors **a video feed** from a camera to detect a biometric signature while a messaging application is actively in use. ’623 Patent, Figure 4, Steps 402 and 404, 9:26-34, (emphasis added). A person of skill would understand that the changes in facial expressions are tracked by comparing the relative positions of the identified features (e.g., landmark points) of a current video frame to the features in a previous frame. Since each frame detects a human facial expression at the time of capture, and since a typical video frame rate captures one frame every 1/30 second, one of skill would have recognized tracking changes in human facial expressions captured in a sequence of video occurs on a

periodic basis, as claimed.

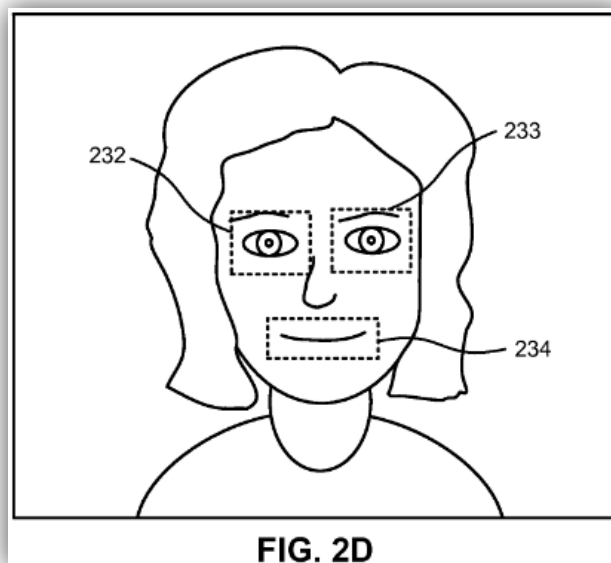
164. However, neither *Corazza* nor *Corazza* in view of *Brown* suggests that the periodic basis in which the human facial expressions are detected is based on a predetermined period of time.

165. As discussed above, *Gates* performs “continuous identification of the end user while the secure connection is established” by capturing “video and/or audio associated with the end user.” *Gates* at 10:61-11:12, 8:43-46. An example of a captured image used to identify the end user is provided in Figure 2C.



166. *Gates* teaches analyzing such an image “in order to identify the end user 238 using facial recognition techniques and to detect particular facial expressions performed by the user (e.g., smiling) using facial expression recognition techniques.” *Id.* at 9:46-53, *see also* 8:26-29, 14:42-50. The analysis identifies

“facial features 232-234 associated with an end user of the computing device. The facial features 232-233 may correspond with eyes and eyebrows of the end user and facial feature 234 may correspond with the mouth of the end user.” *Id.* at 9:56-61; Figure 2D.



167. By identifying changes “in facial expressions (e.g., eyes narrowing, changes in blinking patterns, and changes in the shape of the end user’s eyebrows),” may be “analyzed to detect the person’s emotions or mood.” *Id.* at 9:61-66, 1:22-38; *see also* 11:53-62.

168. According to *Gates*, the detected emotions of the end user are a form of non-verbal communication. *Id.* at 1:10-11. “Emotions may refer to feelings experienced by a person over a short period of time in response to a particular event (e.g., anger due to reading a particular email).” *Id.*, 1:14-20. *Gates* determines a

detected facial expression corresponds to an event-triggered emotion when “the end user performs facial expressions... for **more than a threshold period of time (e.g., five seconds)**.” *Id.*, 29:3-9, 30:56-62 (emphasis added). These emotions are determined from the particular frames captured in the video sequence considered for determining the user’s emotion at some rate (e.g. every second).

169. For the frame rate of the camera being used in the *Gates* system, frames are captured on a periodic basis (such as, for example, once “every second” as taught by *Gates* at 17:8-25) in order to determine the user’s emotion on a predetermined period of time (for example, 5 seconds as taught by *Gates* at 29:3-9, 30:56-62).

170. Since *Gates* adjusts the frequency (periodic basis) for capturing the end user based on the duration of a sampling period, one of ordinary skill in the art would have recognized that *Gates* detects a plurality of human facial expression states on a periodic basis based on a predetermined period of time.

171. In my opinion, it would have been obvious to have detected *Corazza’s* plurality of human facial expression states on a periodic basis based on a predetermined period of time, as taught by *Gates*. In the combined *Corazza/Brown/Gates* method/system, *Corazza* captures video at a sufficient frame rate and for a sufficient period of time “to detect the person’s emotions” using the known facial expression recognition methods of *Gates*. *Gates*, 1:13-14. The detected emotions are then applied to the emoticon-style characters for transmission in the

message of *Brown* to represent “a user’s facial expression” to convey “the tenor of the writer’s message.” *Brown*, 1:18-25. Since *Corazza* captures video images including a human face (*Corazza*, ¶¶63, 54), and *Corazza*, in view of *Brown*, sends messages, such as e-mail, text messages, etc. intended to convey the tenor of the writer’s message, implementing *Gates*’s periodic capture rate and capture durations to detect and classify the end user’s emotion or mood would not fundamentally change the principle of operation of the *Corazza/Brown* system.

172. *Gates* shows that identifying a person’s emotions with facial expression recognition was known in the prior art. One of ordinary skill would have been motivated to configure the *Corazza/Brown* messaging system to recognize the emotions of the end user, as taught by *Gates*, because this combination would have been a combination of prior art elements according to known methods to yield predictable results. The ordinarily skilled artisan would have understood such a modification to have been well within the level of ordinary skill in the art such that there would have been a reasonable expectation of success. *Corazza* in view of *Brown*, and in further view of *Gates*, teaches claim 9.

D. Claim 10

10. The computer device of claim 1, wherein the sensor feed is analyzed for an expression recognition process and a biometric recognition process.

173. It is my opinion that *Corazza* in view of *Brown* and further in view of

Gates renders Claim 10 obvious.

174. As I explained above in the rationale for claims 3 and 9, *Gates* teaches analyzing images “captured from a front-facing camera” that include “a representation of an end user” to “identify the end user 238 using facial recognition techniques and to detect particular facial expressions performed by the end user (e.g., smiling) using facial expression recognition techniques.” *Gates*, 9:46-53; *see also* 8:26-29.

175. One of ordinary skill in the art would have found it obvious to have analyzed *Corazza*’s video sequence that includes a human facial expression to recognize both the end user’s identity and the end user’s facial expressions, as taught by *Gates*. In the combined *Corazza/Brown/Gates* system, the identity and emotions of the end user captured in *Corazza*’s “region of a video image identified as representing a human face” (*Corazza*, ¶63) are determined using the known facial expression recognition methods and the known facial recognition methods of *Gates*. *Gates*, 1:13-34. The recognized emotion detected by *Gates* would be applied to the emoticon-style character of *Corazza/Brown* to be incorporated into a message to convey a user’s facial expression, and thus “the tenor of the writer’s message.” *Brown*, 1:18-25. Such an implementation would not fundamentally change the principle of operation of *Corazza/Brown*. *Corazza* captures video images including a human face, and *Corazza* in view of *Brown* sends messages “to other networked

computing devices over a network” (*Corazza*, ¶¶63, 54), such as “e-mail, text messages, etc.” *Brown*, 1:18-25. Implementing the facial recognition and the facial expression recognition of *Gates* with the configuration of *Corazza/Brown* would not fundamentally change the principle of operation of *Corazza/Brown*.

176. *Gates* shows that a system capable of performing **both** facial recognition and facial expression recognition was known in the prior art. One of ordinary skill would have been motivated to configure the *Corazza/Brown* messaging system to recognize the identity and the emotions of the end user, as taught by *Gates*, because this combination would have been a combination of prior art elements according to known methods to yield predictable results. The ordinarily skilled artisan would have understood such a modification to have been well within the level of ordinary skill in the art such that there would have been a reasonable expectation of success. *Corazza* in view of *Brown*, and in further view of *Gates*, teaches claim 10.

E. Claim 13

13. The computer-implemented method of claim 11, further comprising detecting a facial profile and matching the facial profile against a known facial profile utilizing a facial recognition process to authenticate an operating user.

177. *Corazza* teaches Claim 13. *See* Ground III, Claim 3. Thus, *Corazza*, in view of *Brown* and in further view of *Gates* teaches Claim 13.

VIII. CONCLUSION

178. 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 that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: April 17, 2023

By:

A rectangular box containing a handwritten signature in black ink. The signature appears to be "B. B. Bederson" written in a cursive style.

Benjamin B. Bederson