IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

STRATASYS, INC., Plaintiff, v. SHENZHEN TUOZHU TECHNOLOGY CO., LTD., SHANGHAI LUNKUO TECHNOLOGY CO., LTD., BAMBU LAB LIMITED, AND TUOZHU TECHNOLOGY LIMITED, Defendants.	Civil Action No. 2:24-cv-00644-JRG LEAD CASE Civil Action No. 2:24-cv-00645-JRG MEMBER CASE JURY TRIAL DEMANDED

DEFENDANTS' INVALIDITY AND INELIGIBILITY CONTENTIONS

TABLE OF CONTENTS

Page

I. INTRODUCTION 1

A. Asserted Claims 1

B. Ongoing Discovery and Disclosures 2

C. Claim Construction 2

D. Prior Art Identification and Citation 3

E. Additional Reservation of Rights 5

II. P.R. 3-3 DISCLOSURES AND CONTENTIONS 6

A. P.R. 3-3(a): Identification of Prior Art 6

1. Prior Art Patents and Published Patent Applications 7

a. The ’698 Patent 7

b. The ’381 Patent 8

c. The ’466 Patent 8

d. The ’464 Patent 9

e. The ’324 Patent 10

f. The ’097 Patent 11

g. The ’713 Patent 12

h. The ’357 Patent 13

i. The ’660 Patent 13

j. The ’774 Patent 14

2. Prior Art Non-Patent Publications 15

a. The ’698 Patent 15

b. The ’381 Patent 15

c. The ’466 Patent 16

d. The ’464 Patent 16

e. The ’324 Patent 17

f. The ’097 Patent 18

g. The ’713 Patent 19

h. The ’357 Patent 22

i. The ’660 Patent 24

j. The ’774 Patent 24

3. Prior Art Systems 25
a. The ’698 Patent.....25
b. The ’381 Patent.....25
c. The ’466 Patent.....26
d. The ’464 Patent.....27
e. The ’324 Patent.....27
f. The ’097 Patent.....27
g. The ’713 Patent.....28
h. The ’357 Patent.....28
i. The ’660 Patent.....29
j. The ’774 Patent.....29
B. P.R. 3-3(b): Anticipation and Obviousness Grounds.....30
1. Anticipatory References 30
a. The ’698 Patent.....30
b. The ’381 Patent.....31
c. The ’466 Patent.....31
d. The ’464 Patent.....32
e. The ’324 Patent.....33
f. The ’097 Patent.....33
g. The ’713 Patent.....34
h. The ’357 Patent.....35
i. The ’660 Patent.....35
j. The ’774 Patent.....36
2. Obviousness Combinations.....36
a. The ’698 Patent.....42
b. The ’381 Patent.....58
c. The ’466 Patent.....73
d. The ’464 Patent.....89
e. The ’324 Patent.....103
f. The ’097 Patent.....113
g. The ’713 Patent.....123
h. The ’357 Patent.....136
i. The ’660 Patent.....151

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 3

j. The ’774 Patent 161
C. P.R. 3-3(c): Claim Charts 190
D. P.R. 3-3(d): Invalidity Under 35 U.S.C. § 112 191
1. Legal Standards and Reservation of Rights 191
2. Identification of Terms and Phrases 194
a. The ’698 Patent 194
b. The ’381 Patent 195
c. The ’466 Patent 196
d. The ’464 Patent 196
e. The ’324 Patent 197
f. The ’097 Patent 200
g. The ’713 Patent 205
h. The ’357 Patent 207
i. The ’660 Patent 209
j. The ’774 Patent 210
III. P.R. 3-4 DISCLOSURES AND CONTENTIONS 212
A. P.R. 3-4(a): Production of Documents 212
B. P.R. 3-4(b): Production of Prior Art 213
IV. SUBJECT MATTER INELIGIBILITY 213

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 4

I. INTRODUCTION

Pursuant to P.R. 3-3 and 3-4, Defendants Shenzhen Tuozhu Technology Co., Ltd., Shanghai Lunkuo Technology Co., Ltd., BambuLab Limited, and Tuozhu Technology Limited (collectively, "Defendants" or "Bambu") hereby disclose their P.R. 3-3 and 3-4 disclosures ("Invalidity Contentions") in view Stratasys, Inc.'s ("Plaintiff" or "Stratasys") P.R. 3-1 and 3-2 Disclosures ("Infringement Contentions") served on November 14, 2024. In the event that Stratasys should amend its Infringement Contentions, these Invalidity Contentions may change and Defendants reserve the right to amend or supplement these Invalidity Contentions. Defendants contend that each of the Asserted Claims (as defined below) is invalid under at least 35 U.S.C. §§ 101, 102, 103, and/or 112.

A. Asserted Claims

Stratasys served Defendants with Infringement Contentions concerning the following patents and claims (collectively, the "Asserted Patents" and "Asserted Claims"):

- Claims 1-5, 7-10, 12, 15 of U.S. Patent No. 9,168,698 (the "'698 Patent"); and
- Claims 1, 2, 5, 6, 9, 11, 12, 14 of U.S. Patent No. 10,556,381 (the "'381 Patent"); and
- Claims 1-5, 7-12, 16, 17, 19, 20 of U.S. Patent No. 10,569,466 (the "'466 Patent"); and
- Claims 1-6, 12-15, 17, 18 of U.S. Patent No. 11,167,464 (the "'464 Patent"); and
- Claims 1, 3, 5-11, 17-22 of U.S. Patent No. 8,562,324 (the "'324 Patent"); and
- Claims 1, 2, 4, 5, 8-12, 14-18 of U.S. Patent No. 8,747,097 (the "'097 Patent"); and
- Claims 1, 2, 5-7, 9, 16, 17 of U.S. Patent No. 9,421,713 (the "'713 Patent"); and
- Claims 1-19 of U.S. Patent No. 7,555,357 (the "'357 Patent"); and
- Claims 1, 2, 4, 6-8, 10-12, 14 of U.S. Patent No. 9,592,660 (the "'660 Patent"); and
- Claims 1-6, 8-10, 12, 13, 19 of U.S. Patent No. 11,886,774 (the "'774 Patent").

These Invalidity Contentions address only the Asserted Claims specifically set forth in Stratasys's Infringement Contentions.

B. Ongoing Discovery and Disclosures

Defendants base their Invalidity Contentions on Defendants' current knowledge and understanding of the Asserted Claims and review of prior art items as of the date of these Invalidity Contentions. Defendants' Invalidity Contentions are made without the benefit of discovery regarding the parties' claim construction contentions, any expert discovery, any third-party discovery, and any claim construction opinion or order by the Court. Accordingly, these Invalidity Contentions are provided without prejudice to Defendants' right to revise, amend, correct, supplement, modify, or clarify their Invalidity Contentions. Defendants also reserve the right to complete their investigation and discovery of the facts, to produce subsequently discovered information, and to introduce such subsequently discovered information at the time of any hearing or trial in this action.

Defendants incorporate by reference all other bases for invalidity identified in Defendants' Answer, Initial Disclosures, and interrogatory responses in this matter, and any bases of invalidity identified during the prosecution of the Asserted Patents and all related patents and/or patent applications. Defendants further incorporate by reference all admissions regarding the Asserted Patents including, but not limited to, admissions in the specifications and prosecution histories of the Asserted Patents and related patents and/or patent applications.

C. Claim Construction

The Court has not construed the Asserted Claims. Defendants map the prior art references to the Asserted Claims based on Stratasys's apparent constructions, to the extent understood, of the Asserted Claims as advanced in Stratasys's Infringement Contentions. However, nothing stated in this document or accompanying claim charts should be treated as an admission or

suggestion that Stratasys's apparent claim constructions are correct, or that any claim terms of the Asserted Claims are not invalid under 35 U.S.C. § 112 for being indefinite, failing to satisfy the written description requirement, or failing to satisfy the enablement requirement.

Depending on the Court's construction of the Asserted Claims, and/or positions that Stratasys or its expert witness(es) may take concerning claim interpretation, infringement, and/or invalidity issues, the asserted prior art references may be of greater or lesser relevance. Given this uncertainty, the charts may reflect alternative applications of the prior art against the Asserted Claims. Thus, no chart or position taken by Defendants should be construed as an admission or a waiver of any particular construction of any claim term. Defendants also reserve the right to challenge any of the claim terms under 35 U.S.C. § 112, including by arguing that they are indefinite, not supported by the written description, and/or not enabled.

D. Prior Art Identification and Citation

The accompanying invalidity claim charts cite to particular teachings and disclosures of the prior art references as applied to features of the Asserted Claims. However, persons having ordinary skill in the art may view an item of prior art generally in the context of other publications, literature, products, and understanding. Accordingly, the cited portions are only exemplary and are intended to put Stratasys on notice of the basis for Defendants' contentions. Defendants have endeavored to identify the most relevant portions of the references, but the references may contain additional support for particular claim limitations. Defendants reserve the right to rely on uncited portions of the prior art references, other documents, and/or operational systems, as well as fact and expert testimony, to provide context or to aid in understanding the cited portions of the references and interpreting the teachings of the prior art and to establish bases for combinations of certain cited references that render the Asserted Claims obvious. Defendants reserve the right to rely on any prior art system referenced, embodied, or described in any of the prior art references

identified herein, or which embodies any of the prior art references identified herein. Moreover, Defendants reserve the right to rely on inventor admissions concerning the scope of the prior art relevant to the Asserted Patents found in, *inter alia*, the prosecution histories of the Asserted Patents and related patents and/or patent applications, any testimony or declarations of the named inventors concerning the Asserted Patents or related patents, and any papers or evidence submitted by Stratasys in connection with this litigation, any other pending or future litigation brought by Stratasys involving the Asserted Patents or related patents, or *inter partes* review proceedings involving the Asserted Patents or related patents. Defendants also may establish what was known to a person having ordinary skill in the art through treatises, published industry standards, other publications, products, and/or testimony.

Where the invalidity claim charts cite to a particular figure in a reference, the citation should be understood to encompass the caption of the figure and other text relating to and/or describing the figure. Similarly, where the invalidity claim charts cite to particular text referring to a figure, the citation should be understood to include the figure and related figures as well.

The prior art references listed herein and in the accompanying invalidity claim charts may disclose the elements of the Asserted Claims explicitly and/or inherently. The prior art references are also relevant for their showing of the state of the art and reasons and motivations for making improvements, additions, and combinations. The suggested obviousness combinations are provided in the alternative to Defendants' anticipation contentions and are not to be construed to suggest that any reference is not itself anticipatory.

Further, the combinations of prior art references contained herein demonstrating the obviousness of the Asserted Patents under 35 U.S.C. § 103 are merely exemplary and are not intended to be exhaustive. All such combinations are intended to include and be in view of the

knowledge of a person of ordinary skill in the art. Additional obviousness combinations of the identified prior art references are possible, and Defendants reserve the right to use any such combination(s) in this Action. In particular, Defendants are currently unaware of the extent, if any, to which Stratasys will contend that limitations of any particular claim(s) are not disclosed in the art that Defendants have identified as anticipatory. To the extent that Stratasys does so, Defendants reserve the right to identify other evidence or references that anticipate or render obvious the particular claim(s).

Nothing in these Invalidity Contentions should be treated as an admission that any of Defendants' accused instrumentalities meet any limitation of the Asserted Claims. Defendants deny infringing the Asserted Claims. To the extent that any prior art references identified by Defendants contain a claim element that is the same as or similar to an element in an accused instrumentality, based on a claim construction inferred from Stratasys's Infringement Contentions, inclusion of that reference in Defendants' Invalidity Contentions is not a waiver by Defendants of any claim construction or non-infringement position, nor is it an admission or suggestion by Defendants that any accused instrumentality satisfies the limitations of the Asserted Claims under a proper construction of those claims.

E. Additional Reservation of Rights

Defendants reserve all rights to further supplement or modify these Invalidity Contentions, including the prior art disclosed and stated grounds of invalidity. In addition, Defendants reserve the right to prove invalidity of the Asserted Claims on bases other than those required to be disclosed in these disclosures and contentions pursuant to P.R. 3-3.

Defendants' identification in the prior art of claim elements recited in the preamble of any claims is not intended to indicate that any such preamble is limiting. All such disclosures are made only to the extent the preamble is determined to be limiting.

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 9

Defendants also intend to diligently seek discovery from third parties to demonstrate the alleged inventions were known or used by others under 35 U.S.C. § 102(a), in public use and/or on-sale under 35 U.S.C. § 102(b), derived under 35 U.S.C. § 102(f), and/or invented earlier under 35 U.S.C. § 102(g). Defendants may therefore modify, amend, and/or supplement these Invalidity Contentions if and when further information becomes available.

Subject to the foregoing statements and qualifications, Defendants provide the following:

II. P.R. 3-3 DISCLOSURES AND CONTENTIONS

The provided appendices include claim charts of prior art references that, alone and/or in combination with other references, render the Asserted Claims of the Asserted Patents invalid under §§ 102 and/or 103.

Appendix A	U.S. Patent No. 9,168,698
Appendix B	U.S. Patent No. 10,556,381
Appendix C	U.S. Patent No. 10,569,466
Appendix D	U.S. Patent No. 11,167,464
Appendix E	U.S. Patent No. 8,562,324
Appendix F	U.S. Patent No. 8,747,097
Appendix G	U.S. Patent No. 9,421,713
Appendix H	U.S. Patent No. 7,555,357
Appendix I	U.S. Patent No. 9,592,660
Appendix J	U.S. Patent No. 11,886,774

A. P.R. 3-3(a): Identification of Prior Art

Subject to Defendants' reservation of rights, the following prior art patents, printed publications, and systems, alone and/or in combination, anticipate and/or render obvious the Asserted Claims of the Asserted Patents.

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 10

Discovery, however, is ongoing, and Defendants' prior art investigation and third party discovery are therefore not yet complete. Defendants reserve the right to present additional items of prior art under pre-AIA 35 U.S.C. § 102(a), (b), (e), (f) and/or (g), and/or § 103; or under AIA 35 U.S.C. § 102(a)(1) and/or 102(a)(2), and/or § 103 located during the course of discovery or further investigation. For example, Defendants expect to issue subpoenas to third parties believed to have knowledge, documentation, and/or corroborating evidence concerning some of the prior art listed in this and the following sections and/or additional prior art. These third parties include, without limitation, the authors, inventors, or assignees of the references listed in these disclosures. In addition, Defendants reserve the right to assert invalidity under pre-AIA 35 U.S.C. §§ 102(c) or (d) to the extent that discovery or further investigation yields information forming the basis for such invalidity.

1. Prior Art Patents and Published Patent Applications

Defendants disclose the following patents and patent application publications:

a. The '698 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
A-01	6,986,739	US	Filed: Aug. 23, 2002 Issued: Jan. 17, 2006	Warren
A-02	2007/0179656	US	Filed: May 2, 2004 Published: Aug. 2, 2007	Eshed
A-03	6,629,011	US	Filed: Jul. 17, 2000 Issued: Sep. 30, 2003	Calderon
A-04	2013/000933	US	Filed: July 5, 2011 Published: January 10, 2013	Mayer
A-05	2008/0195353	US	Filed: Jan. 30, 2008 Published: Aug. 14, 2008	Igasaki
A-06	2012/0105903	US	Filed: Jan. 12, 2012	Pettis

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 11

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
			Published May 3, 2012	
A-07	2007/0228592	US	Filed: Apr. 3, 2006 Published: Oct. 4, 2007	Dunn

b. The '381 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
B-01	6,986,739	US	Filed: Aug. 23, 2002 Issued: Jan. 17, 2006	Warren
B-02	2007/0179656	US	Filed: May 2, 2004 Published: Aug. 2, 2007	Eshed
B-03	6,629,011	US	Filed: Jul. 17, 2000 Issued: Sep. 30, 2003	Calderon
B-04	2013/000933	US	Filed: July 5, 2011 Published: January 10, 2013	Mayer
B-05	2008/0195353	US	Filed: Jan. 30, 2008 Published: Aug. 14, 2008	Igasaki
B-06	2012/0105903	US	Filed: Jan. 12, 2012 Published May 3, 2012	Pettis
B-07	2007/0228592	US	Filed: Apr. 3, 2006 Published: Oct. 4, 2007	Dunn

c. The '466 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
C-01	6,022,207	US	Filed: January 26, 1998 Published: February 8, 2000	Dahlin
C-02	2007/0026102	US	Filed: July 28, 2005 Published: February 1, 2007	Devos
C-03	2008/0192074	US	Filed: August 17, 2004	Dubois

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
			Published: August 14, 2008	
C-04	2011/0299110	US	Filed: March 16, 2010 Published: December 8, 2011	Jazayeri
C-05	2006/0091199	US	Filed: October 29, 2004 Published: May 4, 2006	Loughran
C-06	2006/0127153	US	Filed: November 12, 2003 Published: June 15, 2006	Menchik
C-07	2002/0171703	US	Filed: July 12, 2002 Published: November 21, 2002	Phillips
C-08	2004/0181681	US	Filed: March 11, 2003 Published: May 1, 2007	Salisbury
C-09	WO2014/039825	PCT	Filed: September 6, 2013 Published: March 13, 2014	Pax
C-10	WO2011/042899	PCT	Filed: October 5, 2010 Published: April 14, 2011	Sidi
C-11	2010/0192806	US	Filed: January 20, 2010 Published: August 5, 2010	Heugel

d. The '464 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
D-01	6,022,207	US	Filed: January 26, 1998 Published: February 8, 2000	Dahlin
D-02	2007/0026102	US	Filed: July 28, 2005 Published: February 1, 2007	Devos
D-03	2008/0192074	US	Filed: August 17, 2004	Dubois

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
			Published: August 14, 2008	
D-04	2011/0299110	US	Filed: March 16, 2010 Published: December 8, 2011	Jazayeri
D-05	2006/0091199	US	Filed: October 29, 2004 Published: May 4, 2006	Loughran
D-06	2006/0127153	US	Filed: November 12, 2003 Published: June 15, 2006	Menchik
D-07	2002/0171703	US	Filed: July 12, 2002 Published: November 21, 2002	Phillips
D-08	2004/0181681	US	Filed: March 11, 2003 Published: May 1, 2007	Salisbury
D-09	WO2014/039825	PCT	Filed: September 6, 2013 Published: March 13, 2014	Pax
D-10	WO2011/042899	PCT	Filed: October 5, 2010 Published: April 14, 2011	Sidi
D-11	2010/0192806	US	Filed: January 20, 2010 Published: August 5, 2010	Heugel

e. The '324 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
E-01	5,278,479	US	Filed: February 20, 1992, Issued: January 11, 1994	Seki
E-02	6,580,959	US	Filed: May 19, 2000 Issued: June 17, 2003	Mazumder
E-03	7,216,009	US	Filed: June 14, 2004 Issued: May 8, 2007	Farnworth
E-04	2000218708	JP	Filed: April 17, 1989 Published: August 8, 2000	Hull

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 14

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
E-05	2006/0171452	US	Filed: January 31, 2005, Published: August 3, 2006	Waehner
E-06	2006/0054039	US	Filed: December 3, 2003 Published: March 16, 2006	Kritchman
E-07	2010/0063615	US	Filed: September 4, 2009, Issued: March 11, 2010	Mori
E-08	WO2010026397A1	PCT	Filed: September 5, 2008 Published: March 11, 2010	Scott
E-09	7,168,935	US	Filed: August 1, 2003 Issued: January 30, 2007	Taminger
E-10	2004/0207662	US	Filed: April 16, 2003 Published: October 21, 2004	Anderson
E-11	8,054,343	US	Filed: July 25, 2006 Issued: November 8, 2011	Cheatle
E-12	2009/0067706	US	Filed: September 12, 2007 Published: March 12, 2009	Lapa

f. The '097 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
F-01	6,580,959	US	Filed: May 19, 2000 Issued: June 17, 2003	Mazumder
F-02	6,611,617	US	Filed: July 25, 1996 Issued: August 26, 2003	Crampton
F-03	7,216,009	US	Filed: June 14, 2004 Issued: May 8, 2007	Farnworth
F-04	9,156,204	US	Filed: May 17, 2010 Issued on October 13, 2015	Knighton
F-05	2002/0186245	US	Filed: July 19, 2002 Published: December 12, 2002	Chandhoke

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
F-06	2004/0207662	US	Filed: April 16, 2003 Published: October 21, 2004	Anderson
F-07	2006/0160250	US	Filed: August 10, 2005, Published: July 20, 2006	Bonassar
F-08	2010/0142759	US	Filed: May 4, 2007 Published: June 10, 2010	Ridley
F-09	WO2008/102266	WIPO	Filed: February 25, 2008	Biton
F-10	WO2010026397A1	PCT	Filed: September 5, 2008 Published: March 11, 2010	Scott
F-11	7,168,935	US	Filed: August 1, 2003 Issued: January 30, 2007	Taminger
F-12	8,546,717	US	Filed: September 16, 2010 Priority Date: September 17, 2009	Stecker
F-13	2009/0067706	US	Filed: September 12, 2007 Published: March 12, 2009	Lapa
F-14	2010/0063615	US	Filed: September 4, 2009 Issued: March 11, 2010	Mori

g. The '713 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
G-01	WO2012/085914A1	US	Filed: Dec. 21, 2011 Published: Jun. 28, 2012	Belocon
G-02	2014/0034214	US	Filed: Sept. 21, 2012 Published: Feb. 6, 2014	Boyer
G-03	2009/0035405	US	Filed: Jul. 31, 2007	Leavitt

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
			Published: Feb. 5, 2009	
G-04	7,604,470	US	Filed: Apr. 3, 2006 Issued: Oct. 20, 2009	LaBossiere
G-05	2003/0004600	US	Filed: Jul. 1, 2002 Published: Jan. 2, 2003	Priedeman
G-06	2008/0317894	US	Filed: Jun. 21, 2007 Published: Dec. 25, 2008	Turley

h. The '357 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
H-01	6,547,995	US	Filed: Sep. 21, 2001 Issued: April 15, 2003	Comb II
H-02	5,738,817	US	Filed: Feb. 8, 1996 Issued: April 14, 1998	Danforth
H-03	1,286,822	EU	Filed: Sept. 7, 2000 Issued: Nov. 10, 2004	Feenstra
H-04	6,823,230	US	Filed: Sept. 7, 2000 Issued: Nov. 23, 2004	Jamalabad
H-05	6,113,696	US	Filed: May 28, 1998 Issued: Sept. 5, 2000	Tseng

i. The '660 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
I-01	2016/0075091	US	Filed: Sep. 16, 2014 Published: Mar. 17, 2014	Cable
I-02	9,744,730	US	Filed: Nov. 22, 2013 Issued: Aug. 29, 2017	Comb I
I-03	2014/0048981	US	Filed: Aug. 15, 2013	Crump

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 17

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
			Published: Feb. 20, 2014	
I-04	2006/0054039	US	Filed: Dec. 3, 2003 Published: Mar. 16, 2006	Kritchman
I-05	2016/0096326	US	Filed: Nov. 21, 2014 Published: Apr. 7, 2016	Naware
I-06	2017/0036403	US	Priority Date: Mar. 28, 2014 Filed: Sep. 28, 2016 Published: Feb. 2, 2017	Ruff
I-07	2013/0310507	US	Filed: May 17, 2013 Published: Nov. 21, 2013	Tummala

j. The '774 Patent

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
J-01	2013/0329257 Al	US	Filed: June 19, 2013 Published: Dec. 12, 2013	Pettis
J-02	2014/0117585 A1	US	Filed: Oct. 28, 2013 Published: May 1, 2014	Douglas
J-03	2014/0127524 A1	US	Filed: Jan. 10, 2014 Published: May 8, 2014	Batchelder
J-04	2014/0236773 A1	US	Filed: Apr. 16, 2014 Published: Aug. 21, 2014	Hamilton
J-05	2015/0165685 Al	US	Filed: Dec. 18, 2013 Published: Jun. 18, 2015	Klappert
J-06	8,610,927	US	Filed: Sept. 14, 2010 Issued: Dec. 17, 2013	Sweet
J-07	9,858,360	US	Filed: Mar. 10, 2014 Issued: Jan. 2, 2018	Nelson
J-08	9,862,149	US	Filed: Aug. 29, 2014 Issued: Jan. 9, 2018	Wang
J-09	9,694,544	US	Filed: Sept. 19, 2014 Published: Jul. 4, 2017	Mark

Appx.	Patent or Pub No.	Country of Origin	Relevant Dates	Short Title
J-10	1 087 862 B1	EP	Filed: Jan. 14, 1999 Published: Jun. 18, 2008	Dahlin
J-11	2014039825A3	WO	Filed: Sept. 6, 2013 Published: Mar. 13, 2014	Pax

2. Prior Art Non-Patent Publications

Defendants disclose the following non-patent publications:

a. The '698 Patent

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
A-08	*Dynamic Modeling and Monitoring of Contour Crafting—An Extrusion-Based Layered Manufacturing Process*	Feb. 2007	Satish Bukkapatnam / 129 J. MANUFACTURING SCI. & ENGR. 135	Bukkapatnam
A-09	*RepRap Discussion Thread "Genetic Algorithm" (available at https://reprap.org/forum/read.php?1,20208,page=1)*	Jan. 2009	Adrian Bowyer; various internet forum users	RepRap 20208

b. The '381 Patent

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
B-08	*Dynamic Modeling and Monitoring of Contour Crafting—An Extrusion-Based Layered*	Feb. 2007	Satish Bukkapatnam / 129 J. MANUFACTURING SCI. & ENGR. 135	Bukkapatnam

	Manufacturing Process			
B-09	*RepRap Discussion Thread "Genetic Algorithm" (available at https://reprap.org/forum/read.php?1,20208,page=1)*	Jan. 2009	Adrian Bowyer; various internet forum users	RepRap 20208

c. <u>The '466 Patent</u>

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
C-12	KISSlicer Quick-Start Guide (available at https://webcf.waybackmachine.org/web/20120317183721/http://www.kisslicer.com:80/download.html)	Feb. 15, 2012	Jonathan Dummer	KISSlicer Quick-Start Guide
C-13	Eden 260v 3-D Printer System User Guide	March 2013	Objet/Stratasys	Eden 260v User Guide
C-14	FORTUS 360mc/400mc and FDM 360mc/400mc User Guide	July 2013	Stratasys	FORTUS 360mc/400mc and FDM 360mc/400mc User Guide
C-15	Objet260 User Guide	September 2014	Objet	Objet260 User Guide
C-16	HP LaserJet 4100mfp User Guide	February 2004	HP	HP LaserJet 4100mfp User Guide

d. <u>The '464 Patent</u>

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title

D-12	KISSlicer Quick-Start Guide (available at https://webcf.waybackmachine.org/web/20120317183721/http://www.kisslicer.com:80/download.html)	Feb. 15, 2012	Jonathan Dummer	KISSlicer Quick-Start Guide
D-13	Eden 260v 3-D Printer System User Guide	March 2013	Objet/Stratasys	Eden 260v User Guide
D-14	FORTUS 360mc/400mc and FDM 360mc/400mc User Guide	July 2013	Stratasys	FORTUS 360mc/400mc and FDM 360mc/400mc User Guide
D-15	Objet260 User Guide	September 2014	Objet	Objet260 User Guide
D-16	HP LaserJet 4100mfp User Guide	February 2004	HP	HP LaserJet 4100mfp User Guide

e. The '324 Patent

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
E-13	Distributed Rapid Prototyping – A Framework for Internet Prototyping and Manufacturing, Integrated Manufacturing Systems	July 2000	Francis E.H. Tay/Integrated Manufacturing Systems	Tay
E-14	Rapid prototyping modules for remote engineering applications	July 2008	Karsten Henke/International Journal of Online Engineering	Henke
E-15	Web-based rapid prototyping and manufacturing systems: A review	June 9, 2009	Hongbo Lan/Computers in Industry	Lan

E-16	WebTurning: Teleoperation of a CNC turning center through the Internet	2006	Alberto José Álvares/Journal of Materials Processing Technology	Álvares
E-17	Watching my ReRap Mendel (available at https://www.youtube.com/watch?v=14qGE3VgtzM)	November 14, 2010	Jeff Keegan	Watching my RepRap Mendel
E-17	Keegan Blog Post (available at https://www.keegan.org/reprapblog/archives/271)	December 18, 2009	Jeff Keegan	Keegan Blog Post
E-17	Keegan Blog Post 2 (available at https://www.keegan.org/reprapblog/page/10)	September 20, 2010-November 14, 2010	Jeff Keegan	Keegan Blog Post 2
E-18	AC 2007-359 Remotely Accessible Laboratory for Rapid Prototyping	2007	Ismail Fidan/American Society for Engineering Education	Fidan I
E-19	AC 2009-963 Remote Laboratory Collaboration	2009	Ismail Fidan/American Society for Engineering Education	Fidan II
E-20	Acquisition Steps of a Remotely Accessible Rapid Prototyping Laboratory	2007	Ismail Fidan/Inderscience Enterprises Ltd.	Fidan III

f. <u>The '097 Patent</u>

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
F-15	The Development of Internet Accessible	1999	Ren C. Luo/IEEE	Luo

	Rapid Prototyping System			
F-16	WebTurning: Teleoperation of a CNC turning center through the Internet	2006	Alberto José Álvares/Journal of Materials Processing Technology	Álvares
F-17	Watching my ReRap Mendel (available at https://www.youtube.com/watch?v=14qGE3VgtzM)	November 14, 2010	Jeff Keegan	Watching my RepRap Mendel
F-17	Keegan Blog Post (available at https://www.keegan.org/reprapblog/archives/271)	December 18, 2009	Jeff Keegan	Keegan Blog Post
F-17	Keegan Blog Post 2 (available at https://www.keegan.org/reprapblog/page/10)	September 20, 2010-November 14, 2010	Jeff Keegan	Keegan Blog Post 2
F-18	AC 2007-359 Remotely Accessible Laboratory for Rapid Prototyping	2007	Ismail Fidan/American Society for Engineering Education	Fidan I
F-19	AC 2009-963 Remote Laboratory Collaboration	2009	Ismail Fidan/American Society for Engineering Education	Fidan II
F-20	Acquisition Steps of a Remotely Accessible Rapid Prototyping Laboratory	2007	Ismail Fidan/Inderscience Enterprises Ltd.	Fidan III

g. <u>The '713 Patent</u>

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title

G-07	Dual Extruder PLA Printing (available at https://www.okob.net/wp/index.php/2012/10/29/dual-extruder-pla-printing/)	Oct. 28, 2012	Denis Bakin	Dual Extruder Article
G-07	X2 Dual Color Print (available at https://www.youtube.com/watch?v=ZAafPtKjZSc)	Oct. 28, 2012	Denis Bakin	Dual Extruder Video
G-08	KISSlicer Quick-Start Guide (available at https://webcf.waybackmachine.org/web/20120317183721/http://www.kisslicer.com:80/download.html)	Feb. 15, 2012	Jonathan Dummer	KISSlicer Quick-Start Guide
G-09	Reprap Colour Mixing Project (available at https://www.reprap.org/mediawiki/images/0/05/RepRapColourMixingReport-jmc.pdf)	May 1, 2012	James Corbett	RepRap Colour Mixing Article
G-09	Print Any Color You Like… (available at http://blog.reprap.org/2012/02/print-any-colour-you-like.html)	Feb. 21, 2012	Adrian Bowyer; various internet forum users	02/21/2012 Blog Post
G-09	Colour Mixing (available at http://blog.reprap.org/2012/04/colour-mixing.html)	Apr. 19, 2012	Adrian Bowyer; various internet forum users	04/19/2012 Blog Post
G-10	3-Way Quick-Fit Extruder and Colour Blending Nozzle (available at https://richrap.blogspot.com/2012/08/3-way-quick-fit-extruder-and-colour.html)	Aug. 23, 2012	Richard Horne	RichRap Blog Post

G-10	Multicolor Print Head Allows Reprap to Print Rainbows (available at https://hackaday.com/2012/08/27/multicolor-print-head-allows-reprap-to-print-rainbows/)	Aug. 27, 2012	Brian Benchoff; various internet forum users	Multicolor Print Article
G-10	3-Way Extruder and Colour Blending Nozzle Part 2-Build Up and Printed Things (available at https://www.youtube.com/watch?v=nkkbjpHVNZQ)	Aug. 23, 2012	Richard Horne	3-Way Extruder Video
G-11	Watertightish Mugs Then Extruder Fail (available at https://www.keegan.org/reprapblog/page/11)	Aug. 22, 2010	Jeff Keegan	Keegan Blog Post
G-11	Faster, Uglier Print (available at https://www.youtube.com/watch?v=aGVlZKHUBUM)	Aug. 16. 2010	Jeff Keegan	https://www.youtube.com/watch?v=aGVlZKHUBUM
G-11	Result of Reverting Preferences (available at https://www.youtube.com/watch?v=Mf8HYc5_ja0)	Aug. 16, 2010	Jeff Keegan	https://www.youtube.com/watch?v=Mf8HYc5_ja0
G-11	Beginning of JeffTry 22 (available at https://www.youtube.com/watch?v=enuwQTigPTM)	Aug. 16, 2010	Jeff Keegan	https://www.youtube.com/watch?v=enuwQTigPTM
G-11	Further Along in JeffTry22 (available at https://www.youtube.com/watch?v=x01oPkIe9hQ)	Aug. 16, 2010	Jeff Keegan	https://www.youtube.com/watch?v=x01oPkIe9hQ

G-11	On Bed 1 – JeffTry22 (available at https://www.youtube.com/watch?v=lILlppzHeZE)	Aug. 16, 2010	Jeff Keegan	https://www.youtube.com/watch?v=lILlppzHeZE
G-11	On Bed 2 –JeffTry22 (available at https://www.youtube.com/watch?v=3RktZmYN2hk)	Aug. 16, 2010	Jeff Keegan	https://www.youtube.com/watch?v=3RktZmYN2hk

h. The '357 Patent

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
H-06	Structural Quality of Parts Processed by Fused Deposition	1996	Mukesh K. Agarwala	Agarwala
H-07	Sparse-Pixel Recognition of Primitives in Engineering Drawings	1993	Dov Dori	Dori
H-08	Morphing Based Approach for Process Planning for Fabrication of Geometries and the Control of Material Composition	2004	Rajeev Dwivedi	Dwivedi
H-09	Medial Axis Transformation of a Planar Shape	1982	D.T. Lee	D.T. Lee
H-10	Toward Automatic Process Planning of a Multi-Axis Hybrid Laser Aided Manufacturing System: Skeleton-Based Offset Edge Generation	2003	Kunnayut Eiamsa-Ard	Eiamsa-Ard

H-11	PC Based Multi-Material Integrated CAD System for Layered Manufacturing	2002	Cheng-Taio Hsieh	Hsieh
H-12	A Novel System for Fused Deposition of Advanced Multiple Ceramics	2000	M.A. Jafari	Jafari
H-13	Optimal Motion Planning for Deposition in Layered Manufacturing	1998	Ju-Hsien Kao and Fritz B. Prinz	Kao
H-14	Layered Manufacturing of Thin Walls	2000	Sara McMains	McMains
H-15	Void Eliminating Toolpath for Extrusion-Based Multi-Material Layered Manufacturing	2002	Dan Qiu, Noshir A. Langrana	Qiu
H-16	2-D Deposition Pattern and Strategy Study on Rapid Manufacturing	2006	Jianzhong Ruan	Ruan
H-17	Adaptive High-Precision Exterior, High-Speed Interior, Layered Manufacturing	1996	Emmanuel Sabourin	Sabourin1996
H-18	Accurate Exterior, Fast Interior Layered Manufacturing	1997	Emmanuel Sabourin	Sabourin1997
H-19	Computer-Aided Process Planning for Surface Quality in Point-Wise Constructive Manufacturing by Three Dimensional Printing	1996	Sang-Joon John Lee	Sang-Joon

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 27

H-20	Quality of Parts Processed by Fused Deposition	1995	R. van Weeren	van Weeren
H-21	A Process Planning Applicative for Rapid Prototyping Technology	2005	Neri Volpato	Volpato
H-22	Equidistant Path Generation for Improving Scanning Efficiency in Layered Manufacturing	2002	Y. Yang	Yang2002
H-23	Process Analysis and Planning for Fused Deposition	1999	Atif M. Yardimci	Yardimci

i. The '660 Patent

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
I-08	SeeMeCNC forum posts on 3D Printer Design	Sep. 2014	Michael Hackney; various internet forum users	PEI Forum/Blog Posts
I-08	Lulzbot forum post on 3D Printer Design	Jul. 2014	Various internet forum users	PEI Forum/Blog Posts
I-08	RepRap forum post on 3D Printer Design	Aug. 2014	Various internet forum users	PEI Forum/Blog Posts
I-08	Grass Roots Engineering blog post on 3D Printer Design	Dec. 2010	Jim Smith	PEI Forum/Blog Posts

j. The '774 Patent

Appx.	Title	Publication Date	Primary Author/ Publisher	Short Title
J-12	Practical 3D Printers	2012	Brian Evans	Evans
J-13	KISSlicer Quick-Start Guide	2012	Unknown	KISSlicer

3. Prior Art Systems

The following systems were known, publicly used, sold, or offered for sale prior to their respective Asserted Patents. Each prior art system was on sale or publicly available at least as early as the date provided, but discovery may reveal even earlier sale or public availability.

a. The '698 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
A-10	MakerBot Replicator	Jan. 2012	MakerBot Industries, LLC	MakerBot Replicator
A-11	Sequoia Triaxial Vibration & Collision Monitoring System	Oct. 2008	Sequoia IT, Intelligentia IT, and Engineering Solutions Shop	SeTAC
A-09	RepRap Discussion Thread "Genetic Algorithm" (available at https://reprap.org/forum/read.php?1,20208,page=1)	Jan. 2009	Adrian Bowyer; various internet forum users	RepRap 20208
A-08	*Dynamic Modeling and Monitoring of Contour Crafting—An Extrusion-Based Layered Manufacturing Process*	Feb. 2007	Satish Bukkapatnam	Bukkapatnam

b. The '381 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
B-10	MakerBot Replicator	January 2012	MakerBot Industries, LLC	MakerBot Replicator

B-11	Sequoia Triaxial Vibration & Collision Monitoring System	Oct. 2008	Sequoia IT, Intelligentia IT, and Engineering Solutions Shop	SeTAC
B-09	RepRap Discussion Thread "Genetic Algorithm" (available at https://reprap.org/forum/read.php?1,20208,page=1)	Jan. 2009	Adrian Bowyer; various internet forum users	RepRap 20208
B-08	*Dynamic Modeling and Monitoring of Contour Crafting—An Extrusion-Based Layered Manufacturing Process*	Feb. 2007	Satish Bukkapatnam	Bukkapatnam

c. <u>The '466 Patent</u>

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
C-12	The KISSlicer System	Feb. 15, 2012	Jonathan Dummer	KISSlicer System
C-13	Eden 260v 3-D Printer System	March 2013	Objet/Stratasys	Eden 260v
C-14	FORTUS 360mc/400mc and FDM 360mc/400mc Systems	July 2013	Stratasys	FORTUS 360mc/400mc and FDM 360mc/400mc
C-15	Objet260	September 2014	Objet	Objet260
C-16	HP LaserJet 4100mfp	February 2004	HP	HP LaserJet 4100mfp

d. The '464 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
D-12	The KISSlicer System	Feb. 15, 2012	Jonathan Dummer	KISSlicer System
D-13	Eden 260v 3-D Printer System	March 2013	Objet/Stratasys	Eden 260v
D-14	FORTUS 360mc/400mc and FDM 360mc/400mc Systems	July 2013	Stratasys	FORTUS 360mc/400mc and FDM 360mc/400mc
D-15	Objet260	September 2014	Objet	Objet260
D-16	HP LaserJet 4100mfp	February 2004	HP	HP LaserJet 4100mfp

e. The '324 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
E-16	Álvares System	2006	Alberto José Álvares	Álvares System
E-21	Charliex	October 3, 2009	Charliex	Charliex
E-22	i.materialise	August 6, 2010	i.materialise	i.materialise
E-17	Keegan	August 22, 2010	Jeff Keegan	Keegan
E-23	Trumpf	March 4, 2008	Trumpf	Trumpf

f. The '097 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
F-16	Álvares System	2006	Alberto José Álvares	Álvares System

F-21	Charliex	October 3, 2009	Charliex	Charliex
F-22	i.materialise	August 6, 2010	i.materialise	i.materialise
F-17	Keegan	August 22, 2010	Jeff Keegan	Keegan
F-23	Trumpf	March 4, 2008	Trumpf	Trumpf

g. The '713 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
G-07	The Dual Extruder System	At least as of Oct. 28, 2012	Denis Bakin	Dual Extruder System
G-08	The KISSlicer System	January 2012	Jonathan Dummer	KISSlicer System
G-09	The Mixer Extrude System	At least as of Feb. 21, 2012	James Corbet, Adrian Bowyer, various internet forum users	Mixer Extruder System
G-10	RichRap's Multi-Color Extruder Project	At least as of Aug. 23, 2012	Richard Horne, Brian Benchoff, various internet forum users	RichRap's Multi-Color Extruder
G-11	The RepRap Software	At least as of Aug. 22, 2010	Jeff Keegan	RepRap Software

h. The '357 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
H-24	Stratasys Fused Deposition Modeling Process	At least 2001	Stratasys	Stratasys FDM
H-25	Z Corporation's Equipment, Spectrum Z510	At least 2004	Z Corporation Equipment	Spectrum Z510

i. The ’660 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
I-08	SeeMeCNC forum posts on 3D Printer Design	Sep. 2014	Michael Hackney; various internet forum users	PEI Forum/Blog Posts
I-08	Lulzbot forum post on 3D Printer Design	Jul. 2014	Various internet forum users	PEI Forum/Blog Posts
I-08	RepRap forum posts on 3D Printer Design	Aug. 2014	Various internet forum users	PEI Forum/Blog Posts
I-08	Grass Roots Engineering blog post on 3D Printer Design	Jun. 2013	Jim Smith	PEI Forum/Blog Posts
I-09	3D HD and Wolfbite Adhesive	Feb. 2014	Airwolf 3D	Airwolf 3D Products
I-10	CEL Robox	Dec. 2013	CEL	CEL Robox
I-11	CTD-201 Polyimide Coating	Dec. 2013	Composite Technology Development, Inc.	CTD-201 Polyimide Coating
I-12	MakerBot Replicator 2X	Jan. 2013	MakerBot	MakerBot Replicator 2X
I-13	Printrbot Simple Metal	Nov. 2014	Printrbot	Printrbot
I-14	SpiderBot 3D Printer	Mar. 2013	QUALUP	SpiderBot

j. The ’774 Patent

Appx.	System	Date of Sale or Public Availability	Seller or Manufacturer Making Information Available and to Whom	Short Title
J-14	MakerBot Replicator	By Jan. 2012	MakerBot Industries, LLC	MakerBot Replicator
J-15	SFACT	By May 9, 2012	Ahmet Cem Turan, Felix Schneider, Miro	SFACT

			Hrončok, and/or Jordan Holoboski	

B. P.R. 3-3(b): Anticipation and Obviousness Grounds

1. Anticipatory References

Defendants contend that certain prior art references anticipate one or more Asserted Claims under 35 U.S.C. § 102, and that to the extent the identified prior art references do not anticipate the Asserted Claims, those claims are invalid as obvious under 35 U.S.C. § 103. Each anticipatory prior art reference disclosed herein, either alone or in combination with other prior art, also renders the Asserted Claims invalid as obvious. In particular, each anticipatory prior art reference may be combined with (1) information generally known to persons skilled in the art at the time of the alleged invention, and/or (2) any of the other anticipatory prior art references. To the extent that Stratasys contends that any of the anticipatory prior art fails to disclose one or more limitations of the Asserted Claims, Defendants contend that any difference between the reference and the corresponding patent claims would have been obvious to one of ordinary skill in the art. Thus, Defendants' identification of anticipatory references should be interpreted as both reflecting anticipation by the reference as well as invalidity due to single reference obviousness, to the extent that Stratasys contends that any limitation is missing.

a. <u>The '698 Patent</u>

Appx.	Reference	Short Title
A-01	U.S. Patent No. 6,986,739	Warren
A-08	*Dynamic Modeling and Monitoring of Contour Crafting—An Extrusion-Based Layered Manufacturing Process*	Bukkapatnam
A-03	U.S. Patent No. 6,629,011	Calderon
A-07	U.S. Appl. No. 2007/0228592	Dunn
A-02	U.S. Appl. No. 2007/0179656	Eshed

Appx.	Reference	Short Title
A-09	RepRap Discussion Thread "Genetic Algorithm" (available at https://reprap.org/forum/read.php?1,20208,page=1)	RepRap 20208

b. The '381 Patent

Appx.	Reference	Short Title
B-01	U.S. Patent No. 6,986,739	Warren
B-08	*Dynamic Modeling and Monitoring of Contour Crafting—An Extrusion-Based Layered Manufacturing Process*	Bukkapatnam
B-03	U.S. Patent No. 6,629,011	Calderon
B-07	U.S. Appl. No. 2007/0228592	Dunn
B-02	U.S. Appl. No. 2007/0179656	Eshed
B-09	RepRap Discussion Thread "Genetic Algorithm" (available at https://reprap.org/forum/read.php?1,20208,page=1)	RepRap 20208

c. The '466 Patent

Appx.	Reference	Short Title
C-01	U.S. Patent No. 6,022,207	Dahlin
C-02	U.S. Patent Appl. Pub. No. 2007/0026102	Devos
C-03	U.S. Patent Appl. Pub. No. 2008/0192074	Dubois
C-13	Eden 260v 3-D Printer System	Eden 260v
C-14	FORTUS 360mc/400mc and FDM 360mc/400mc Systems	FORTUS 360mc/400mc and FDM 360mc/400mc
C-11	U.S. Patent Appl. Pub. No. 2010/0192806	Heugel
C-05	U.S. Patent Appl. Pub. No. 2006/0091199	Loughran
C-06	U.S. Patent Appl. Pub. No. 2006/0127153	Menchik
C-15	Objet260 System	Objet260

Appx.	Reference	Short Title
C-09	WIPO International Patent Application Publication No. 2014/039825	Pax
C-08	U.S. Patent Application Publication No. 2004/0181681	Salisbury
C-10	WIPO International Patent Application Publication No. 2011/042899	Sidi

d. The '464 Patent

Appx.	Reference	Short Title
D-01	U.S. Patent No. 6,022,207	Dahlin
D-02	U.S. Patent Appl. Pub. No. 2007/0026102	Devos
D-03	U.S. Patent Appl. Pub. No. 2008/0192074	Dubois
D-13	Eden 260v 3-D Printer System	Eden 260v
D-14	FORTUS 360mc/400mc and FDM 360mc/400mc Systems	FORTUS 360mc/400mc and FDM 360mc/400mc User Guide
D-11	U.S. Patent Appl. Pub. No. 2010/0192806	Heugel
D-05	U.S. Patent Appl. Pub. No. 2006/0091199	Loughran
D-06	U.S. Patent Appl. Pub. No. 2006/0127153	Menchik
D-15	Objet260 System	Objet260 User Guide
D-09	WIPO International Patent Application Publication No. 2014/039825	Pax
D-08	U.S. Patent Application Publication No. 2004/0181681	Salisbury
D-10	WIPO International Patent Application Publication No. 2011/042899	Sidi

e. The ’324 Patent

Appx.	Reference	Short Title
E-01	US 5,278,479	Seki
E-02	US 6,580,959	Mazumder
E-03	US 7,216,009	Farnworth
E-06	US 2006/0054039	Kritchman
E-07	US 2010/0063615	Mori
E-13	Distributed Rapid Prototyping – A Framework for Internet Prototyping and Manufacturing, Integrated Manufacturing Systems	Tay
E-14	Rapid prototyping modules for remote engineering applications	Henke
E-15	Web-based rapid prototyping and manufacturing systems: A review	Lan
E-16	Álvares System	Álvares System
E-21	Charliex	Charliex
E-22	i.materialise	i.materialise
E-17	Keegan	Keegan
E-23	Trumpf	Trumpf
E-09	7,168,935	Taminger
E-10	2004/0207662	Anderson
E-11	8,054,343	Cheatle
E-12	2009/0067706	Lapa
E-18	AC 2007-359 Remotely Accessible Laboratory for Rapid Prototyping	Fidan I
E-19	AC 2009-963 Remote Laboratory Collaboration	Fidan II
E-20	Acquisition Steps of a Remotely Accessible Rapid Prototyping Laboratory	Fidan III

f. The ’097 Patent

Appx.	Reference	Short Title
F-01	US 6,580,959	Mazumder
F-02	US 6,611,617	Crampton
F-03	US 7,216,009	Farnworth

Appx.	Reference	Short Title
F-04	US 9,156,204	Knighton
F-05	US 2002/0186245	Chandhoke
F-06	US 2004/0207662	Anderson
F-07	US 2006/0160250	Bonassar
F-08	US 2010/0142759	Ridley
F-09	WO2008/102266	Biton
F-15	The Development of Internet Accessible Rapid Prototyping System	Luo
F-16	Álvares System	Álvares System
F-21	Charliex	Charliex
F-22	i.materialise	i.materialise
F-17	Keegan	Keegan
F-23	Trumpf	Trumpf
F-10	WO2010026397A1	Scott
F-11	7,168,935	Taminger
F-12	8,546,717	Stecker
F-13	2009/0067706	Lapa
F-18	AC 2007-359 Remotely Accessible Laboratory for Rapid Prototyping	Fidan I
F-19	AC 2009-963 Remote Laboratory Collaboration	Fidan II
F-20	Acquisition Steps of a Remotely Accessible Rapid Prototyping Laboratory	Fidan III
F-14	US 2010/0063615	Mori

g. <u>The '713 Patent</u>

Appx.	Reference	Short Title
G-02	US 2014/0034214	Boyer
G-07	The Dual Extruder System	Dual Extruder System
G-08	The KISSlicer System	KISSlicer System
G-09	The Mixer Extruder System	Mixer Extruder System
G-10	RichRap's Multi-Color Extruder Project	RichRap's Multi-Color Extruder

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 38

h. The ’357 Patent

Appx.	Reference	Short Title
H-06	Structural Quality of Parts Processed by Fused Deposition	Agarwala
H-02	5,738,817	Danforth
H-12	A Novel System for Fused Deposition of Advanced Multiple Ceramics	Jafari
H-04	6,823,230	Jamalabad
H-13	Optimal Motion Planning for Deposition in Layered Manufacturing	Kao
H-14	Layered Manufacturing of Thin Walls	McMains
H-15	Void Eliminating Toolpath for Extrusion-Based Multi-Material Layered Manufacturing	Qiu
H-20	Quality of Parts Processed by Fused Deposition	van Weeren
H-25	Z Corporation’s Equipment, Spectrum Z510	Spectrum Z510
H-24	Stratasys Fused Deposition Modeling Process	Stratasys FDM

i. The ’660 Patent

Appx.	Reference	Short Title
I-1	2016/0075091	Cable
I-2	9,744,730	Comb I
I-9	AW3D HD, HD2x, and Wolfbite Adhesive	Airwolf Products
I-10	CEL Robox	CEL Robox
I-14	SpiderBot 3D Printer	SpiderBot

j. The '774 Patent

Appx.	Reference	Short Title
J-01	US 2013/0329257 Al	Pettis
J-02	US 2014/0117585 A1	Douglas
J-04	US 2014/0236773 A1	Hamilton
J-05	US 2015/0165685 Al	Klappert
J-08	US 9,862,149	Wang
J-14	MakerBot Replicator	MakerBot Replicator

2. Obviousness Combinations

Based on presently known information and the apparent constructions Stratasys is asserting in its Infringement Contentions, the prior art references identified above anticipate the Asserted Claims or, alone or in combination with the knowledge in the art, render the Asserted Claims obvious. To the extent Stratasys asserts that any of the prior art references charted in the attached Appendices fails to explicitly or inherently disclose any element of the Asserted Claims, Defendants contend that it would have been obvious to modify such reference to include the allegedly missing element, in view of the knowledge of one of ordinary skill in the art, the admitted prior art of the Asserted Patents, and/or in combination with any of the other prior art references. A single prior art reference can establish obviousness where the differences between the disclosures within the reference and the claimed invention would have been obvious to one of ordinary skill in the art. For instance, "[c]ombining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness." *Boston Sci. Scimed, Inc. v. Cordis Corp.*, 554 F. 3d 982, 991 (Fed. Cir. 2009).

Defendants reserve the right to rely upon combinations disclosed within the prosecution history of the references cited herein, and hereby expressly incorporate by reference any statements and reasons set forth by the examiners during prosecution of the Asserted Patents and related patent

applications as to why it would have been obvious to modify or combine references to achieve the limitations of the Asserted Claims. Defendants further reserve the right to rely on additional prior art references to show the state and evolution of technology at the time of the alleged invention and that may be relevant to the validity of the Asserted Claims depending on the claim construction, infringement, and other positions taken by Stratasys.

Much of the art identified in the attached Appendices reflects common knowledge and the state of the art at the time of alleged priority dates of the Asserted Patents. Defendants may rely on additional citations, references, expert testimony, and other material to provide context or to aid in understanding the cited portions of the references and/or cited features of the systems. Defendants may also rely on expert testimony explaining relevant portions of references, relevant systems, and other discovery regarding relevant subject matter. Additionally, Defendants may rely on other portions of any prior art reference for purposes of explaining the background and general technical subject area of the reference.

Where an individual reference is cited with respect to fewer than all elements of an Asserted Claim, Defendants contend that the reference renders obvious the claim under 35 U.S.C. § 103(a) in view of each other reference and combination of references that discloses the remaining claim element(s), as indicated in the Appendices submitted herewith. "Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007), *quoting Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966) (internal quotation marks omitted). Defendants reserve the right to rely upon any references or assertions identified herein in connection with Defendants' contention that each

Asserted Claim is invalid under 35 U.S.C. § 103 and to rely upon expert testimony addressing such references and assertions.

Many of the references cited in the Appendices cite or relate to additional references and/or products, systems, or services. Defendants may rely upon such additional references and copies or exemplars of such products or systems. Defendants may also rely upon the disclosures of the references cited and/or discussed during the prosecutions of the Asserted Patents and/or the assertions presented regarding those references.

Each prior art reference may be combined with one or more other prior art references to render obvious the Asserted Claims in combination. The disclosures of these references also may be combined with information known to persons skilled in the art at the time of the alleged inventions, and understood and supplemented in view of the common sense of persons skilled in the art at the time of alleged inventions, including any statements in the intrinsic record of the Asserted Patents and related applications.

A person of ordinary skill in the art would have been motivated to combine the prior art references in the attached Appendices based on the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. The identified prior art references within each Appendix address the same or similar technical issues and suggest the same or similar solutions to those issues at the Asserted Claims. On an element-by-element basis, Defendants expressly intend to combine one or more prior art items identified with each other to address any contentions from Stratasys that a particular prior art item supposedly lacks one or more elements of an Asserted Claim. In other words, Defendants contend that each charted prior art item can be combined with other charted prior art items when a particular prior art item lacks or does not explicitly disclose an element or feature of an Asserted Claim. The suggested

obviousness combinations described below are not to be construed to suggest that any reference included in the combinations is not anticipatory. Further, to the extent Stratasys contends that any of the anticipatory prior art fails to disclose one or more limitations of the Asserted Claims, Defendants reserve the right to identify other prior art references that, when combined with the anticipatory prior art, would render the claims obvious despite an allegedly missing limitation. Defendants will further specify the motivations to combine the prior art, including through reliance on expert testimony, at the appropriate later stage of this litigation.

A person of ordinary skill in the art would have been motivated to combine the prior art items identified. As the Supreme Court held in *KSR International Company v. Teleflex, Inc.*, "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." 550 U.S. 398, 416 (2007). The Supreme Court further held that, "[w]hen a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *Id.* at 417.

Moreover, "in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420. It is sufficient that a combination of elements was "obvious to try" holding that, "[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill

and common sense." *Id.* at 421. "In that instance the fact that a combination was obvious to try might show that it was obvious under § 103." *Id.* Finally, the Supreme Court recognized that "[g]ranting patent protection to advances that would occur in the ordinary course without real innovation retards progress and may, in the case of patents combining previously known elements, deprive prior inventions of their value or utility." *Id.* at 419. All of the following rationales recognized in *KSR* support a finding of obviousness:

1) Combining prior art elements according to known methods to yield predictable results;
2) Simple substitution of one known element for another to obtain predictable results;
3) Use of known techniques to improve similar devices (methods or products) in the same way;
4) Applying a known technique to a known device (method or product) ready for improvement to yield predictable results;
5) "Obvious to try"—choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
6) 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 would have been predictable to one of ordinary skill in the art; and
7) Some 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 prior art reference teachings to arrive at the claimed invention

Defendants further contend that the prior art identified is evidence of simultaneous or near-simultaneous independent invention by others of the alleged invention as recited in one or more of

the Asserted Claims. Defendants reserve the right to rely on the simultaneous or near-simultaneous independent invention by others as further evidence of the obviousness of the Asserted Claims.

Each limitation of the Asserted Claims was well-known to those of ordinary skill in the art before the alleged priority dates of the Asserted Patents, as detailed below and in the attached Appendices. The elements recited in the Asserted Claims are mere combinations and modifications of these well-known elements. A person of ordinary skill in the art would have been able and motivated to improve the existing technology in the same or similar manner by combining or modifying the individual elements that were already known in the art to yield predictable results.

Defendants believe that no showing of a specific motivation to combine the identified prior art references described herein and in the attached charts is required, as each combination of art would have no unexpected results and at most would simply represent a known alternative to one of ordinary skill in the art. *See KSR*, 550 U.S. at 414-18 (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach). Indeed, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id*. at 421. Nevertheless, in addition to the information contained in this section and elsewhere in these contentions, Defendants identify additional motivations and reasons to combine the cited art.

Subject to the foregoing, Defendants identify the following exemplary reasons that skilled artisans would have combined elements of the prior art to render obvious the Asserted Claims. The fact that others are not discussed more specifically should not be interpreted as an admission or

concession that it does not apply. To the contrary, the discussion below simply provides more explanation of these specific rationales.

a. The ’698 Patent

The ’698 Patent relates to detecting contact forces against a 3D printer’s extruder and using that feedback data to adjust the operation of the printer during fabrication. ’698 Patent at Abstract. The patent’s background section explains that the “components of the three-dimensional printer may degrade with time—i.e., become dented, warped, misaligned, etc.” *Id.* at 1:14–16. Because these errors can “affect the ability of the three-dimensional printer to accurately fabricate objects,” the ’698 identifies a “need for pressure-sensing extruders and methods for using same.” *Id.* at 1:16–20. “An extruder or other tool head of a three-dimensional printer is instrumented to detect contact force against the extruder, such as by a build platform or an object being fabricated.” *Id.* at Abstract; *see also* 1:23-30. “The resulting feedback data can be used in . . . to control operation of the three-dimensional printer.” *Id.*

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for need for “pressure-sensing extruders and methods for using same,” *id.* at 1:16–20, was already recognized in the prior art and the field of the invention and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Warren, titled “Architecture Tool and Methods of Use” discloses “controlling the position of one or more elements of a depositing system that accurately determines the intensity of the contact force between a dispensing tip and a substrate surface to maintain a desired contact force between the dispenser and the substrate.” Warren ¶¶ [0287], [0283–84], [0288–90].

- Warren discloses “an exemplary system for controlling the position of a dispenser 3700 relative to a substrate 3710 [which] may have irregular surfaces.” *Id.* ¶ [0293].

- "A vibration sensor 3730 and a transducer 3740 are attached to the dispenser 3700." *Id.* ¶¶ [0300], [0315]. Warren teaches vibrating the dispenser 3700, and when "[t]he vibration imposed on the dispenser 3700 is changed, e.g., modulated, by the contact of the 3700 dispenser with the substrate 3710 . . . [t]he transducer 3740 senses and transfers the changed vibration signal to an amplifier . . . which then creates a feedback signal that is generally proportional to the intensity of the physical contact of the dispenser 3700 with the substrate 3710." *Id.* ¶¶ [0302], [0303–07].

As another example, Eshed, titled "Rapid Prototyping Apparatus" also discloses a known collision problem in which shuttle (including print head) may collide with "unwanted protuberances," when, "during construction of an object, construction material debris may fall on a construction layer." *Id.* ¶ [0171].

- "A collision usually generates a force that produces an unwanted shuttle acceleration having a characteristic profile useable to identify the acceleration as resulting from a collision. For example, a collision in general results in an impulse applied to the shuttle that produces a corresponding identifiable acceleration." *Id.* ¶ [0181].
- Eshed discloses "an obstacle detection system" that "[u]pon occurrence of a collision, controller…stops production of the object and generates an alarm indicating that user intervention is required." *Id.* ¶ [0180].

As another example, Calderon, titled "Autoinitialization in a Three-Dimensional Modeling Machine" discloses "modeling machines which form three-dimensional objects by depositing modeling material onto a substrate mounted to a modeling platform." *Id.* at 1:5–10, Abstract.

- "An incorrect z-start position can result in failure in forming a model." *Id.*, 2:63-3:1. "[I]f the substrate is not mounted flat to the platform, or if the substrate is deformed or improperly mounted so that it lacks a horizontal planar surface, the model quality will be adversely affected regardless of the z-start position selected." *Id.*
- To address the "need for a z-axis initialization routine that does not require operator intervention or judgment," Calderon describes "an automated apparatus and method for initialization of a computer-controlled modeling machine that builds up three-dimensional objects on a substrate supported by a modeling platform." *Id.* at 3:1–10.
- Calderon teaches using a "sensor assembly . . . mounted to an extrusion head of an extrusion-based layered modeling system," such as the one depicted in FIG. 1, to sense "the force of contact of the [sensor] tip against the substrate." *Id.* at 5:10–24, 6:16–18, 6:37–47.

Additional references similarly discuss the same identified problem and similar solutions:

- The SeTAC reference discloses the "harmful cost is unplanned equipment and manufacturing process downtime." SeTAC at 2. It "has the ability of detecting impending mechanical failures in working processes at the early stages of fault development and detecting shocks and collisions during the working process." *Id.* One system's deployment involved the ability to "discriminate collisions from axes rapid movement avoiding false alarms and permit a conforming collision detection and reaction." *Id.* at 17.

- The Dunn reference discloses "a method for performing a calibration routine of a deposition device in a three-dimensional modeling machine." Dunn at Abstract. It explains that "there exists a need for an automatic extrusion tip calibration routine that does not require operator intervention or judgment." *Id.* ¶ [0008]. Dunn discloses a "multi-axis sensor assembly" with "the capability of sensing surfaces in the X and Y directions" in addition to "sensing surfaces in the Z-direction." *Id.* ¶ [0069]. Based on the difference between expected data and sensed data, the "modeling system then positions the deposition device based upon the offset." *Id.* at Abstract.
- The discussion thread of RepRap20208 includes postings from different users that target a common problem, namely, how to improve control of the RepRap 3D printer. The developer community observed "it shouldn't be too hard to hack together a bunch of open source monitoring devices to record data like temperature, speed, vibration, etc." *Id.* One developer suggested that "[a] strain gauge on the extruder mount would [show head collisions] as well, and it could do a few other things as well, like finding the bed height automatically." *Id.* He further explained that "[c]ollision detection is a nice side affect [sic]; I'd have the machine shut down and flag me if it happens, as opposed to breaking something . . . That saved my machine once already." *Id.*
- Igasaki discloses a measurement probe with a force sensor. In this disclosure, "the force sensor **10** connected to an actuator (not shown) is controlled so that the output amplitude ratio k0 is constantly kept, measurement force (F) fixed profiling

measurement (referred to as force fixed profiling measurement) can be realized that is capable of measuring a shape or roughness of the work **8**." Igasaki ¶ [0007].

- Pettis discloses a "machine vision system may support a variety of imaging-based automatic inspection, process control, and/or robotic guidance functions for the three-dimensional printer **100** including without limitation pass/fail decisions, error detection (and corresponding audible or visual alerts), shape detection, position detection, orientation detection, collision avoidance, and so forth." Pettis ¶ [0035].
- Bukkapatnam explains the concept of condition monitoring. It explains that the "essence of condition monitoring is to select and extract features from the measured sensor signals and relate these to specific, possibly anomalous, process conditions." Bukkapatnam at 140. "The use of an adequate model of process dynamics can lead to significant reductions in the amount of physical experiments necessary to extract accurate feature sets and develop a functional mapping between the features and the various conditions." *Id.*
- Mayer recites a system that "may be used to determine whether an object is present that should not be, or to detect when an object is absent." *Id.* ¶ [0024]. "The feedback from this sensor may be used by the controller **110** to issue processing interrupts or otherwise control operation of the printer **100**." *Id.*

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that the reactive qualities of 3D printing apparatuses be improved to respond to data and not print blindly. Thus, one of skill in the art would have been

motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Warren in combination with MakerBot
Warren in combination with SeTAC
Warren in combination with Mayer
Warren in combination with Calderon
Warren in combination with Dunn
Calderon in combination with RepRap 20208
Calderon in combination with RepRap 20208 and MakerBot
Calderon in combination with RepRap 20208 and SeTAC
MakerBot in combination with SeTAC
MakerBot in combination with SeTAC and Mayer
MakerBot in combination with SeTAC and Igasaki
MakerBot in combination with SeTAC and Bukkapatnam
MakerBot in combination with SeTAC and Pettis
MakerBot in combination with SeTAC and Eshed
MakerBot in combination with SeTAC and Warren
MakerBot in combination with SeTAC and Calderon
MakerBot in combination with SeTAC and Dunn

MakerBot in combination with Igasaki
MakerBot in combination with Igasaki and Mayer
MakerBot in combination with Igasaki and Pettis
SeTAC in combination with Pettis
SeTAC in combination with Pettis and Mayer
SeTAC in combination with Pettis and Igasaki
SeTAC in combination with Mayer
SeTAC in combination with Mayer and Igasaki
Mayer in combination with Igasaki
Mayer in combination with Igasaki and Bukkapatnam
Pettis in combination with Igasaki
Pettis in combination with Igasaki and Bukkapatnam
MakerBot in combination with Dunn
MakerBot in combination with Dunn and Mayer
MakerBot in combination with Dunn and Igasaki
MakerBot in combination with RepRap
MakerBot in combination with RepRap and Mayer
MakerBot in combination with RepRap and Igasaki
MakerBot in combination with RepRap and Calderon
MakerBot in combination with Eshed
MakerBot in combination with Eshed and Mayer
MakerBot in combination with Eshed and Igasaki
MakerBot in combination with Eshed and Calderon
MakerBot in combination with Eshed and Dunn

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Mechanically Coupled Fabrication-Sensor References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose one or more sensors mechanically coupled to the fabrication tool, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Mechanically Coupled Fabrication-Sensor References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Warren
- RepRap 20208
- Mayer
- Eshed
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Mechanically Coupled Fabrication-Sensor References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Mechanically Coupled Fabrication-Sensor References, mechanically coupling one or more sensors to a fabrication tool was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Mechanically Coupled Fabrication-Sensor References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, detecting

forces at the fabrication tool, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Detecting Current Contact Force References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose detecting the current contact force based on a sensor signal from the one or more sensors, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Detecting Current Contact Force References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Warren
- RepRap 20208
- Igasaki
- Calderon
- Eshed
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Detecting Current Contact Force References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Detecting Current Contact Force References, detecting the current contact forces acting upon the fabrication tool was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Detecting Current Contact Force References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results.

Furthermore, given the design needs, *e.g.*, identifying the forces acting upon the fabrication tool for process monitoring, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Force-Sensor Responsive Control Signal References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose creating a control signal to control at least one component of the three-dimensional printer in response to the current contact force while depositing material during the build, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Force-Sensor Responsive Control Signal References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Igasaki
- Mayer
- Pettis
- Warren
- RepRap 20208
- Eshed

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Force-Sensor Responsive Control Signal References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Force-Sensor Responsive Control Signal References, sending control signals based on current operating conditions to control and/or change the functioning of a device was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Force-

Sensor Responsive Control Signal References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, adapting manufacturing processes to current operating conditions, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Controlling Feed-Rate References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose sending a control signal in response to response to the current contact force to control a feed rate for a build material used in the build, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Controlling Feed-Rate References") to render obvious claims that may require such or similar features.

- Mayer
- MakerBot Replicator
- Pettis
- Warren
- Bukkapatnam

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Controlling Feed-Rate References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Controlling Feed-Rate References, controlling the rate that the extruded material (or material deployed through other additive process) in response to the current operating conditions was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Controlling Feed-Rate References would have amounted to applying a known technique to a known device

ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, ensuring consistent deposition of additive material per the required build instructions, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Controlling Z-Height References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose sending a control signal in response to response to the current contact force to control a z-distance between the extruder and a build platform of the three-dimensional printer, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Controlling Z-Height References") to render obvious claims that may require such or similar features.

- MakerBot
- Bukkapatnum
- Igasaki
- Mayer
- Warren
- Calderon
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Controlling Z-Height References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Controlling Z-Height References, controlling the z-height of the fabrication tool (or, alternatively, the build platform or substrate) was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Controlling Z-Height References would have amounted to

applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, ensuring material is deposited at the correct z-height (that is, the third dimension contemplated by "3D printers"), combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Detecting Forces Due to External Structures References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose one or more sensors configured to detect a current contact force between the fabrication tool and a separate structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Detecting Forces Due to External Structures References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Warren
- RepRap 20208
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Detecting Forces Due to External Structures References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Detecting Forces Due to External Structures References, detecting the forces acting upon the fabrication tool due to separate structures was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Detecting Forces Due to External Structures

References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, detecting collisions, calibrating the print bed, etc., combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Current and Expected Contact Forces References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose comparing the current contact force to an expected contact force, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Current and Expected Contact Forces References") to render obvious claims that may require such or similar features.

- Igasaki
- Warren
- RepRap 20208
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Current and Expected Contact Forces References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Current and Expected Contact Forces References, determining whether an actual contact force is greater than, less than, or equal to that expected by a particular process was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Current and Expected Contact Forces References would have amounted to applying a known technique to

a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, determining whether the operating conditions exist as predicted, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Detecting Planarity References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose detecting a planarity of the separate structure based upon a number of contact force measurements across a surface of the separate structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Detecting Planarity References") to render obvious claims that may require such or similar features.

- Igasaki
- Warren
- Calderon
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Detecting Planarity References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Detecting Planarity References, determining whether the printing location was level or otherwise understanding the condition of the printing location was well-known in the art by the time of the '698 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Detecting Planarity References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, ensuring that the 3D printing

apparatus accurately understands the location where it will be depositing material or ensuring that operating conditions are adequate for a printing process, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

b. The ’381 Patent

The ’381 Patent relates to relates to detecting contact forces against a 3D printer’s extruder and using that feedback data to adjust the operation of the printer during fabrication. ’381 Patent at Abstract. The patent’s background section explains that the “components of the three-dimensional printer may degrade with time—i.e., become dented, warped, misaligned, etc.” *Id.* at 1:16–18. Because these errors can “affect the ability of the three-dimensional printer to accurately fabricate objects,” the ’381 identifies a “need for pressure-sensing extruders and methods for using same.” *Id.* at 1:20–22. “An extruder or other tool head of a three-dimensional printer is instrumented to detect contact force against the extruder, such as by a build platform or an object being fabricated.” *Id.* at Abstract; *see also* 1:25–32. “The resulting feedback data can be used in . . . to control operation of the three-dimensional printer.” *Id.*

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for “pressure-sensing extruders and methods for using same,” *id.* at 1:20–22, was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Warren, titled “Architecture Tool and Methods of Use” discloses “controlling the position of one or more elements of a depositing system that accurately determines the intensity of the contact force between a dispensing tip and a substrate surface to maintain a desired contact force between the dispenser and the substrate.” Warren ¶¶ [0287], [0283–84], [0288–90].

- Warren discloses "an exemplary system for controlling the position of a dispenser 3700 relative to a substrate 3710 [which] may have irregular surfaces." *Id.* ¶ [0293].
- "A vibration sensor 3730 and a transducer 3740 are attached to the dispenser 3700." *Id.* ¶¶ [0300], [0315]. Warren teaches vibrating the dispenser 3700, and when "[t]he vibration imposed on the dispenser 3700 is changed, e.g., modulated, by the contact of the 3700 dispenser with the substrate 3710 . . . [t]he transducer 3740 senses and transfers the changed vibration signal to an amplifier . . . which then creates a feedback signal that is generally proportional to the intensity of the physical contact of the dispenser 3700 with the substrate 3710." *Id.* ¶¶ [0302], [0303–07].

As another example, Eshed, titled "Rapid Prototyping Apparatus" also discloses a known collision problem in which shuttle (including print head) may collide with "unwanted protuberances," when, "during construction of an object, construction material debris may fall on a construction layer." *Id.* ¶ [0171].

- "A collision usually generates a force that produces an unwanted shuttle acceleration having a characteristic profile useable to identify the acceleration as resulting from a collision. For example, a collision in general results in an impulse applied to the shuttle that produces a corresponding identifiable acceleration." *Id.* ¶ [0181].
- Eshed discloses "an obstacle detection system" that "[u]pon occurrence of a collision, controller…stops production of the object and generates an alarm indicating that user intervention is required." *Id.* ¶ [0180].

As another example, Calderon, titled "Autoinitialization in a Three-Dimensional Modeling Machine" discloses "modeling machines which form three-dimensional objects by depositing modeling material onto a substrate mounted to a modeling platform." *Id.* at 1:5–10, Abstract.

- "An incorrect z-start position can result in failure in forming a model." *Id.*, 2:63-3:1. "[I]f the substrate is not mounted flat to the platform, or if the substrate is deformed or improperly mounted so that it lacks a horizontal planar surface, the model quality will be adversely affected regardless of the z-start position selected." *Id.*
- To address the "need for a z-axis initialization routine that does not require operator intervention or judgment," Calderon describes "an automated apparatus and method for initialization of a computer-controlled modeling machine that builds up three-dimensional objects on a substrate supported by a modeling platform." *Id.* at 3:1–10.
- Calderon teaches using a "sensor assembly . . . mounted to an extrusion head of an extrusion-based layered modeling system," such as the one depicted in FIG. 1, to sense "the force of contact of the [sensor] tip against the substrate." *Id.* at 5:10–24, 6:16–18, 6:37–47.

Additional references similarly discuss the same identified problem and similar solutions:

- The SeTAC reference discloses the "harmful cost is unplanned equipment and manufacturing process downtime." SeTAC at 2. It "has the ability of detecting impending mechanical failures in working processes at the early stages of fault development and detecting shocks and collisions during the working process." *Id.* One system's deployment involved the ability to "discriminate collisions from axes

rapid movement avoiding false alarms and permit a conforming collision detection and reaction." *Id.* at 17.

- The Dunn reference discloses "a method for performing a calibration routine of a deposition device in a three-dimensional modeling machine." Dunn at Abstract. It explains that "there exists a need for an automatic extrusion tip calibration routine that does not require operator intervention or judgment." *Id.* ¶ [0008]. Dunn discloses a "multi-axis sensor assembly" with "the capability of sensing surfaces in the X and Y directions" in addition to "sensing surfaces in the Z-direction." *Id.* ¶ [0069]. Based on the difference between expected data and sensed data, the "modeling system then positions the deposition device based upon the offset." *Id.* at Abstract.
- The discussion thread of RepRap20208 includes postings from different users that target a common problem, namely, how to improve control of the RepRap 3D printer. The developer community observed "it shouldn't be too hard to hack together a bunch of open source monitoring devices to record data like temperature, speed, vibration, etc." *Id.* One developer suggested that "[a] strain gauge on the extruder mount would [show head collisions] as well, and it could do a few other things as well, like finding the bed height automatically." *Id.* He further explained that "[c]ollision detection is a nice side affect [sic]; I'd have the machine shut down and flag me if it happens, as opposed to breaking something . . . That saved my machine once already." *Id.*
- Igasaki discloses a measurement probe with a force sensor. In this disclosure, "the force sensor **10** connected to an actuator (not shown) is controlled so that the

output amplitude ratio k0 is constantly kept, measurement force (F) fixed profiling measurement (referred to as force fixed profiling measurement) can be realized that is capable of measuring a shape or roughness of the work **8**." Igasaki ¶ [0007].

- Pettis discloses a "machine vision system may support a variety of imaging-based automatic inspection, process control, and/or robotic guidance functions for the three-dimensional printer **100** including without limitation pass/fail decisions, error detection (and corresponding audible or visual alerts), shape detection, position detection, orientation detection, collision avoidance, and so forth." Pettis ¶ [0035].
- Bukkapatnam explains the concept of condition monitoring. It explains that the "essence of condition monitoring is to select and extract features from the measured sensor signals and relate these to specific, possibly anomalous, process conditions." Bukkapatnam at 140. "The use of an adequate model of process dynamics can lead to significant reductions in the amount of physical experiments necessary to extract accurate feature sets and develop a functional mapping between the features and the various conditions." *Id.*
- Mayer recites a system that "may be used to determine whether an object is present that should not be, or to detect when an object is absent." *Id.* ¶ [0024]. "The feedback from this sensor may be used by the controller **110** to issue processing interrupts or otherwise control operation of the printer **100**." *Id.*

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that reactive qualities of 3D printing apparatuses be improved to respond to data and not print blindly. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the

same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Warren in combination with MakerBot
Warren in combination with SeTAC
Calderon in combination with RepRap 20208
Calderon in combination with RepRap 20208 and MakerBot
MakerBot in combination with SeTAC
MakerBot in combination with SeTAC and Bukkapatnam
MakerBot in combination with SeTAC and Igasaki
MakerBot in combination with SeTAC and Pettis
MakerBot in combination with SeTAC and Mayer
MakerBot in combination with SeTAC and RepRap
MakerBot in combination with SeTAC and Calderon
MakerBot in combination with SeTAC and Dunn
MakerBot in combination with Igasaki
MakerBot in combination with Igasaki and Bukkapatnam
MakerBot in combination with Igasaki and Mayer

SeTAC in combination with Bukkapatnam
SeTAC in combination with Bukkapatnam and Igasaki
SeTAC in combination with Mayer
SeTAC in combination with Mayer and Bukkapatnam
SeTAC in combination with Mayer and Igasaki
SeTAC in combination with Pettis
SeTAC in combination with Pettis and Bukkapatnam
SeTAC in combination with Pettis and Igasaki
Mayer in combination with Igasaki
Mayer in combination with Igasaki and Bukkapatnam
Pettis in combination with Igasaki
Pettis in combination with Igasaki and Bukkapatnam
Pettis in combination with Igasaki and Mayer
MakerBot in combination with Dunn
MakerBot in combination with Dunn and Bukkapatnam
MakerBot in combination with Dunn and Calderon
MakerBot in combination with Dunn and Igasaki
MakerBot in combination with RepRap
MakerBot in combination with RepRap and Calderon
MakerBot in combination with RepRap and Igasaki

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Mechanically Coupled Extruder-Sensor References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose one or more sensors mechanically coupled to the extruder, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Mechanically Coupled Extruder-Sensor References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Warren
- RepRap 20208
- Mayer
- Eshed
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Mechanically Coupled Extruder-Sensor References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Mechanically Coupled Extruder-Sensor References, mechanically coupling one or more sensors to the extruder was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Mechanically Coupled Extruder-Sensor References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, detecting forces at the fabrication tool, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Sensors Operable to Sense Contact Force References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose one or more sensors are collectively operable to sense a contact force, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Sensors Operable to Sense Contact Force References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Warren
- RepRap 20208
- Igasaki
- Calderon
- Eshed
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Sensors Operable to Sense Contact Force References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Sensors Operable to Sense Contact Force References, using sensor to sense a contact force was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Sensors Operable to Sense Contact Force References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, identifying the forces acting upon the fabrication tool for process monitoring, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Calculating Contact Force References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a controller configured to calculate the contact force between the extruder and the separate structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Calculating Contact Force References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Igasaki
- Warren
- Calderon
- RepRap 20208
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Calculating Contact Force References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Calculating Contact Force References, calculating the contact force between the extruder and separate structure based on signals from sensors was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Calculating Contact Force References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, determining the magnitude and direction of forces acting upon the fabrication tool for process monitoring, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Force-Sensor Responsive Control Signal References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a controller configured to receive a signal from the one or more sensors on the extruder, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Force-Sensor Responsive Control Signal References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Igasaki
- Mayer
- Pettis
- Warren
- RepRap 20208
- Eshed

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Force-Sensor Responsive Control Signal References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Force-Sensor Responsive Control Signal References, controllers configured to receive signals from sensors containing operating condition information was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Force-Sensor Responsive Control Signal References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, adapting manufacturing processes to current operating conditions, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Controlling Z-Height References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a controller configured to adjust a z-axis position of the extruder in response to the calculated contact force, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Controlling Z-Height References") to render obvious claims that may require such or similar features.

- MakerBot
- Bukkapatnum
- Igasaki
- Mayer
- Warren
- Calderon
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Controlling Z-Height References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Controlling Z-Height References, controlling the z-height of the fabrication tool (or, alternatively, the build platform or substrate) was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Controlling Z-Height References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, ensuring material is deposited at the correct z-height (that is, the third dimension contemplated by "3D printers"), combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Specified Contact Force References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose controlling the one or more actuators to achieve a specified contact force between the one or more sensors and the separate structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Specified Contact Force References") to render obvious claims that may require such or similar features.

- Igasaki
- Bukkapatnam
- Mayer
- Warren
- RepRap 20208

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Specified Contact Force References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Specified Contact Force References, maintaining a constant, specified contact force was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Specified Contact Force References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, maintaining an optimal level of contact force between the extruder and external structures (for instance, the build platform or extruded material), combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Detecting Forces Due to External Structures References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose one or more sensors that are collectively operable to sense a contact force between the extruder and a separate structure distinct from the fabrication tool, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Detecting Forces Due to External Structures References") to render obvious claims that may require such or similar features.

- SeTAC
- Bukkapatnam
- Warren
- RepRap 20208
- Dunn

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Detecting Forces Due to External Structures References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Detecting Forces Due to External Structures References, sensing a contact force acting upon the fabrication tool due to separate structures was well-known in the art by the time of the '381 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Detecting Forces Due to External Structures References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, detecting collisions, calibrating the print bed, etc., combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

c. The ’466 Patent

The ’466 Patent relates to “[a] supply of build material such as a spool or cartridge is instrumented with a data tag that includes information about the build material,” and “[a] three-dimensional printer [that] can read the information from the tag and determine how to use the build material during fabrication of a three-dimensional object.”. ’466 Patent at 1:29–33. The ’466 Patent explains that “three-dimensional printers use build material of various type and configuration to print three-dimensional objects.” *Id.* at 1:16–22. “In order to properly process the build material through the three-dimensional printer extruder for the fabrication of an object, the three-dimensional printer controller may need at least a basic set of characteristics of the build material to determine operation.” *Id.* However, “[t]here remained a need for methods and systems for the automatic detection and acquiring of three-dimensional printer build material characteristics.” *Id.* at 1:23–25.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for automatic detection and acquiring of three-dimensional printer build material characteristics was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, U.S. Patent Application Publication No. 2006/0091199A1 (“Loughran”), titled “Retrieving information on material used in solid freeform fabrication” discloses the desirability of automatic identification of build materials and their characteristics, and solving that problem using information included on the supply of the build material:

- “Solid freeform fabrication (SFF) encompasses technologies that are employed to fabricate physical objects directly from computer-aided drafting (CAD) data sources.” Loughran at [0001]. “Updating both SFF systems of SFF fabricators, as

well as client devices of users, can be a laborious process. Typically, the SFF systems, and sometimes the client devices, are hard coded with the information of the materials, such that the introduction of information regarding new materials into the systems and the devices is difficult to accomplish. Even if the SFF systems and client devices are soft coded with the information of the materials, users may have to remember to perform updates to retrieve information regarding new materials. Furthermore, information regarding already known materials can change over time." Loughran at [0003].

- "Still referring to FIG. 1, a material container 110 containing a material 112 from which physical objects can be fabricated at the second SFF system 104 in accordance with SFF fabrication jobs generated at the first SFF system 102 is introduced into the second SFF system 104, as indicated by the arrow 116. The material 112 may be a new, and thus unknown, or already known material. The material container 110 contains a tag 114 that includes a material identifier that is unique among material identifiers of different containers containing other materials. Based on the material identifier of the tag 114, the second SFF system 104 is able to recognize the material 112 being introduced thereinto, and determine whether the material 112 is an already known material, or a new and unknown material." Loughran at [0020].

As another example, U.S. Patent Application Publication No. 2006/0127153 ("Menchik"), titled "Three-dimensional object printing " also discloses that managing the build supply, and identifying the supply's characteristics, is beneficial to a three-dimensional printing system:

- ”Various systems have been developed for computerized three-dimensional printing, wherein material for object printing is deposited in consecutive layers according to a pre-determined configuration or in selected arrays as defined by, for example, a Computer Aided Design (CAD) system connected to the printing systems. Such materials may include materials for constructing an object and materials used for constructing support structures for an object.” Menchik at [0003].
- “Some three-dimensional printers utilize a printing head, for example an ink-jet type printing head, through which material for printing three-dimensional objects is jetted. The printing head may draw material from a reservoir containing the material. The reservoir may be connected to the printing head, and may supply the material via a tube or tubes to the printing head. A common type of reservoir may consist of a container, such as a cartridge, containing building material. Other types of reservoirs and feed systems may be used.” Menchik at [0004].
- “The printing of a given three-dimensional object may require a finite and calculable amount of building material for completion. It may be advantageous to have a system for efficiently managing the supply of materials for usage during a printing process.” Menchik at [0005].

As another example, U.S. Patent No. 6,022,207 (“Dahlin”), titled “Rapid prototyping system with filament supply spool monitoring” also discloses the same need, a need for information related to the build material supply, and the same solution—monitoring information received from the supply:

- “In using either a filament feed or a solid rod feed, it is desirable for the control system of the rapid prototyping system to keep track of the amount of modeling

material remaining in a cassette or on a spool. It is also desirable for the control system to know the type of modeling material that is on the cassette or spool, and the proper extrusion parameters for dispensing the material." Dahlin at 1:41–47.

- "The memory device is attached to the cassette so that electrical contact is made to the control system through a connector when the cassette is manually inserted. The memory device serves as an electronic tag which informs the control system of the type of material that is in the cassette, the proper extrusion parameters for dispensing the material, the current number of rods in the cassette, and the cassette serial number." Dahlin at 1:51–58.
- "The present invention is a filament spool and a filament supplied rapid prototyping system that provides a circuit for monitoring data concerning the filament on the filament spool." Dahlin at 1:61–64.

Additional references similarly discuss the need for automatic detection of printing materials:

- The solid freeform fabrication system 100 also includes a controller (not shown) which is programmed to, among other things, control the positioning and repositioning of the print head 103 during the 3D object fabrication process. The controller can take the form of a discrete module positioned proximate to the print head; alternatively, the operations performed by the controller can be distributed among a plurality of controllers, processors or the like, and/or the controller can be remotely located relative to the print head. Devos at [0016].

- The printer uses RFID technology to automatically identify the material cartridges. For this purpose, an RFID module is part of the printer hardware. Tampering with this module will render the printer inoperable and may void Stratasys warranties and service contracts.

  Eden 260v User Guide at 6-4.

- SmartSpool System

  1. The 360mc/400mc uses the SmartSpool system to give you canister information. This allows you to manage material resources, and maximize part build strategies for long, unattended part builds.
  2. Each canister contains an encoded chip (Figure 3-15) that tracks the status of the canister material. Canister information is reported to the system and displayed on the user panel.

  Fortus 360mc User Guide at 3-17.

- However, these properties are static properties which define the component once it has been produced. Now, these properties are obtained as the result of a dynamic production process and depend on the physico-chemical characteristics of the materials which have already been deposited or are to be deposited, the characteristics of the printer used to produce the component and the characteristics of interaction between the materials and the printer used for production. Dubois at [0068].

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that identification of build material characteristics be improved. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer

improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are

rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Loughran in combination with Dubois
Loughran in combination with Dubois and Jazayeri
Loughran in combination with Devos
Loughran in combination with Menchik and Jazayeri
Loughran in combination with Eden 260v
Loughran in combination with Fortus
Loughran in combination with Dahlin
Loughran in combination with Dahlin and Menchik
Loughran in combination with KISSlicer
Loughran in combination with Objet260
Loughran in combination with Heugel
Loughran in combination with HP LaserJet 4100mfp
Dubois in combination with Devos
Dubois in combination with Menchik
Dubois in combination with Dahlin
Dubois in combination with Eden260v
Dubois in combination with Fortus 360mc
Dubois in combination with Objet260
Jazayeri in combination with Devos

Jazayeri in combination with Menchik
Jazayeri in combination with Dahlin
KISSlicer in combination with Devos
KISSlicer in combination with Menchik
Devos in combination with Menchik
Devos in combination with Dahlin
Devos in combination with Eden260v
Devos in combination with Fortus 360mc
Menchik in combination with Dahlin
Menchik in combination with Eden260v
Menchik in combination with Fortus 360mc
Menchik in combination with Objet260
Dahlin in combination with Eden260v
Dahlin in combination with Eden 260v and Menchik
Dahlin in combination with Fortus 360mc
Dahlin in combination with Fortus 360mc and Menchik

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Network References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose communications over a network, including receiving a request from a client over a network to fabricate an object on the three-dimensional printer, the three-dimensional printer coupled to a supply of a build material including a tag that stores at least one property of the build material;, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Network References") to render obvious claims that may require such or similar features.

- Loughran
- Jazayeri
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Network References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Network References, receiving a request from a client over a network to fabricate an object or providing data over a network was well-known in the art by the time of the '466 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Network References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, communicating information from one device or computer to another, combined with a

finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Tag Data References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose reading data from the tag with the tag sensor, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Tag Data References") to render obvious claims that may require such or similar features.

- Loughran
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Tag Data References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Tag Data References, reading data from the tag with the tag sensor was well-known in the art by the time of the '466 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Tag Data References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, automatically identifying information related to the build material coupled to the three-dimensional printer, combined with a finite number of

identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Operational Parameters References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose the use of operational parameters, including operational parameters that include at least one of an extruder temperature, a feed rate, a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement, receiving one or more operational parameters from the client selected for use in controlling operation of the three-dimensional printer when fabricating the object with the build material having the at least one property stored in the tag, and determining an operational parameter for configuring the three-dimensional printer for a fabrication process using the build material based upon at least one property of the build material in the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Operational Parameters References") to render obvious claims that may require such or similar features.

- Dubois
- Menchik
- Loughran
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260
- Heugel

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 87

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Operational Parameters References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Operational Parameters References, the use of operational parameters related to properties of a build material in fabricating an object was well-known in the art by the time of the '466 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Operational Parameters References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, ensuring that the selected build material is capable of being effectively used by the three-dimensional printer, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Diagnostic Test References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose performing a diagnostic test to determine whether the one or more operational parameters is suitable for the three-dimensional printer, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Diagnostic Test References") to render obvious claims that may require such or similar features.

- Loughran
- Dubois
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc

- Phillips
- Salisbury
- Pax
- Sidi
- Objet260
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Diagnostic Test References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Diagnostic Test References, performing a diagnostic test to determine whether the one or more operational parameters is suitable for the three-dimensional printer was well-known in the art by the time of the '466 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Diagnostic Test References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, confirming that given operational parameters are appropriate for use with a given build material in the operation of a three-dimensional printer, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Determining References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose determining an operational parameter for configuring the three-dimensional printer for a fabrication process using the build material based upon at least one property of the build material in the data, , such reference can be combined with the corresponding disclosures from any

one or more of the following prior art references ("Determining References") to render obvious claims that may require such or similar features.

- Loughran
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Phillips
- Salisbury
- Pax
- Sidi
- Heugel
- Objet
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Determining References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Determining References, determining an operational parameter for configuring the three-dimensional printer for a fabrication process using the build material based upon at least one property of the build material in the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement was well-known in the art by the time of the '466 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Determining References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, selecting operational parameters for use with a

given build material, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Tag Data Content References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose the data includes at least one of a material identification number, a build material type, a build material diameter, an extruder temperature requirement, a build material melting temperature, a build material color, a build material color lot number, a cost per unit of build material, a build material density, a build material tensile strength, a build material viscosity, a build material recycle code, and a build material expiration date, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Tag Data Content References") to render obvious claims that may require such or similar features.

- Loughran
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Tag Data Content References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Tag Data Content References, the data includes at least one of a material identification number, a build material type, a build material diameter, an extruder temperature requirement, a build material melting temperature, a build material color, a build material color lot number, a cost

per unit of build material, a build material density, a build material tensile strength, a build material viscosity, a build material recycle code, and a build material expiration date was well-known in the art by the time of the ’466 Patent’s claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Tag Data Content References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, reading tag data related to the printing process, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

First and Second Material References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose receiving a selection of one of the first build material and the second build material from the client for use in fabricating the object using the three-dimensional printer, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references (“First and Second Material References”) to render obvious claims that may require such or similar features.

- Loughran
- Dubois
- KISSlicer
- Devos
- Menchik
- Dahlin
- Eden260v
- Fortus 360mc
- Objet260

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary First and Second Material References to improve the function and utility of the same

and such a combination would have been within that person's skill. As shown in the teachings of the foregoing First and Second Material References, receiving a selection of one of the first build material and the second build material from the client for use in fabricating the object using the three-dimensional printer was well-known in the art by the time of the '466 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary First and Second Material References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, reading tag data related to the printing process from more than one material supply, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

d. <u>The '464 Patent</u>

The '464 Patent relates to "[a] supply of build material such as a spool or cartridge is instrumented with a data tag that includes information about the build material," and "[a] three-dimensional printer [that] can read the information from the tag and determine how to use the build material during fabrication of a three-dimensional object.". '464 Patent at 1:31–36. The '464 Patent explains that "three-dimensional printers use build material of various type and configuration to print three-dimensional objects." *Id.* at 1:18–24. "In order to properly process the build material through the three-dimensional printer extruder for the fabrication of an object, the three-dimensional printer controller may need at least a basic set of characteristics of the build material to determine operation." *Id.* However, "[t]here remained a need for methods and systems for the automatic detection and acquiring of three-dimensional printer build material characteristics." *Id.* at 1:25–27.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for automatic detection and

acquiring of three-dimensional printer build material characteristics was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, U.S. Patent Application Publication No. 2006/0091199A1 ("Loughran"), titled "Retrieving information on material used in solid freeform fabrication" discloses the desirability of automatic identification of build materials and their characteristics, and solving that problem using information included on the supply of the build material:

- "Solid freeform fabrication (SFF) encompasses technologies that are employed to fabricate physical objects directly from computer-aided drafting (CAD) data sources." Loughran at [0001]. "Updating both SFF systems of SFF fabricators, as well as client devices of users, can be a laborious process. Typically, the SFF systems, and sometimes the client devices, are hard coded with the information of the materials, such that the introduction of information regarding new materials into the systems and the devices is difficult to accomplish. Even if the SFF systems and client devices are soft coded with the information of the materials, users may have to remember to perform updates to retrieve information regarding new materials. Furthermore, information regarding already known materials can change over time." Loughran at [0003].
- "Still referring to FIG. 1, a material container 110 containing a material 112 from which physical objects can be fabricated at the second SFF system 104 in accordance with SFF fabrication jobs generated at the first SFF system 102 is introduced into the second SFF system 104, as indicated by the arrow 116. The material 112 may be a new, and thus unknown, or already known material. The

material container 110 contains a tag 114 that includes a material identifier that is unique among material identifiers of different containers containing other materials. Based on the material identifier of the tag 114, the second SFF system 104 is able to recognize the material 112 being introduced thereinto, and determine whether the material 112 is an already known material, or a new and unknown material." Loughran at [0020].

As another example, U.S. Patent Application Publication No. 2006/0127153 ("Menchik"), titled "Three-dimensional object printing" also discloses that managing the build supply, and identifying the supply's characteristics, is beneficial to a three-dimensional printing system:

- "Various systems have been developed for computerized three-dimensional printing, wherein material for object printing is deposited in consecutive layers according to a pre-determined configuration or in selected arrays as defined by, for example, a Computer Aided Design (CAD) system connected to the printing systems. Such materials may include materials for constructing an object and materials used for constructing support structures for an object." Menchik at [0003].
- "Some three-dimensional printers utilize a printing head, for example an ink-jet type printing head, through which material for printing three-dimensional objects is jetted. The printing head may draw material from a reservoir containing the material. The reservoir may be connected to the printing head, and may supply the material via a tube or tubes to the printing head. A common type of reservoir may consist of a container, such as a cartridge, containing building material. Other types of reservoirs and feed systems may be used." Menchik at [0004].

- "The printing of a given three-dimensional object may require a finite and calculable amount of building material for completion. It may be advantageous to have a system for efficiently managing the supply of materials for usage during a printing process." Menchik at [0005].

As another example, U.S. Patent No. 6,022,207 ("Dahlin"), titled "Rapid prototyping system with filament supply spool monitoring" also discloses the same need, a need for information related to the build material supply, and the same solution—monitoring information received from the supply:

- "In using either a filament feed or a solid rod feed, it is desirable for the control system of the rapid prototyping system to keep track of the amount of modeling material remaining in a cassette or on a spool. It is also desirable for the control system to know the type of modeling material that is on the cassette or spool, and the proper extrusion parameters for dispensing the material." Dahlin at 1:41–47.
- "The memory device is attached to the cassette so that electrical contact is made to the control system through a connector when the cassette is manually inserted. The memory device serves as an electronic tag which informs the control system of the type of material that is in the cassette, the proper extrusion parameters for dispensing the material, the current number of rods in the cassette, and the cassette serial number." Dahlin at 1:51–58.
- "The present invention is a filament spool and a filament supplied rapid prototyping system that provides a circuit for monitoring data concerning the filament on the filament spool." Dahlin at 1:61–64.

Additional references similarly discuss the need for automatic detection of printing materials:

- The solid freeform fabrication system 100 also includes a controller (not shown) which is programmed to, among other things, control the positioning and repositioning of the print head 103 during the 3D object fabrication process. The controller can take the form of a discrete module positioned proximate to the print head; alternatively, the operations performed by the controller can be distributed among a plurality of controllers, processors or the like, and/or the controller can be remotely located relative to the print head. Devos at [0016].

- The printer uses RFID technology to automatically identify the material cartridges. For this purpose, an RFID module is part of the printer hardware. Tampering with this module will render the printer inoperable and may void Stratasys warranties and service contracts.

  Eden 260v User Guide at 6-4.

- SmartSpool System

  1. The 360mc/400mc uses the SmartSpool system to give you canister information. This allows you to manage material resources, and maximize part build strategies for long, unattended part builds.
  2. Each canister contains an encoded chip (Figure 3-15) that tracks the status of the canister material. Canister information is reported to the system and displayed on the user panel.

  Fortus 360mc User Guide at 3-17.

- However, these properties are static properties which define the component once it has been produced. Now, these properties are obtained as the result of a dynamic production process and depend on the physico-chemical characteristics of the materials which have already been deposited or are to be deposited, the characteristics of the printer used to produce the component and the characteristics

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 97

of interaction between the materials and the printer used for production. Dubois at [0068].

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that identification of build material characteristics be improved. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references,

which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Loughran in combination with Dubois
Loughran in combination with Dubois and Jazayeri
Loughran in combination with Devos
Loughran in combination with Menchik
Loughran in combination with Menchik and Jazayeri
Loughran in combination with Eden 260v
Loughran in combination with Fortus
Loughran in combination with Dahlin
Loughran in combination with Dahlin and Menchik
Loughran in combination with KISSlicer
Loughran in combination with Objet260

Loughran in combination with Heugel
Dubois in combination with Devos
Dubois in combination with Menchik
Dubois in combination with Dahlin
Dubois in combination with Eden260v
Dubois in combination with Fortus 360mc
Dubois in combination with Objet260
Jazayeri in combination with Devos
Jazayeri in combination with Menchik
Jazayeri in combination with Dahlin
KISSlicer in combination with Devos
KISSlicer in combination with Menchik
Devos in combination with Menchik
Devos in combination with Dahlin
Devos in combination with Eden260v
Devos in combination with Fortus 360mc
Menchik in combination with Dahlin
Menchik in combination with Eden260v
Menchik in combination with Fortus 360mc
Menchik in combination with Objet260

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 100

Dahlin in combination with Eden260v
Dahlin in combination with Eden 260v and Menchik
Dahlin in combination with Fortus 360mc
Dahlin in combination with Fortus 360mc and Menchik

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Tag Data References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose reading data from a tag included on a supply of a build material using a tag sensor in communication with a controller of a three-dimensional printer, the data including at least one property of the build material, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Tag Data References") to render obvious claims that may require such or similar features.

- Loughran
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Tag Data References to improve the function and utility of the same and such a

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 101

combination would have been within that person's skill. As shown in the teachings of the foregoing Tag Data References, reading data from the tag with the tag sensor was well-known in the art by the time of the '464 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Tag Data References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, automatically identifying information related to the build material coupled to the three-dimensional printer, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Operational Parameters References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose the use of operational parameters, including operational parameters that include at least one of an extruder temperature, a feed rate, a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement, and determining an operational parameter for configuring the three-dimensional printer for a fabrication process using the build material based upon at least one property of the build material in the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Operational Parameters References") to render obvious claims that may require such or similar features.

- Dubois

- Menchik
- Loughran
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260
- Heugel

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Operational Parameters References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Operational Parameters References, the use of operational parameters related to properties of a build material in fabricating an object was well-known in the art by the time of the '464 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Operational Parameters References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, ensuring that the selected build material is capable of being effectively used by the three-dimensional printer, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Diagnostic Test References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Diagnostic Test References") to render obvious claims that may require such or similar features.

- Loughran
- Dubois
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Phillips
- Salisbury
- Pax
- Sidi
- Objet260
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Diagnostic Test References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Diagnostic Test References, performing a diagnostic test to determine whether the one or more operational parameters is suitable for the three-dimensional printer was well-known in the art by the time of the '464 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Diagnostic Test References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, confirming that given operational parameters are appropriate for use with a given build material in the operation of a three-dimensional printer, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Determining References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose determining an operational parameter for configuring the three-dimensional printer

for a fabrication process using the build material based upon at least one property of the build material in the data, , such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Determining References") to render obvious claims that may require such or similar features.

- Loughran
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Phillips
- Salisbury
- Pax
- Sidi
- Heugel
- Objet
- HP LaserJet 4100mfp

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Determining References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Determining References, determining an operational parameter for configuring the three-dimensional printer for a fabrication process using the build material based upon at least one property of the build material in the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement was well-known in the art by the time of the '464 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Determining References would have amounted to applying a known technique to a known device ready for improvement to yield predictable

results. Furthermore, given the design needs, *e.g.*, selecting operational parameters for use with a given build material, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Tag Data Content References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose the data includes at least one of a material identification number, a build material type, a build material diameter, an extruder temperature requirement, a build material melting temperature, a build material color, a build material color lot number, a cost per unit of build material, a build material density, a build material tensile strength, a build material viscosity, a build material recycle code, and a build material expiration date, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Tag Data Content References") to render obvious claims that may require such or similar features.

- Loughran
- Devos
- Menchik
- Dahlin
- Eden 260v
- Fortus 360mc
- Objet260

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Tag Data Content References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Tag Data Content References, the data includes at least one of a material identification number, a build material type, a build material diameter, an extruder temperature requirement, a

build material melting temperature, a build material color, a build material color lot number, a cost per unit of build material, a build material density, a build material tensile strength, a build material viscosity, a build material recycle code, and a build material expiration date was well-known in the art by the time of the ’464 Patent’s claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Tag Data Content References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, reading tag data related to the printing process, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

e. The ’324 Patent

The ’324 Patent relates to “three-dimensional fabrication using networked resources.” ’324 Patent at 1:14-15. According to the patent, a “recent trend has emerged toward low-cost three-dimensional prototyping devices suitable for hobbyists and home users.” *Id.* at 1:23-25. “As these resources become more readily and widely available, a need has emerged for networking capabilities and network management for three-dimensional printers.” *Id.* at 1:25-28. “Web-based servers or the like can provide a single point of access for remote users to manage access to distributed content on one hand, and to manage use of distributed fabrication resources on the other.” *Id.* at 1:35-38. Furthermore, “[i]t will also be appreciated that a wide variety of sensors may usefully be employed” including “a video camera directed toward a working volume of the three-dimensional printer.” *Id.* at 18:32-36.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for networks with 3D printing and sensors including video cameras was already recognized in the prior art and the field of the

invention and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Mazumder, titled "System and Method for Remote Direct Material Deposition" discloses implementing remote control of 3D printers and the inclusion of sensors:

- "The need remains, however, for a system and method enabling a design team at a remote site to monitor, control and modify the fabrication process of a product at a local manufacturing site." Mazumder at 1:51-54.
- "This invention utilizes advances in telecommunication and fast data transfer to control the fabrication of precisely dimensioned and intricately-detailed products through an automated, feedback-controlled, laser-aided direct material deposition (DMD) process. . ." *Id.* at 1:62-66.
- "Optical sensors at the manufacturing site continuously monitor the composition, temperature, and dimensions of the product." *Id.* at 2:43-45.

As another example, Tay, titled "Distributed Rapid Prototyping – A Framework for Internet Prototyping and Manufacturing, Integrated Manufacturing Systems" also discloses utilizing the Internet and cameras manufacturing:

- "Manufacturing and design technologies are gradually gravitating towards Internet integrated technology to cope with emerging challenges such as the need for shorter time to market, reduced lead time in the supply chain of new products, reduced cost and higher quality." Tay at 1.
- "The Internet based distributed rapid prototyping architecture is a common client server model, which centers on object-oriented application model using Java and common Web tools. The four basic components of the approach are . . . Other Web

tools (e.g. Virtual Network Computing, Web Cam): as an access and configuration tool for a remote server system . . .” *Id.* at 2.

- “Though the concept has been developed using FDM, the same concept is applied to other rapid prototyping technologies such as Selective Laser Sintering (SLS), Stereo-Lithography Apparatus (SLA) and Laminated Object Manufacturing (LOM).” *Id.*

As another example, the publication supporting the Álvares System, titled “WebTurning: Teleoperation of a CNC turning center through the Internet” (“Álvares”) also discloses Internet networking and camera monitoring:

- “[T]he development of systems that allow the remote manufacture of parts is important, because the client and the company that manufactures the parts can maintain contact at a distance, but in a direct manner.” Álvares at 1.
- “The man-machine interface has a main objective to provide a realistic and intuitive supervisory control that allows: to monitor the operation continually through displays based on video or virtual environments.” *Id.* at 2.
- “The developed system is quite versatile and robust, allowing the production of parts remotely through the Internet, applying e-manufacturing and telemanufacturing concepts, and the teleoperation environment is part of an integrated CAD/CAPP/CAM system for the design, process planning and manufacture of parts through the Internet.” *Id.* at 1.

Additional references similarly discuss Internet networking and camera monitoring:

- “[A]n object of the invention is to provide a machining status monitoring method and machining status monitoring apparatus with which it is possible to sufficiently

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 109

monitor the machining status of a work-piece with images obtained from imaging means." Mori at [0005].

- "Seeing prints remotely was nice, but I had to artificially keep the Rovio from driving off the table. I wanted a better solution, and immediately thought about the old USB Xbox Live Vision camera I had lying around . . . [o]ne Google search later and I found a quick description of how to get it up and running on Ubuntu with almost no effort, streaming video to a remote web browser." Keegan Blog Post, https://www.keegan.org/reprapblog/page/10
- "The machine vision system of the present invention enables the precise deposition of flowable material in a desired location on or over the substrate." Farnworth at 2:66-3:1.
- "RP&M technique using the Internet can further enhance the design and manufacturing productivity, speed, and economy, as well as share the RP machines." Lan at 2.
- "A present invention, may include a printing apparatus to print three-dimensional objects; a controller that may prepare the digital data that characterizes the 3-D object for printing, and control the operation of the printing apparatus; and a printing tray with a selected adhesion characteristic." Kritchman at [0005].

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that networking and monitoring of the printing process be improved. Thus, one of skill in the art would have been motivated to combine or modify

references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed

herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Mazumder in combination with Mori
Mazumder in combination with Mori and Hull
Mazumder in combination with Mori and Seki
Mazumder in combination with Mori and Waehner
Mazumder in combination with Mori and Lan
Mazumder in combination with Mori and Anderson
Mazumder in combination with Mori and Álvares System
Mazumder in combination with Mori and Keegan
Mazumder in combination with Mori and Charliex
Mazumder in combination with Mori and i.materialise
Mazumder in combination with Mori and Trumpf
Kritchman in combination with Tay
Kritchman in combination with Tay and Henke
Kritchman in combination with Tay, Henke, and Lan
Kritchman in combination with Tay, Henke, and Anderson
Kritchman in combination with Tay, Henke, and Álvares System
Kritchman in combination with Tay, Henke, and Keegan
Kritchman in combination with Tay, Henke, and Charliex
Kritchman in combination with Tay, Henke, and i.materialise

Kritchman in combination with Tay, Henke, and Trumpf
Álvares System in combination with Tay, Henke, and Lan
Álvares System in combination with Mori, Waehner, and Seki
Álvares System in combination with Farnworth, Fidan I and Taminger
Álvares System in combination with Farnworth, Stecker, and Lapa
Keegan in combination with Tay, Henke, and Lan
Keegan in combination with Mori, Waehner, and Seki
Keegan in combination with Farnworth, Fidan I, and Taminger
Keegan in combination with Farnworth, Stecker, and Lapa
Charliex in combination with Farnworth, Stecker, and Lapa
Charliex in combination with Tay, Henke, and Lan
Charliex in combination with Mori, Waehner, and Seki
i.materialise in combination with Farnworth, Stecker, and Lapa
i.materialise in combination with Tay, Henke, and Lan
i.materialise in combination with Mori, Waehner, and Seki
Trumpf in combination with Farnworth, Stecker, and Lapa
Trumpf in combination with Tay, Henke, and Lan
Trumpf in combination with Mori, Waehner, and Seki

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 113

Network References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a network interface coupled to a data network, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Network References") to render obvious claims that may require such or similar features.

- Mazumder
- Kritchman
- Henke
- Álvares System

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Network References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Network References, connecting a 3D printer to a wider network was well-known in the art by the time of the '324 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Network References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, additional user access and remote access of the printer, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Authentication References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose credential-based user access, such reference can be combined with the

corresponding disclosures from any one or more of the following prior art references ("Authentication References") to render obvious claims that may require such or similar features.

- Hull
- Fidan I
- Fidan III

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Authentication References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Authentication References, using credentials and user specific access to 3-D printers was well-known in the art by the time of the '324 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Authentication References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, providing additional security and/or access by multiple discrete users, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Two-Dimensional References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose comparing two-dimensional and three-dimensional representations of the fabricated object, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Two-Dimensional References") to render obvious claims that may require such or similar features.

- Seki

- Mazumder
- Mori
- Lapa

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Two-Dimensional References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Two-Dimensional References, comparing two-dimensional representations of the object with a three-dimensional representation was well-known in the art by the time of the '324 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Two-Dimensional References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, the ability to track and compare the fabrication process of the object, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Stop-Motion References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose capturing a stop-motion animation of the fabrication, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Stop-Motion References") to render obvious claims that may require such or similar features.

- Waehner
- Cheatle

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Stop-Motion References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Stop-Motion References, capturing video from a camera that can be presented in a stop-motion format was well-known in the art by the time of the '324 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Stop-Motion References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, the ability to view discrete sections of the fabrication process, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

f. <u>The '097 Patent</u>

The '097 Patent relates to "three-dimensional fabrication using networked resources." '097 Patent at 1:15-16. According to the patent, a "recent trend has emerged toward low-cost three-dimensional prototyping devices suitable for hobbyists and home users." *Id.* at 1:24-26. "As these resources become more readily and widely available, a need has emerged for networking capabilities and network management for three-dimensional printers." *Id.* at 1:26-29. "Web-based servers or the like can provide a single point of access for remote users to manage access to distributed content on one hand, and to manage use of distributed fabrication resources on the other." *Id.* at 1:36-39. Furthermore, "[i]t will also be appreciated that a wide variety of sensors may usefully be employed" including "a video camera directed toward a working volume of the three-dimensional printer." *Id.* at 18:32-36.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for networks with 3D printing and machine vision was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Mazumder, titled "System and Method for Remote Direct Material Deposition" discloses implementing remote control of 3D printers and the inclusion of machine vision:

- "The need remains, however, for a system and method enabling a design team at a remote site to monitor, control and modify the fabrication process of a product at a local manufacturing site." Mazumder at 1:51-54.
- "This invention utilizes advances in telecommunication and fast data transfer to control the fabrication of precisely dimensioned and intricately-detailed products through an automated, feedback-controlled, laser-aided direct material deposition (DMD) process. . ." *Id.* at 1:62-66.
- "Optical sensors at the manufacturing site continuously monitor the composition, temperature, and dimensions of the product." *Id.* at 2:43-45.

As another example, the publication supporting the Álvares System, titled "WebTurning: Teleoperation of a CNC turning center through the Internet" ("Álvares") also discloses Internet networking and camera monitoring:

- "[T]he development of systems that allow the remote manufacture of parts is important, because the client and the company that manufactures the parts can maintain contact at a distance, but in a direct manner." Álvares at 1.

- "The man-machine interface has a main objective to provide a realistic and intuitive supervisory control that allows: to monitor the operation continually through displays based on video or virtual environments." Id. at 2.
- "The developed system is quite versatile and robust, allowing the production of parts remotely through the Internet, applying e-manufacturing and telemanufacturing concepts, and the teleoperation environment is part of an integrated CAD/CAPP/CAM system for the design, process planning and manufacture of parts through the Internet." Id. at 1.

As another example, Knighton, titled "Hybrid Scanner Fabricator" also discloses "[a] more reliable and faster apparatus and system for forming three dimensional objects from a digital representation is desirable." Knighton at 1:34-36.

- "In one embodiment of the invention, a three dimensional scanner 130 is provided within the housing 100 to scan the object 114 during fabrication. This permits the fabrication process to be adjusted responsive to identification of variance in the fabricated object 114 from the intended object as reflected in the digital model sourcing the data for the fabrication." Knighton at 2:31-37.
- "In some embodiments, the intermediate scanned model may be analyzed to determine whether corrective measures may be deferred until later in the fabrication process where such deferral would improve the efficiency of the fabrication." *Id.* at 41-44.
- "During fabrication controller 200 may periodically initiate a scan of the partial object using scan head 204. The resulting scan data may be provided to the monitoring software module 202, which may conduct an analysis." *Id.* at 3:1-4.

Additional references similarly discuss discloses Internet networking and machine vision:

- "Seeing prints remotely was nice, but I had to artificially keep the Rovio from driving off the table. I wanted a better solution, and immediately thought about the old USB Xbox Live Vision camera I had lying around . . . [o]ne Google search later and I found a quick description of how to get it up and running on Ubuntu with almost no effort, streaming video to a remote web browser." Keegan Blog Post, https://www.keegan.org/reprapblog/page/10
- "The machine vision system of the present invention enables the precise deposition of flowable material in a desired location on or over the substrate." Farnworth at 2:66-3:1.
- "The interface controller 104 can take the form of a print server which receives print job progress information from the printer(s) and then provides this information to the user's computer via web pages or other active (real time) windows." Anderson at [0018].
- The system allows users to directly control our rapid prototyping machine via the Internet and access our Home Page through a friendly user interface." Luo at 1.

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that networking and monitoring of the fabrication process be improved. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were

known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are

rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Knighton in combination with Luo and Anderson
Knighton in combination with Luo, Anderson, and Crampton
Knighton in combination with Luo, Anderson, and Chandhoke
Knighton in combination with Luo, Anderson, and Ridley
Knighton in combination with Luo, Anderson, and Mazumder
Knighton in combination with Luo, Anderson, and Biton
Knighton in combination with Luo, Anderson, and Álvares System
Knighton in combination with Luo, Anderson, and Keegan
Knighton in combination with Luo, Anderson, and Charliex
Knighton in combination with Luo, Anderson, and i.materialise
Knighton in combination with Luo, Anderson, and Trumpf
Mazumder in combination with Bonassar
Mazumder in combination with Bonassar and Crampton
Mazumder in combination with Bonassar and Chandhoke
Mazumder in combination with Bonassar and Ridley
Mazumder in combination with Bonassar and Biton
Mazumder in combination with Bonassar and Álvares System
Mazumder in combination with Bonassar and Keegan
Mazumder in combination with Bonassar and Charliex
Mazumder in combination with Bonassar and i.materialise
Mazumder in combination with Bonassar and Trumpf

Álvares System in combination with Luo, Anderson, and Bonassar
Álvares System in combination with Farnworth, Fidan I, and Stecker
Álvares System in combination with Farnworth, Fidan I, and Taminger
Álvares System in combination with Luo, Anderson, and Mazumder
Keegan in combination with Luo, Anderson, and Bonassar
Keegan in combination with Farnworth, Fidan I, and Taminger
Keegan in combination with Luo, Anderson, and Mazumder
Charliex in combination with Luo, Anderson, and Bonassar
Charliex in combination with Farnworth, Fidan I, and Stecker
Charliex in combination with Luo, Anderson, and Mazumder
i.materialise in combination with Luo, Anderson, and Bonassar
i.materialise in combination with Farnworth, Fidan I, and Stecker
i.materialise in combination with Luo, Anderson, and Mazumder
Trumpf in combination with Luo, Anderson, and Bonassar
Trumpf in combination with Farnworth, Fidan I, and Stecker
Trumpf in combination with Luo, Anderson, and Mazumder

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Machine Vision References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose integrating a web server to the network, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Machine Vision References") to render obvious claims that may require such or similar features.

- Knighton
- Chandhoke
- Anderson
- Bonassar
- Biton
- Farnworth
- Luo
- Taminger
- Álvares System
- Lapa
- Mori

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Machine Vision References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Machine Vision References, implementing machine vision sensors in printing apparatus was well-known in the art by the time of the '097 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Machine Vision References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, additional sensors providing information regarding the fabrication process, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Web Server References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose integrating a web server to the network, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Web Server References") to render obvious claims that may require such or similar features.

- Mazumder
- Álvares System
- Luo
- Fidan I
- Fidan II
- Fidan III

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Web Server References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Web Server References, connecting printing apparatus through web servers was well-known in the art by the time of the '097 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Web Server References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, additional connectivity between users and the printing apparatus, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Error Detection References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose detecting errors in the fabricated object during fabrication, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Error Detection References") to render obvious claims that may require such or similar features.

- Mazumder
- Chandhoke
- Knighton
- Stecker

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Error Detection References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Error Detection References, detection of errors or defects in the fabricated object during the fabrication process was well-known in the art by the time of the '097 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Error Detection References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, the ability to identify flaws in the fabricated object without waiting for project completion, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Structured Light References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose using structed light techniques in scanners, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Structured Light References") to render obvious claims that may require such or similar features.

- Crampton
- Lapa

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Structured Light References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Structured Light References, utilizing structured light sensors for analyzing objects was well-known in the art by the time of the '097 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Structured Light References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, additional methods for performing imaging scans of a fabricated object, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

g. <u>The '713 Patent</u>

The '713 Patent relates to "a method for printing 3D parts and support structures using an additive manufacturing system with the use of a purge tower (or multiple purge towers)." '713 Patent at Abstract. Specifically, the method includes "printing layers of the three-dimensional part

and of a support structure for the three-dimensional part from multiple print heads or deposition lines," "switching the print heads or deposition line between stand-by modes and operating modes in-between the printing of the layers of the three-dimensional part and support structure," and "performing a purge operation for each print head or deposition line switched to the operating mode" by "printing a layer of at least one purge tower from the print head or deposition line switched to the operating mode." *Id.*

According to the '713 Patent, "[w]hen each print head is brought to its operating mode, it preferably undergoes a purge operation prior to printing the next layer." *Id.* at 4:39-41. The purge operation "frees any part or support material filament that may be adhered to the walls of the liquefier assembly, and verifies that the print head can extrude the part or support material;" "removes any entrained gases and degraded materials in the print head, and brings the print head to a known operating state for printing the subsequent layer;" "removes variable ooze that may hang from a nozzle of the liquefier assembly while the print head is in idle or in its stand-by mode, and can account for variability of any voids in the tip pipe region of the nozzle;" and "provide minimum flow volume per layer to reduce the residence time-at-temperature for the part material." *Id.* at 4:46-62,

Further according to the '713 Patent, while "a purge operation conventionally involves moving the given print head to a purge station," the use of a purge station requires a large amount of part or support material to be extruded, the station requires a sizable space in the printer, and the station needs to be periodically emptied. *Id.* at 4:41-43, 4:63-5:6. Thus, as the '713 Patent describes, the purge tower "allows each print head to achieve the above-discussed desired functions of a purge operation without requiring the use of a separate purge station. This can increase the usable build volume in the additive manufacturing system, as well as reducing the

amount of part and support materials consumed during the purge operations and allowing the additive manufacturing system to operate in a fully automated manner." *Id.* at 5:7-17.

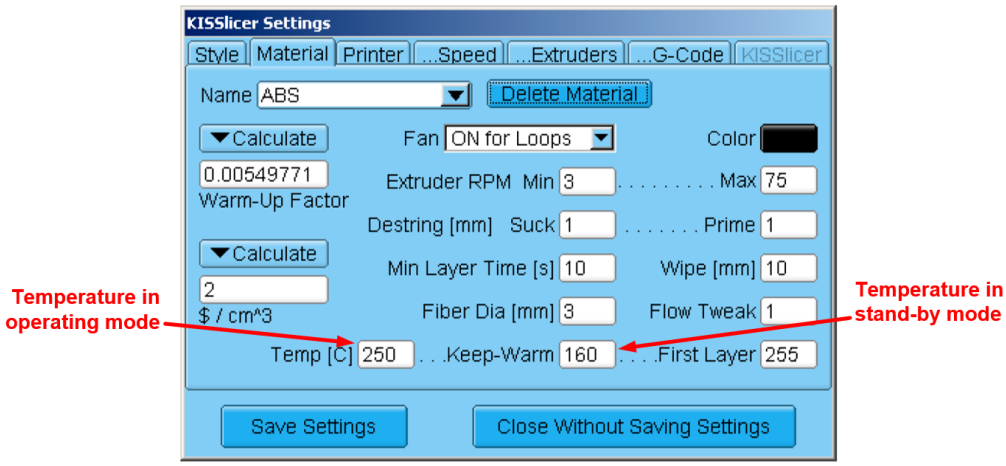
The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for a purge tower was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, the Dual Extruder System discloses a method for printing three-dimensional objects with multiple extruders and multiple materials, wherein the extruder prints a layer of a "parking space" before printing the three-dimensional object to "plug the nozzle while the temperature changes" and to "establish the consistent flow of plastic":

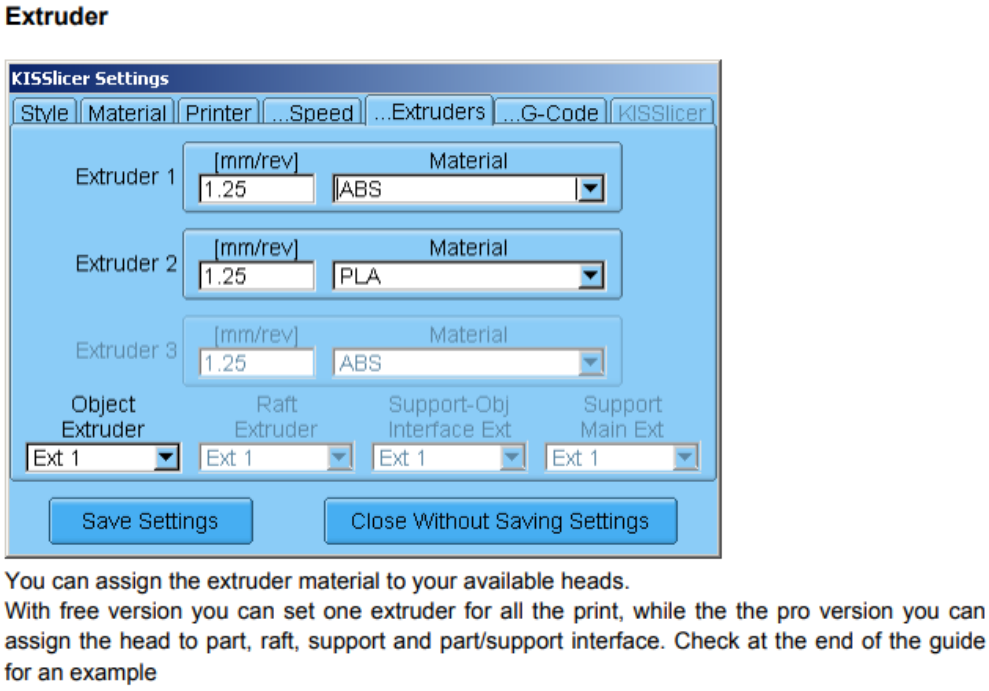
- "One of the most annoying problems with the dual extruder printing is the plastic leaking from the idle extruder. It is especially noticeable with PLA that flows easier than ABS. Lowering the temperature of the idle extruder while it is not needed and restore it when it is time to start printing with that extruder again helps to deal with leaking. It is tricky though since leaking has to be prevented during the temperature changes.

  The technique being used with the current generation of the RepRap X2 printers (S/N: 020*) is to print a "parking space" besides the actual object. That "parking space" serves two purposes, one is to plug the nozzles while the temperature changes and the other is to "prime" the extruders (i.e. establish the consistent flow of plastic) before printing the actual object after the temperature change." Dual Extruder Article.

As another example, the KISSlicer System also discloses a method for printing three-dimensional objects with multiple extruders and multiple materials, wherein the extruder prints a layer of a "wipe pillar" before printing the three-dimensional object to "clean the extruder tip" and "ensure the printer is ready":



- KISSlicer Quick-Start Guide at 3 (annotated).



- *Id.* at 5.

- "The wipe pillar is a cylinder printed before every layer to clean the extruder tip. It reduces hairing and it is extremely important in dual head prints. Can be switched off, or the position with respect to the main part can be chosen." *Id.* at 9.
- "Wipe [mm]: after a warm up the printer will push (prime) this amount of filament to ensure the printer is ready. *Id.* at 10.

As another example, the Mixer Extruder System also discloses a method for printing three-dimensional objects with multiple extruders and multiple materials, wherein the extruder prints a layer of a "block in tandem" before printing the three-dimensional object to "purge the nozzle with the correct printing colour before applying the colour to the print":

- "Another feature that will be required of the firmware, will be a method to purge the nozzle with the correct printing colour before applying the colour to the print, there are a couple of theories to achieve this; the first is to print a block in tandem with the print which will be used to purge material on, this method will be somewhat wasteful with having to print this block for every print, also the size of this block will have to be increased for multiple colour changes on the same layer. Another more economical solution would be to use the infill of a part to purge the plastic to the correct colour, and possible the inner boundary as the outer boundary will define the appearance of the object. This method will create much less waste although will not be as practical if parts of an object are desired to be clear as the infill will appear messy in terms of colour. Nor will this method be practical when determining the hardness of an object by using hard and soft plastics or by printing support material using water soluble material so a 'purge print' will have to be done alongside prints with these features." Reprap Colour Mixing Article at 88.

- “Rather than purging into a bucket, which would tend to need a nozzle wipe afterwards, perhaps it is better to build a dummy object during the purge, E.g., a cube where one layer is the correct volume for the most purges on a layer.” 04/19/2012 Blog Post, comment posted by nophead at 10:32pm on April 19, 2012.
- “Using the control software to designated an object on the plate for colour purging would be a good feature.” 04/19/2012 Blog Post, comment posted by jaf at 11:46pm on April 19, 2012.
- “What if you could also specify an actual second part to print, that's just "ugly" and made up of purges plus whatever other plastic was needed to make the part.

  Imagine someone buying pretty RepRap parts from a seller (with multicolor logos etc), and during that same print the seller also made an 'ugly' set of equally functional parts, but they sell for a bargain discount price.

  (If you don't specify an ugly part to print, it could always default back to a cube, as nophead suggests). 04/19/2012 Blog Post, comment posted by Jeff Keegan at 6:31am on April 20, 2012.

Additional references similarly discuss a method for printing three-dimensional objects with multiple extruders and multiple materials, wherein the extruder prints a layer of a purge tower before printing the three-dimensional object:

- “The interplay between the tool path and transitions may be resolved with a variety of techniques. For example, each transition may have a length sufficiently great to permit a first build material (e.g., first color) to evacuate an interior volume of an extruder, as determined empirically or based upon volume displacement or any other suitable technique. As another example, the transition may have a length

sufficiently great for a complete change at the nozzle of the extruder from a first color (or build material) to a second color (or build material). This may be particularly useful where volumetric estimates fail to account for residual build material within the extruder that continues to miscolor extruded build material even after extruding a significant multiple of the extruder volume. As noted above, the tool path during these transitions may include an excursion from the object, with the transition occurring during this excursion. This may be an excursion outside an exterior of the object, or along infill structures, or between the infill in interstitial void space. As another example, the tool path may be dynamically monitored with a color camera or the like. With images from this camera, a controller may monitor a color of extrusion from the nozzle and continue to extrude sacrificial material in an excursion from the tool path until the color of extrusion matches the second color of a second build material. Similar measurements such as reflectometry, opacity, or microtexture may also or instead be used, such as for changes from one type of build material to another." Boyer at [0040].

- "Embodiments of the present invention are directed to a system and method for reusing surplus material generated by an Additive Manufacturing system in the process of manufacturing a 3-dimensional (3D) object. Surplus material removed from deposited layers and purged material used for printing head maintenance are transferred to back to the printing system to be deposited within subsequent layers. The reusable material may be deposited within the boundaries of a cross section of the 3-dimensional object to become part of 3D object or outside the boundaries of a cross section of the 3-dimensional object as part of the support construction,

which is removed from the finished product. According to embodiments of the invention, a portion of the waste material for disposal may be deposited and cured layer by layer to form a waste block, concurrently with printing the layers of the 3D dimensional object. The fully cured waste block may be then disposed of in a safe manner." Belocon at Abstract.

- "Instead of a scrap pile of plastic, this change-over blended material would be used for the object's infill, then print features in the new colour on the perimeter, and change colour again in the next layer of infill." Multicolor Print Article, reply by Richard H (RichRap) at 1:16am on August 28, 2012.
- "That tall L-shaped thing to the front-left of the cylinder in those pictures is the "shield" that the RepRap host prints out every layer, to ensure there's plastic in the nozzle before printing." Keegan Blog Post.

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that the traditional way of performing the purge operation with a purge station/purge bucket to be improved. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Belocon in combination with the Dual Extruder System
Belocon in combination with the KISSlicer System
Belocon in combination with the Mixer Extruder System
Belocon in combination with RichRap's Multi-Color Extruder
Belocon in combination with the RepRap Software
Leavitt in combination with the Dual Extruder System
Leavitt in combination with the KISSlicer System
Leavitt in combination with the Mixer Extruder System
Leavitt in combination with RichRap's Multi-Color Extruder
Leavitt in combination with the RepRap Software
Boyer in combination with the Mixer Extruder System
Boyer in combination with RichRap's Multi-Color Extruder
Priedeman in combination with the Dual Extruder System
Priedeman in combination with the KISSlicer System
Priedeman in combination with the Mixer Extruder System
Priedeman in combination with RichRap's Multi-Color Extruder
Priedeman in combination with the RepRap Software
Turley in combination with the Mixer Extruder System
LaBossiere in combination with the Dual Extruder System
LaBossiere in combination with the KISSlicer System
LaBossiere in combination with the Mixer Extruder System
LaBossiere in combination with RichRap's Multi-Color Extruder
LaBossiere in combination with the RepRap Software

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 136

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Support Structure References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a method that includes printing a support structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Support Structure References") to render obvious claims that may require such or similar features.

- Belocon
- Leavitt
- Boyer
- Priedeman
- Turley
- LaBossiere
- RepRap Software

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Support Structure References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Support Structure References and as admitted by the applicant in the '713 Patent itself, the use of a support material to print a support structure for a 3D object was well-known in the art by the time of the '713 Patent's claimed invention. *See, e.g.*, '713 Patent at 1:40-53 ("In fabricating 3D parts by depositing layers of a part material, supporting layers or structures are typically built underneath overhanging portions or in cavities of 3D parts under construction, which are not supported by the part material itself.") Combining an anticipatory reference or exemplary

combination with any one of the above exemplary Support Structure References and/or with the admission in the ’713 Patent would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs for a structure to support the 3D object combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Purge Tower with Reduced Cross-Section References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a method that includes printing a support structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references (“Purge Tower with Reduced Cross-Section References”) to render obvious claims that may require such or similar features.

- Boyer
- Dual Extruder System
- Mixer Extruder System
- RichRap’s Multi-Color Extruder

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Purge Tower with Reduced Cross-Section References to improve the function and utility of the same and such a combination would have been within that person’s skill. As shown in the teachings of the foregoing Purge Tower with Reduced Cross-Section References, the use of a purge tower with a cross-sectional area that reduces in height along an axis that is perpendicular to a build plane was well-known in the art by the time of the ’713 Patent’s claimed invention. *See, e.g.*, Dual Extruder Video at 5:04 (showing a purge tower with a greater cross-sectional area at a lower layer than at a higher layer); Boyer at Fig. 1 (showing that the cross-section of the infilled

material has a greater cross-sectional area at a lower layer than at a higher layer). Combining an anticipatory reference or exemplary combination with any one of the above exemplary Purge Tower with Reduced Cross-Section References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs for a purge tower that varies in size according to the amount of material that needs to be purged, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Purge Tower Stopped at Last Material Change References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a method that includes printing a support structure, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Purge Tower Stopped at Last Material Change References") to render obvious claims that may require such or similar features.

- Boyer
- Dual Extruder System
- KISSlicer
- Mixer Extruder System
- RichRap's Multi-Color Extruder

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Purge Tower with Reduced Cross-Section References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Purge Tower Stopped at Last Material Change References, the use of a purge tower that is stopped at a highest layer at which there is a material change was well-known in the art by the time of the '713 Patent's claimed invention. *See, e.g.*, Dual Extruder Video

at 5:04 (showing that the highest layer of the purge tower comprises the same orange material as the last material change in the actual object from white to orange); KISSlicer Quick-Start Guide at 9 (explaining that "before every layer" when an extruder warms up as part of a material change, the extruder prints a portion of purge tower). Combining an anticipatory reference or exemplary combination with any one of the above exemplary Purge Tower Stopped at Last Material Change References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs to purge the nozzles before each print and after switching materials, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

h. <u>The '357 Patent</u>

The '357 Patent relates to "forming a 3D object using an extrusion-based layered deposition system" that generates a build path defining "a void region" and "generating at least one intermediate path in the void region." '357 Patent at 2:6-16. The '357 explains that "there is a need for a method of generating build data that is effective for depositing roads of build material in small void regions." *Id.* at 2:31-3. "Void region[s] [are] a location between perimeter paths 12, 14, and 16 that is too small to generate a perimeter path or a bulk raster path." *Id.* at 3:35-37. Further, if the void is left unfilled, "the resulting 3D object will contain a cavity," and as a result, the invention "generates a remnant path… to fill [the] void region." *Id.* at 3:41-45. This "remnant path [] has a road width that varies with the void width of [the[void region." *Id*. at 3:47-48.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for identifying and filling small void regions in a substrate was already recognized in the prior art and the field of the invention and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Danforth, titled "Solid freeform fabrication methods" describes fused deposition processes for forming three-dimensional solid objects including layer based routing:

- "One aspect of the present invention provides a process for producing a three-dimensional article using freeform fabrication techniques. A mixture of a particulate composition dispersed in a binder is fed to a dispensing apparatus and dispensed onto a build platform." Danforth at 2:28-33.
- "Desirably, an image of the three-dimensional article is created on the computer, the image including a plurality of segments defining the article. Program signals correspond- ing to each of the segments are generated in a predetermined sequence for determining the movement of the dispensing apparatus and the build platform relative to one another in the first predetermined pattern and the at least one other predetermined pattern. The at least one other predetermined pattern may include a plurality of raster segments contacting the outer boundary at points of intersection." Danforth at 3:55-64.
- "The drive systems preferably are controlled by drive signals generated from a computer 20 running a commercially available CAD program. Utilizing such program, the design of a three-dimensional article 22 may be inputted to computer 20. The article design then may be sectioned into multiple layers by a commercially available software pro- gram to provide data corresponding to the particular shape of each individual layer. Such software programs are in commercial use for computer-aided machining (CAM) purposes and include NC Polaris. Smartcam and Mastercam." Danforth at 8:58-67.

- "Particular care must be exercised in depositing the layers so as to eliminate internal defects in the formed article. Internal defects such as voids, cracking and delaminations may arise from several different sources. Subperimeter voids typically are caused by the incomplete filling of the area inside the perimeter of the layers. As noted, each layer is built by laying down a predetermined width of road defining the outer boundary of each layer and then filling up the internal portion of the defined boundaries by raster scan." Danforth 11:44-54.
- "Still another way of overcoming the formation of subperimeter voids is to insert additional layering data signals at each point where a raster scan intersects with the perimeter road of a layer." Danforth 12:14-18.
- "Internal voids may also result from the use of an incorrect road width for filling the internal area of each layer such that an unfilled region narrower than the road width remains after the raster scans for the layer have been completed. These defects can be eliminated by carefully determining the precise road width needed to fill each layer completely." Danforth 12:24-29.

As another example, Qiu, titled "Void eliminating toolpath for extrusion-based multi-material layered manufacturing" describes methods for multi-material CAD toolpath generation for extrusion-based layered manufacturing:

- "For extrusion based multi-material layered manufacturing (LM) processes, a CAD system has been developed which generates high quality toolpath for part fabrication. This closed loop CAD system includes solid model design and slicing, single-material toolpath generation, multi-material toolpath generation and virtual simulation modules. The solid model is sliced equally. Intelligent features and

adaptive roadwidth optimum toolpath generation algorithm computes void sizes and their location and generates void free toolpath." Qiu at 38.

- "The goal of adaptive roadwidth is to eliminate voids and has least building time for the part. When roadwidth and all other parameters are fixed, SRV [sub-perimeter road-turn void] size varies along the boundary. When the intersection angle between vector road and perimeter is 908, the SRV size is minimum. When the angle is closer to 08, the SRV size is maximum. At certain roadwidth, some locations are already SRV free, but others still have unacceptable SRV (Figure 2a). To reduce the void sizes, the constant roadwidth is reduced everywhere (Figure 2b) (Qiu *et al*., 1999). At SRV free locations in Figure 2a, there is no need to reduce the roadwidth. But in Figure 2b, the SRV still exists after roadwidth reduction. In addition, the constant reduction in roadwidth increases the part building time. By calculating the SRV free roadwidth for all SRV locations, adaptive roadwidth can eliminate SRV on the need basis, so that it has both least building time while keeping SRV free." Qiu at 40.
- "In each contour, there are SRV path locations and void free path locations. The next step is to sub-divide each contour into Void Contours (VC) and original roadwidth contours (Figure 5c) based on void size calculation." Qiu at 41.
- "To eliminate voids in VC, a new and finer roadwidth is calculated. Among all void locations in a VC, the largest void size and location is identified. At this location, the intersection angle between vector road and perimeter road must be minimum in this VC. The roadwidth is decreased so that the new path generates acceptable void size for the largest void location. Then in all locations within VC, new void sizes

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 143

are acceptable. This roadwidth reduction at largest void location is performed in an iterative fashion. The user can select the reduction step size in roadwidth." Qiu at 43.

Further, Kao, titled "Optimal Motion Planning for Deposition in Layered Manufacturing" discloses methods for shape optimization using cross-sectional geometry within 3D printing:

- "The basic constituent in LM is the iterative building process. For most LM processes, an object is decomposed into 2D planar layers and each layer is 'stacked' on top of the other to construct an approximated 2 1/2 D object (Marsan and Dutta, 1997). Newer LM processes, such as Shape Deposition Manufacturing(SDM) (Merz et al., 1994), offer non-planar 3D layer decomposition where decomposed subcomponents are iteratively built and shaped. Each sub- component is in turn sliced into multiple 2D layers for material deposition and, in order to achieve surface quality and accuracy, a shaping process is invoked after a subcomponent is entirely deposited." Kao at 1.
- "In order to overcome the problems posed by the off-set algorithm, a geometry manipulation strategy (Fig.2) is employed to accommodate the desired path pattern. The original 2D cross-sectional geometry is first relaxed and optimized. The objective of such geometry optimization is to allow the subsequent spiral path generation algorithm to produce paths without or with minimum number of undesired features, such as gaps or path discontinuities. The new geometry must also guarantee to cover the original cross-section so that no designated area is left undeposited." Kao at 2.

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 144

- "We introduce an approach that uses medial axis transforms (MAT) (Blum, 1967), or skeletons, to optimize the cross-sectional geometry so that a connected, smooth deposition path could be produced from the optimized geometry with the least amount of excess deposits. The next section reviews the definition of MAT and is followed by detailed formulation of the proposed approach." Kao at 4.
- "The medial axis and the radius functions together define the medial axis transform (MAT), and the process of obtaining MAT is called medial axis transformation. Medial axis transformation extracts features from given figures and represents them by lower dimensional entities (medial axes) and associated size information (radius functions). The feature of such dimension reduction allows analysis or recognition to be performed in a more efficient and convenient manner." Kao at 4.

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded voids and deformations in three-dimensional printed objects be minimized and filled. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of

the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Agarwala in combination with Kao
Agarwala in combination with Kao an Jamalabad

Agarwala in combination with Kao, Jamalabad, and Yardimci
Agarwala in combination with Kao, Jamalabad, and Comb II
Agarwala in combination with Kao and Comb II
Agarwala in combination with Feenstra
Agarwala in combination with Feenstra, Jamalabad, and Yardimci
Agarwala in combination with Feenstra, Jamalabad, and Comb II
Agarwala in combination with Feenstra and Comb II
Agarwala in combination with Comb II
Agarwala in combination with McMains and Qiu
Agarwala in combination with McMains and Hsieh
Agarwala in combination with McMains, Hsieh, and Jamalabad
Qiu in combination with Kao
Qiu in combination with Kao an Jamalabad
Qiu in combination with Kao, Jamalabad, and Yardimci
Qiu in combination with Kao, Jamalabad, and Comb II
Qiu in combination with Kao and Comb II
Qiu in combination with Feenstra
Qiu in combination with Feenstra, Jamalabad, and Yardimci
Qiu in combination with Feenstra, Jamalabad, and Comb II
Qiu in combination with Feenstra and Comb II
Qiu in combination with Comb II
Qiu in combination with McMains and Qiu
Qiu in combination with McMains and Hsieh
Qiu in combination with McMains, Hsieh, and Jamalabad

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 147

Kao in combination with Qiu
Kao in combination with Qiu an Jamalabad
Kao in combination with Qiu, Jamalabad, and Yardimci
Kao in combination with Qiu, Jamalabad, and Comb II
Kao in combination with Qiu and Comb II
Kao in combination with Feenstra
Kao in combination with Feenstra, Jamalabad, and Yardimci
Kao in combination with Feenstra, Jamalabad, and Comb II
Kao in combination with Feenstra and Comb II
Kao in combination with Comb II
Kao in combination with McMains and Qiu
Kao in combination with McMains and Hsieh
Kao in combination with McMains, Hsieh, and Jamalabad
Jamalabad in combination with Qiu
Jamalabad in combination with Qiu and Kao
Jamalabad in combination with Qiu, Kao, and Yardimci
Jamalabad in combination with Qiu, Kao, and Comb II
Jamalabad in combination with Qiu and Comb II
Jamalabad in combination with Feenstra
Jamalabad in combination with Feenstra, Kao, and Yardimci
Jamalabad in combination with Feenstra, Kao, and Comb II
Jamalabad in combination with Feenstra and Comb II
Jamalabad in combination with Comb II
Jamalabad in combination with McMains and Qiu

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 148

Jamalabad in combination with McMains and Hsieh
Jamalabad in combination with McMains, Hsieh, and Kao
McMains in combination with Kao
McMains in combination with Kao an Jamalabad
McMains in combination with Kao, Jamalabad, and Yardimci
McMains in combination with Kao, Jamalabad, and Comb II
McMains in combination with Kao and Comb II
McMains in combination with Feenstra
McMains in combination with Feenstra, Jamalabad, and Yardimci
McMains in combination with Feenstra, Jamalabad, and Comb II
McMains in combination with Feenstra and Comb II
McMains in combination with Comb II
McMains in combination with Agarwala and Qiu
McMains in combination with Agarwala and Hsieh
McMains in combination with Agarwala, Hsieh, and Jamalabad
Spectrum Z510 in combination with Kao
Spectrum Z510 in combination with Kao an Jamalabad
Spectrum Z510 in combination with Kao, Jamalabad, and Yardimci
Spectrum Z510 in combination with Kao, Jamalabad, and Comb II
Spectrum Z510 in combination with Kao and Comb II
Spectrum Z510 in combination with Feenstra
Spectrum Z510 in combination with Feenstra, Jamalabad, and Yardimci
Spectrum Z510 in combination with Feenstra, Jamalabad, and Comb II

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 149

Spectrum Z510 in combination with Feenstra and Comb II
Spectrum Z510 in combination with Comb II
Spectrum Z510 in combination with McMains and Qiu
Spectrum Z510 in combination with McMains and Hsieh
Spectrum Z510 in combination with McMains, Hsieh, and Jamalabad
Stratasys FDM in combination with Kao
Stratasys FDM in combination with Kao an Jamalabad
Stratasys FDM in combination with Kao, Jamalabad, and Yardimci
Stratasys FDM in combination with Kao, Jamalabad, and Comb II
Stratasys FDM in combination with Kao and Comb II
Stratasys FDM in combination with Feenstra
Stratasys FDM in combination with Feenstra, Jamalabad, and Yardimci
Stratasys FDM in combination with Feenstra, Jamalabad, and Comb II
Stratasys FDM in combination with Feenstra and Comb II
Stratasys FDM in combination with Comb II
Stratasys FDM in combination with McMains and Qiu
Stratasys FDM in combination with McMains and Hsieh
Stratasys FDM in combination with McMains, Hsieh, and Jamalabad

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Intermediate Path References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose generating an intermediate path in the void region, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Intermediate Path References") to render obvious claims that may require such or similar features.

- Agarwala
- Danforth
- Dori
- Dwivedi
- Eiamsa-Ard
- Jamalabad
- Hsieh
- Kao
- Yardimci

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Intermediate Path References to improve the function and utility of the same and such a combination would have been within that person's skill.

As shown in the teachings of the foregoing Intermediate Path References, the use of intermediate paths used for planning and calculating the size of an area was well-known in the art by the time of the '357 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Intermediate Path References and/or with the admission in the '357 Patent would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs for improved path planning with fewer voids combined with a finite number of identified,

predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Variable Deposition References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose deposition rates that are configured to vary based on the dimensions of the void regions, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Variable Deposition References") to render obvious claims that may require such or similar features.

- Comb II
- Feenstra
- Jamalabad
- Hsieh
- Qiu
- Sabourini1996
- Sabourini1997
- Tseng

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Variable Deposition References to improve the function and utility of the same and such a combination would have been within that person's skill.

As shown in the teachings of the foregoing Variable Deposition References, variable deposition rates to fill specified regions in a build layer was well-known in the art by the time of the '357 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Variable Deposition References and/or with the admission in the '357 Patent would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs for

improved path planning with fewer voids combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Void Dimension References

To the extent Stratasys contends that an anticipatory reference fails to determining the dimensions of the void regions, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Void Dimension References") to render obvious claims that may require such or similar features.

- Dori
- Hsieh
- Jafari
- Jamalabad
- Kao
- Lee
- McMains
- Qiu
- Yang2002
- Yardimci

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Void Dimension References to improve the function and utility of the same and such a combination would have been within that person's skill.

As shown in the teachings of the foregoing Void Dimension References, identifying void regions and determining the area and dimensions of specified regions within a build layer was well-known in the art by the time of the '357 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Void Dimension References and/or with the admission in the '357 Patent would have amounted to

applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs for improved path planning with fewer voids combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Raster Pathing References

To the extent Stratasys contends that an anticipatory reference fails to generating a raster path in the void region to be used for filling the void region, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Raster Pathing References") to render obvious claims that may require such or similar features.

- Dori
- Lee
- Jamalabad
- Jafari
- McMains
- Yang2002
- Volpato

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Raster Pathing References to improve the function and utility of the same and such a combination would have been within that person's skill.

As shown in the teachings of the foregoing Raster Pathing References, generating raster paths within a confined region in a slice and using that to fill the region was well-known in the art by the time of the '357 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Raster Pathing References and/or with the admission in the '357 Patent would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the needs

for improved path planning with fewer voids combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

i. The ’660 Patent

The ’660 Patent relates to “3D printing of objects” and “developing a heated build platform for supporting the three-dimensional objects.” U.S. Patent 9,592,660 at 1:7–10. The ’660 patent explains that “poor adhesion between the 3D object and the build platform” is a “major issue[] in current build platforms or plates” and contemporaneous designs often employed “polyimide tape as a substrate on the build plate for 3D part adherence.” *Id.* at 3:1–4, 1:33–34. However, the ’660 Patent recognizes that “[a]pplying polyimide tape is a difficult process.” *Id.* at 1:49–54. “Further, the adhesive for the polyimide tape can burn off under high temperatures…[and e]ven if a part is built on an area of polyimide tape without debris or air bubbles, the tape can be easily damaged upon removal of the part.” *Id.* at 1:54–60. The resulting alleged invention of the ’660 patent amounts to “a heated build platform, a thin removable plate secured on top of the build platform, [and] a high temperature polymer coating applied over the removable plate…to maintain adhesion between 3D object and printing surface.” *Id.* at Abstract.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for a heated printbed and polymer coated substrate was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Cable, titled “Additive Manufacturing Object Removal” discloses an additive manufacturing system that utilizes a heated printbed and polymer coating meant to increase adhesion while still facilitating easy removal of the 3D object:

- "Additive manufacturing systems have heretofore been unable to achieve optimal platform adhesion during object formation and to eliminate warping of the object during object formation while also facilitating easy removal of the object after it is produced on the substrate. In many situations, configuring an additive manufacturing system with desired adhesion characteristics at the interface between the substrate and the object can be complex and difficult to achieve. In particular, users of additive manufacturing systems can utilize various techniques to achieve greater adhesion of the object to the substrate, but, damage to the object can result upon removal of the object from the substrate." U.S. Patent App. No. 2016/0075091 at [0024].
- "In the example of FIG.3, the substrate 300 is shown as having at least a top layer 308 ("surface layer 308) that is made of a first material, such as any of the thermoplastic polymers described above. The substrate 300 shown in FIG.3 can be manufactured by coating a main portion 310 or body of the substrate 300 with a first material (e.g., a thermoplastic polymer) to form the top layer 308. Alternatively, substantially all of the substrate 300 may be made of the first material, such as any of the thermoplastic polymers described above." *Id.* at [0061].
- "An object can be produced by depositing a material, layer-by-layer according to a pattern, onto a surface of a substrate. The pattern in which the material is deposited may be based on three-dimensional (3D) model data that is accessed by an additive manufacturing system. Removal of the object from the substrate (dislodging the object) may be accomplished without mechanically contacting the object with a device (e.g., a tool such as a chisel, blade, etc.) or chemically contacting the object

(e.g., chemically dissolving material at an interface between the object and the substrate). In an example, removal of the object from the substrate can be accomplished by flexing or bending the substrate, causing the object to dislodge, or "pop-off" of the substrate." *Id.* at [0004].

As another example, Comb I, titled "Magnetic Platen Assembly for Additive Manufacturing System" also discloses an additive manufacturing apparatus including a heated printbed and a removable substrate with a top film derived from a polymeric coating:

- "Good adhesion is beneficial for anchoring the printed layers, thereby reducing curl and part distortions during the printing process. However, this good adhesion can also present an issue with removal of the printed 3D part and support structure from the build substrate, particularly where the first printed layer is derived from a part material or other non-soluble material. As such, the build substrate is preferably flexible enough to allow a user to peel the build substrate from the base of the printed 3D part/support structure." U.S. Patent No. 9,744,730 at 3:65–5.
- "Platen plate 52 is a heatable platen, preferably fabricated from one or more metallic materials (e.g., aluminum), and is configured to retain build sheet 36 by magnetic coupling, as discussed below." *Id.* at 7:29–32.
- "The top film 36a, as an adhesive tape or other coating adhered to base sheet 36b, preferably exhibits good adhesion to the part and/or support materials used in system 10. To this end, top film 36a may optionally be surface treated or otherwise conditioned to increase its adhesive properties (e.g., texturing). As mentioned above, good adhesion is beneficial for anchoring the printed layers, thereby reducing curl and part distortions during the printing process." *Id.* at 8:43–50.

As another example, the Airwolf Products system discloses an additive manufacturing system with a heated printbed and polymer coating to promote adhesion:

- "The Airwolf 3d printer comes with a great heated bed, that heats up entirely and evenly to minimize part curl up. We took it a step further- and covered the glass plate with PET film." https://web.archive.org/web/20141204211929/http://airwolf3d.com/faq/.
- "Wolfbite is a new premium solution specially engineered to bond Acrylonitrile Butadiene Styrene (ABS) plastic parts directly to a heated glass 3D printing surface without lifting—also known in the industry as "warpage,"—and to enable smooth release of objects after printing." *See* https://web.archive.org/web/20141206025011/http://airwolf3d.com/shop/wolfbite-prevents-3d-printed-parts-from-warping.

Additional references similarly discuss the use of heated printbeds and polymer coatings to prevent warpage and promote adhesion:

- "According to some embodiments of the present invention, printing tray 170 may be warmed prior to printing of a 3-D object, to a temperature that is, for example, close to the glass transition point of the modeling and/or support materials, by, for example, a temperature control unit 204. Printing tray 170 may subsequently be allowed to gradually cool down after printing, for example, causing a controlled, gradual cooling down of the initial printed layers. In this way the cured material of the initial layers may remain for a relatively long time in near flow-able state, and may thus attain close contact with the molecular lattice of tray 170, resulting in firm

adherence of the printed object to the printing tray after solidifying." U.S. Patent App. No. 2006/0054039 at [0095].

- "The various embodiments of the present invention address the above needs and achieve other advantages by providing an adhesive that provides satisfactory bonding of the extruded print material (or support material) to the print pad during the print process yet enables the printed material to be easily separated from the print pad after the print process. Such use of an adhesive in 3D printing is not previously known." U.S. Patent App. No. 2013/0310507 at [0007].
- "The present invention provides a coated print bed for a 3D printer, comprising a permanent print-surface coating secured to a print bed Substrate plate. The permanent print-surface coating provides an interface layer between a first layer of the applied plastic print material and the coated print bed, and that provides a high degree of adhesion of the applied plastic print material to the coated print bed. The permanent print-surface coating is selected to provide a level of adhesion sufficient for removal of the printed object at the end of the printing task. The permanent print-surface coating does not require the end user to apply anything additional to the surface of the print bed to begin printing ("plug and play')." U.S. Patent App. No. 2017/0036403 at [0015].
-
- "CTD-201 is a polyimide coating that provides a primary insulation layer on complex surfaces where the use of polyimide films (e.g., Kapton®) is difficult. This product can be applied by spraying or brushing, and the resulting coating has similar properties to polyimide films."

https://web.archive.org/web/20140814005449/http://www.ctd-materials.com/wordpress/?page_id=1339#tab-id-5.

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that warpage or other deformation of 3D objects during printing be minimized, while still maintaining proper adhesion. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods

used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Cable in combination with Naware
Cable in combination with Kritchman
Cable in combination with Naware or Kritchman, and Comb I
Cable in combination with Kritchman, and Ruff
Comb I in combination with Tummala
Comb I in combination with Tummala, and Kritchman
Kritchman in combination with Ruff
Crump in combination with Ruff
Airwolf Products in combination with Ruff
Airwolf Products in combination with Comb I
Airwolf Products in combination with Comb I, and Kritchman

Airwolf Products in combination with CTD-201
Airwolf Products in combination with SpiderBot, and CTD-201
Airwolf Products in combination with PrintrBot, and CTD-201
CEL Robox in combination with Ruff
CEL Robox in combination with Tummala
CEL Robox in combination with Tummala, and Kritchman
CEL Robox in combination with CTD-201, and Kritchman
CEL Robox in combination with CTD-201
CEL Robox in combination with Airwolf Products
SpiderBot in combination with Ruff
SpiderBot in combination with Tummala
SpiderBot in combination with CTD-201
SpiderBot in combination with Airwolf Products
PrintrBot in combination with PEI Forum/Blog Posts
PrintrBot in combination with Ruff
PrintrBot in combination with Tummala
PrintrBot in combination with CTD-201
PrintrBot in combination with Tummala, and Kritchman
PrintrBot in combination with Comb I
PrintrBot in combination with Airwolf Products
MakerBot Replicator 2X in combination with Ruff
MakerBot Replicator 2X in combination with Ruff, and Kritchman
MakerBot Replicator 2X in combination with Tummala, and Kritchman
MakerBot Replicator 2X in combination with Comb I

MakerBot Replicator 2X in combination with PEI Forum/Blog Posts
MakerBot Replicator 2X in combination with Airwolf Products
PEI Forum/Blog Posts in combination with Kritchman
PEI Forum/Blog Posts in combination with Ruff
PEI Forum/Blog Posts in combination with Ruff, and Kritchman
PEI Forum/Blog Posts in combination with Airwolf Products

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Heated Printbed References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a heated printbed, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Heated Printbed References") to render obvious claims that may require such or similar features.

- Kritchman
- Naware
- Airwolf Products
- SpiderBot
- Printrbot
- MakerBot Replicator 2X

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Heated Printbed References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing

Heated Printbed References, the use of heated printbeds to prevent the deformation of 3D printed objects was well-known in the art by the time of the ’660 Patent’s claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Heated Printbed References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, a method of preventing object warpage, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Polymer Coating References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose a polymer coating, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references (“Polymer Coating References”) to render obvious claims that may require such or similar features.

- CTD-201 Polyimide Coating
- Tummala
- Ruff
- Airwolf Products

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Polymer Coating References to improve the function and utility of the same and such a combination would have been within that person’s skill. As shown in the teachings of the foregoing Polymer Coating References, using a polymer coating to facilitate adhesion of the 3D object to the print substrate was well-known in the art by the time of the ’660 Patent’s claimed invention. Combining an anticipatory reference or exemplary combination with any one of the

above exemplary Polymer Coating References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, a method of promoting object adhesion, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

j. The ’774 Patent

The ’774 Patent relates to “the use of configuration information for a three-dimensional printer to select suitable machine-ready models.” ’774 Patent at 1:18-20. According to the patent, “[w]hile a three-dimensional printer may know its own hardware and software configuration, a service providing machine-ready models may not.” *Id.* at 1:30-32. Therefore, there “remains a need for providing machine-ready models based on a three-dimensional printer’s configuration, and for improved matching of models to printers.” *Id.* at 1:32-35. The ’774 patent allegedly provides a “printer [that] may respond to configuration queries with a dictionary of capabilities or properties, and this dictionary may be used to select suitable models, or determine when a new model must be created.” *Id.* at 1:46-49. Furthermore, “when a printable model is sent to the printer, metadata for the printable model may be compared to printer properties in the dictionary to ensure that the model can be fabricated by the printer.” *Id.* at 1:49-52.

The identified references are in the same or similar technical fields, address the same technical issues, and suggest similar solutions. Indeed, the need for querying and receiving configuration information from printers to select (or even modify or create) a suitable model and the need for metadata to confirm the printer can print the model was already recognized in the prior art and the field of the invention, and would have provided a person of ordinary skill in the art motivation to combine the prior art references identified as to this patent.

For example, Pettis, titled "Networked Three-Dimensional Printing," discloses querying and receiving configuration information from printers to select, modify, or create a suitable model with metadata to confirm the printer can print the model:

- "A server is configured to store a number of different models of an object in machine-ready form corresponding to a number of different three-dimensional printers having differing capabilities and/or hardware configurations. When a user at a client device or a printer requests the object, the server automatically determines a printer type and selects a suitable, corresponding machine-ready model for immediate fabrication by the printer." Pettis at [0004].
- "Additionally, certain printers may have optional features useful in printing such as a heated build platform or a conveyor or the like to remove objects from a build volume. These may be provided as options from a commercial manufacturer, or these maybe custom-made by end users. Thus the configuration for a three-dimensional printer may include one or more hardware components such as a display, a heated build platform, a camera, a conveyor or a color-mixing system. Each printer may thus nominally have different slicing rules for creating a machine-ready model 314, and the slicing engine 312 may produce any number of corresponding machine-ready models 314 for an object." Pettis at [0065].
- "In one aspect, this may include machine-ready models 314 that are required for different printers that do not have interoperable machine coding, that is, for which a machine ready model on one printer will not render properly on another printer. In another aspect, this may include machine ready models 314 that accommodate a variety of possible user preferences concerning, e.g., print resolution, size, infilling

density, rafting or support structures, and so forth. This may also or instead include machine-ready models 314 for various optional printer features such as build volume temperature control, a heated build platform, a conveyor to remove objects from a build volume, and so forth. As another example, where a three-dimensional printer has a camera or the like, a corresponding machine-ready model 314 may enable the camera for remote viewing during a build. As another example, a printer may have color-mixing capabilities or an ability to select among various, different build materials either at the beginning of a build or during a build. These types of variations may in general be accommodated among the machine-ready models 314 at any desired level of granularity according to, e.g., the data storage and processing capabilities of the database and server being used." Pettis at [0066].

- "The server may include an analysis engine 310 that processes a three-dimensional model 304 when it is received by the server. This may, for example, include processing the model 304 and metadata 308 from the user to create additional metadata 308 concerning the model 304. For example, the analysis engine 310 may generate useful metadata concerning the size, printability, build material requirements, and so forth for the object based upon any suitable set of rules and populate the metadata 308 with results. Similarly, the analysis engine 310 may create a snapshot or other rendering of the object (based upon the model 304) that may be stored in the metadata 308 for use, e.g., in a user interface when browsing models in a database for the data structure 300." Pettis at [0062].
- "A verification engine 316 may also be included to verify the suitability of machine-ready models 314 for fabrication on an intended device. This may, for

example, include computer-based verification such as a rules-based verification of compliance with any number of build rules covering, e.g., overhangs, support, size, and so forth. In another aspect, a machine-ready model may be manually verified by fabricating the model with a printer and having a user confirm that the build is successful. In one aspect, this manual verification may be performed selectively, e.g., for popular printer types, and each machine-ready model 314 may be annotated in the metadata 308 or within the model 314 to indicate whether it has been successfully fabricated." Pettis at [0067].

As another example, Douglas, titled "Tagged Build Material for Three-Dimensional Printing," also discloses querying and receiving configuration information from printers to select, modify, or create a suitable model with metadata to confirm the printer can print the model:

- The three-dimensional models themselves may also or instead include a type (e.g., tool, game, home, art, jewelry, replacement part, upgrade part, etc.) or any other metadata, and prioritizing the content may includes prioritizing the content according to this type and/or metadata." Douglas at [0056].
- "The supply 302 may include a data tag 304 that stores data providing information on characteristics of the build material 312. Once the supply 302 is coupled to the three-dimensional printer 306, the data tag 304 may be automatically read by a tag sensor 310 on the three-dimensional printer 306." Douglas at [0062].
- "In one embodiment, the controller may make the determination of operational parameters using only the data from the data tag 304. For example, the data tag 304 may explicitly specify an extruder temperature and the controller may use the

extruder temperature as an operational parameter, or the data tag 304 may identify a type of build material and the controller may calculate a suitable extruder temperature based on the type. Similarly, the controller may calculate other operational parameters such as build platform temperature, feed rate, cooling parameters, build chamber heating parameters, and so forth." Douglas at [0066].

- "As a non-limiting example, a remote client device 206 may request an object 314 be printed on the network connected three-dimensional printer 306. The three-dimensional printer 306 may have one or more supplies 302, containing build material 312, connected to one or more couplings 308. The client device 206 may request the three-dimensional printer 306 to transmit the data tag 304 data for one or more of the connected supplies 302 for the determination of operational parameters for at least one of the connected supplies 302. The client device 206 may select which of the one or more supplies 302 to use in fabricating the object 314, determine the operational parameters for the selected supply 302, and transmit the operational parameters back to the three-dimensional printer 306 for fabrication of the object 314." Douglas at [0073].
- "As shown in step 610, the method 600 may include determining an operational parameter for the fabrication of an object by the three-dimensional printer based on data from the data tag. More specifically information about the build material stored in the data tag may be used to determine how the build material should be used in a fabrication process. For example, based upon the type of build material, the controller may determine a variety of parameters such as an extruder temperature, a feed rate, a build platform temperature, a build volume temperature, an infill

requirement, a rafting requirement, a support structure requirement, an extruder movement speed, and a cooling requirement. More generally, any parameter that can be controlled by the three-dimensional printer might usefully be determined with reference to the type of material and/or other information available on the data tag." Douglas at [0097].

- "As shown in step 612, the method 600 may include fabricating an object while using the operational parameter(s) to control operation of a three-dimensional printer. It will be appreciated that this approach can dramatically simplify use of a three-dimensional printer by automating those aspects of printer configuration that depend on the type of build material being used. Thus a user may simply load a build materially from a suitably instrumented container and select an object to print without specifying various configuration details that might otherwise be required. At the same time, a printer may simply select default operational parameters that a user can override if further customization of a fabrication process is desired." Douglas at [0099].

As another example, Hamilton, titled "3D Printer Based Product Delivery System and Methods," also discloses querying and receiving configuration information from printers to select, modify, or create a suitable model:

- "In various embodiments of the present invention, the local production capability information includes an indication of a material stock available to the 3D printer, and an indication of the 3D printer type. The product supplier is operable to provide a rejection in response to the product request information based upon one or both of the 3D printer type and the material stock. In particular instances of the

aforementioned embodiments, the product construction specification are instructions for the 3D printer. In one or more embodiments of the present invention, the product is a multi-part product, and the product receiving system is further operable to receive product assembly instructions from the product supplier." Hamilton at [0016].

- "The system includes a design dealer system operable to send and receive information regarding a 3D printer via a communication system and a computer system; a computer system operable to send and receive information from a 3D printer and a design dealer; and a 3D printer system operable to print given designs and to send and receive information from the computer system. The information mentioned above consists of but is not limited to, information on the accuracy of the printer, materials the printer is able to use, materials currently in the printer, and information on payment for the design. The Designs for the printer will consist of the necessary printer requirements for the design, information on the materials required, instructions for the 3D printer, separately numbered individual parts, and instructions for assembly of the product for the user. If the requirements found in the design are met by the printer, the user is allowed to purchase the design. If the requirements in the design are not met by the printer the user will not be allowed to purchase the design." Hamilton at [0019].
- "Turning to FIG. 3, a block diagram of the process in which a product is printed from the design Supplier's side. The system will wait until a request for a design is made 310. Once a design is requested, the system will access the design for the design requirements 320. Using these design requirements the system will query

the user's 3D printer for its accuracy and material abilities 330. The system will wait for a response from the printer 330. The user's 3D printer will then respond with its accuracy and material capabilities. The system will then compare the capabilities of the printer to the requirements of the design. If the designs requirements are not met by the user's 3D printer the system will send a no purchase message and not design is sent 390. If the requirements are met by the user's 3D printer then the system will proceed to ask the user to provide payment for the design 360. If payment is not received a no purchase message is sent and no design is sent and the system returns to waiting fora design request 390. If payment is received then a design is sent and the system returns to waiting for a design request 380." Hamilton at [0021].

As another example, Klappert, titled "Systems and Methods for Selectively Printing Three-Dimensional Objects Within Media Assets Based on 3D Printer Capability," also discloses querying and receiving configuration information from printers to select, modify, or create a suitable model with metadata to confirm the printer can print the model:

- "In some embodiments, in order to make the selection, control circuitry 304 may consider a capability of a 3D printer (e.g., 3D printer 426) associated with a user profile. For example, if 3D printer 426 includes the capability to print using plastic, but not metal, then frying pan 506a could not be recommended because a design file associated with frying pan 506a may specify metal components. Accordingly, a selection may include that of beer mug 502a or flower pot 508a, and may exclude frying pan 506a. A three-dimensional printer may be associated with one or more capabilities. For example, a three-dimensional printer may only be able to print in

certain colors, such as blue or red. As another example, a three-dimensional printer may be able to print utilizing either metal, plastic, or both. A three-dimensional printer may be able to print using soft metals (e.g., gold) but not hard metals (e.g., titanium)." Klappert at [0097].

- "As described in the foregoing, control circuitry 304 may determine which object of a set of objects to transmit a request for printing for based on printer capabilities, such as those described in database entry 702. Database entry 702 may be stored in a data structure, or as a record in a database. Control circuitry 304 may access database entry 702 by querying a database such as media guidance data source 418 via communications network 414. Alternatively, 3D printer 426 may store data entry 702 (e.g., at storage 308), and control circuitry 304 may query 3D printer 426 to learn of 3D printer 426's printing capabilities." Klappert at [0110].
- "Control circuitry 304 may compare printer capabilities reflected in data entry 702 to requirements specified by a design file of an object. For example, if a design file for a toy dinosaur specifies that a dinosaur's height is to be 14 inches, and data entry 702 reflects that the maximum height of an object 3D printer 426 is capable of printing is 12 inches, then control circuitry 304 may refrain from selecting the toy dinosaur as an object for which a request will be transmitted to print a three-dimensional representation of." Klappert at [0112].
- "In step 1508, control circuitry 304 may select a design file from the set of design files based on the determined printer capability. For example, control circuitry 304 may assess whether a design file shares a printing capability (e.g., that 3D printer

426 can only print using iron), and select a design file accordingly (e.g., a design file that utilizes only iron may be selected). In step 1510, control circuitry 304 may transmit a request to a printer (e.g., 3D printer 426) to print a three-dimensional representation of the object described by the selected design file. For example, if the design file specifies a three-dimensional representation of frying pan 506a that is to be printed using cast iron, 3D printer 426 may print a 3D representation of frying pan 506a following the specification of the design file in response to the request." Klappert at [0140].

As another example, the MakerBot Replicator also discloses querying and receiving configuration information from printers to select, modify, or create a suitable model:

- "To take your Replicator experience to the next level, you'll need to download and install our software, ReplicatorG. This software translates designs from Thingiverse, 3D design software, and all around the interwebs into the kinds of instructions that the MakerBot Replicator understands." https://web.archive.org/web/20120304165532/http://www.makerbot.com/docs/replicator/software

- "Make sure your computer is connected to the Replicator with the supplied USB cable. Open ReplicatorG by double-clicking the application. The ReplicatorG software will try to connect to your Replicator. You'll see the band just below the buttons turn light green if everything goes OK. If your machine doesn't connect properly, go to the Machine->Machine Type (Driver) menu in ReplicatorG and choose 'The Replicator Single' or 'The Replicator Dual,' depending on your configuration. Next go to the Machine->Connection (Serial Port) menu. On

Windows, try selecting the highest-numbered port. Then click the 'Connect' button."

https://web.archive.org/web/20120306084347/http://www.makerbot.com/docs/replicator/software/

- "The first thing you'll want to do here is select the proper Base Profile for the Replicator. Start off with 'The Replicator Default Profile.' . . . For now you'll want to 'use machine-specific start/end Gcode' and 'use Print-O-Matic' so that your Replicator will run at its default settings."

  https://web.archive.org/web/20120306084347/http://www.makerbot.com/docs/replicator/software/

- "When you make the file on the computer, it kind of customizes if for the specific machine that you're using to print on. . . . While the 3D model is universal, the gcode files are actually tweaked specific for the machine you're printing on. So, if you're printing on this, you'll have a different gcode file than if you print on a RepRap. And if you dial in the settings on your MakerBot, then you'll have a different file even than somebody else who has the same model MakerBot." https://www.youtube.com/watch?v=dYyqy1DZRIc&t=17s at 6:40-7:01.

- "We usually use a tool called *Skeinforge* to convert a model into gcode. . . . Most users will want to tune skeinforge for their particular machines, or create new profiles. . . . When you edit a Skeinforge profile, you'll see the familiar Skeinforge configuration interface appear. Change whatever you like— the settings are stored in different directories for different profiles, and won't interfere with any other

Skeinforge configuration you may already have on your computer." https://web.archive.org/web/20120221044608/http://replicat.org/usage

- "Once you're happy with your settings, simply hit the Generate Gcode button, and let your computer do the heavy lifting." https://web.archive.org/web/20120306084347/http://www.makerbot.com/docs/replicator/software/

As another example, Wang, titled "Print Bureau Interface for Three-Dimensional Printing," also discloses querying and receiving configuration information from printers to select, modify, or create a suitable model with metadata to confirm the printer can print the model:

- "The print bureau data collection engine 214 can be used to collect information from the print bureau systems 204. Examples of information collected by the print bureau data collection engine 214 include pricing information, accepted 3D model formats, 3D printer capabilities, geographical location of the printer, and other information. In some examples, the information is collected from the print bureau systems 204 through sources that are publicly available, such as Web pages of the print bureau service 204. In some examples, the print bureaus are configured to provide special access to the collected data. For example, each print bureau system 204 may be configured to respond to queries received from the Web broker system 200. The print bureau data collection engine 214 uses print bureau specific APIs 218 to obtain print bureau specific information from each of the print bureau systems 204. When interacting with a specific print bureau system 204, the Web broker system 200 may use the print bureau specific API 218 corresponding to that print bureau system 204. Each print bureau may also have an API that is part of the

print bureau system and is configured to communicate with the print bureau specific API 218. To maintain the print bureau specific APIs 218, the Web broker system 200 may receive vendor specific updates from each of the print bureau systems 204. Interactions between the client system 202 and the Web broker system 200 may be controlled by the unified user API 220, which can interface with each of the print bureau APIs 218. In this way, the client system 202 can maintain only one API rather than one for each print bureau system 204." Wang at 7:60-8:22.

- "The printability check engine 222 can be used to determine whether a 3D model received from the client is printable. For example, printability check engine 222 can automatically determine whether the 3D model represents a true, closed volume, and whether the faces are oriented properly. The printability check engine 222 can also automatically determine whether texture data representing color is included in the 3D model and is valid, and whether certain meta data, such as scale, are specified. The printability check engine 222 can also determine whether the 3D model includes features that are difficult to print, such as features that are too small to be printed successfully based on the capabilities of the print bureaus 204. If the printability check engine 222 determines that the 3D model is not printable, the printability check engine 222 can trigger a number of responses, such as sending a message to the client system 202 to alert the client that the 3D model is not printable and identify the reasons why the 3D model is not printable. Depending on the nature of the problem, the printability check engine 222 may launch the model repair engine 224, which can attempt to fix the 3D model. For example, if the 3D model is not a closed volume, the model repair engine 224 can

attempt to repair any holes that may exist on the surface of the 3D model by connecting mesh vertices. If the 3D model is not a true volume, the model repair engine 224 can re-define certain features of the model to make it a true volume. If one or more faces of the 3D model are not oriented correctly, the model repair engine 224 can change the orientation of the faces that are improperly oriented." Wang at 8:56-9:18.

- "The printability check engine 222 can be used to determine whether a 3D model received from the client is printable. For example, printability check engine 222 can automatically determine whether the 3D model represents a true, closed volume, and whether the faces are oriented properly. The printability check engine 222 can also automatically determine whether texture data representing color is included in the 3D model and is valid, and whether certain meta data, such as scale, are specified." Wang at 8:56-64.
- "If the 3D model is not printable, the process flow advances from block 510 to block 512. At block 512, the 3D model is modified to correct any detected defects in the 3D model. For example, correcting defects may include connecting vertices of the 3D model to generate a closed volume, changing the orientation of faces, correcting 3D model meta-data such as scale or the material designations of the 3D model, among others." Wang at 12:42-49.

Additional references similarly discuss querying and receiving configuration information from printers to select, modify, or create a suitable model and/or using metadata to confirm the printer can print the model:

- "FIG. 7 is a flow chart describing the overall operation of path planner, 1.e., the slice, contour, subcontour (region) and path generator and planners depicted in FIGS. 5 and 6. The fiber path planner of FIG. 7 receives as an input a 'sliced' database of layers from the slicer, in this case referred to as a 'sliced stack' or 'empty deck'. This sliced stack database may be in the form of, per layer, topological information (contours, defined as a solid or a hole via the conventional right hand rule), and/or toolpath information (trajectories), metadata, and/or G-code or an equivalent. For example, one form of subset would include the 'SLC' file format or an equivalent, which includes only the geometry of the contours. A superset could include the STL file, or analyses or parameters recognized from the STL file (e.g., a label for a through hole that is shared by code segments generating that through hole in G-Code)." Mark at 13:4-19.
- "Exemplary global rules that control path planning for each layer that are available to the path planner, and also available to a display renderer for the view panel and a controls renderer for the selection panel, are shown in the view panel 1004. Numbering for features rendered in the view panel 1004 may reference any of FIG. 10 (display), FIG. 9 (process control), FIGS. 20 and/or 21 (rule sets and data structures), as each are related as the data structures defining operations and the part are created and changed by process control according to rule sets and priorities, and the results of the changes displayed to the user." Mark at 17:34-44.
- "Generally, many more parameters may be set by presenting a configuration file (e.g., layer thickness and/or bonded row width; variable feedrate for curves, bends, or outer/inner walls; bridging (printing unsupported spans) lengths for neat plastic

or fiber; or limitations for printing spurs (single walled sections)." Mark at 17:53-58.

- "IO card 94 monitors data concerning modeling material filament spool 42 through communications with a modeling drybox processor board 116. Modeling drybox processor board 116 is mounted inside of modeling filament drybox 45. It receives data concerning the modeling filament from a modeling filament sensor 118 (located at the inlet to filament guide 236, shown in Figure 8) and a modeling EEPROM board 120, which is a circuit board carrying an electronically readable and writeable device (EEPROM 188, shown in Fig. 7) attached to modeling material filament spool 42. EEPROM board 120 acts as an electronic tag with a variety of functions. It informs the control system 90 of the type of filament that is on the spool and of the lineal feet of filament on the spool. As filament 40 is wound off of the spool 42, the CPU keeps track of how much material was commanded to be extruded, subtracts this amount from the total on the EEPROM 188 and writes the new value to the EEPROM 188. Preferably, the data on EEPROM board 120 is encrypted so that it can be updated only by the CPU 92. Filament sensor 118 senses and indicates the presence or absence of filament at the entrance to the filament feed tube. With filament remaining on the spool, the operator can then grab ahold of the filament and extract it from the extrusion head 32. Unloading of the used filament and spool and reloading of a new spool is thereby made easier." Dahlin at [0022].
- "CPU 92 receives the modeling filament data from IO card 94. At the outset of a job, the CPU 92 will calculate whether a spool 42 or 56 contains enough filament

to complete the job. Operator notification is then provided via touch screen display 21, stating either that the filament is adequate to complete the job, or that the filament spool will need replacement and reloading during the process. Also at the outset of a job, the CPU verifies that the modeling filament material on the spool is the same material specified in object data. If these materials are not the same, an operator notification is provided via touch screen display 21, providing the operator an opportunity to switch spools." Dahlin at [0023].

- "Encoded markings 50 include encoded information, which may be read by sensor assembly 24 or 26 as successive portions of filament 44 pass through pathway 36 or 40 of system 10. As discussed above, the read information may then be transmitted to controller 32 over communication line 38 or 42, thereby allowing controller 32 to use the received information to assist in building 3D model 28 and/or support Structure 30." Batchelder at [0052].

- "Encoded markings 50 may include a variety of different information, Such as information relating to filament 44 and/or system 10. Examples of suitable types of information that may be included in encoded markings 50 include local filament cross-sections (e.g., diameters and root-mean square variations), Volume increments, local and global filament extrusion parameters, length of filament 44 remaining in Supply source 20 or 22, measurements of local filament fingerprint characteristics, material type (e.g., modeling and Support materials), material composition, material color, manufacturing information for filament 44 (e.g., manufacturing dates, manufacturing locations, and lot numbers), product codes,

material origin information, Software and firmware updates for system 10, and combinations thereof." Batchelder at [0054].

- "To generate the path for our printer's extruder, we need to use a separate application called a slicer to take our solid 3D model and slice it into layers suitable for 3D printing. This process makes the code that tells the 3D printer where to move the extruder, when to extrude plastic, and how much plastic to extrude. These commands, or G-code, are sent from our printer control software to the firmware on our electronics, which are responsible for interpreting these codes to control the printer's motors and heaters. To get a sense for what this toolpath looks like, we've sliced a bunny—not literally—using the slicer application Skeinforge to see the resulting path and direction of the extruder in Figure 2-8." Evans at 37.
- "Slic3r is quickly becoming one of the more popular slicers because of its ease of use, blistering slicing times, and remarkable print quality. It previously lacked some of the features that the more mature slicers have, but with the addition of cooling and support material, it has addressed many of its faults. Where Skeinforge asks users to make a lot of calculations regarding the filament extrusion, Slic3r calculates all of these values under the hood after inputting only a few parameters about your printer, the filament, and the desired print settings. While I have personally used just about every slicing application out there, Slic3r has become the only one I use to slice 3D models because it is so easy to use and for its consistent high-quality results." Evans at 40.
- In step 1106, the types, amounts, and colors of available build materials may be identified. In some implementations, a user (e.g., an operator of the three

dimensional printer) may be directly queried as to what build materials are available. In some implementations, a system (e.g., the controller of the three dimensional printer or a remote computer) automatically tracks material usage and updates material inventory with respect to an initial inventory. In another aspect, predetermined values may be obtained from computer memory and used in subsequent processing. For example, a printer may have four feedpaths intended for specific colors of red, green, blue, and white build material. The intended color of each material may be stored and associated with a particular drive motor or the like. When determining colors for a build, or when adjusting an output color, the controller may reference the stored color value for corresponding calculations. Similarly, a user may manually enter a color value for each build material or color source." Pax at [0098].

- It is possible for the available build materials to be inadequate in other ways. If the available build materials are inadequate, a user may be notified. In some implementations, the user is notified of the particular missing resources. (E.g., the user may be informed that 10 more grams of yellow filament are needed.) In some implementations, if the available build materials are inadequate, the model may be automatically modified in various ways as described more fully below. In some implementations, the model may be manually modified by the user. In another aspect, a number of recommendations may be made for changes to scaling, color or the like to conform the object to available build materials, and a user may be prompted to select one or more such recommendations. In still other implementations, the process 1100 may be paused or canceled so the user can

obtain adequate build materials. More generally, where a need for modification is identified, the model may be manually, semi- automatically, or automatically revised according to available materials, and the method may return to step 1102 so that another pre-fabrication check can be performed." Pax at [0101].

- "In step 1406, once the first input material is within the chamber the chamber may be heated to liquefy the first build material and the first build material may be extruded through the extrusion port. In this manner a three-dimensional printing process may be realized using the first build material for fabrication. At some point, e.g., according to an instruction in code for the printing process, metadata for a model being fabricated (e.g., denoting a different surface color), or due to a manual user input or the like, the build material used for fabrication may be changed. This may, for example, include changing to a different color, or changing to a build material with different mechanical properties. [00121] As shown in step 1408, the first build material may be withdrawn back through the first input port by a predetermined amount to facilitate introduction of a second build material into the chamber. With build material fed into two different input ports, there may generally be some mixing at the interface between the materials." Pax at [00120].
- "The disclosed embodiments provide a system that supports printing from a computing device (e.g., a mobile computing device). During operation, the system first uses a discovery protocol to identify printers that can be accessed by the computing device. Next, the system receives a selection of a printer that can be accessed by the computing device. The system then obtains printer capability information from the selected printer and generates printer data for a print job based

on the selected printer capability information. Finally, the system sends the generated printer data to the selected printer. In some embodiments, the printer capability information includes current printer status information for the selected printer. For example, the current status information can specify: whether the selected printer is off-line; whether the selected printer is busy; or whether an error condition exists in the selected printer. In some embodiments, obtaining the printer capability information involves querying the selected printer again to obtain the printer capability information. In some embodiments, obtaining the printer capability information involves obtaining the printer capability information from the printer during the discovery protocol." Sweet at 2:13-35.

- "As mentioned above, the printer capability information can be obtained from the selected printer during a query for the discovery protocol (Bonjour™), or during a subsequent network-printing protocol (IPP) query. More specifically, during the discovery protocol, the printer can return printer-specific information specifying what types of data the printer can accept and information specifying the printer's capabilities." Sweet at 6:60-66.
- "For example, design representation 115 may be a file generated according to the STereoLithography (STL) format known in the art (also known as Standard Tessellation Language). Although STL is mainly referred to herein, other formats may be used without departing from the scope of the invention. Generally, a design representation may be generated according to any device independent format and may be further processed by a specific device in order to generate a specific format usable by the specific manufacturing or printing device. For example, a 3D printer

may process an STL file to produce a gcode (also known as Gcode or G-Code) representation or file and use the gcode representation in order to manufacture or print an item. It will be understood that embodiments of the invention enable using any device independent format in order to generate a design representation (e.g., design representation 115)." Nelson at 3:15-30.

- "As shown by block 410, the flow may include a registration of a printer. For example, manufacturing unit 141 sends a request to server unit 121. A request to register may include any data information or metadata. For example, in a request to register as shown by block 410, manufacturing unit 141 may include or indicate any attributes, description or properties of manufacturing system 140. For example, metadata provided by manufacturing unit 141 may include a model number or commercial name, a type etc. Metadata provided by manufacturing unit 141 may include a list of the materials that manufacturing unit 141 can use to manufacture items (e.g., plastic and copper), colors manufacturing unit 141 can use, etc. Other information in metadata provided by a manufacturing system may include restrictions or limitations, e.g., a minimal/maximal size of items that can be manufactured, a time period during which the manufacturing system can manufacture items etc." Nelson at 10:5-21.
- "User restrictions or limitations may be included in a device registration message or process. For example, even though a manufacturing device is capable of manufacturing objects in blue, green and red, an owner of the manufacturing device may want the manufacturing device to only manufacture green objects. In such case, user restrictions or limitations (e.g., included in a message sent as

shown by block 410) may indicate that only green objects can be manufactured by the relevant device. As further described herein, controlling the manufacturing of an item may include determining whether or not to provide a token or decryption key based on user restrictions or constraints, characteristics or attributes of a manufacturing device and characteristics or limitations provided by a designer. For example, manufacturing of an item may be enabled if user and manufacturing device restrictions or constraints do not conflict with limitations or constraints indicated by a designer of the item." Nelson at 10:30-47.

- "As described, an LSTL file may be stored on a server, e.g., in database 234 on server 120. In other embodiments, a server may store metadata related to a design and an LSTL file containing an encrypted digital representation of the design may be stored elsewhere, e.g., on a computer owned or operated by a designer, e.g., on designer computer 110." Nelson at 9:55-60.
- "Under style you can save as many profiles as you like. For the first print you can leave the parameters as they are. . . . You can select the material in the extruder. ABS and PLA default profiles are provided. You can select if the Fan should be on all the time, only when printing the perimeter or never. You can set printing temperature, min/max printing speeds, destring settings and modify the flowrate to adapt to your material. You can also set a print cost and a warm up parameter to estimate print time and cost. Select your material from one of the default options, and for the moment keep the default settings. In case you already have a working temperature profile for your material update it accordingly." KISSlicer at 3-4.

- "After having reviewed the model, and selected the printer parameters it is time to create the print file. Press the SLICE button and let the magic begin." KISSlicer at 9.
- "You need to have Python installed (if you had Skeinforge running before that's sufficent) 1-Extract the contents of the RAR file into a Folder of your choice :) Go into folder skeinforge_application. 2-Click skeinforge.py 3-Go to DIMENSION tab and enter your "measured" filament diameter. 4-Go to Carve, enter reasonable Layer height and Extrusion width values. (Try to have layer height slightly lower than nozzle diameter and Extrusion width slightly wider than nozzle diameter.) 5-Click Skeinforge at bottom of tab and choose the STL file to slice. 6-Generated Gcode will be at the sam folder as the STL file. Enjoy good Prints." https://web.archive.org/web/20120509225656/http://reprap.org/wiki/Sfact
- "Option to individually name the exported gcode files with description, timestamp and profile used." https://web.archive.org/web/20120509225656/http://reprap.org/wiki/Sfact

As shown by these exemplary references, there were common objectives and solutions that predated the patent, such that a person of ordinary skill in the art would have been motivated to combine these and other references.

In addition, market forces demanded that the ability to use configuration information for a three-dimensional printer to select (or even modify or create) suitable machine-ready models, including the use of metadata to confirm the printer can print the model, be improved. Thus, one of skill in the art would have been motivated to combine or modify references using known methods that one of skill in the art would have recognized as offering improvements to solutions

of that time. The references identified describe solutions that were known to offer improvements and, accordingly, one of skill in the art would have been motivated to combine or modify combined references to include such improvements.

Because the Asserted Claims simply arrange old elements known in the field with each performing the same function it had been known to perform, and yields no more than what one would expect from such an arrangement, combinations of the prior art are obvious. At the time of the alleged invention, there were a finite number of predictable solutions, and a person of ordinary skill in the art had good reason to pursue and/or combine known options and related applications.

In sum, motivations to modify or combine the identified references including the references listed can be found via, for example, discussions in the cited references, the state of the art discussed in the references, and the knowledge of one of ordinary skill in the art. One of ordinary skill in the art would have been motivated to combine these references, because these references relate to common objectives and subject matter. The references share commonalities in terms of their general subject matter as well as the types of equipment, products, systems, and/or methods used. Further, the prior art references explicitly or implicitly reference other prior art references, which would motivate one of skill in the art to combine them. These references are within the same or similar fields, and are directed to similar subject matter. Additionally, the references, and any products, devices, or processes described in the references, existed and/or were invented in the same time period providing further motivation for combination. Further elaboration and information shall be provided with Defendants' expert reports.

In view of the following, Defendants provide the follow non-limiting combinations, which are not intended to be exhaustive, as there are many possible combinations of the prior art listed herein and it is not practical, particularly at this early stage prior to further factual investigation, to

identify and list all potentially relevant combinations. In particular, the Asserted Claims are rendered obvious under 35 U.S.C. § 103 in view of at least, and without limitation, the following exemplary combinations:

Exemplary Combinations
Douglas in combination with Mark
Douglas in combination with Mark and Dahlin
Douglas in combination with Mark and Batchelder
Douglas in combination with Mark and Pettis
Hamilton in combination with Evans (with or without KISSlicer)
Hamilton in combination with Evans and Pax (with or without KISSlicer)
Hamilton in combination with Evans and Batchelder (with or without KISSlicer)
Hamilton in combination with Evans and Pettis (with or without KISSlicer)
Hamilton in combination with Evans, Pax, and Pettis (with or without KISSlicer)
Klappert in combination with Pettis
Klappert in combination with MakerBot Replicator
Klappert in combination with SFACT
Pettis in combination with MakerBot Replicator
Pettis in combination with SFACT
MakerBot Replicator in combination with SFACT
Wang in combination with Evans
Wang in combination with Evans and Sweet
Wang in combination with Nelson
Wang in combination with Nelson and Sweet

In addition to the above exemplary combinations, it would have been obvious to combine any of the anticipatory references or exemplary combinations with any references in the following illustrative categories.

Querying and Receiving References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose querying the printer for configuration information of the printer relevant to creation of printable model and receiving such information (including whether the configuration information/property is a hardware configuration, an automatically detected hardware reconfiguration, firmware configuration, or a new or previous user setting), such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Querying and Receiving References") to render obvious claims that may require such or similar features.

- Batchelder
- Dahlin
- Douglas
- Evans
- Hamilton
- Klappert
- MakerBot Replicator
- Pettis
- Sweet
- Wang

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Querying and Receiving References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Querying and Receiving References, querying the target printer for configuration

information of the target printer relevant to creation of a printable model for fabrication of the object on the target printer and receiving, from the target printer, a dictionary of configuration information containing one or more properties (including a hardware configuration, an automatically detected hardware reconfiguration, firmware configuration, or a new or previous user setting) from the target printer that affect fabrication capabilities of the target printer was well-known in the art by the time of the ’774 Patent’s claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Querying and Receiving References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, the need for querying and receiving configuration information from printers to select (or even modify or create) a suitable model, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Fabrication Profile References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose creating a fabrication profile based on the one or more properties queried for and received from the printer, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references (“Fabrication Profile References”) to render obvious claims that may require such or similar features.

- Douglas
- Evans
- Hamilton
- KISSlicer
- Klappert
- MakerBot Replicator
- Mark
- Pettis
- SFACT
- Sweet

- Wang

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Fabrication Profile References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Fabrication Profile References, creating a fabrication profile based on the one or more properties queried for and received from the printer was well-known in the art by the time of the '774 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Fabrication Profile References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, the need for querying and receiving configuration information from printers to select (or even modify or create) a suitable model, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

Metadata References

To the extent Stratasys contends that an anticipatory reference or exemplary combination fails to disclose generating descriptive metadata to accompany the machine-ready representation, the descriptive metadata specifying one or more properties for comparison to properties of printers selected for fabricating the model, such reference can be combined with the corresponding disclosures from any one or more of the following prior art references ("Metadata References") to render obvious claims that may require such or similar features.

- Klappert
- Mark
- Nelson

- Pax
- Pettis
- SFACT
- Wang

One of ordinary skill in the art would have been motivated to combine any one or more of the anticipatory references or exemplary combinations with any one or more of the above exemplary Metadata References to improve the function and utility of the same and such a combination would have been within that person's skill. As shown in the teachings of the foregoing Metadata References, generating descriptive metadata to accompany the machine-ready representation, the descriptive metadata specifying one or more properties for comparison to properties of printers selected for fabricating the model, was well-known in the art by the time of the '774 Patent's claimed invention. Combining an anticipatory reference or exemplary combination with any one of the above exemplary Metadata References would have amounted to applying a known technique to a known device ready for improvement to yield predictable results. Furthermore, given the design needs, *e.g.*, need for metadata to confirm the printer can print the model, combined with a finite number of identified, predictable solutions, a person of ordinary skill in the art would have been motivated to combine the teachings of these references.

C. P.R. 3-3(c): Claim Charts

The attached Appendices of these contentions are charts that specifically identify where each element of each Asserted Claim is found in the prior art. In addition, Defendants specifically incorporate by reference arguments and evidence disclosed in petitions for *inter partes* review of the Asserted Patents and any supporting declarations. These include IPR2025-00257, IPR2025-00311, IPR2025-00321, IPR2025-00354, and forthcoming IPRs on the Asserted Patents.

To the extent any limitation of any of the Asserted Claims is construed to have a similar meaning, or to encompass similar feature(s) and function(s), as apparently contended by Stratasys

in its Infringement Contentions, or later determined by the Court, and to the extent at least one claim chart in the attached Appendices identifies any prior art reference, or a portion thereof, as disclosing or teaching such similarly construed claim limitation, such identified prior art reference, or the portion thereof, and Defendants' contentions with respect to such claim limitation and such prior art reference as found in such claim chart, are incorporated by reference, and are part of, Defendants' invalidity contention with respect to each of the Asserted Claims that includes such similarly construed claim limitation.

The claim charts in these contentions provide example sections within the prior art references that teach or suggest each and every element of the Asserted Claims either expressly or inherently. These Invalidity Contentions set forth obviousness arguments based on the disclosures in each of the references, teachings well known at the time of filing, admitted prior art, and the knowledge of a person of ordinary skill in the art at the time the respective patent application was filed.

D. P.R. 3-3(d): Invalidity Under 35 U.S.C. § 112

1. Legal Standards and Reservation of Rights

Pursuant to P.R. 3-3(d), Defendants contend that certain claims of the Asserted Patents are invalid under 35 U.S.C. § 112 because: (1) the claims are indefinite; (2) the claims are not enabled; and/or (3) the claims lack adequate written description. Defendants' contentions that the following claims are invalid under 35 U.S.C. § 112 are made in the alternative, and do not constitute, and should not be interpreted as, admissions regarding the construction or scope of the claims of the Asserted Patents, or that any of the claims of the Asserted Patents are not anticipated or rendered obvious by any prior art.

These contentions are based on Defendants' current understanding of Stratasys's Infringement Contentions. To the extent Stratasys contends that the prior art references identified

STRATASYS, INC. EXHIBIT 2007
IPR2025-00438, Page 195

above would not enable a person of ordinary skill to make or use the elements of the Asserted Claims against which they are cited, and to the extent Stratasys contends that the Asserted Claims cover something different from what Defendants understand them to cover, the Asserted Claims may not comply with the enablement, written description, and/or definiteness requirements of 35 U.S.C. § 112(a) and (b). Because compliance with the requirements of 35 U.S.C. § 112(a) and (b) depends on the construction of those phrases—and no claim construction positions have been exchanged, no claim construction order issued, and no expert discovery undertaken—Defendants' positions on written description, enablement, and/or indefiniteness are necessarily preliminary at this early stage of the case. Defendants reserve all rights to amend or further revise these contentions based on further developments in the case in accordance with the Court's Rules or as otherwise authorized by the Court.

The written description and enablement requirements are analyzed by comparing the claims with the disclosure in the specification. If the claimed invention does not appear in the specification, the claim fails regardless of whether one of skill in the art could make or use the claimed invention. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1348 (Fed. Cir. 2010). To satisfy the written description requirement, the patentee must convey to those skilled in the art that, as of the filing date, the applicant was in possession of the invention, and demonstrate that possession by disclosing the invention in the specification. *Id*. at 1352. To satisfy the enablement requirement, a patentee must "describe the manner and process of making and using the invention so as to enable a person of skill in the art to make and use the full scope of the invention without undue experimentation." *LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1344-45 (Fed. Cir. 2005). A patent must also be precise enough to afford clear notice to what is claimed. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 899 (2014). A patent is invalid for

indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention. *Id*. at 898-99. The standard for assessing if a patent claim is sufficiently definite to satisfy the statutory requirement is whether "one skilled in the art would understand the bounds of the claim when read in light of the specification." *Novo Indus., L.P. v. Micro Molds Corp*., 350 F.3d 1348, 1358 (Fed. Cir. 2003).

A claim term can be indefinite based on multiple grounds ranging from the substantive concerns to unresolvable drafting errors, each of which can be fatal to the validity of the claims as a matter of law. For example, the Federal Circuit has repeatedly held that apparatus claims that contain method claim limitations are indefinite because it is impossible to determine when direct infringement occurs. *See, e.g., Rembrandt Data Techs., LP v. AOL, LLC*, 641 F.3d 1331, 1339-40 (Fed. Cir. 2011) (an independent claim that recited both an apparatus and a method of using that apparatus was indefinite, as were its dependent claims); *IPXL Holdings v. Amazon.com*, 430 F.3d 1377, 1384 (Fed. Cir. 2005); *In re Katz Interactive Call Processing Patent Litigation*, 639 F.3d 1303, 1318 (Fed. Cir. 2011) (mixed claims "create confusion as to when direct infringement occurs because they are directed both to systems and to actions performed by" users).

Claim terms that lack antecedent basis are indefinite. *See, e.g.*, A*llen Eng'g Corp. v. Bartell Indus., Inc*., 299 F.3d 1336, 1348-49 (Fed. Cir. 2002) (claim ending in the middle of a claim limitation was indefinite because it was "impossible to discern the scope of such a truncated limitation"). Furthermore, means plus function claims, which invoke 35 U.S.C. § 112 ¶ 6, may be invalid as indefinite where a patent owner has failed to disclose adequate corresponding structure linked to the recited claim functionality. *Noah Sys., Inc. v. Intuit Inc*., 675 F.3d 1302, 1311-12 (Fed. Cir. 2012).

In *Nautilus, Inc. v. Biosig Instruments, Inc.*, the Supreme Court clarified that a patent is invalid "for indefiniteness if its claims read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." 572 U.S. at 898-99. "It cannot be sufficient that a court can ascribe some meaning to a patent's claim; the definiteness inquiry trains on the understanding of a skilled artisan at the time of the patent application, not that of a court viewing matters *post hoc*." *Id.* at 911. The Asserted Claims fail the enablement, written description, and/or definiteness requirements in view of at least the following claim terms and phrases:

2. Identification of Terms and Phrases

a. The '698 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 1	"mechanically coupled to the fabrication tool"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"sensors configured to detect a current contact force"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims.
Claim 5	"comparing the current contact force to an expected contact force"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 7	"indicates a fabrication error."	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		the invention.
Claim 10	"detecting a planarity of the separate structure based upon a number of contact force measurements across a surface of the separate structure"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

b. The '381 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 1	"mechanically coupled to the extruder"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 11	""to achieve a specified contact force between the one or more sensors and the separate structure."	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. and/or The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

c. The '466 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 1	"selected"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 17	"performing a diagnostic test"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims.
Claim 19	"determining an operational parameter"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

d. The '464 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claims 1, 12	"determining an operational parameter"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 12	"performing a diagnostic test"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims.

e. The '324 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 1	"provide"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"network interface coupled to a data network"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 7, 18, 19	"remote user"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		the invention.
Claim 1, 3, 5, 6, 19	"two-dimensional projection"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1, 7-11, 17, 19, 21	"user interface"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 11	"two-dimensional tool path"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 17	"control to capture a stop-motion animation"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 19	"providing"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 19	"digital image"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 20	"transmitting status information over the data network upon completion of the object"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

f. The ’097 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 1	"three-dimensional scanner"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1, 9-12, 14-18	“machine vision system”	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	“capture”	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1, 4, 5	"web server"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"print job executing on the three-dimensional printer"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"couple the three-dimensional printer in a communicating relationship with a data network"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"status of the print job"	
Claim 4	"host"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 5	"web server displays"	The claim limitation is invalid

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 8	"structured light techniques"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 9	"automatic inspection"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 10	"robotic guidance function"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims.

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 14	"the machine vision system creates a visual alert"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 15	"actual progress"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 15	"predicted progress"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		skilled in the art about the scope of the invention.
Claim 16	"actual three-dimensional result"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 16	"expected three-dimensional result"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 18	"misalignment of layers"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

g. The ’713 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claims 1, 2	“deposition line(s)”	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 2	“print head(s)”	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 2	“stand-by mode(s)”	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 2	“operating mode(s)”	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	“performing a purge operation for each print head or deposition line switched to the operating mode, the purge operation comprising printing at least one purge tower in a layer-by-layer manner”	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claims 1, 5, 6, 7, 9, 16	"purge tower"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 6, 7, 9, 16	"layer(s)"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 5	"cross-sectional area that reduces in height along an axis that is perpendicular to a build plane"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 6	"wherein the at least one purge tower is stopped at a highest layer at which there is a material change for the printed layers of the three-dimensional part and	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
	support structure"	claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 16	"first layer"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 16	"second layer"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

h. The '357 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
1, 4, 8, 12, 18	"determining [the] dimensions of the void region"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
1	"determining dimensions of the void region based on at least in part on the at least one intermediate path"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
1, 10, 11, 16, 17	"intermediate path"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
2	"road width resolution limit"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
8	"identifying a void region in a build path"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
15	"a void region having dimensions that are smaller than the first road width resolution along at least one axis"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
15	"pan of a cavity"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

i. The '660 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claims 1, 6, 7, 9, 12, 14, 15	"a thermally conductive plate"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		in the art about the scope of the invention.
Claims 1, 2, 6, 10, 11, 12	"a polymer coating"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"(ii) permitting removal of the 3D object once the 3D object has been formed and cooled without chemically or mechanically removing the polymer coating from 3D object and without damaging the polymer coating, the thermally conductive plate, or the 3D object."	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

j. The '774 Patent

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
Claim 1	"receiving a request"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"dictionary of configuration	The claim limitation is invalid

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
	information"	under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"affect fabrication capabilities of the target printer"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claims 1, 10, 13, 14, 15, 17, 18	"creating a fabrication profile"	The claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 1	"generating a machine-ready representation"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 3	"fabricating the object with the target printer"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims.

Asserted Claim(s)	Claim Term/Phrase	Invalidity Under 35 U.S.C. § 112
		In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.
Claim 19	"comparison"	The claim limitation is invalid under 35 U.S.C. § 112(a) because the specification fails to describe or enable the full breadth of the claims. In addition/alternatively, the claim limitation is invalid under 35 U.S.C. § 112(b) because the claim limitation fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

These examples are merely exemplary and are not intended to be limiting. Defendants reserve all rights to amend their Invalidity Contentions under 35 U.S.C. § 112, including after the Asserted Claims are ultimately construed by the Court, in response to any interpretation of the Asserted Claims embodied in Stratasys's infringement positions, and/or to account for any changes in the law concerning invalidity under 35 U.S.C. § 112. Defendants additionally reserve the right to provide additional explanation and/or argument for its Invalidity Contentions under § 112, including, for example, based on expert testimony.

III. P.R. 3-4 DISCLOSURES AND CONTENTIONS

A. P.R. 3-4(a): Production of Documents

Pursuant to P.R. 3-4(a), Defendants are producing technical documentation that shows the operation of aspects or elements of any Accused Instrumentality identified by Stratasys in its Infringement Contentions. *See* BAMBU-00000001-35208, BAMBU-00038878, BAMBU-

00038879. Defendants do not concede that any version of any Accused Instrumentality is representative of any other. Defendants will continue to produce technical documentation as it can be located. Defendants reserve the right to supplement these disclosures with additional documentation.

B. P.R. 3-4(b): Production of Prior Art

In accordance with P.R. 3-4(b), Defendants are producing all prior art references identified in these Invalidity Contentions. *See* BAMBU-00035209-38877, BAMBU-00038880-41767. Defendants are also producing prior art references concerning prior art systems and methods. These prior art references are cited herein and support the contentions presented. Defendants' search for prior art references, additional documentation, and/or corroborating evidence concerning prior art apparatuses and methods is ongoing. Accordingly, Defendants reserves the right to supplement their production, as provided by the local rules, as additional prior art references, additional documentation, and/or corroborating evidence concerning prior art documents/apparatuses, and methods are obtained during the course of discovery.

IV. SUBJECT MATTER INELIGIBILITY

As set forth in the Court's Standing Order Regarding Subject Matter Eligibility Contentions, attached are charts identifying the following for the Asserted Claims of certain Asserted Patents:

- each exception to eligibility (e.g., abstract idea) to which each Asserted Claim is directed and the factual and legal basis therefor;
- whether one or more of the Asserted Claims are representative of any other Asserted Claims;
- a description of the industry, at the relevant time, in which the Asserted Claims are alleged to be well understood, routine, and conventional, and the factual and legal basis therefor;

- a description of how each element of each Asserted Claim, both individually and in combination with the other elements of that claim, was well understood, routine, and conventional, in the relevant industry at the relevant time, and the legal and factual basis therefor; and

- other factual and legal bases for how the Asserted Claims are otherwise ineligible for patent protection.

Appendix C-101	U.S. Patent No. 10,569,466
Appendix D-101	U.S. Patent No. 11,167,464
Appendix E-101	U.S. Patent No. 8,562,324
Appendix F-101	U.S. Patent No. 8,747,097
Appendix H-101	U.S. Patent No. 7,555,357
Appendix J-101	U.S. Patent No. 11,886,774

Additional evidence regarding the state of the industry prior to the filing of the Asserted Patents, how each element of each Asserted Claim was well understood, routine, and conventional, and other evidence supporting the ineligibility of the Asserted Claims is contained in foregoing Section II and related Appendices (all of which are incorporated herein by reference), and in Defendants' 3-4(b) productions of prior art, which include numerous references disclosing the alleged invention claimed in the Asserted Patents and the elements thereof. Defendants reserve the right to rely on percipient and/or expert testimony to supplement, summarize, and/or explain the state of the industry prior to the filing of the Asserted Patents, how each element of each Asserted Claim was well understood, routine, and conventional, and other evidence supporting the ineligibility of the Asserted Claims. Any such witnesses will be disclosed pursuant to the Federal Rules of Civil Procedure and the Court's Docket Control Order in this case for initial, additional, and expert disclosures.

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Respectfully submitted,

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CERTIFICATE OF SERVICE

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