UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

SENKO ADVANCED COMPONENTS
Petitioner

v.

US CONEC LTD.
Patent Owner

_____

Case: PGR2024-00046
Patent No. 11,808,994

DECLARATION OF EDWARD LURIE

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1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;" 70

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;" 72

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing," 75

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1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;"....154

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;"....155

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;"....157

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing,"....159

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1.a.2 "the housing having a top surface and a bottom surface joined by two opposing side surfaces such that a lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body;" 219

1.b.1 "two ferrule assemblies disposed within the opening of the housing, each of the ferrule assemblies comprising a fiber optic ferrule spaced apart from each other along the height and a ferrule holder to hold the fiber optic ferrule," 220

1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;" 223

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;" 224

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;" 227

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing," 231

1.f "wherein the first projection is of a different size than the second projection; and" 235

1.g "a strain relief boot having a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass." 236

C. Claim 2 "The fiber optic connector according to claim 1, wherein the first projection extends longitudinally along the top surface of the housing." 238

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5.b "wherein the strain relief boot extends rearwardly away from the housing." 245

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J. Claim 11 "The fiber optic connector according to claim 1, wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter." 252

K. Claim 12 "The fiber optic connector according to claim 1, wherein each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ferrule seats of the fiber optic ferrules of each of the ferrule assemblies, the wall located between the top surface and the bottom surface of the main body of the housing."..253

L. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two springs between the crimp body and the first and second ferrule flanges engaged with the wall."....257

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B. Claim 7 "The fiber optic connector of claim 6, wherein the fiber optic connector is configured to receive a push force to insert the fiber optic connector into an adapter or a pull force to release the latch component from the adapter." 272

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A. Claim 14 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an angled physical contact (APC) ferrule." 273

B. Claim 15 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an ultra-physical contact (UPC) ferrule." 276

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A. Modification of Toyama Based on Shimozu 280

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1.P "A fiber optic connector comprising:" 289

1.a.1 "a housing having a main body extending between a front end and a rear end and having an opening extending therebetween," 290

1.a.2 "the housing having a top surface and a bottom surface joined by two opposing side surfaces such that a lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body;" 292

1.b.1 "two ferrule assemblies disposed within the opening of the housing, each of the ferrule assemblies comprising a fiber optic ferrule spaced apart from each other along the height and a ferrule holder to hold the fiber optic ferrule," 293

1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;" 295

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;" 296

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;" 297

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing," 299

1.f "wherein the first projection is of a different size than the second projection; and" 300

1.g "a strain relief boot having a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass." 301

C. Claim 2 "The fiber optic connector according to claim 1, wherein the first projection extends longitudinally along the top surface of the housing." 301

D. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs." 302

E. Claim 4 "The fiber optic connector according to claim 1, wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter." 304

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5.a "The fiber optic connector according to claim 1, further comprising: a crimp band secured around an outer surface of the rear end of the crimp body, and" 305

5.b "wherein the strain relief boot extends rearwardly away from the housing." 306

G. Claim 6 "The fiber optic connector according to claim 1, wherein each of the top surface and the bottom surface has a receiving area for a latch component to secure the fiber optic connector to an adapter." 306

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L. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two springs between the crimp body and the first and second ferrule flanges engaged with the wall." 314

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C. Wong is Prior Art to the '994 Patent....341

DECLARATION OF EDWARD LURIE

I, Edward Lurie, hereby declare as follows:

I. INTRODUCTION

1. Although I continue to provide consulting, I retired from full time work in Sept. 2019, after a 36-year career in new product design & development in the field of optical fiber connectivity. I worked for 34 years for 3M in the Telecom, Interconnect Solutions (ISD), and Communication Markets (CMD) Divisions. I worked the last two years of my career for Corning in the Optical Connector Systems (OCS) Division, after 3M sold its CMD Division to Corning.

2. I currently have a number issued US Patents in fiber optics, in both discrete and multi-fiber interconnects. I also developed dozens of proprietary processes that are held confidentially as trade secrets.

3. I received a BS Degree from Franklin & Marshall College in 1980, and did post graduate study at the Institute of Optics in Rochester, NY. My qualifications are enumerated in detail in my curriculum vitae, along with a list of issued patents, which is attached as Appendix A to this declaration.

4. I have been a member of the Optical Society of America (OSA), and have contributed to Telcordia, IEC, and TIA/EIA Standards Bodies for Intermatability Standards for Discrete and Multi-Fiber Connectors. My research interests have included F.O. Connectors, Adapters, Field Installation Kits,

Precision Cleaving Tools, and Cable Assembly. I have published papers on various topics related to all of the above.

5. Through many years of working and research, I have gained extensive knowledge, experience and expertise in the field of fiber optic connector design. Having worked on fiber optic connector design for most of my career, I have an extensive background and understanding of the principles and processes involved with the field of technology of U.S. Patent No. 11,808,994 ("the '994 Patent").

6. I have gained general experience with patents as an inventor. I am a lead named inventor on a number of patents in fiber optic interconnects. I assisted in the prosecution of the aforementioned patents including writing the records of invention, assisting counsel in preparing the patent applications, and assisting counsel in responding to communications received from the U.S. Patent and Trademark Office.

7. I am being compensated at $450/hour. My compensation is in no way dependent on the outcome of this proceeding, and my compensation in no way affects the substance of my statements and opinions in this Declaration.

8. In providing the testimony set out in this declaration, I have reviewed the figures, specification, and claims of the '994 Patent and the file history of the '944 Patent. I have also reviewed the following documents:

Exhibit No.	Description
1001	U.S. Patent No. 11,808,994
1003	U.S. Publication No. 2019/0018209 (“Takano’209”)
1004	U.S. Provisional Application No. 62/588,276
1005	U.S. Publication No. 2017/0205588 (“Lee”)
1006	U.S. Patent No. 6,450,695 (“Matsumoto”)
1007	U.S. Publication No. 2016/0202431 (“Hill”)
1008	English Translation of Japanese Patent No. 2573482 (“Shimozu”)
1009	U.S. Patent No. 11,307,369 (“Takano’369”)
1010	U.S. Provisional Application No. 62/532,710
1011	U.S. Publication No. 2020/0285005 (“Watanabe”)
1012	U.S. Publication No. 2018/0217340 (“Wong”)
1013	U.S. Provisional Application No. 62/463,901
1014	English Translation of Japanese Publication No. 2012-053375 (“Toyama”)
1015	QSFP-DD Hardware Specification (“QSFP-DD”)
1016	SFP-DD Hardware Specification (“SFP-DD”)
1017	PCT Publication No. WO 2018/042775
1018	U.S. Publication No. 2018/0224608
1019	U.S. Publication No. 2005/0136722
1020	U.S. Publication No. 2018/0106972

Exhibit No.	Description
1021	U.S. Patent No. 11,733,466
1022	U.S. Patent No. 5,673,346
1023	U.S. Publication No. 2016/0161680
1024	U.S. Publication No. 2005/0135753
1025	U.S. Patent No. 9,366,829
1026	U.S. Patent No. 5,222,168
1027	PCT Publication No. 2012/174227
1028	Tutorials of Fiber Optic Products: Fiber Optic Connector Polishing
1029	UPC or APC – Which One to Chose
1030	APC vs. UPC: What's the Difference
1031	Prosecution History of U.S. Application No. 17/327,197
1032	Prosecution History of U.S. Patent No. 11,808,994
1033	Stay Order
1034	Claim Listing
1035	QSFP-DD MSA Group Announces New Hardware Specification
1036	Internet Archive WayBack Machine: QSFP-DD MSA Group Announces New Hardware Specification
1037	SFP-DD MSA Releases Specification for High-Speed, High-Density Interface
1038	Internet Archive WayBack Machine: SFP-DD MSA Releases Specification for High-Speed, High-Density Interface

9. In forming my opinions, I have relied upon various legal principles as explained to me by Senko's counsel. My understanding of these principles is summarized below.

10. I understand that in patent law, a patent's claims define the scope of protection for the claimed invention.

11. I understand that the validity of a patent's claims is determined on a claim-by-claim basis.

12. I understand that in this proceeding, Senko has the burden of proving that the challenged claims would have been unpatentable over the prior art by a preponderance of the evidence.

13. Ground 1 asserts that claims 12 and 13 of the '994 Patent should be invalidated for being indefinite.

14. I understand that a claim is unpatentable for being indefinite if the claim, read in light of the specification and prosecution history of the patent, fails to inform with reasonable certainty, those skilled in the art about the scope of the invention.

15. Ground 2 asserts that claims 1-15 of the '994 Patent should be invalidated for lacking written description support.

16. I understand that a claim is unpatentable for lacking written description support if the specification of the challenged patent does not reasonably

convey to a person of ordinary skill in the art ("POSA") that the inventor or inventors had possession of the claimed subject matter as of the filing date of the challenged patent.

17. Grounds 3-16 assert that the claims of the '994 Patent should be invalidated as anticipated by one or more prior art references or obvious over one or more combinations of prior art references.

18. I understand that a claim is unpatentable as anticipated if the prior art reference teaches the claimed subject matter.

19. I understand that a claim is unpatentable as obvious if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious to a hypothetical person having ordinary skill in the art at the time of the invention and who is presumed to have known the relevant prior art.

20. I understand that the question of obviousness is resolved based on underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of non-obviousness.

21. I further understand that for each of the obviousness grounds, Senko must demonstrate a person of ordinary skill would have: (1) a motivation to

combine the teachings of the relevant references and (2) a reasonable expectation of success of developing the claimed invention.

22. I understand that a motivation to combine the teachings of the relevant references may come from, but is not limited to: teachings, suggestions, or motivations found in the prior art; the nature of the problem; or the knowledge of a person having ordinary skill in the art.

23. I understand that the United States Patent and Trademark Office ("USPTO") will interpret the claims of the '994 Patent as they would have been understood by those of ordinary skill in the art as of the filing date of the '994 Patent in view of the claim language itself, the specification and figures of the '994 Patent, the prosecution history of the '994 Patent, and other relevant evidence showing how one of ordinary skill would have understood the language.

24. In forming my opinions, I have applied the understanding of one of ordinary skill in the art working at the time of the invention claimed in the '994 Patent, i.e., shortly prior to December 19th, 2017.

25. It is my opinion that a person having ordinary skill in the art ("POSA") at that time would have: (1) at least a bachelor's degree in mechanical engineering, electrical engineering, physics, or a related field and three years of experience in fiber optics and fiber optic connectors; (2) a master's degree in mechanical engineering, electrical engineering, physics, or a related field and at

least one year of experience in fiber optics and fiber optic connectors; or (3) industry experience (at least three years) designing fiber optic connectors in lieu of a formal degree.

26. In my opinion, the level of ordinary skill is not determinative because those of less or more skill would also find the claims to be unpatentable.

II. BACKGROUND OF THE '994 PATENT

27. The '994 Patent pertains to small footprint fiber optic connectors. EX1001: 1:28-30. The '994 Patent's first embodiment of a fiber optic connector (100) includes a housing (102), two ferrule assemblies (120), a crimp body (106), a latch component (104), and a boot (110). EX1001: 4:55-67.

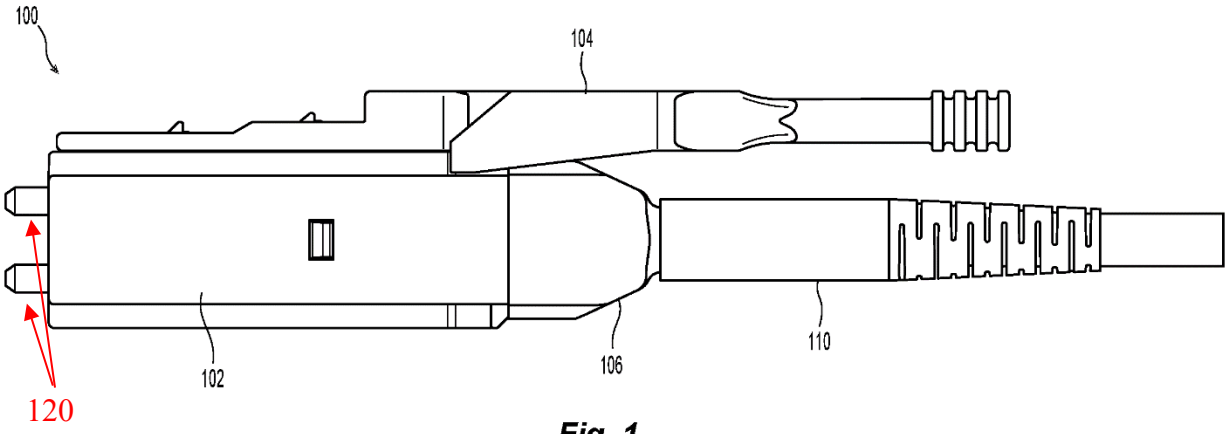


Fig. 1

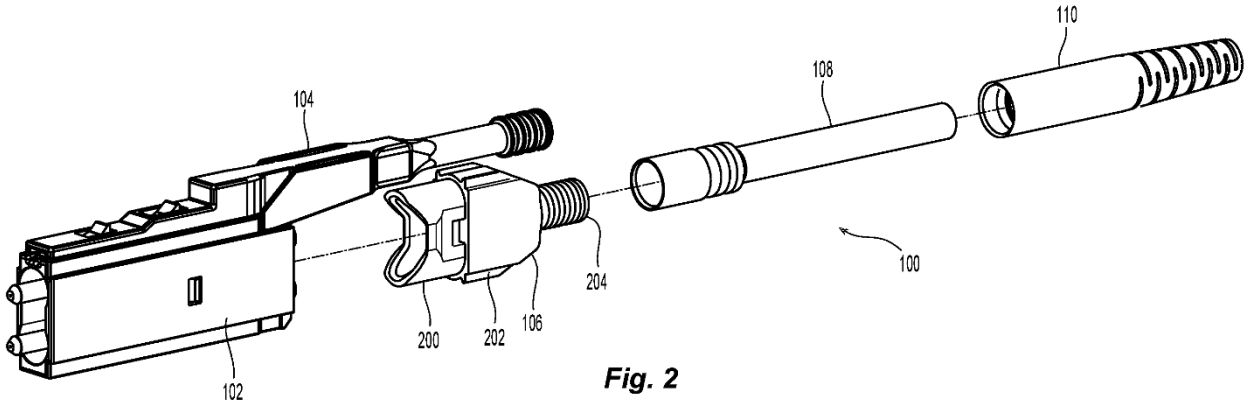


Fig. 2

EX1001: Figs. 1 and 2 (annotated).

28. The latch component (104) is used to insert and remove the connector (100) from an adapter (400) and is attachable to the top or bottom of the housing (102) to set the polarity of the connector. EX1001: 8:23-50.

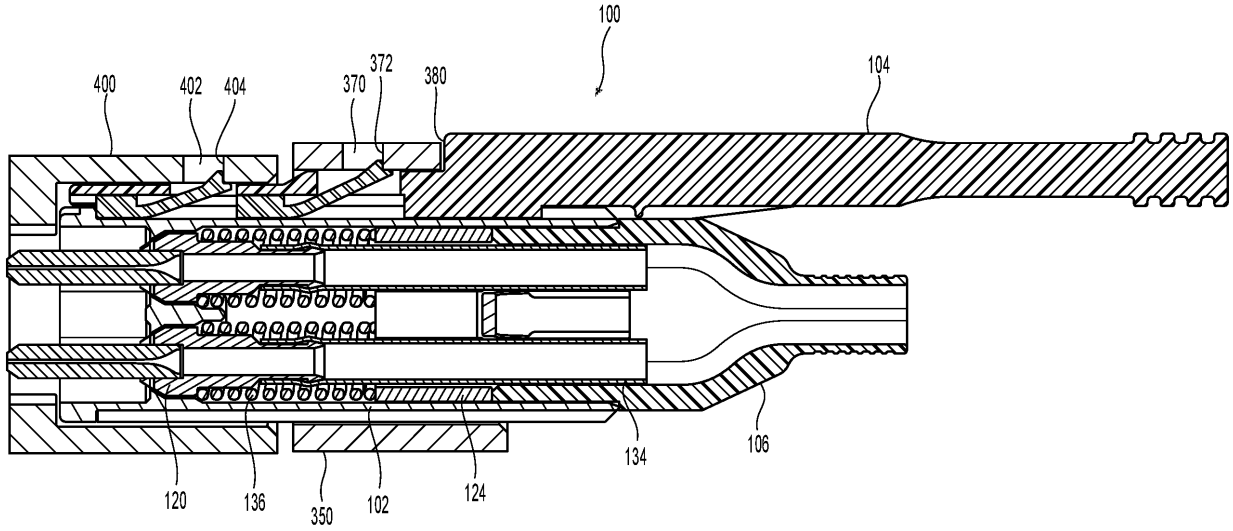


Fig. 21

EX1001: Fig. 21.

29. The other embodiments of the fiber optic connectors (1100, 2100) disclose different variations of the latch component (1104, 2104).

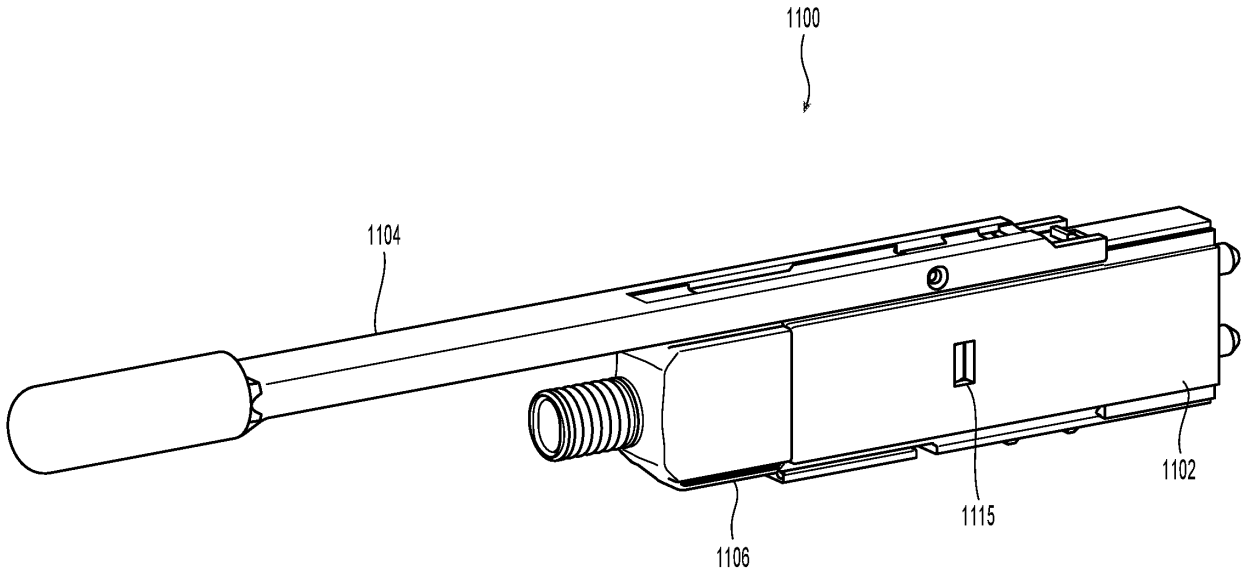


Fig. 23

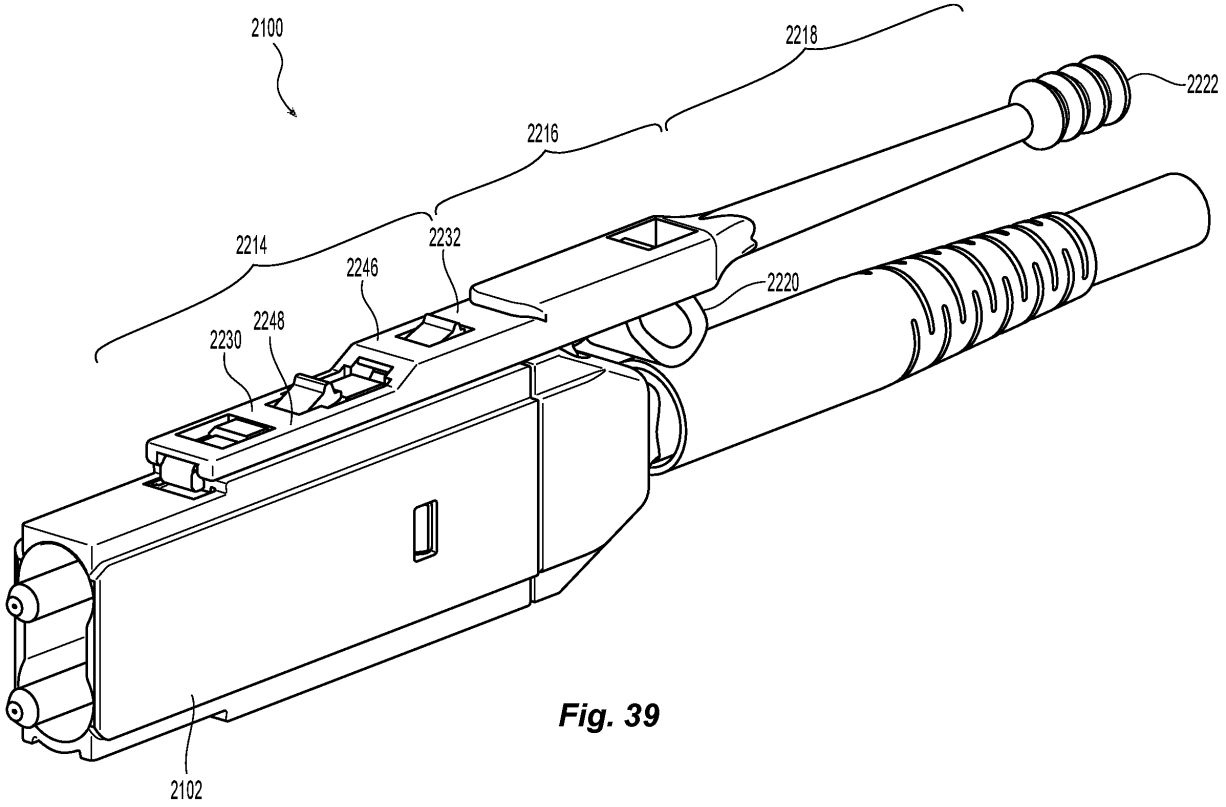


Fig. 39

EX1001: Figs. 23 and 39.

III. BACKGROUND OF THE PRIOR ART

30. While there have been evolving standards for fiber optic connectors and increasing demands for higher pitch densities, fiber optic connection systems have been well known in the art for decades.

31. Fiber optic connectors are commercially available in multiple industry standardized varieties and ferrule types, including FC, SC, ST, LC, MU (primarily in Japan), E-2000 (primarily in parts of Europe), MPO/MTP, and MTRJ:



FC/UPC



ST Multi-mode



SC/APC



LC/UPC



LC/UPC Duplex



LC/APC



MT-RJ



MPO

32. The ceramic ferrule types listed are available in single fiber (simplex) and dual fiber (duplex) configurations. The MT ferrule types have been developed for higher density ribbon fiber (& cable) - from 2-fiber in the case of MT-RJ, to 8-fiber, 12-fiber, 24-fiber, 48-fiber, and up to 72-fiber ribbon in a single, rectangular MT ferrule that was first commercialized in the MPO/MTP connector footprint.

The MT ferrules and MPO/MTP connectors are utilized in the highest data/bandwidth applications, such as singlemode telephony, cell towers for mobile communications, and data centers that power the internet and the ever expanding broadband needs for on-demand 'video streaming' and 'big data.' Today's data center customers are pressing for even higher density, more compact connector designs.

33. The claims of the '994 Patent are not specific to a singular fiber optic connector or ferrule type, and in theory would be compatible with a number of the common fiber optic connector and ferrule types. However, the specification of the '994 Patent shows and describes a Very (or ultra) Small Form Factor ("VSSF") duplex optical connector that utilizes 1.25mm diameter ceramic ferrules, which are conventionally deployed in LC and MU Connectors. EX1001: Fig. 1.

34. The references outlined below, and other references elsewhere herein, disclose features of fiber optic connection systems, and those of ordinary skill in the art would consider them all to be in the same field of endeavor with each other and with the '994 Patent. EX1001: 1:18-39; EX1003: ¶[0002]; EX1005: ¶[0002]; EX1006: 1:4-7; EX1007: Abstract; EX1008: ¶[0001]; EX1009: 1:34-36; EX1011: ¶[0001]; EX1012: ¶[0002]; EX1014: ¶[0001]; EX1015: 1, EX1016: 1.

A. U.S. Publication No. 2019/0018209 ("Takano'209")

35. Takano'209 "relates generally to optical receptacles within adapters and optical transceivers and to ultra-small form factor optical connectors received within the optical receptacles." EX1003: ¶[0002].

36. Takano teaches multiple different embodiments of optical connectors. EX1003: Figs. 3 and 21A. I will refer to these different embodiments of optical connectors in this declaration as the "first embodiment" and the "second embodiment."

1. First Embodiment of Takano'209

37. Takano'209 discloses an optical connector (300, 400, 500, 1100A-B, 1200) having an outer housing (301, 401, 501, 1101, 1201), a front body (302, 402, 502, 1202), ferrules (303, 403), ferrule flanges (304), two springs (305), a back body (306, 406), a back post (307), a crimp ring (308), and a boot (309, 409). EX1003: ¶¶[0091]-[0093], [0105]-[0107]. I will hereby refer to this embodiment of Takano'209 as the first embodiment.

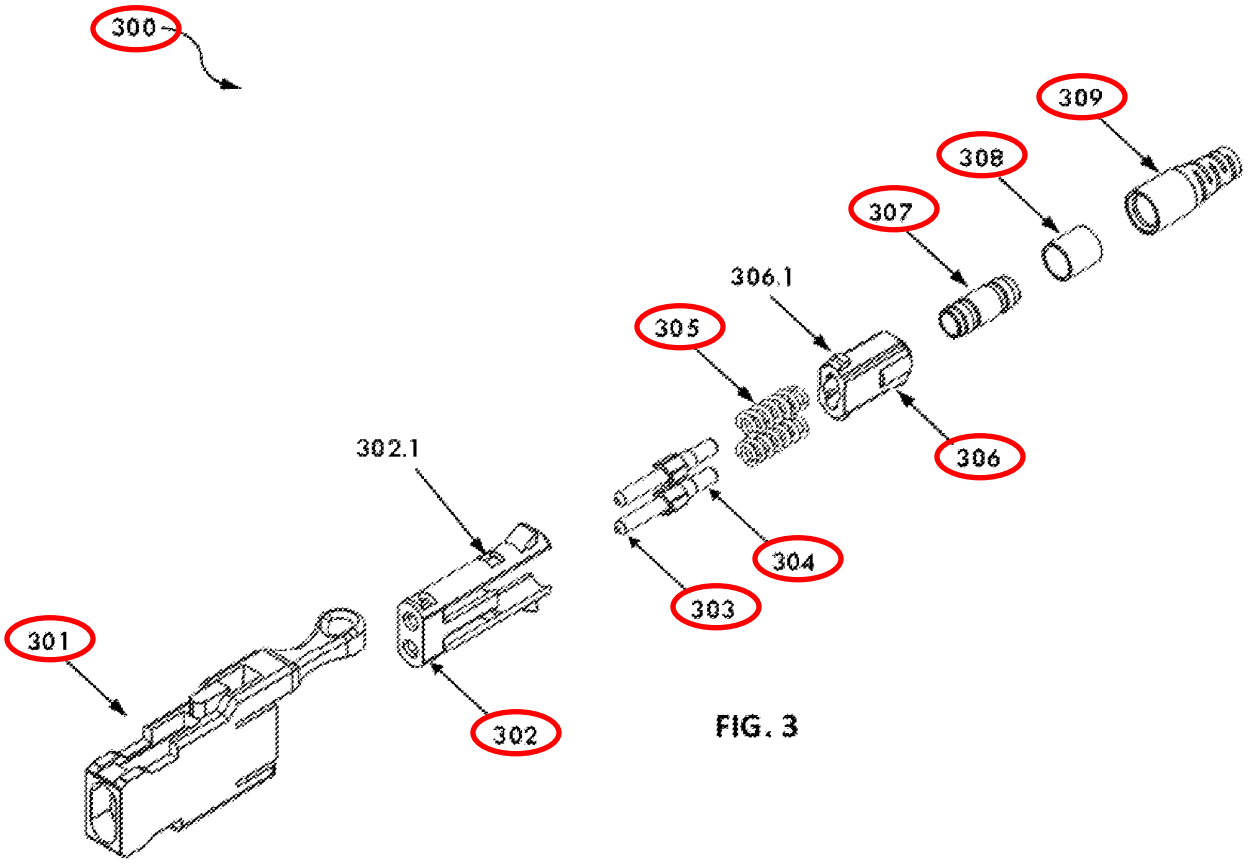


FIG. 3

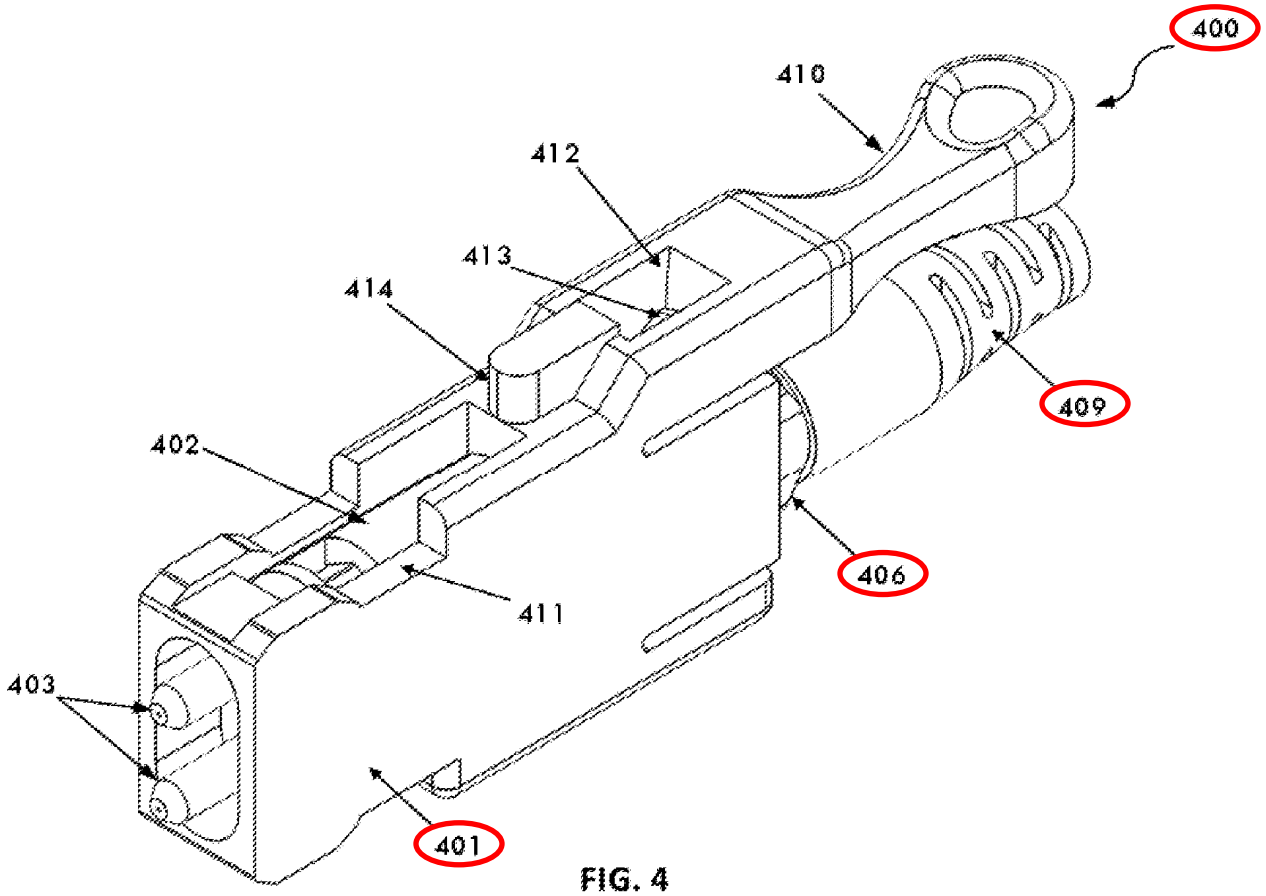


FIG. 4

EX1003: Figs. 3 and 4 (annotated).

38. The optical connector (300, 400, 500, 1100A-B, 1200) includes a key (414) on one side of the outer housing (301, 401, 501, 1101, 1201) for properly orienting the optical connector relative to a corresponding mating adapter.

EX1003: ¶[0092], Figs. 4, 11A, and 12B.

2. Second Embodiment of Takano'209

39. Takano'209 discloses another optical connector (2100) having an outer housing (2110), a front body (2115), two ferrule assemblies (2120), two springs (2125), a back body (2130), a back post (2135), a crimp ring (2140), and a

boot (2145). EX1003: ¶[0117]. I will hereby refer to this embodiment of Takano'209 as the second embodiment.

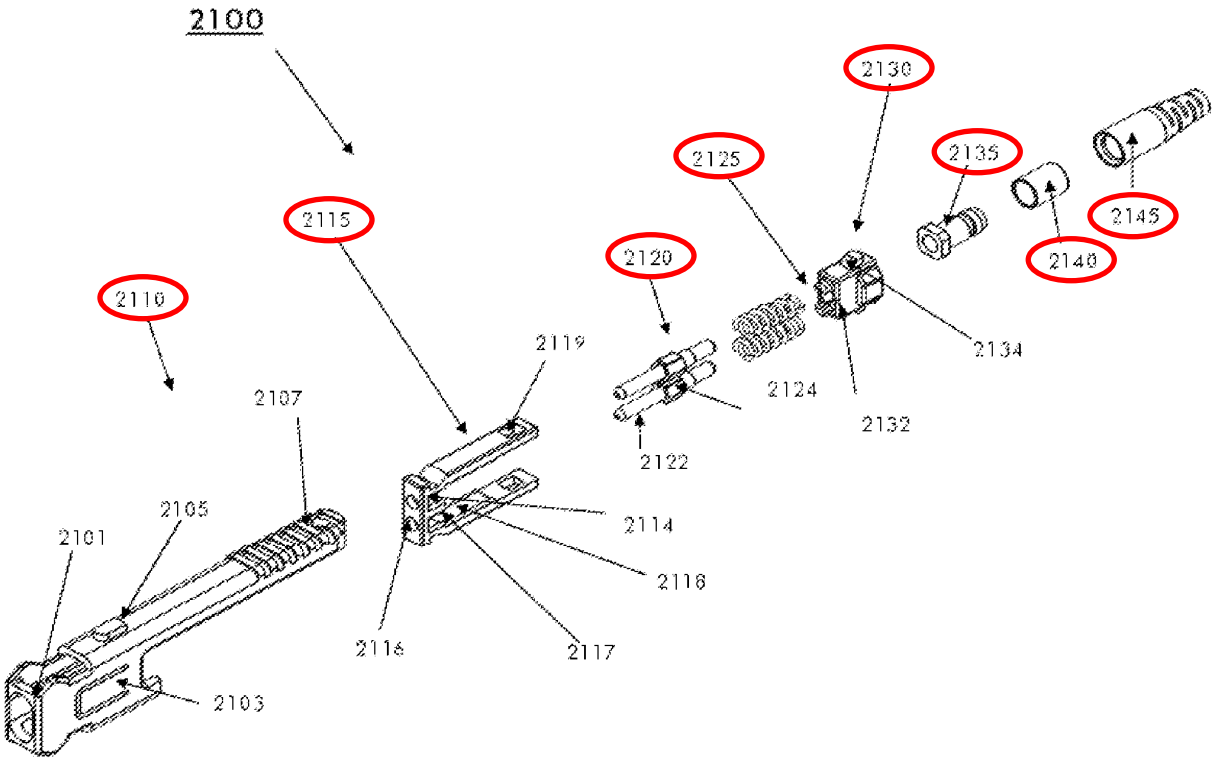


FIG. 21A

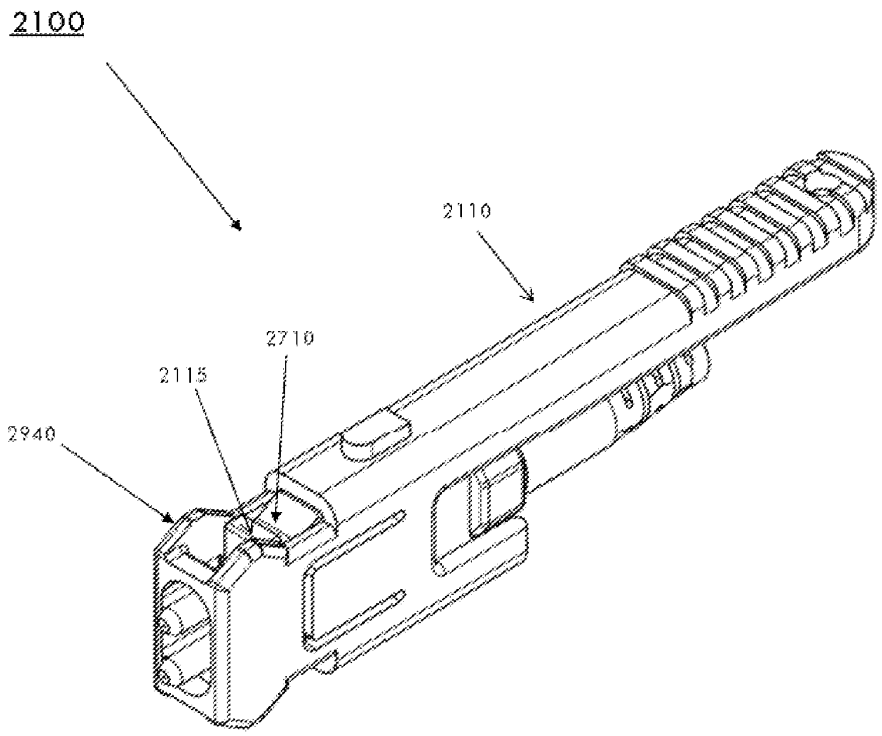


FIG. 21B

EX1003: Figs. 21A-B (annotated).

40. The outer housing (2110) includes a connector alignment key (2105) received in a corresponding connector alignment slot (2403) of the adapter (2400). EX1003: ¶¶[0117], [0127].

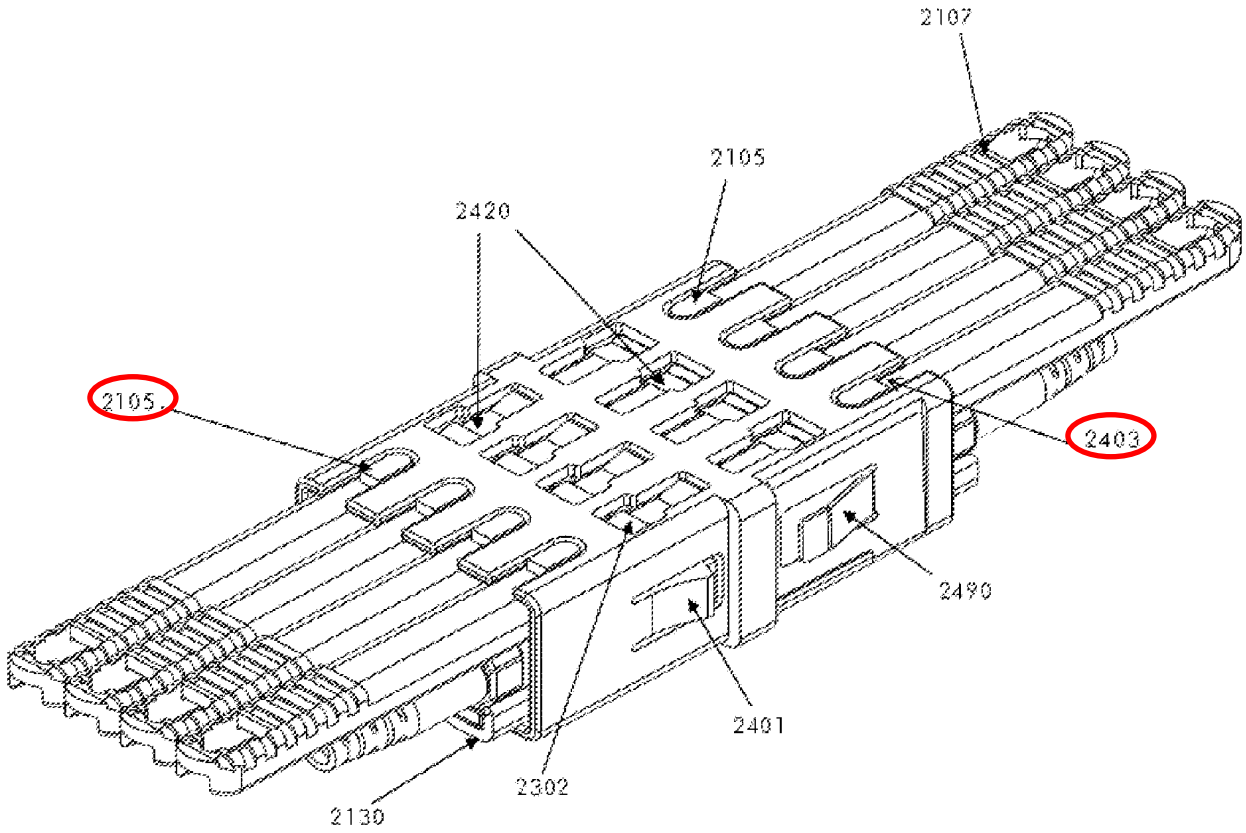


FIG. 31

EX1003: Fig. 31 (annotated).

B. U.S. Publication No. 2017/0205588 ("Lee")

41. Lee—published in July 2017—"relates generally to fiber optic connectors, and more particularly fiber optic connectors suitable for use in data centers or the like." EX1005: ¶[0002].

42. Lee teaches an optical connector (10) that is taller than it is wide and holds two spring-loaded single-fiber ferrules (20, 22) at vertically spaced apart positions. EX1005: Figs. 2 and 3, ¶¶[0029]-[0030]. Fibers (86, 88) enter the optical connector (10) through a single opening in a two-piece crimp body (36,

110) at a rear end and extend forward through ferrule springs (100, 102) to the ferrules (20, 22). EX1005: Figs. 2 and 3, ¶¶[0030], [0037], [0038], [0040]. Between the two-piece crimp body (36, 110) and the ferrule springs (100, 102) is a separate spring push (104). EX1005: Figs. 2 and 3, ¶[0038].

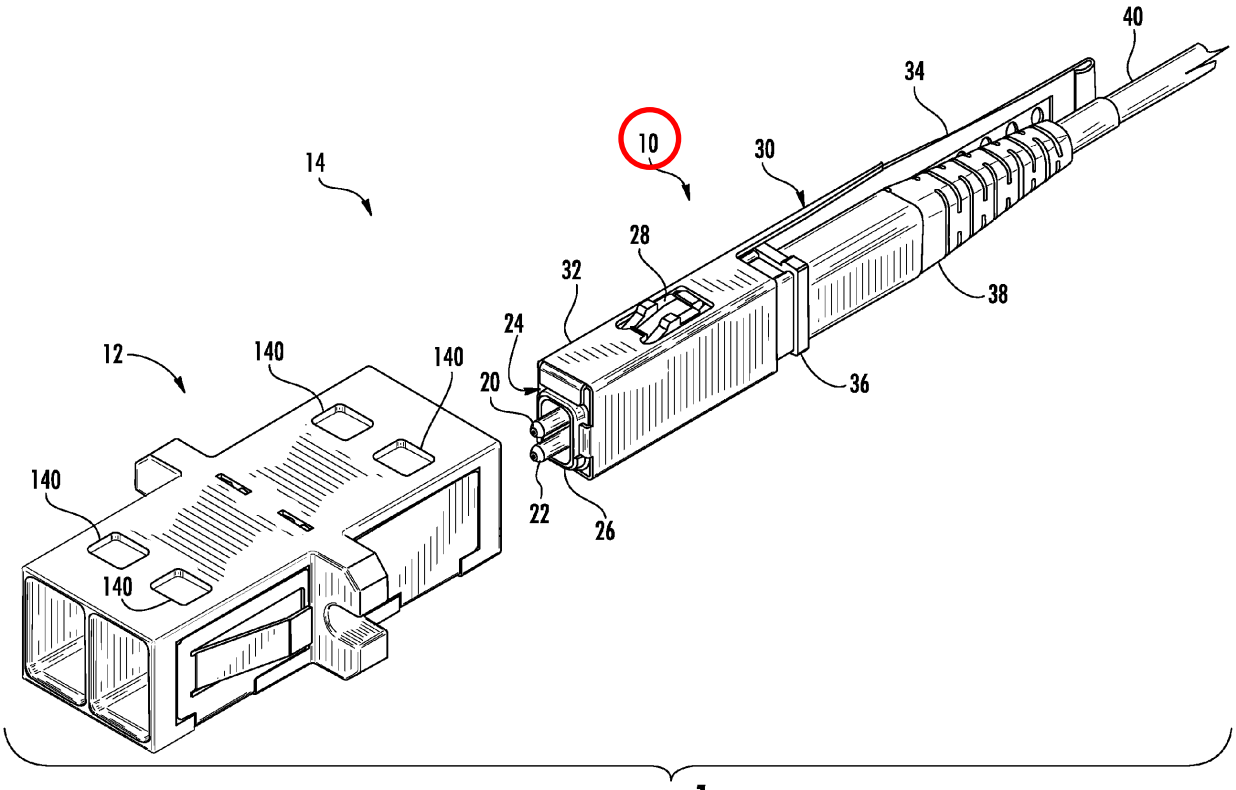


FIG. 1

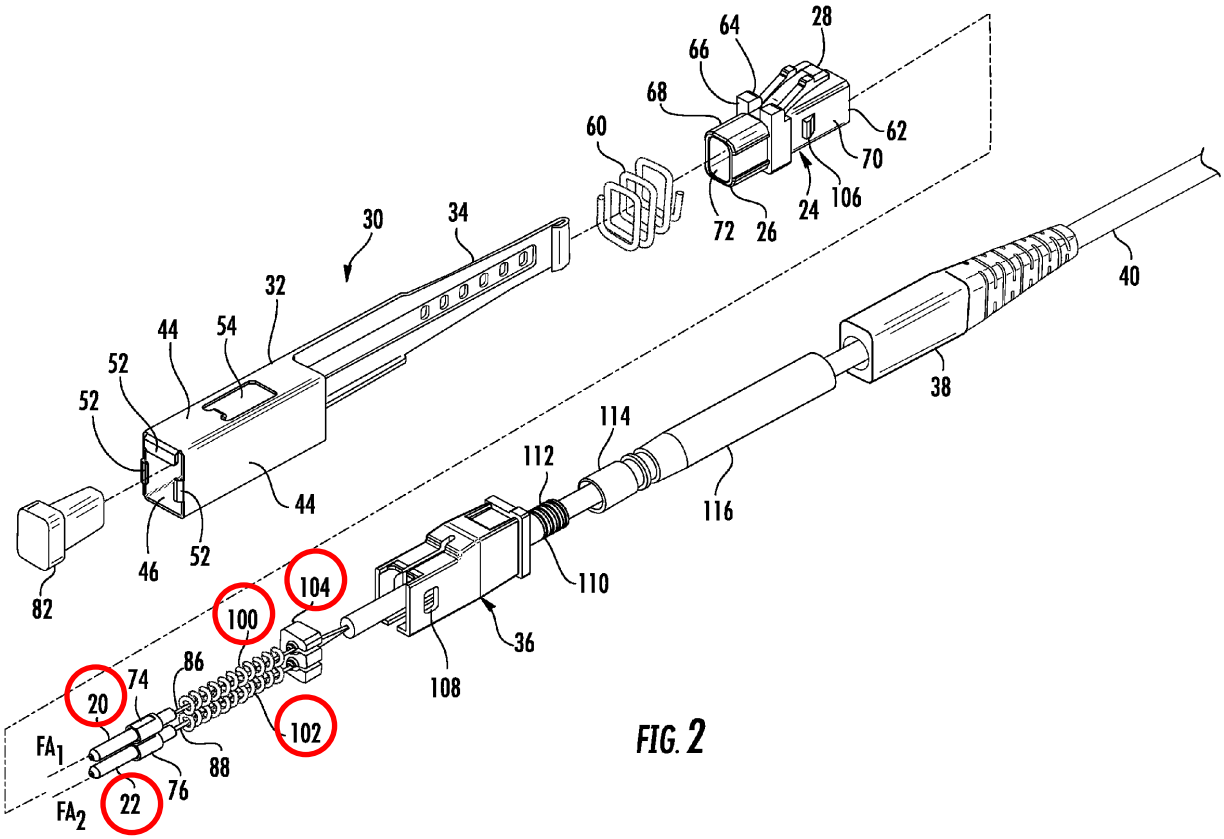


FIG. 2

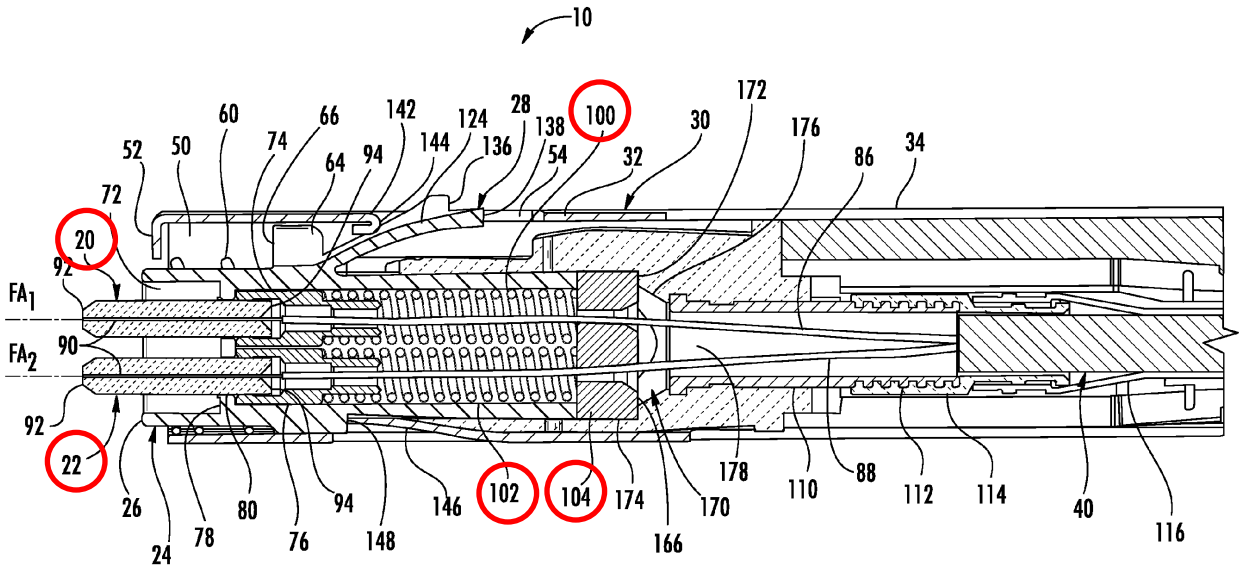


FIG. 3

EX1005: Figs. 1-3 (annotated).

43. Lee teaches that the spring push (104) is an E-shaped body with first and second slots (156, 158) for receiving the fibers (86, 88). EX1005: ¶[0052]. The slots (156, 158) are "kept relatively small to help position the first and second optical fibers 86, 88 on or close to the longitudinal axes FA1, FA2 of the first and second ferrules 20, 22." EX1005: ¶[0052]. Spring seats (162, 164) are positioned around the slots (156, 158) on the front side of the spring push. EX1005: ¶[0056]. The spring seats (162, 164) retain the rear ends of the ferrule springs (100, 102) and help "prevent the first and second inner springs 100, 102 from moving laterally on the spring push 104 and contacting the first and second optical fibers 86, 88." EX1005: ¶[0053]. Lee further teaches that the separate spring push (104) facilitates an improved connectorization assembly of a fiber optic cable by allowing for placement of the spring push onto the cable after the fibers (80, 86) have been installed in the ferrules (20, 22). EX1005: ¶¶[0055]-[0058].

C. U.S. Patent No. 6,450,695 ("Matsumoto")

44. Matsumoto—issued in June 2002—relates to "optical connectors and, particularly, to an optical connector capable of incorporating a damping or filtering element." EX1006: 1:5-7.

45. Matsumoto teaches an adapter (6) for optical connectors with guides (63) formed at spaced apart locations to separate individual connector ports. EX1006: Fig. 4, 4:1-7. The guides (63) ensure proper alignment of the optical

connectors into the connector ports. EX1006: Fig. 4, 4:5-7. The guides (63) make it "possible to mount a plurality of optical connectors very closely, thus providing high-density mounting." EX1006: 4:9-11.

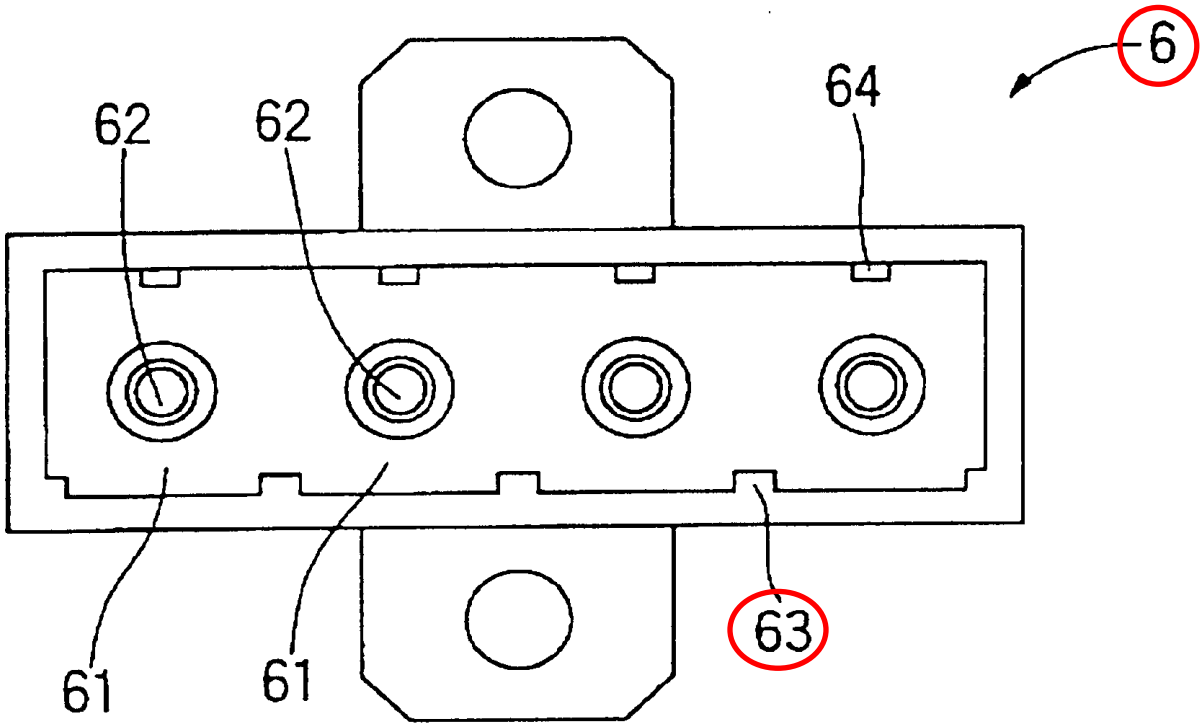


FIG. 4

EX1006: Fig. 4 (annotated).

D. U.S. Publication No. 2016/0202431 ("Hill")

46. Hill—published in 2016—relates to "[a]n optical fiber connector and method for assembly and use." EX1007: Abstract.

47. Hill discloses an optical fiber connector with ferrules that "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for angle-physical contact and the acronym "UPC" stands for ultra-physical contact. EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively.

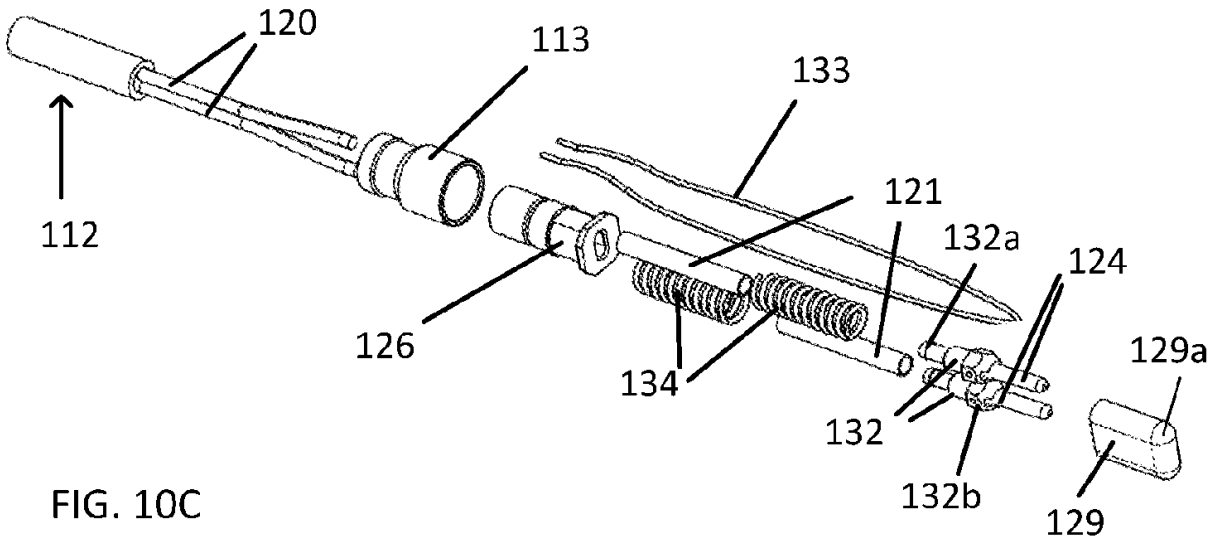


FIG. 10C

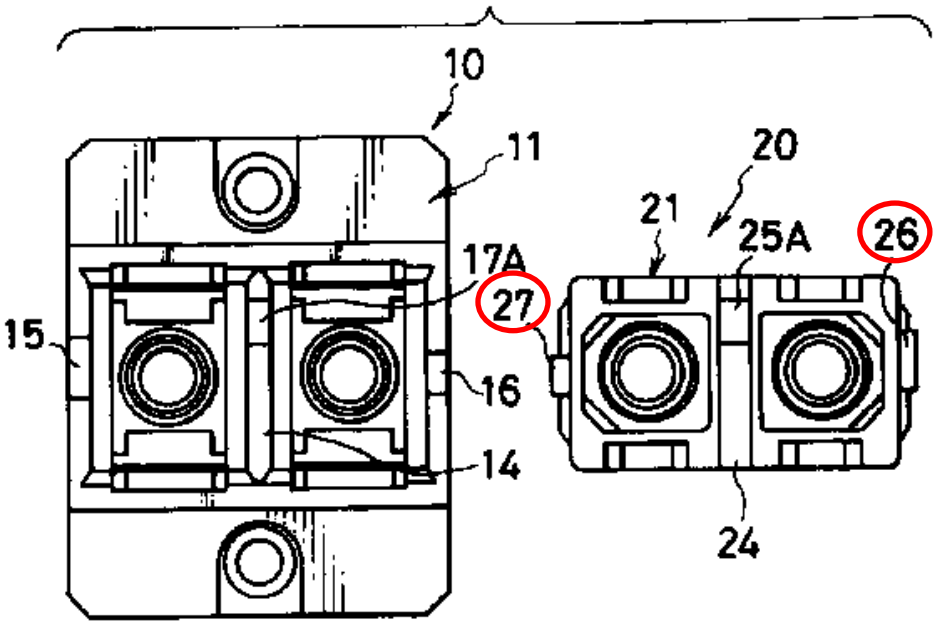
EX1007: Fig. 10C.

E. Japanese Patent No. 2573482 ("Shimozu")

48. Shimozu—issued in 1998—relates to "double-core optical connector." EX1008: ¶[0001].

49. Shimozu discloses a double-core optical connector plug (20) comprising an outer housing (21) with first and second identification guide keys (26, 27) on opposite side walls (22, 23). EX1008: ¶[0011]. The second identification guide key (27) is located in a center of the side wall (23), and the first identification guide key (26) is offset from center. EX1008 ¶[0012]. In addition, the first identification guide key (26) is wider than the second identification guide key (27). EX1008: ¶[0012].

【図２】

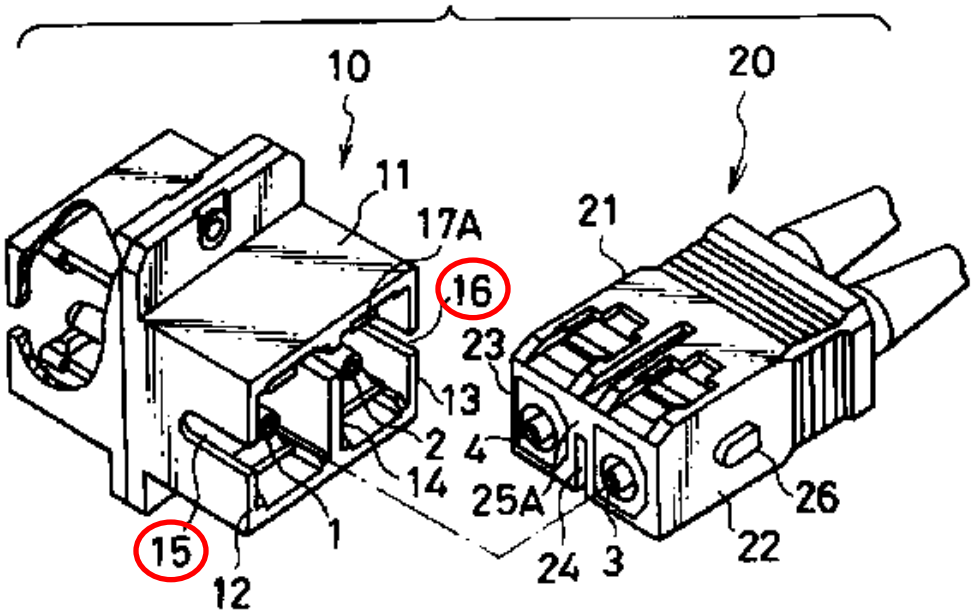


EX1008: Fig. 2 (annotated).

50. The different size identification guide keys (26, 27) on opposite sides of the outer housing (21) fit into corresponding first and second identification

guide keyways (15, 16) formed on opposite sides of a housing (11) of a mating adapter (10). EX1008: ¶[0014]. The connector plug (20) will only fit in the mating adapter (10) if the wider first identification guide key (26) is aligned with the wider first identification guide keyway (15) and the narrower second identification guide key (27) is aligned with the narrower second identification guide keyway (16). EX1008: ¶[0014]. The identification guide keys (26, 27) will not fit into the incorrect identification guide keyways (15, 16) if the connector plug (20) is inserted upside down. EX1008: ¶[0014].

【図１】



EX1008: Fig. 1 (annotated).

51. Shimozu teaches the positions of the identification guide keys (26, 27) and corresponding identification guide keyways (15, 16) could be shifted for similar connectors terminating different types of optical fibers. EX1008: ¶[0015].

F. U.S. Patent No. 11,307,369 ("Takano'369")

52. Takano'369 "relates generally to ultra-small form factor optical connectors and related connections within adapters and optical transceivers." EX1009: 1:34-36.

53. Takano'369 discloses a fiber optic connector (10300, 10400, 10500) having outer housing (10301, 10401, 10501), ferrules (10303, 10403), ferrule holders (10304), ferrule springs (10305), a back body (10306, 10406), a back post (10307), a boot (10309, 10409, 10509), a locking tab (10411), and a push-pull tab (10310, 10410, 10510). EX1009: 18:66-19:50.

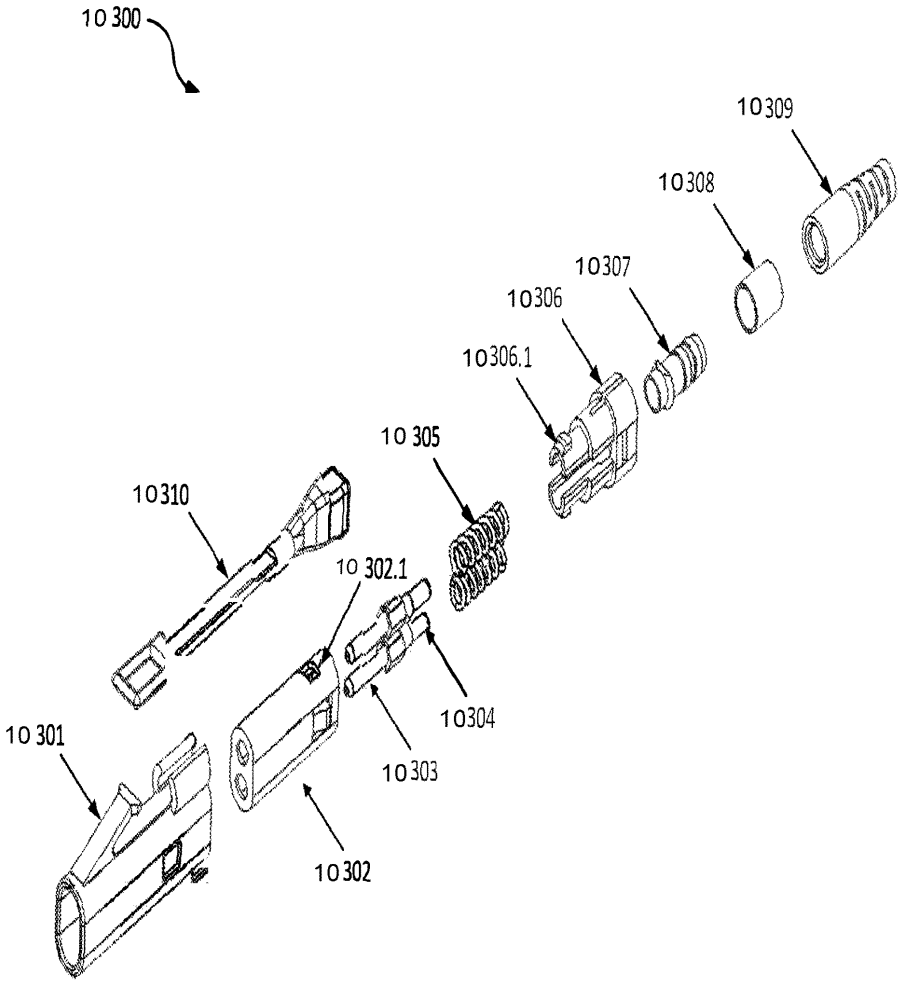

10 300
10309
10308
10307
10306
10306.1
10 305
10310
10 302.1
10304
10 301
10303
10302

FIG. 53

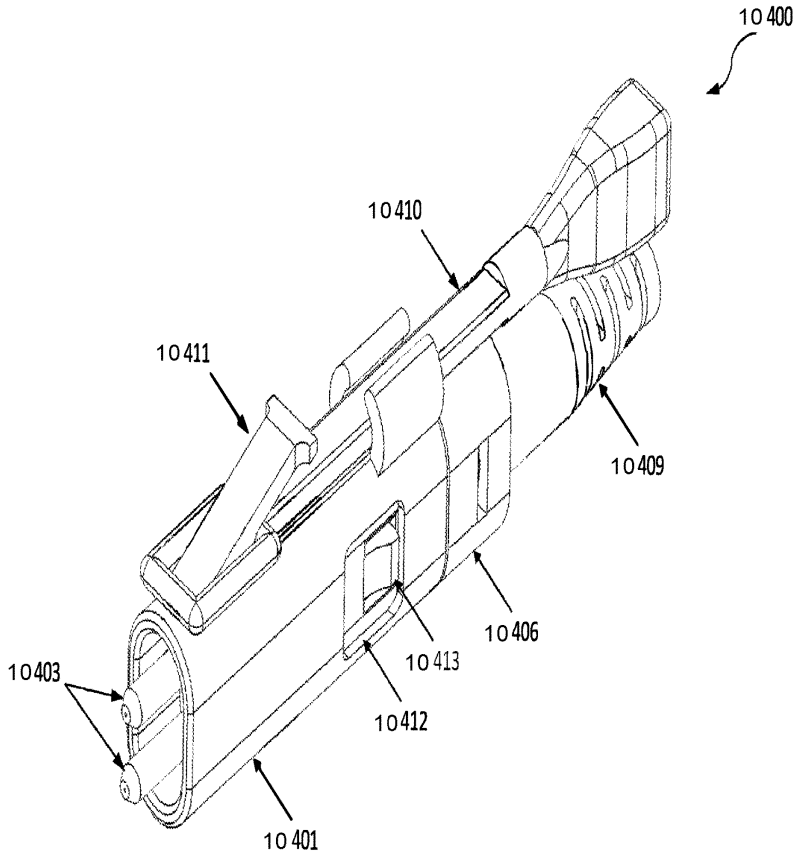


FIG. 54

EX1009: Figs. 53 and 54.

G. U.S. Publication No. 2020/0285005 ("Watanabe")

54. Watanabe "relates to an optical connection structure." EX1011: ¶[0001].

55. Watanabe discloses a plug connector (10A) comprising a "plug housing 11A having a rectangular parallepiped shape" with a latch (13) on the top wall and a guide rail (21) on the bottom wall. EX1011: ¶¶[0032], [0038], [0040].

"When the plug connector 10A is inserted into the backplane housing 3, the guide rail 21 is inserted (fitted) into a guide rail fitting section 22 from the end 21d." EX1011: ¶[0039].

56. The guide rail (21) is configured to fit into a guide rail fitting section (22) on the bottom wall of an adapter (backplane housing (3)): "When the guide rail 21 is inserted into the guide rail fitting section 22, the pair of side surfaces 21a and 21b of the guide rail 21 face the corresponding pair of side surfaces 22a and 22b of the guide rail fitting section 22, and the bottom surface 21c of the guide rail 21 faces the bottom surface 22c of the guide rail fitting section 22. In the state where the guide rail 21 is fitted to the guide rail fitting section 22, the plug housing 11A is moved frontward in the Z direction in the connector hole 6 of the backplane housing 3." EX1011: ¶[0042].

Fig.1

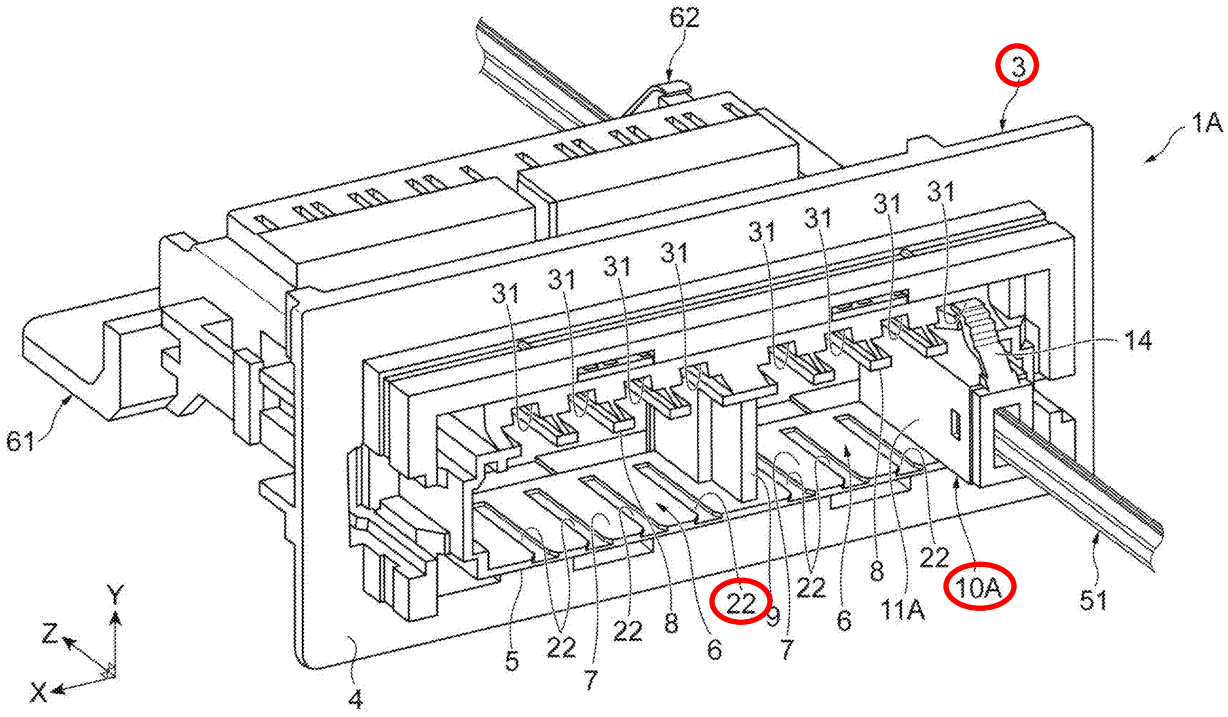
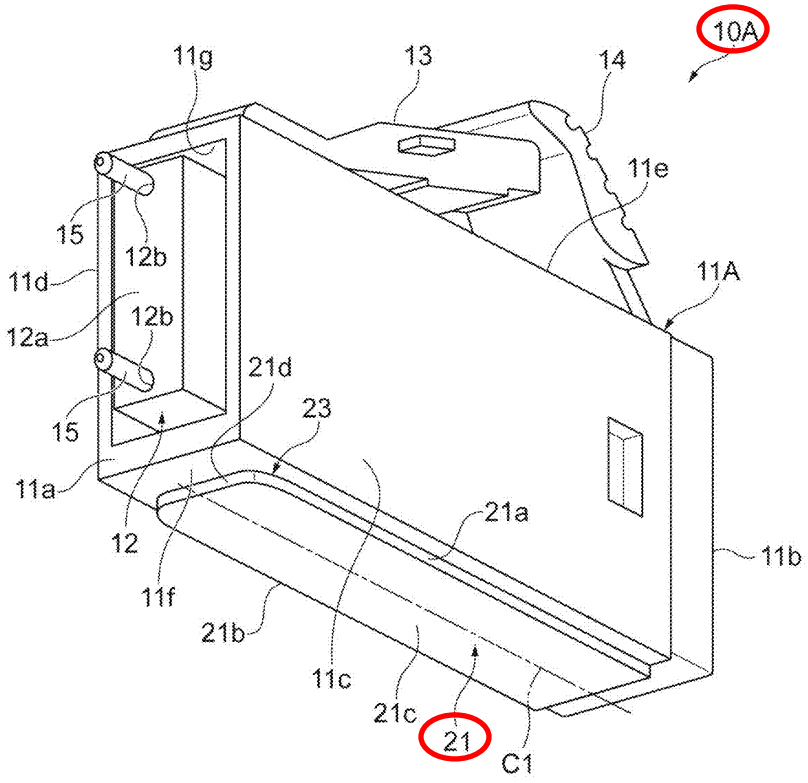

62
3
1A
31
14
61
22
10A
51
Y
Z
X
4
5
7
9
11A

Fig.3


10A
11g
13
14
11e
11A
15
12b
11d
12a
21d
23
11a
12
21a
11b
11f
21b
11c
21c
21
C1

EX1011: Figs. 1 and 3 (annotated).

H. U.S. Publication No. 2018/0217340 ("Wong")

57. Wong "relates generally [to] optical connectors with reversible polarity." EX1012: ¶[0001].

58. Wong discloses a reversible polarity fiber optic connector (300) that addresses demand "for smaller fiber optic connectors that will meet the needs of future developments in smaller SFPs and are reconfigurable for flexible deployment." EX1012: ¶[0007]. The connector (300) comprises a connector housing (320) with latch couplings (e.g., dovetail slots) on top and bottom exterior walls. EX1012: ¶¶[0067], [0072], Figs. 1B, 4B, 4C.1. The latch couplings selectively receive a dovetail shaped fitting on the bottom of a latch (330) for mounting the latch on the connector housing (320). EX1012: ¶¶[0067], [0072], Figs. 1B, 4B, 4C.1. The latch couplings and dovetail fitting allow the latch (330) to be selectively coupled to either the top exterior wall or the bottom exterior wall for changing the polarity of the connector. EX1012: ¶¶[0067], [0072]. As evident by Figs. 4C.1 and 4D, the connector housing (320) is inherently symmetrical on opposite sides of a middle latitudinal plane in order to enable the polarity change by moving the latch (330) between the top and bottom of the connector housing. EX1012: Figs. 4C.1, 4D, and 10A-D.

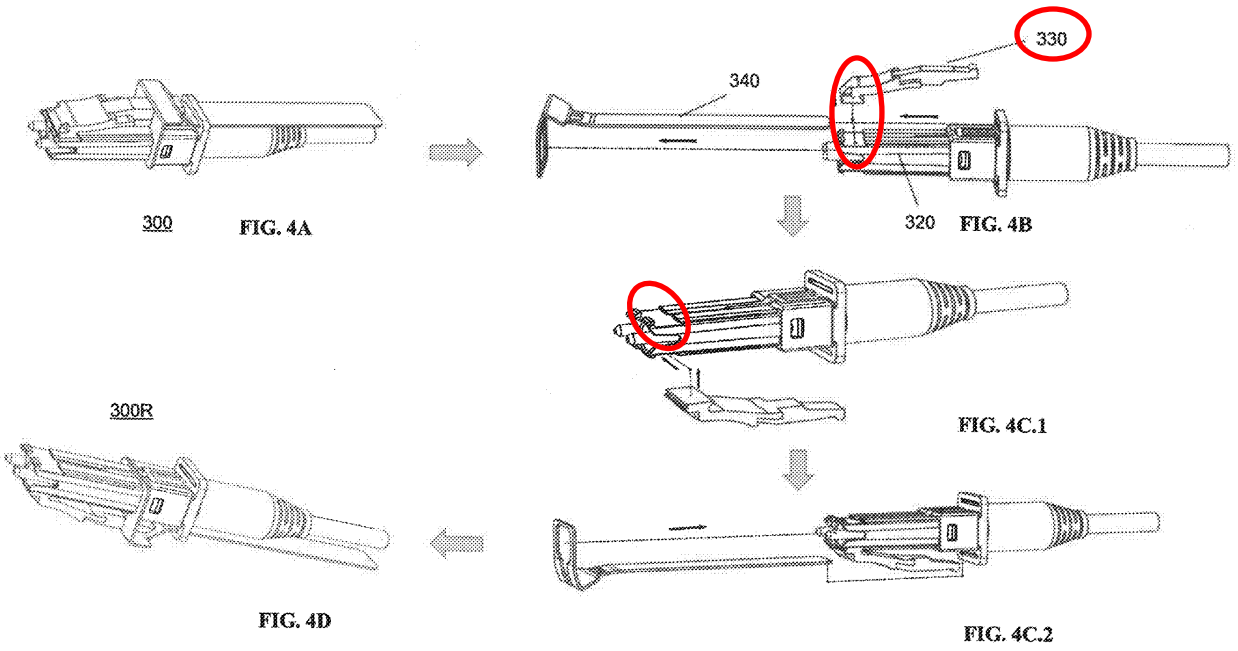
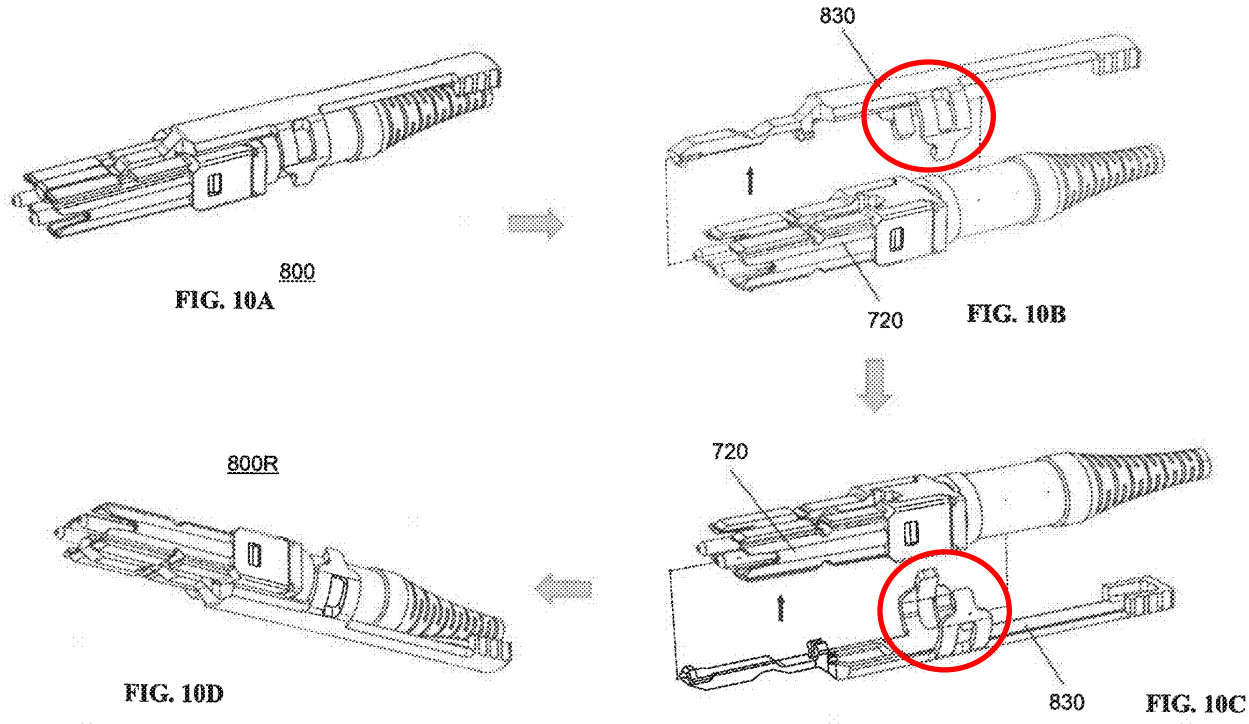


FIG. 4A FIG. 4B FIG. 4C.1 FIG. 4D FIG. 4C.2

EX1012: Figs. 4A-D (annotated).

59. Wong also teaches that a pull tab (830) can include a clip that clips onto the boot of the connector and allows the pull tab to move along the boot. EX1012: Figs. 8B.1-2, 10A-D, ¶¶[0085], [0088]. The clips also allow the pull tab (830) to be selectively positioned along the top or bottom of the connector housing when changing the polarity of the connector. EX1012: Figs. 10A-D.

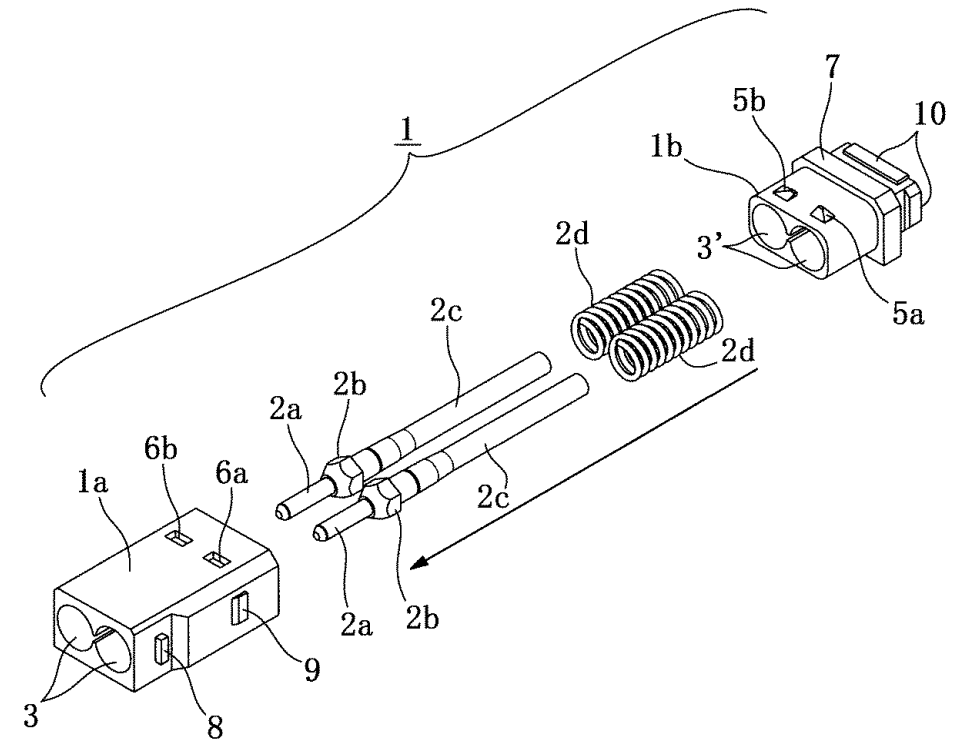


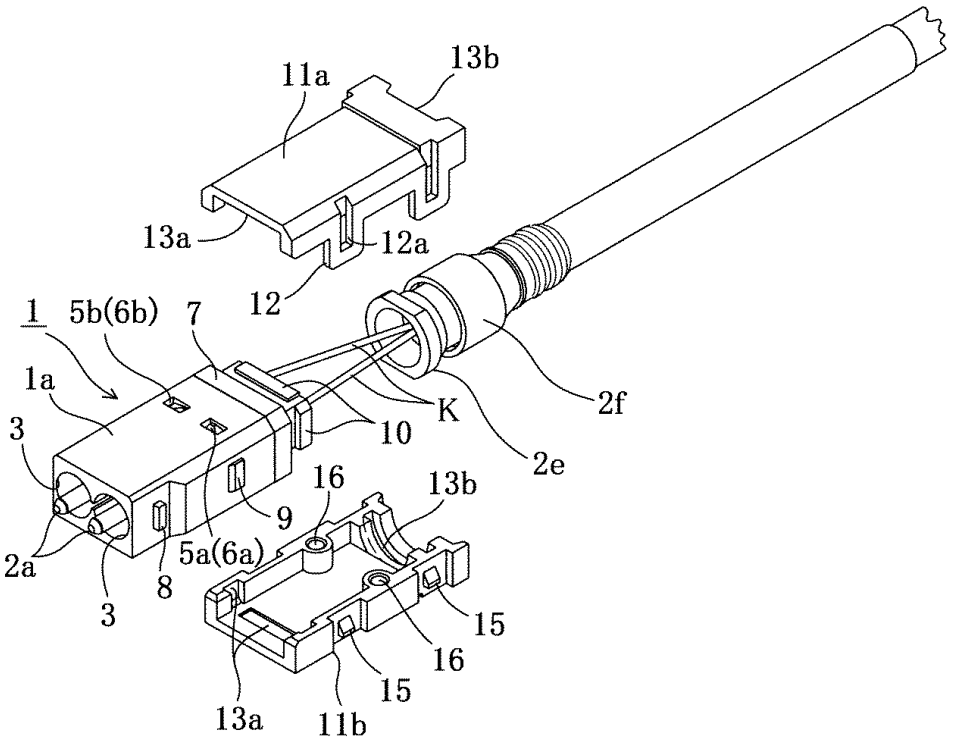
EX1012: Figs. 10A-D (annotated).

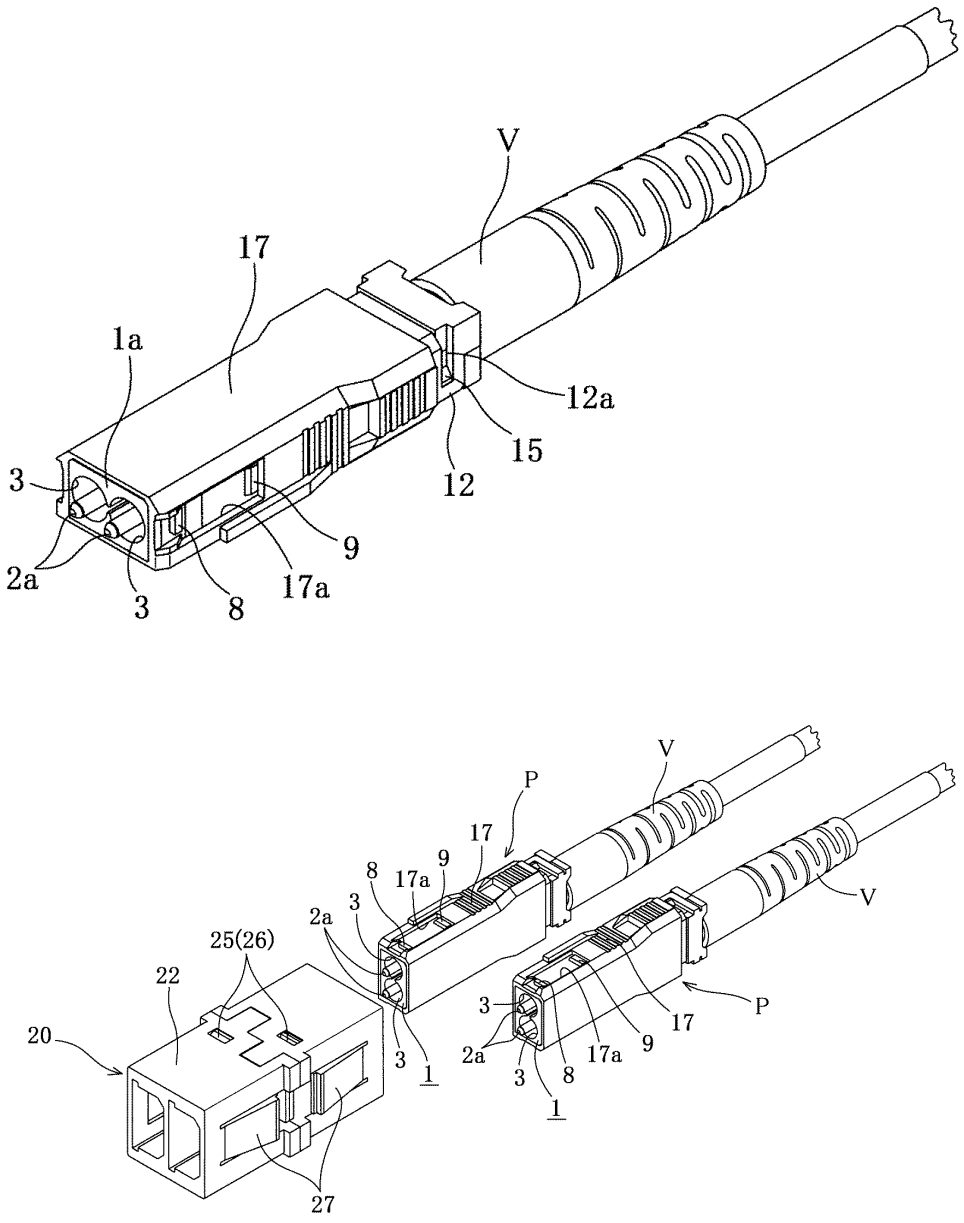
I. Japanese Publication No. 2012-53375 ("Toyama")

60. Toyama—published in 2012—"relates to a multi-connection type optical connector in which a plurality of optical connector plugs are connected in parallel to enable use as a multi-core connector plug." EX1014: ¶[0001].

61. Toyama discloses an optical fiber connector (e.g., a plug body (P)) including two ferrules (2a), each supported by a ferrule holder (2b), two springs (2d), a knob (17), holder portions (11a, 11b), a stop ring (2e), and a strain relief boot (V). EX1014: ¶[0022].


1
7
5b
10
1b
3'
2d
5a
2c
2d
2a
2b
6b
6a
1a
2c
2a
2b
9
3
8


11a
13b
13a
12a
12
1
5b(6b)
7
1a
K
2f
3
10
2e
16
13b
9
2a
5a(6a)
8
3
15
16
15
13a
11b



EX1014: Figs. 1, 3, 6, and 11.

J. QSFP-DD Hardware Specification("QSFP-DD")

62. QSFP-DD—published in September 2017 (EX1035; EX1036)—is a technical specification delineating the "requirements of the pluggable QSFP

Double Density (QSFP-DD) module, connector and cage system." EX1015: 1. In particular, QSFP-DD sets forth the requirements for a QSFP-DD high density, 8 Channel optical module, cage and connector system, supporting up to 400 Gb/s transmission in aggregate, over an 8 x 50Gb/s electrical interface. It also provides backwards compatibility for (pre-existing) QSFP28 modules, which can be inserted into a QSFP-DD port, and connected to 4 of the 8 electrical channels. EX1015: 59.

63. QSFP-DD Section 5.10 defines the optical interface port for QSFP-DD applications for three receptacle options: either a male MPO Receptacle (to accept a female MPO Connector), a dual LC Receptacle (to accept a dual LC Connector), or two CS Receptacles (to accept two CS Connectors). Transmit (TX) and receive (RX) channel locations are defined for each connector/module footprint in Fig. 33 below. For the dual LC Receptacle and the CS Receptacle, the transmit (TX) and receive (RX) channel locations are where the corresponding 1.25mm diameter ceramic LC ferrules from the dual LC Connector and CS Connector, respectively, are generally positioned when the dual LC Connector is inserted into the dual LC Receptacle and the CS Connector is inserted into the CS Receptacle.

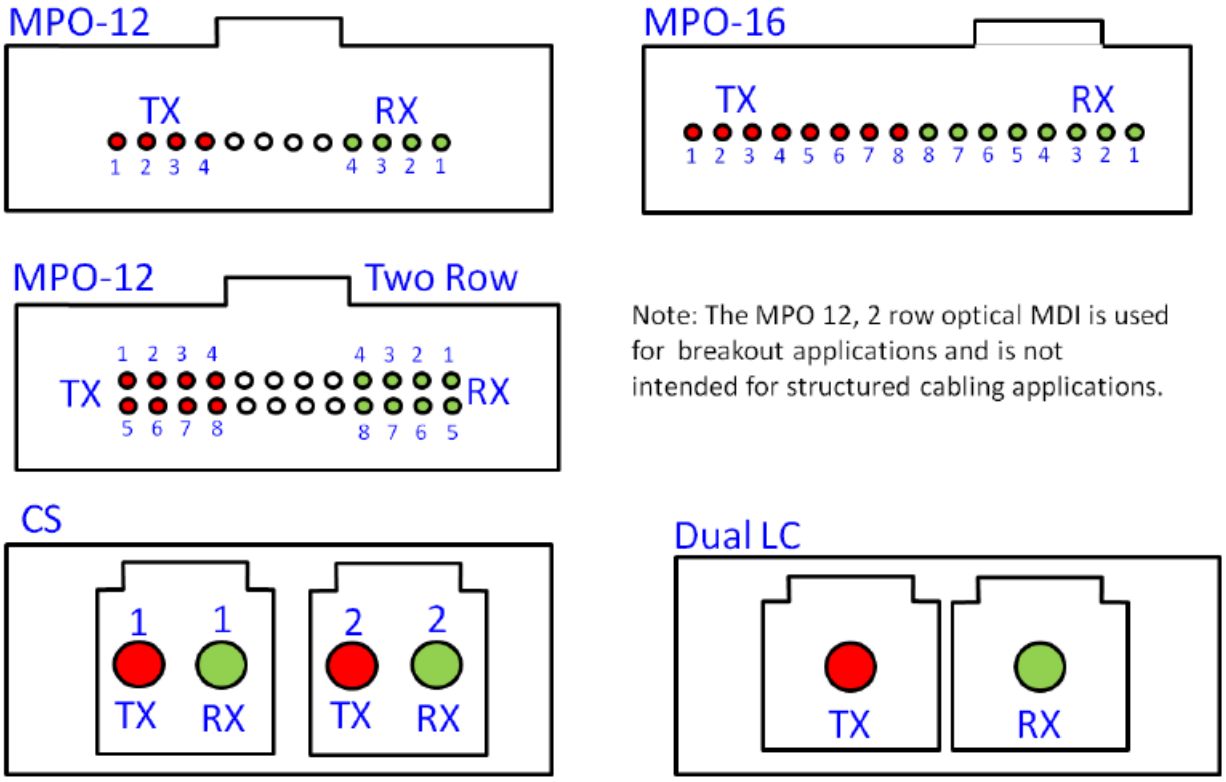


Figure 33: Optical Media Dependent Interface port assignments

EX1015: Fig. 33.

K. SFP-DD Hardware Specification("SFP-DD")

64. SFP-DD—published in September 2017 (EX1037; EX1038)—is a technical specification delineating the "requirements of the pluggable SFP Double Density (SFP-DD) module, connector and cage system." EX1016: 1. In particular, SFP-DD sets forth the requirements for a SFP-DD high density, 2 Channel optical module, cage and connector system, supporting up to 100 Gb/s transmission in aggregate, over a 2 x 50Gb/s electrical interface. EX1016: 6.

65. SFP-DD Section 5.10 defines the optical interface port for SFP-DD applications for two receptacle options: a male MPO Receptacle (to accept a

female MPO Connector) and a dual LC Receptacle (to accept a dual LC Connector). Transmit (TX) and receive (RX) channel locations are defined for each connector/module footprint in Fig. 22 below. For the dual LC Receptacle, the transmit (TX) and receive (RX) channel locations are where the corresponding 1.25mm diameter ceramic LC ferrules from the dual LC Connector are generally positioned when the dual LC Connector is inserted into the dual LC Receptacle.

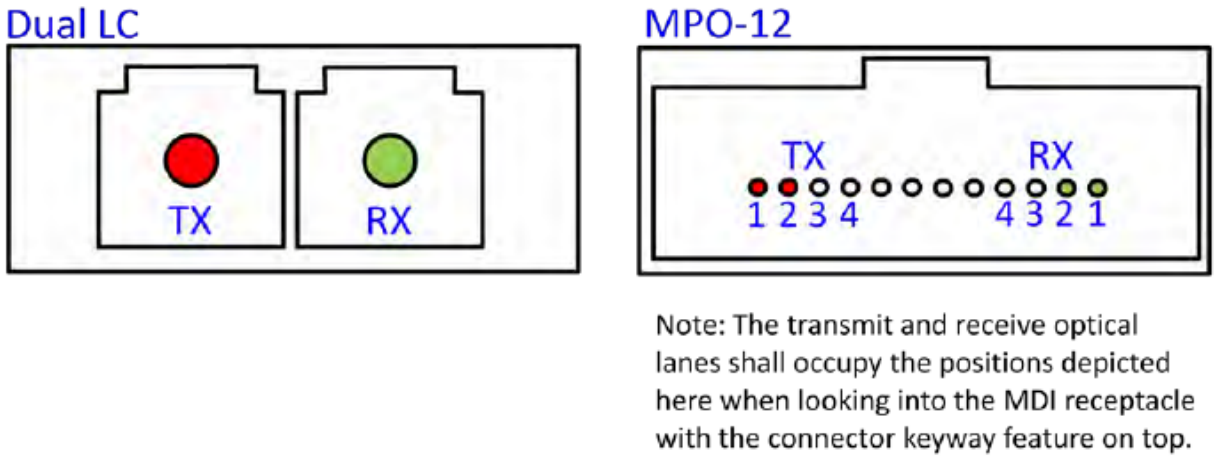


Figure 22: Optical Media Dependent Interface port assignments

EX1016: Fig. 22.

IV. CLAIM CONSTRUCTION

66. As I stated in Paragraph 23 above, it has been explained to me that the Board will interpret the claims of the '994 Patent as they would have been understood by those of ordinary skill in the art as of the filing date of the '994 Patent in view of the claim language itself, the specification and figures of the '994

Patent, the prosecution history of the '994 Patent, and other relevant evidence showing how one of ordinary skill would have understood the language.

67. In my opinions discussed below, I have applied the plain and ordinary meaning of the claim terms within the grounds below.

V. INDEFINITENESS (GROUND 1)

68. As I stated in Paragraph 14 above, it has been explained to me that a claim is invalid for being indefinite if the claim, read in light of the specification and prosecution history of the patent, fails to inform with reasonable certainty, those skilled in the art about the scope of the invention.

A. Claim 12 (and Dependent Claim 13) is Indefinite

69. In my opinion, claim 12 is indefinite.

70. Claim 12 recites that "each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ***ferrule seats*** of the fiber optic ferrules of each of the ferrule assemblies." In my opinion, this limitation is indefinite because it is unclear what structure is required to correspond to the claimed "ferrule seats."

71. I have reviewed the specification of the '994 Patent and, in my opinion, the specification of the '994 Patent is of no help in deciphering the intended meaning. The specification of the '994 Patent never uses the term "ferrule seat." EX1001. Further, the prosecution history is also of no help in

deciphering the intended meaning, as claim 12 was never rejected by the Examiner, and, no arguments regarding the patentability of claim 12 were made during examination. EX1032: 13-22, 122-124.

72. Further, the natural understanding of what a "ferrule seat" is, is inconsistent with the phrasing here. A POSA would understand "ferrule seat" to mean the structure that seats a ferrule or ferrule assembly in a connector housing. EX1018: ¶[0071]; EX1019: ¶[0027]; EX1020: ¶[0055]. The "ferrule seat" could theoretically be part of the connector housing or part of the ferrule assembly, but it would need to be structure that performs the function of "seating" the ferrule in the connector housing.

73. In the '994 Patent, the potential seating structures include (1) the ferrule holders (132, 1132) or (2) the structures (148, 1148) of the housing (102, 1102) that orient the ferrule assemblies (120, 1120) in the housing and the corresponding flat surfaces (150, 1150) of the ferrule holders (132, 1132).

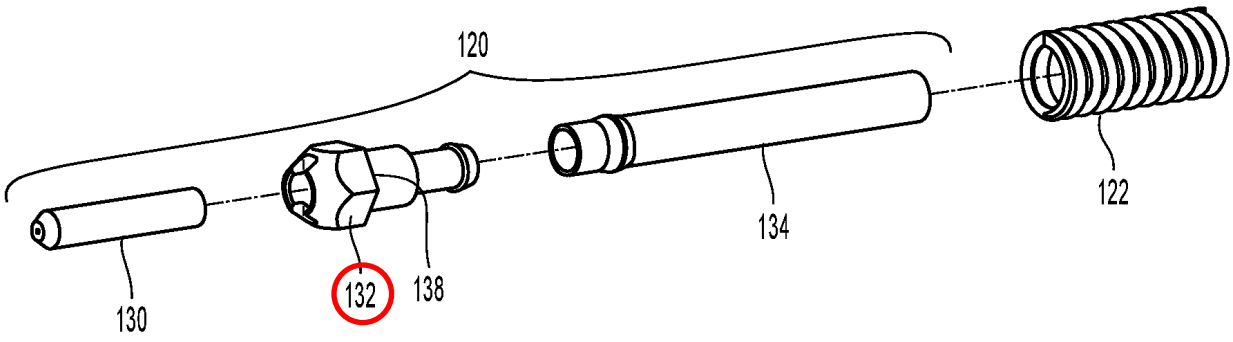


Fig. 3A

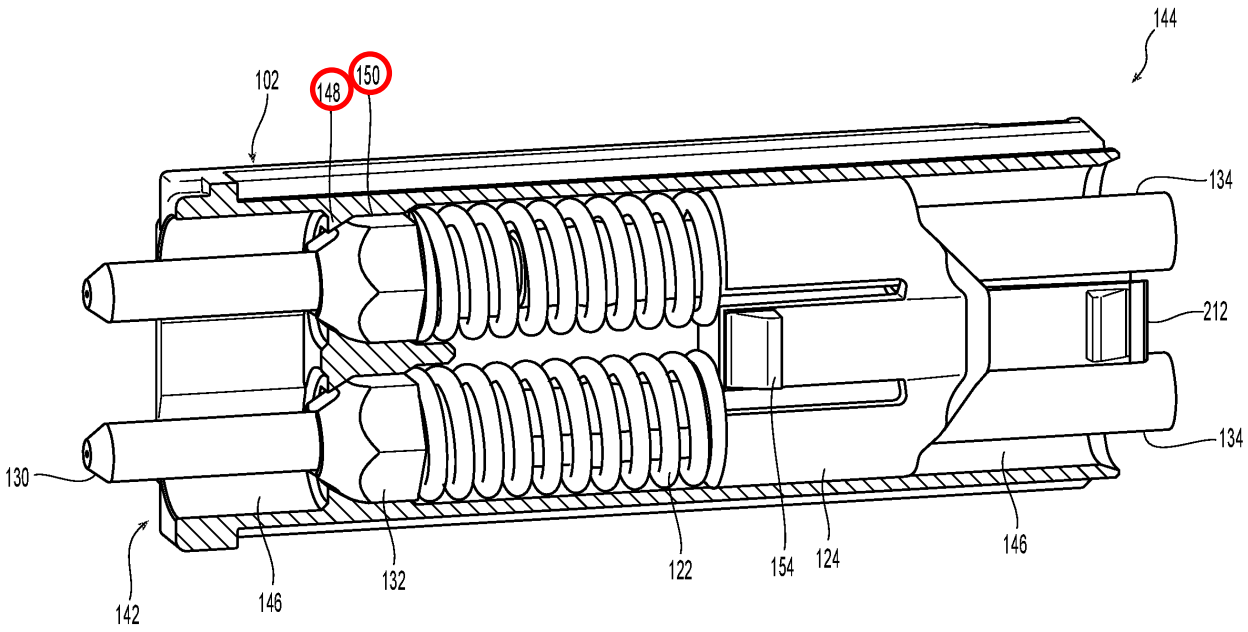


Fig. 4

EX1001: Figs. 3A and 4 (annotated).

74. However, claim 12 specifically recites that the "ferrule seats" are neither part of the housing nor part of the ferrule holder, but rather, ***are part of*** the fiber optic ferrules themselves—"ferrule seats ***of the*** fiber optic ferrules." Again, claim 1 recites that the ferrule assemblies comprise two distinct components—ferrules and ferrule holders. Here, claim 12 specifically recites that the ferrule seats are a part "of the fiber optic ferrules of each of the ferrule assemblies." I have been informed that I am to interpret and apply the claims as they are written and that I cannot take a construction different than the plain meaning of the claim language. The only grammatical interpretation of this phrase is that the claimed ferrule seats are part of the ferrules, not the ferrule holders or connector housing. It

is therefore unclear to a POSA what structural feature a ferrule needs to have in order for the ferrule to have a "ferrule seat" as claimed.

75. Therefore, in my opinion, claim 12 is indefinite.

76. I have been informed that dependent claims also are invalid for being indefinite if the claim the dependent claims depend from is indefinite. Dependent claim 13 depends from claim 12. Therefore, in my opinion, dependent claim 13 is invalid for being indefinite because it depends from claim 12.

VI. LACK OF WRITTEN DECRIPTION (GROUND 2)

77. As I stated in Paragraph 16 above, it has been explained to me that a claim is invalid for lacking written description support if the specification of the '994 Patent does not reasonably convey to a person of ordinary skill in the art that the inventors had possession of the claimed subject matter as of the filing date of the '994 Patent.

78. In my opinion, claims 1-15 are invalid for lack of written description support.

A. Claim 1 (and Dependent Claims 2-15) Lacks Written Description

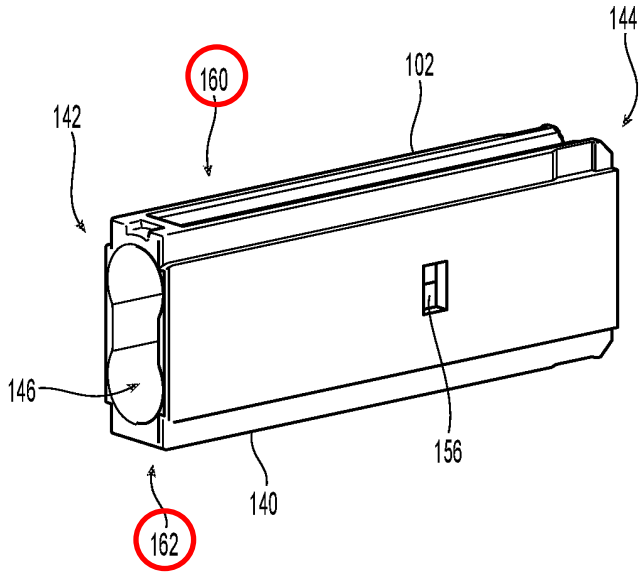
79. In my opinion, claim 1 is invalid for lack of written description support.

80. Claim 1 recites that "a first projection on the top surface and a second projection on the bottom surface of the housing, wherein the first projection is of a ***different size*** than the second projection."

81. In my opinion, the specification of the '994 Patent contains no reference or indication that US Conec was in possession of this limitation.

82. The '994 Patent describes three different embodiments of fiber optic connectors (100, 1100, 2100), each having slightly different housings (102, 1102, 2102). EX1001: 4:55-58, 10:51-54, 16:8-31, Figs. 5, 25, 39.

83. The housing (102), shown below, of the first embodiment of the fiber optic connector (100) of the '994 Patent, has a top surface (160) and a bottom surface (162). EX1001: 5:56-57. With particular focus on Fig. 6 below, there are no projections on the top and bottom surfaces (160, 162) of this embodiment of the housing (102), let alone different sized projections.



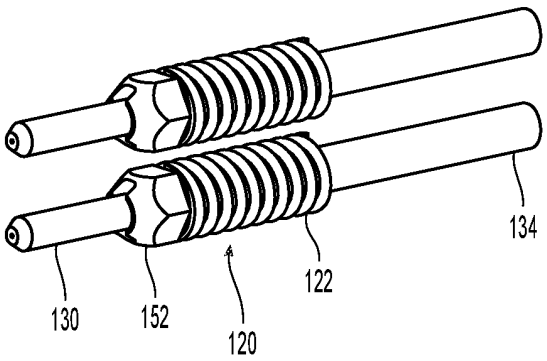


Fig. 3

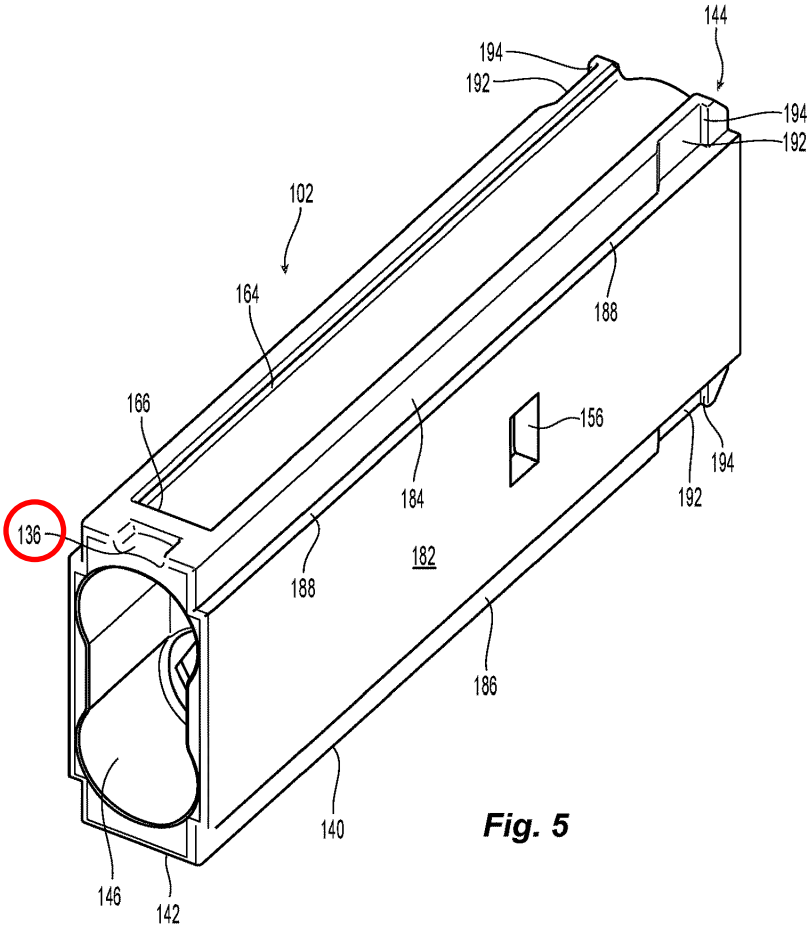


Fig. 5

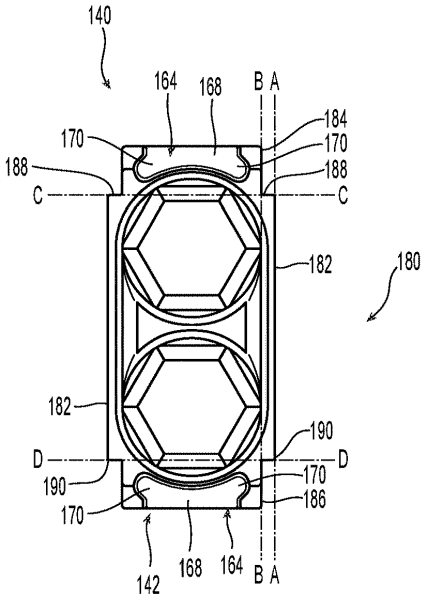


Fig. 6

EX1001: Figs. 3, 5, and 6 (annotated).

84. In fact, the '994 Patent explains "[t]he top and bottom surfaces 160, 162 are ***preferably the same***, with the exception of the indicia 136, as one of the two surfaces 160, 162 would not have it." EX1001: 5:57-60. However, as shown in Fig. 5 above, the indicia (136) is a recess on only one of the surfaces (i.e., top surface (160)), not a projection.

85. Moreover, the specification of the '994 Patent is of no help as the specification never uses the term "projection" as a name or description of any component on the top or bottom of the first embodiment of the housing (102). EX1001: 4:55-10:50.

86. If it is argued that the latch component (104) is a projection, I note that the fiber optic connector (100) only includes one latch component (104) connected to either the top or bottom of the housing (102). EX1001: 8:30-50. So even if the latch component (104) is a projection, there is still no "second projection" as recited by claim 1.

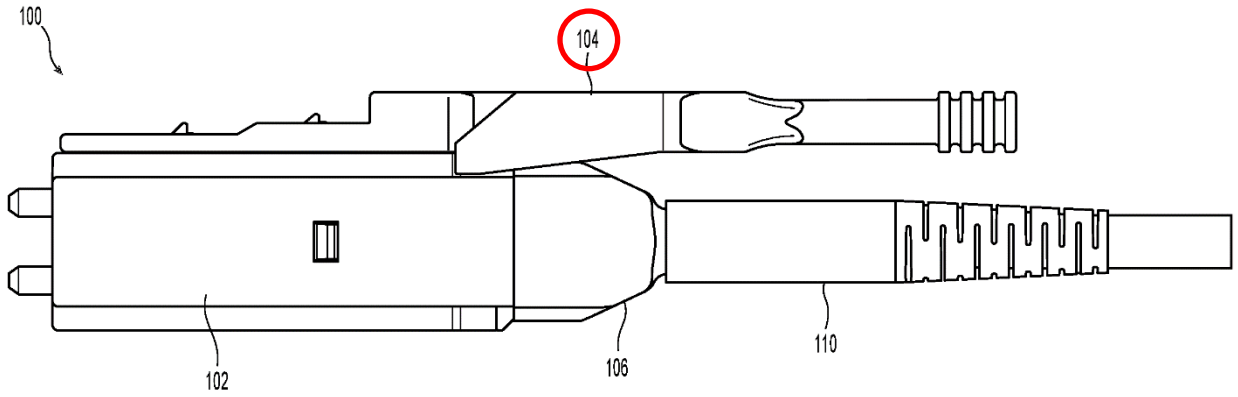


Fig. 1

EX1001: Fig. 1 (annotated).

87. Turning to the second embodiment of the fiber optic connector (1100) of the '994 Patent, the housing (1102) has a top surface (1160) and a bottom surface (1162), as shown below. EX1001: 11:50-51.

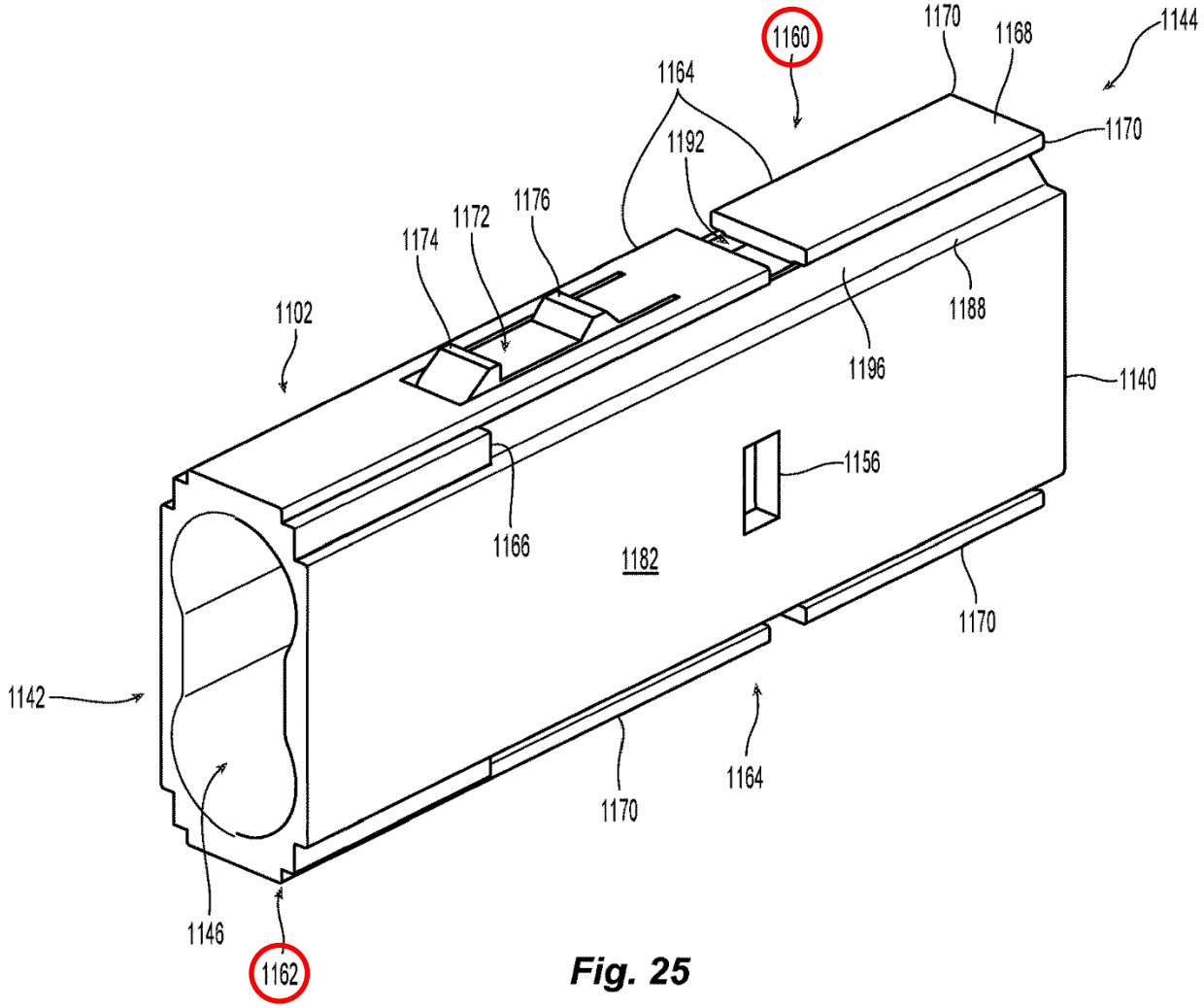


Fig. 25

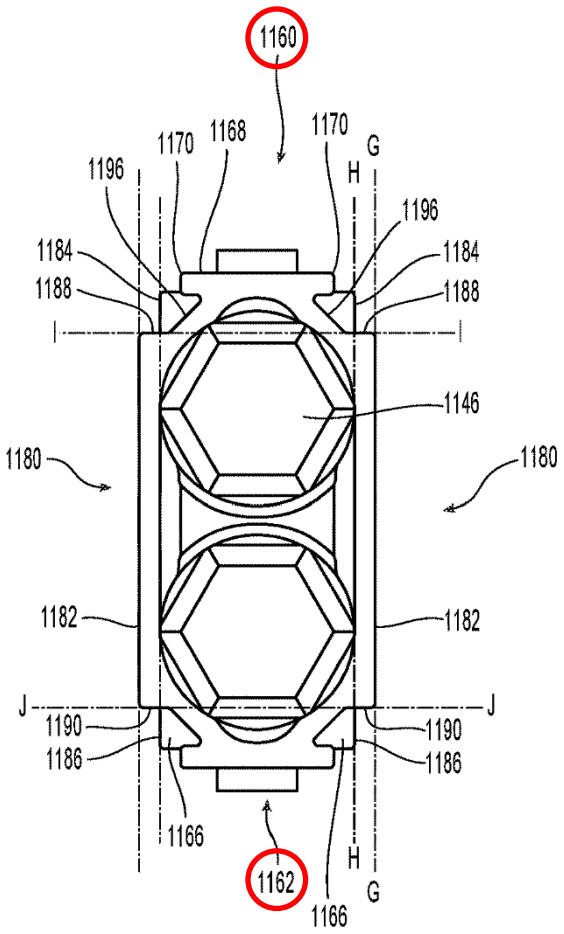


Fig. 26

EX1001: Figs. 25 and 26 (annotated).

88. In this embodiment, the top and bottom surfaces (1160, 1162) each include a latch (1172) having an engagement surface (1174) and a release ramp (1176). EX1001: 12:39-41.

89. If it is argued that the latches (1172) are projections, I note that the latches (1172) on the top and bottom surfaces (1160, 1162) are identical, and therefore do not support "the first projection [being] of a ***different size*** than the second projection" as recited by claim 1. EX1001: Figs. 24, 26, and 33, 11:51-52.

90. Further, claim 4 states that "the first projection and the second projection determine a ***correct orientation*** or ***polarity*** of the housing during an insertion into an adapter." The latches (1172) do not perform either of these functions. First, the latches (1172) only secure the fiber optic connector (1100) to the adapter (1400). EX1001: Fig. 41-43, Fig. 35. And second, only one latch (1172) is used to secure the fiber optic connector (1100) to the adapter (1400)—the latch connected to the latch component (1104). EX1001: Fig. 35, 15:20-33. The other latch (1172)—the latch not connected to the latch component (1104)—serves no function when the fiber optic connector (1100) is being inserted into the adapter (1400). EX1001: Fig. 35.

91. For this second embodiment, the '994 Patent again explains "[t]he top and bottom surfaces 1160, 1162 are ***preferably the same***." EX1001: 11:51-52. And the specification of the '994 Patent is again of no help as the specification never uses the term "projection" as a name or description of any component on the top or bottom of the second embodiment of the housing (1102). EX1001: 10:51-16:7.

92. If it is argued that the latch component (1104) as being a projection, I again note that the fiber optic connector (1100) only includes one latch component (1104) connected to either the top or bottom of the housing (1102). EX1001:

12:39-50. So even if the latch component (1104) is a projection, there is still no "second projection" as recited by claim 1.

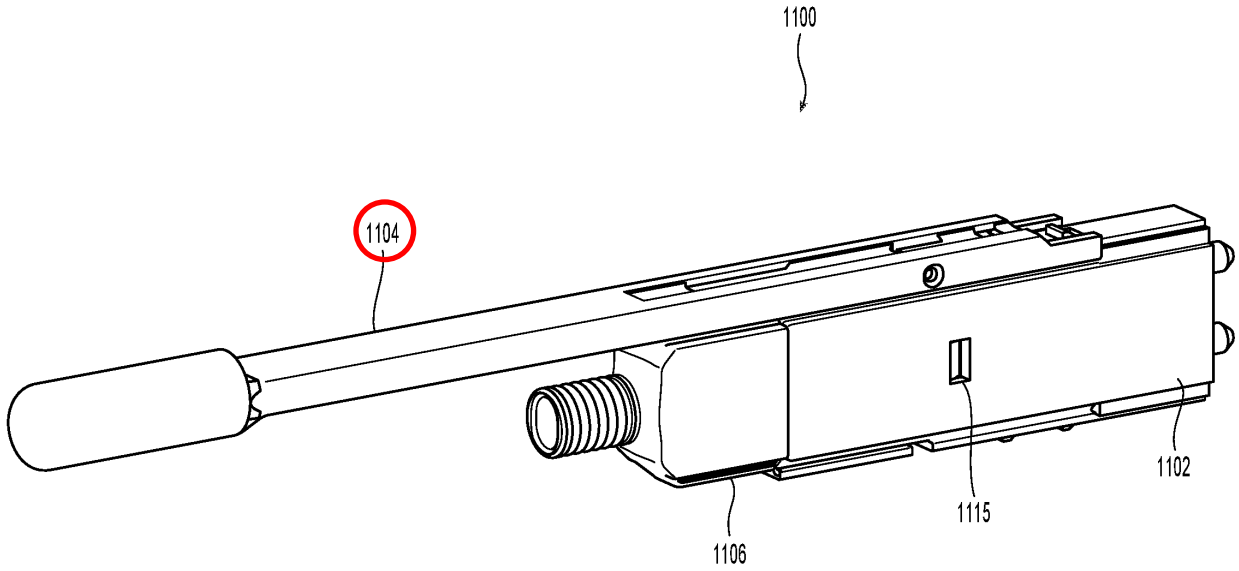


Fig. 23

EX1001: Fig. 23 (annotated).

93. Turning to the third embodiment of the fiber optic connector (2100) of the '994 Patent, "the fiber optic connector 2100 is similar to the other embodiments in that the majority of the parts of the fiber optic connector 2100 ***are the same***, except that the latch component (push-pull mechanism) 2104 is a self-returning latch component (push-pull mechanism) 2104 … the discussion will be about the latch component (push-pull mechanism) 2104 and ***small changes*** to the housing 2102." EX1001: 16:10-31.

94. With reference to Figs. 39 and 48 below, these "small changes" to the housing (2102) do not include the addition of different sized projections on top and bottom surfaces of the housing (2102). Instead, the "small changes" appear to only be in the configuration of the rail receiving portions (as comparted to the rail receiving portions (164) in Fig. 5), such as a shorter length.

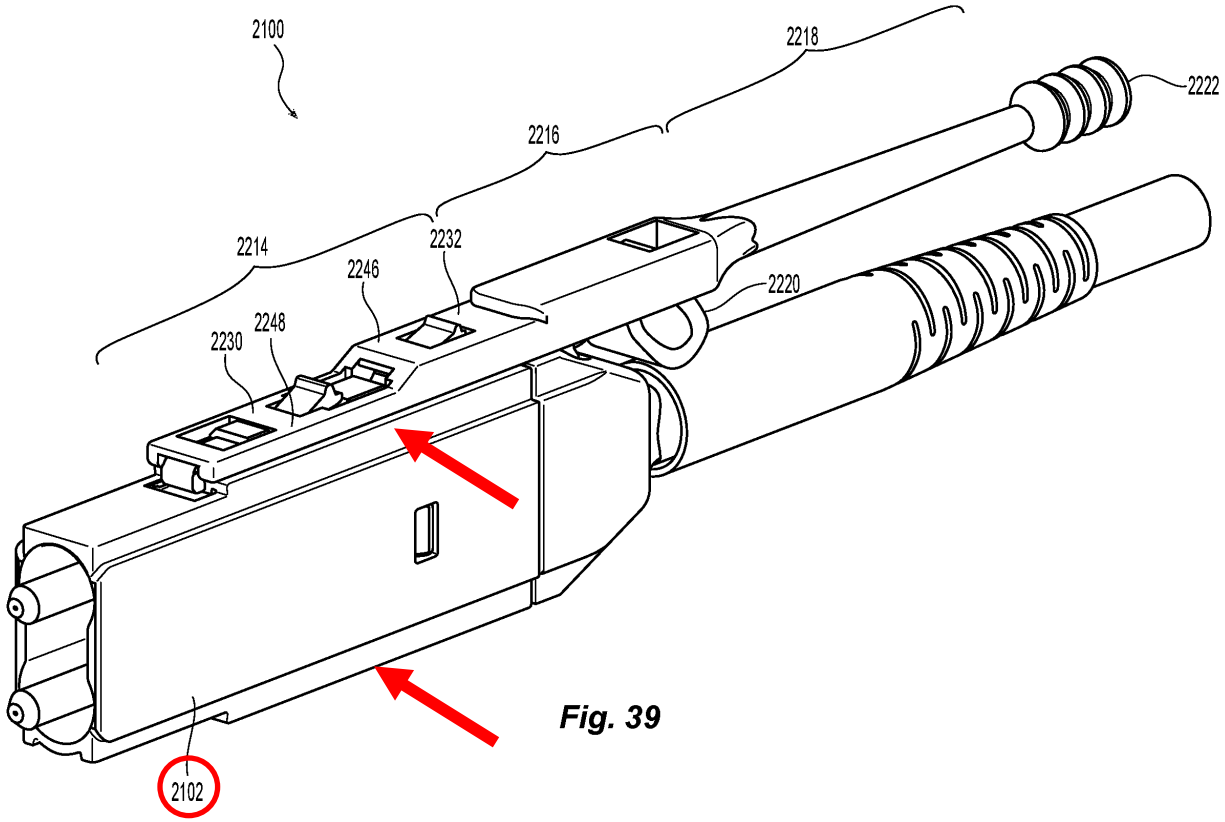


Fig. 39

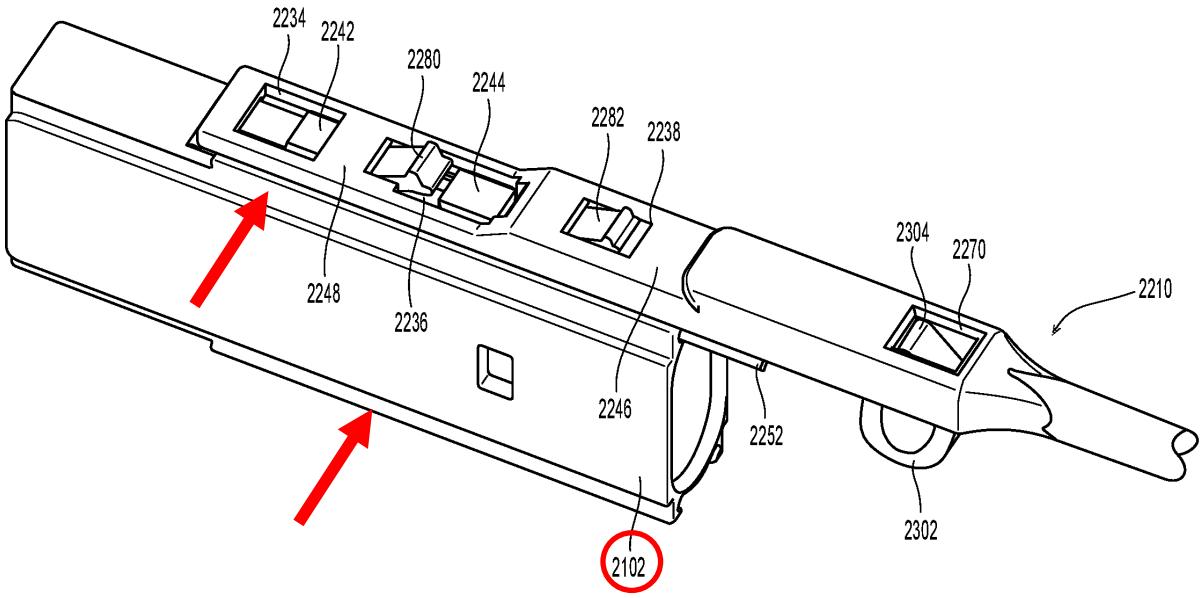


Fig. 48

EX1001: Figs. 39 and 48 (annotated).

95. Again, if it is argued that the latch component (2104) is a projection, I again note that the fiber optic connector (2100) only includes one latch component (2104) connected to either the top or bottom of the housing (2102). EX1001: Fig. 39, 17:7-9. So even if the latch component (2104) is a projection, there is still no "second projection" as recited by claim 1. Again, the specification repeatedly teaches that the top and bottom walls of the connector housing are identical. The presence of a latch component on one of two identical walls does not convey possession of "a first projection on the top surface and a second projection on the bottom surface of the housing, wherein the first projection is of a ***different size*** than the second projection."

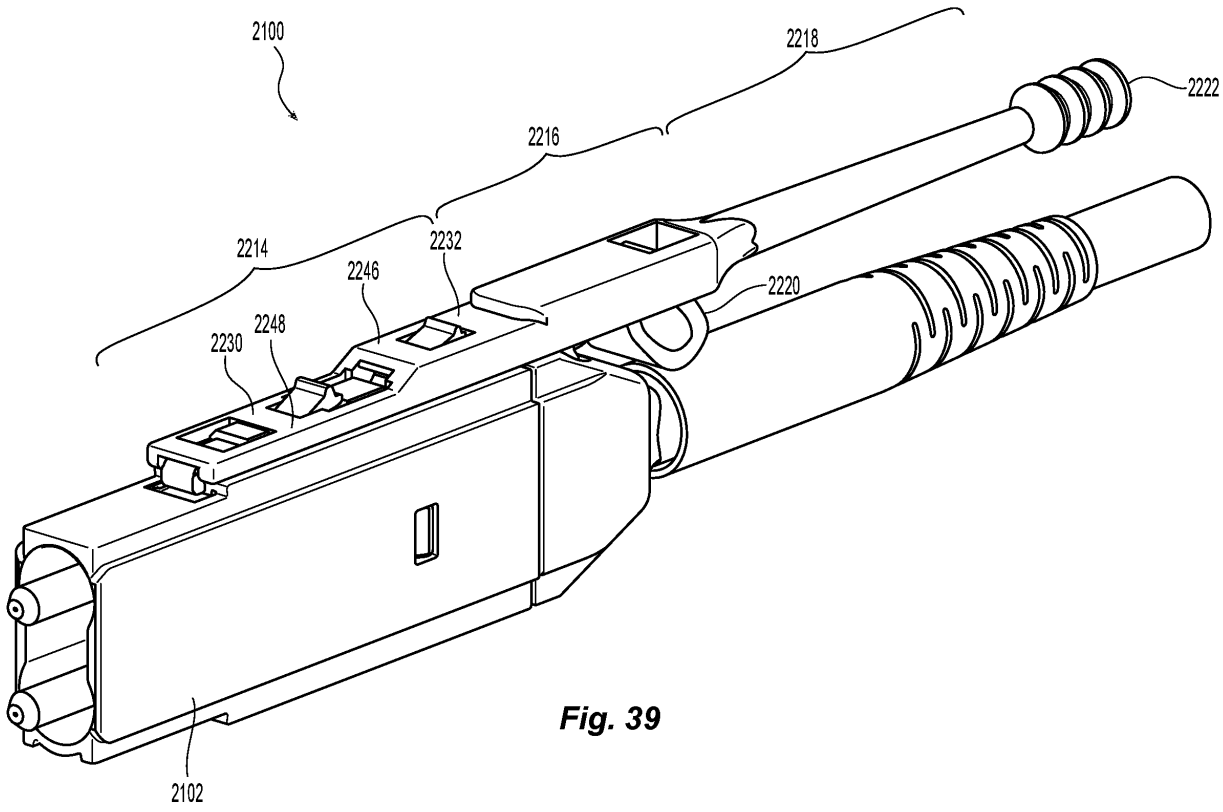


Fig. 39

EX1001: Fig. 39.

96. Thus, in my opinion, none of the three embodiments of the fiber optic connector (1001, 1100, 2100) of the '994 Patent demonstrate US Conec was in possession of "a first projection on the top surface and a second projection on the bottom surface of the housing, wherein the first projection is of a ***different size*** than the second projection," as recited by claim 1.

97. Therefore, in my opinion, claim 1 is invalid for lack of written description support.

98. I have been informed that dependent claims also are invalid for lack of written description support if the claim the dependent claims depend from lacks

written description support. Claims 2-15 depend from independent claim 1. Therefore, in my opinion, dependent claims 2-15 are invalid for lack of written description support because these claims depend from independent claim 1.

B. Claim 12 (and Dependent Claim 13) Lacks Written Description

99. In my opinion, claim 12 is invalid for lack of written description support.

100. Claim 12 recites that "each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ***ferrule seats*** of the fiber optic ferrules of each of the ferrule assemblies." In my opinion, the specification of the '994 Patent contains no reference or indication that US Conec was in possession of this limitation.

101. I have been informed that I am to interpret and apply the claims as they are written and that I cannot take a construction different than the plain meaning of the claim language. As I explained in Section V(A), the plain grammatical interpretation of this claim is that the "ferrule seats" ***are part of*** the "ferrules," not another component such as a ferrule holder or collar.

102. The specification of the '994 Patent never uses the term "ferrule seat." Further, the specification of the '994 Patent never shows or describes the ferrules (130, 1130) themselves as including any additional component. EX1001: 4:65-5:5, 10:63-11:4. Instead, the specification states:

> The two ferrule assemblies 120 each include a fiber optic ferrule 130 (generally a 1.25 mm LC fiber optic ferrule), a ferrule holder 132, and a lead-in tube 134. The spring 122 is added later. The ferrule assemblies 120 are preferably preassembled and are inserted into the housing 102 without needing any further processing. EX1001: 4:67-5:5.

103. In addition, the specification of the '994 Patent never shows the ferrules (130, 1130) themselves as including any additional component. EX1001: 4:65-5:5, 10:63-11:4.

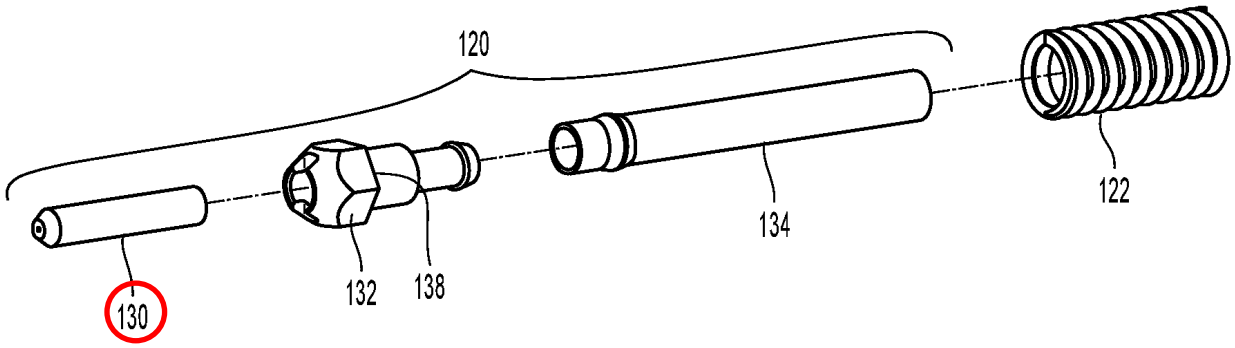


Fig. 3A

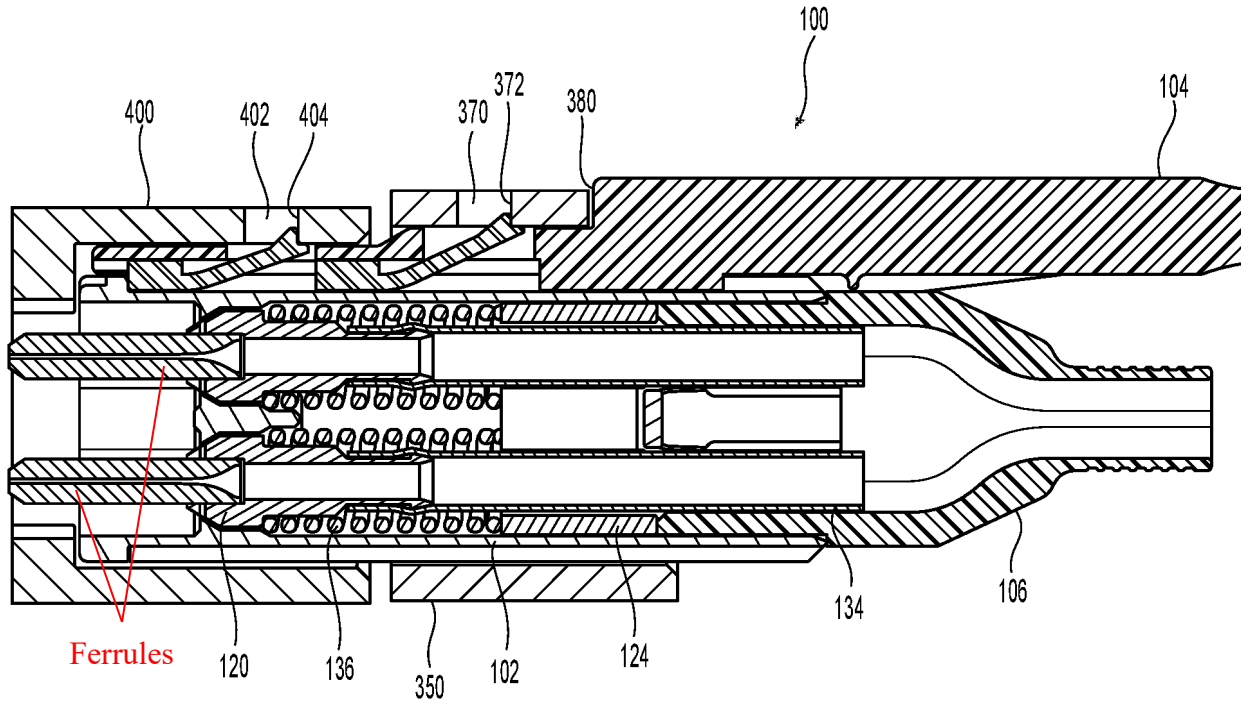


Fig. 21

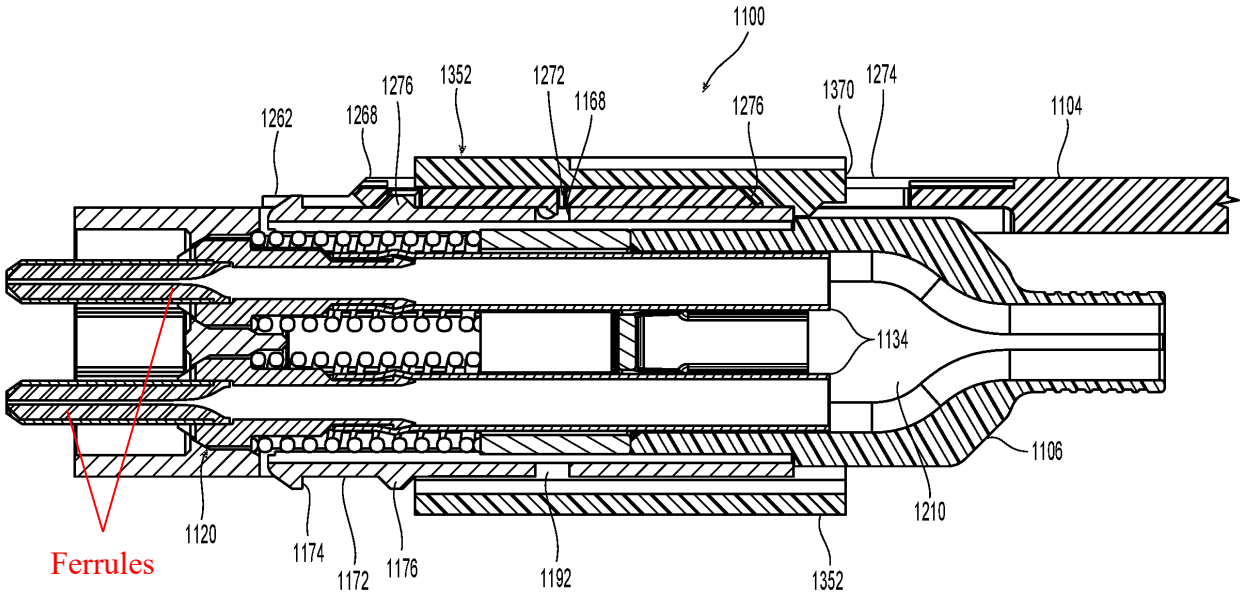


Fig. 33

EX1001: Figs. 3A, 21, and 33 (annotated).

104. Therefore, in my opinion, claim 12 is invalid for lack of written description support.

105. I have been informed that dependent claims also are invalid for lack of written description support if the claim the dependent claims depend from lacks written description support. Dependent claim 13 depends from claim 12. Therefore, in my opinion, dependent claim 13 is invalid for lack of written description support because it depends from claim 12.

VII. ANTICIPATION: TAKANO'209 (GROUND 3)

106. In my opinion, claims 1-13 are anticipated by Takano'209.

107. This ground is based on the first embodiment of the optical connector (300, 400, 500, 1100A-B, 1200) shown in Figs. 3-5, and 11A-12B of Takano'209.

A. Independent Claim 1

1.P "A fiber optic connector comprising:"

108. Takano'209 discloses an optical connector (300, 400, 500, 1100A-B, 1200). EX1003: ¶¶[0091]-[0093], [0105]-[0107].

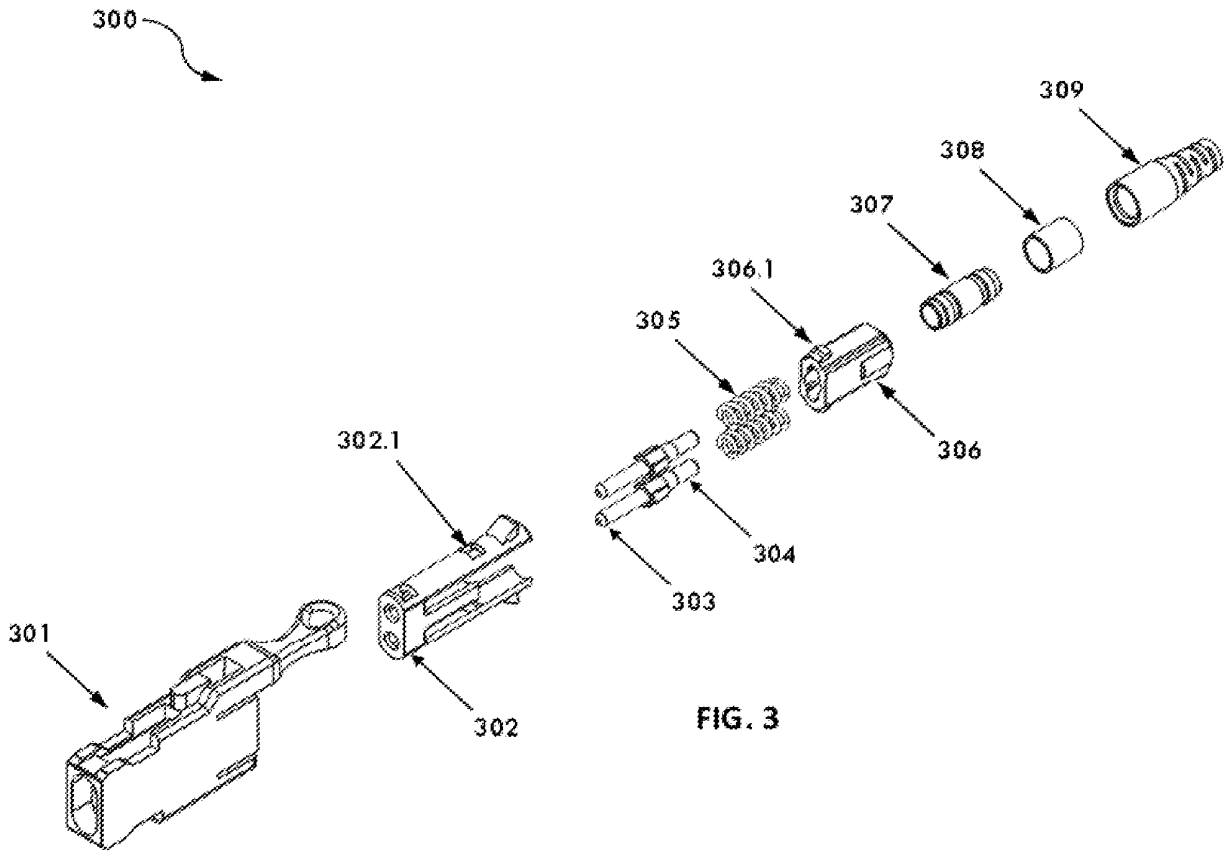


FIG. 3

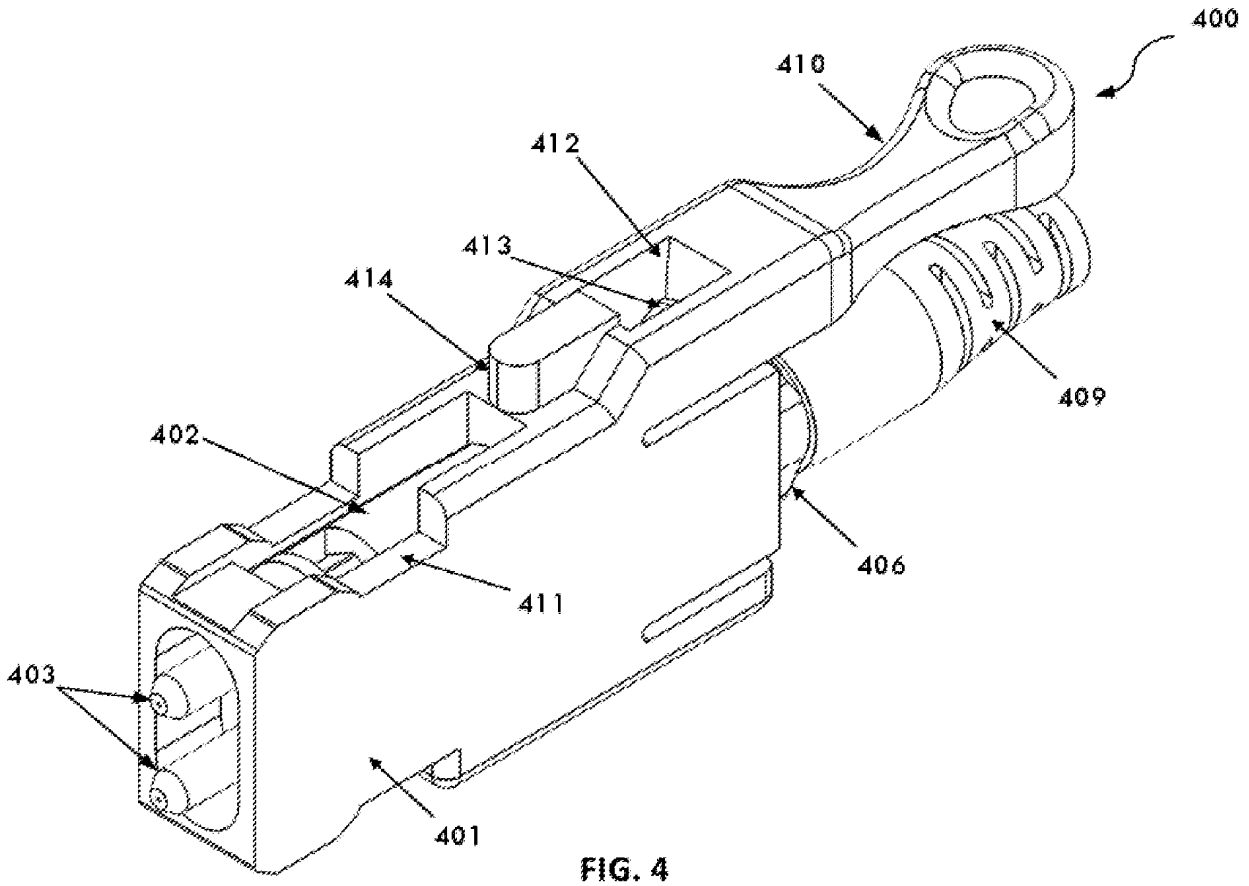


FIG. 4

EX1003: Figs. 3 and 4.

109. Although different reference numbers are used—e.g., 300, 400, 500, 1100A-B, 1200—, the POSA would recognize that these reference numbers all indicate the same optical connector and components thereof. EX1003: ¶¶[0091]-[0093], [0105]-[0107]; Figs. 3-5, and 11A-12B. As illustrated, the components of the connectors (300, 400, 500, 1100A-B, 1200) are essentially identical. Likewise, the description of these connectors (300, 400, 500, 1100A-B, 1200) uses the same names for identical component parts. EX1003: ¶¶[0091]-[0093], [0105]-[0107]. The description also builds on itself when describing these connectors (300, 400,

500, 1100A-B, 1200). EX1003: ¶¶[0091]-[0093], [0105]-[0107]. For example, when explaining the connector (500) of Fig. 5, the description explains Fig. 4 shows the front body attached to the outer housing. EX1003: ¶[0093]. Likewise, when explaining Figs. 12A-B, the description refers to the front body shown in Fig. 5 and the windows shown in Fig. 4. EX1003: ¶[0107]. Further, when introducing the connector (300) of Fig. 3, the description states "a connector 300." EX10039: ¶[0091]. But when introducing the subsequent connectors (400, 500, 1100A-B, 1200) of Figs. 4, 5, and 11A-12B, the description states:

- "an embodiment is shown wherein the connector 400." EX1003: ¶[0092].
- "FIG. 5 depicts a procedure for changing the polarity of the optical connectors of the present disclosure. As shown in FIG. 5, in some embodiments, the latching mechanism of the connector 500 may be made up of two main parts: a window (not visible) and one or more protrusions 513." EX1003: ¶[0093].
- "Accordingly, in some embodiments, the receptacle 1114 may have a receptacle hook 1115, which is flexible and can secure the connector 1100A into the receptacle via latching onto the wall of the recess 1111, as shown." EX1003: ¶[0105].
- "Additionally or alternatively, in some embodiments, such as that shown in FIG. 11B, a connector 1100B may be removed from a receptacle 1114 by pulling the connector away from the adapter as indicated by the directional arrow." EX1003: ¶[0106].

110. These statements tell the reader that the description is referencing and adding more description pertaining to the earlier described connectors.

111. The POSA would also understand that Fig. 13 shows a connection system and illustrates how four of the same connector (300, 400, 500, 1100A-B,

1200) would mate with a quad adapter (1314). The adapter (1314) of Fig. 13 is described as receiving an optical connector (800) of Fig. 8 with a four body outer housing (801) with four push-pull tabs (1310). EX1003: ¶[0108]. While described in relation to the connector (800) of Fig. 8, the POSA understands that Fig. 13 also illustrates how four connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B would look when mounted in the adapter (1314). EX1003: ¶[0107]. This is apparent given the similar construction of the connector (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B and the connector (800) of Fig. 8, especially with respect to the push-pull tabs, the back bodies, and the boot. EX1003: ¶¶[0091]-[0093], [0099].

112. And upon closer examination, the adapter (1314) of Fig. 13 may be for four optical connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B. Fig. 13 may in fact show four separate duplex connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B mounted in the adapter (1314). Fig. 13 shows intermediate chamfered edges/corners in the outer housing that would be present between adjacent outer housings of the individual connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B. EX1003: Fig. 13. There are no corresponding intermediate chamfered edges/corners on the corresponding four-body outer housing (801) of the connector (800) of Fig. 8. EX1003: Fig. 8.

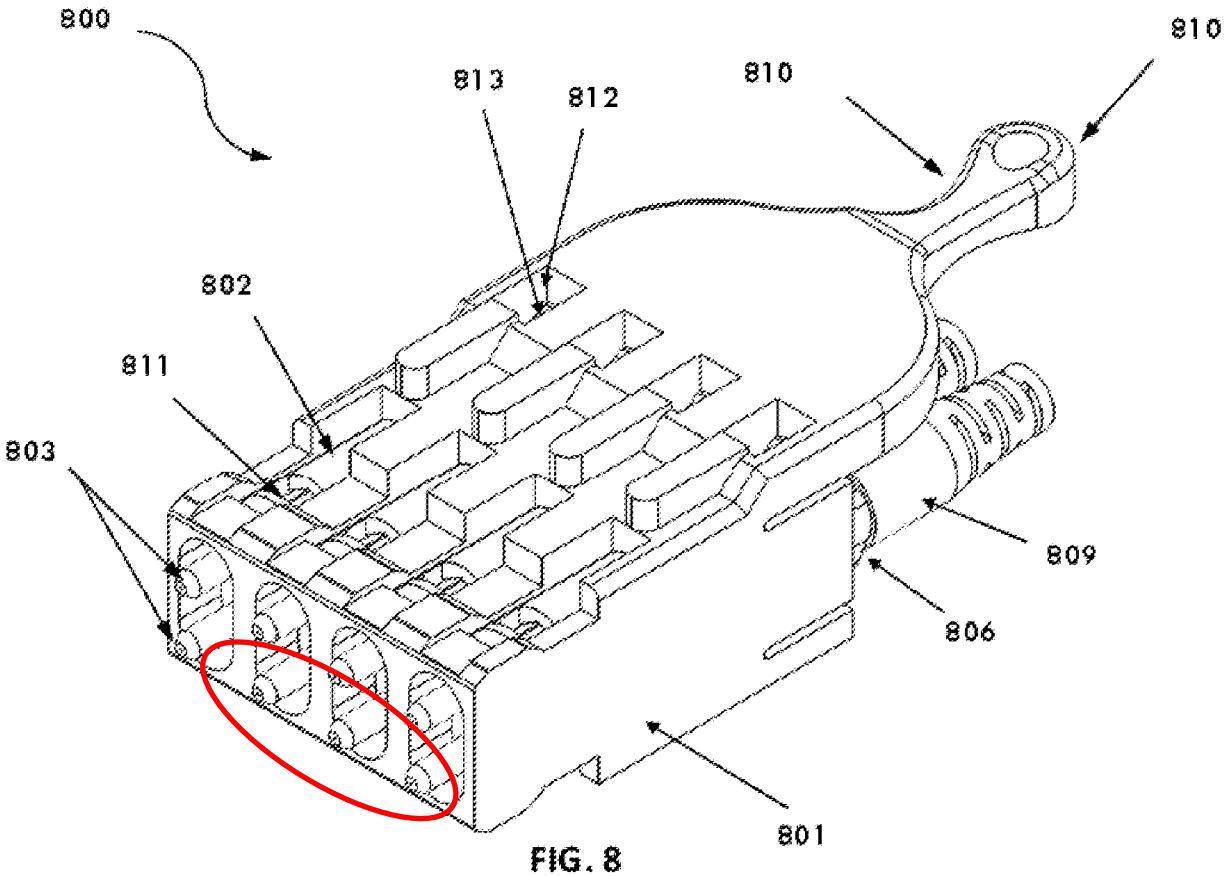


FIG. 8

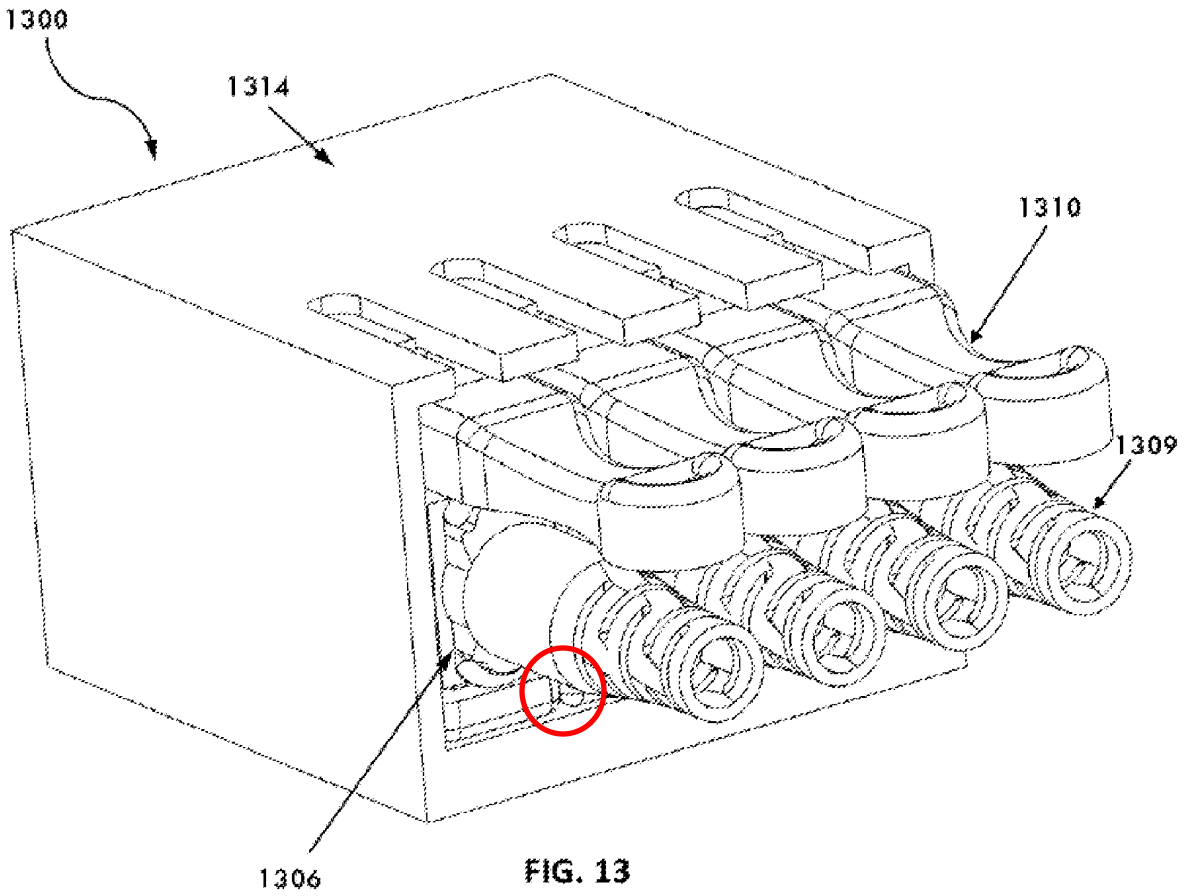


FIG. 13

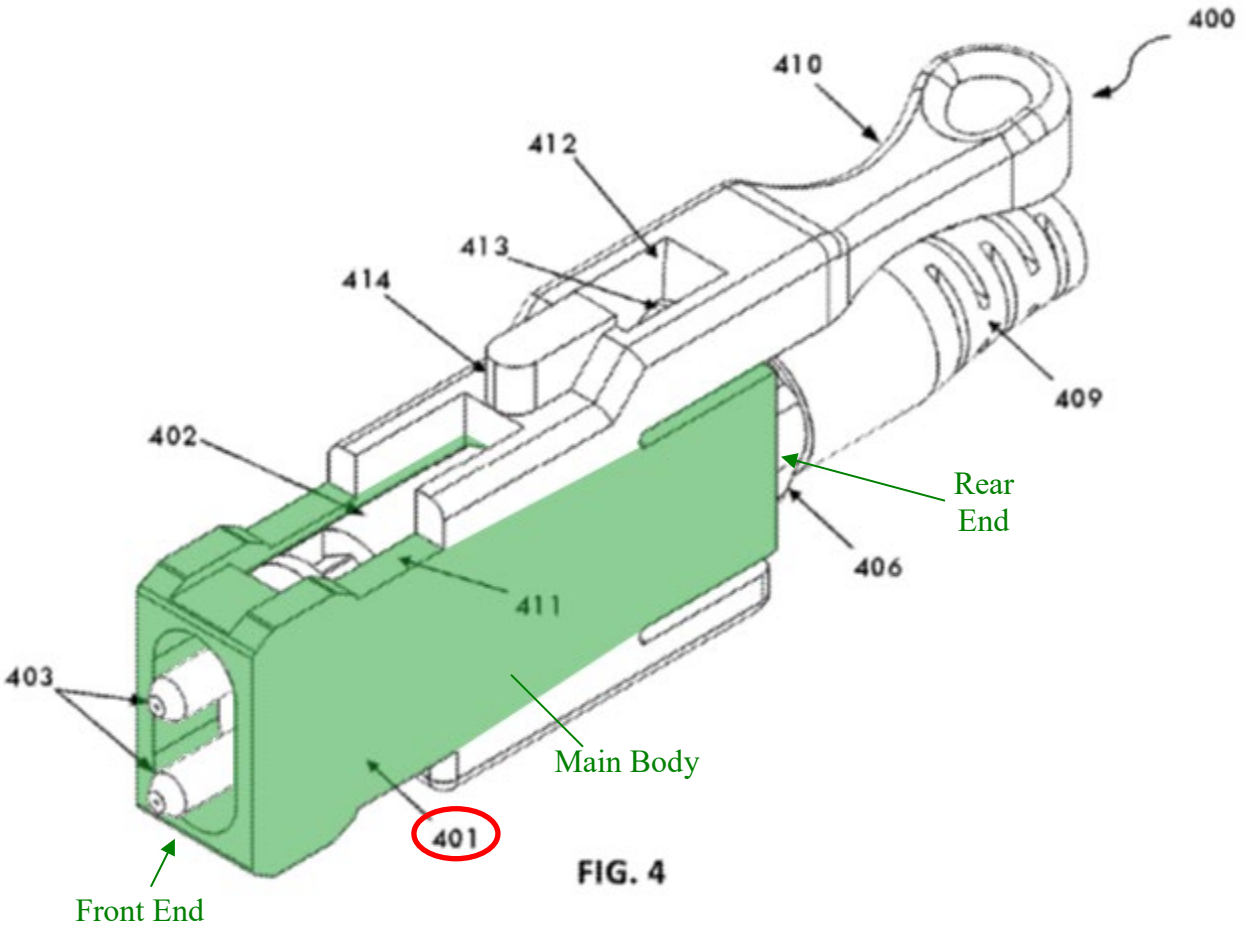
EX1003: Figs. 8 and 13 (annotated).

113. Therefore, in my opinion, Takano'209 meets this limitation.

1.a.1 "a housing having a main body extending between a front end and a rear end and having an opening extending therebetween,"

114. Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) includes an outer housing (301, 401, 501, 1101, 1201). EX1003: ¶¶[0091]-[0093], [0105]-[0107]. The outer housing (301, 401, 501, 1101, 1201) includes a main body that houses the internal components of the optical connector (300, 400, 500, 1100A-B, 1200). EX1003: Figs. 4 and 12B. The main body of the outer housing

(301, 401, 501, 1101, 1201) extends between a front end and a rear end. EX1003: Fig. 4.



EX1003: Fig. 4 (annotated).

115. The "main body" of the outer housing (301, 401, 501, 1101, 1201) is the portion of the housing piece that surrounds, protects, and houses the internal components. The push-pull tab (410, 510, 1110) extending rearward from the main body serves a different purpose and therefore would not be considered part of the "main body" of a housing as set forth in claim 1. EX1003: ¶¶[0092], [0106]. In addition, the Takano'209 repeatedly teaches that the push-pull tab (410, 510,

1110) is optional. EX1003: ¶¶[0092] ("the assembled connector may have … a push-pull tab 410") ("[a]lternatively, the push-pull tab may be eliminated"), [0106] ("when a push-pull tab is not present"). So Takano'209 expressly teaches an outer housing (301, 401, 501, 1101, 1201) devoid of a pull tab (410, 510, 1110). EX1003: ¶¶[0092], [0106].

116. The outer housing (301, 401, 501, 1101, 1201) has an opening extending between the front end and the rear end of the main body. EX1003: ¶[0093], Figs. 3-5, 12B.

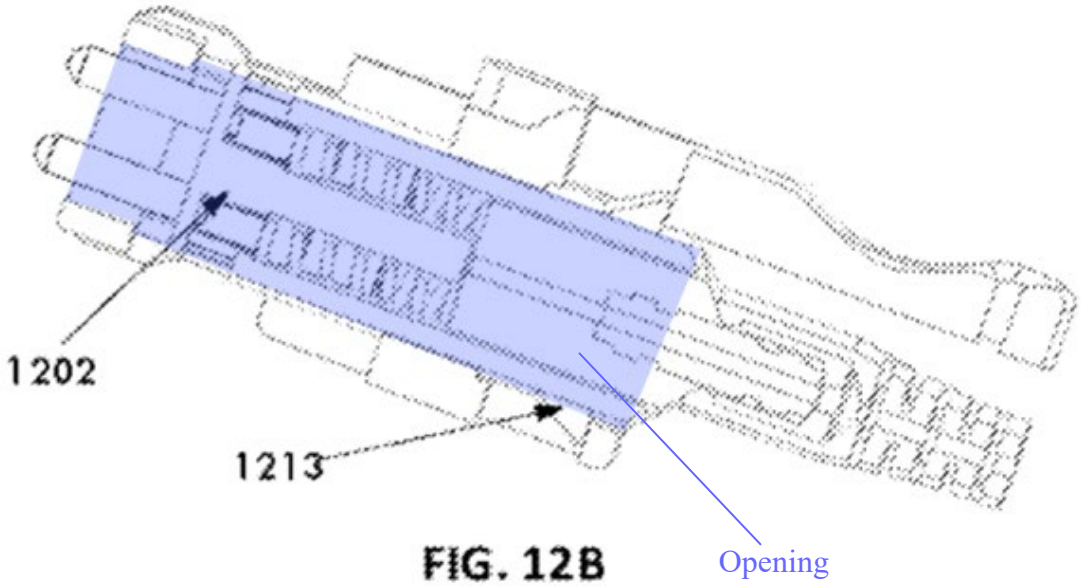


FIG. 12B

EX1003: Fig. 12B (annotated).

117. Therefore, in my opinion, Takano'209 meets this limitation.

1.a.2 "the housing having a top surface and a bottom surface joined by two opposing side surfaces such that a lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body;"

118. The outer housing (301, 401, 501, 1101, 1201) has a top surface and a bottom surface bound by two opposing side surfaces. EX1003: Figs. 4, 11A, and 12B. As shown below, the lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body.

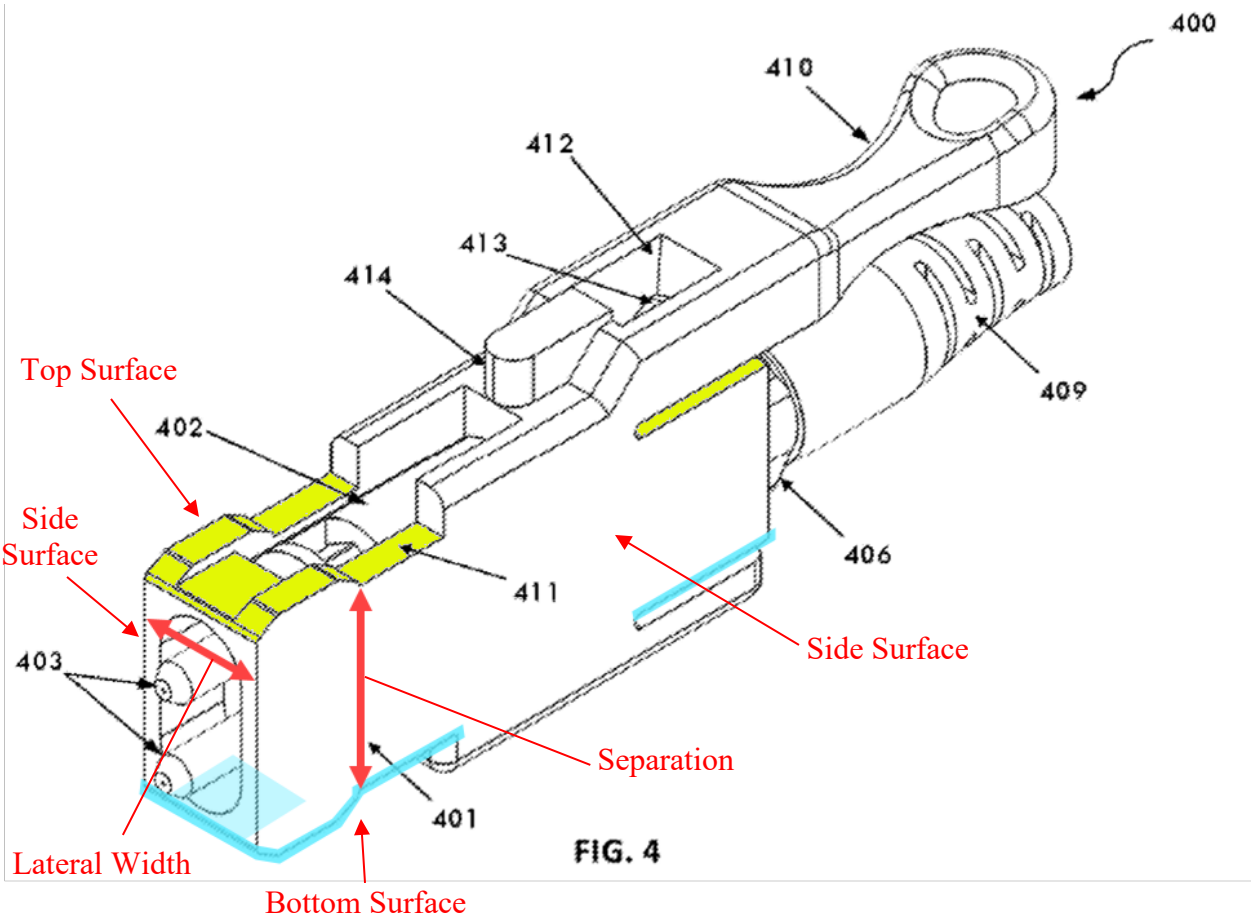


FIG. 4

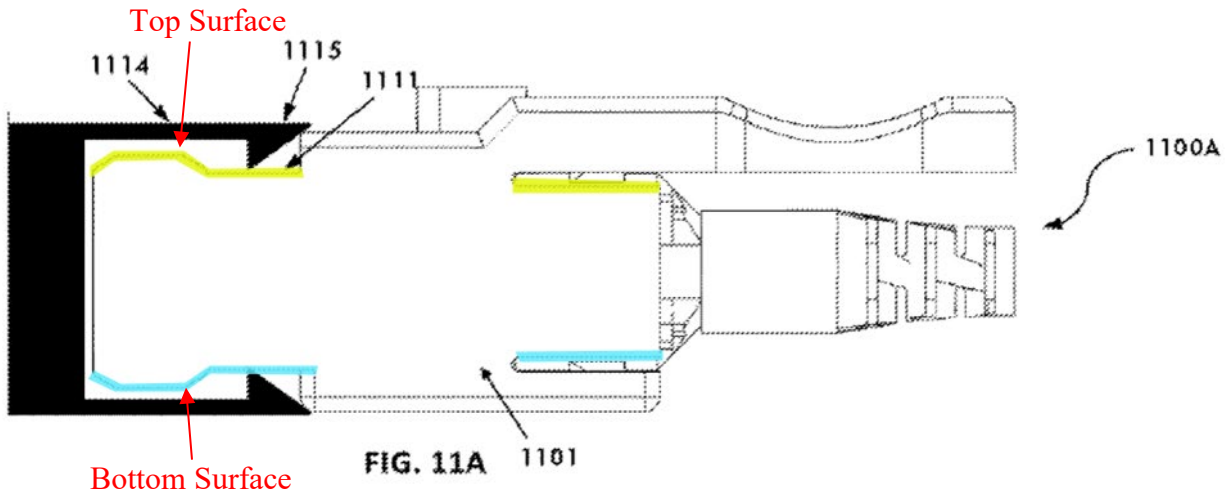


FIG. 11A

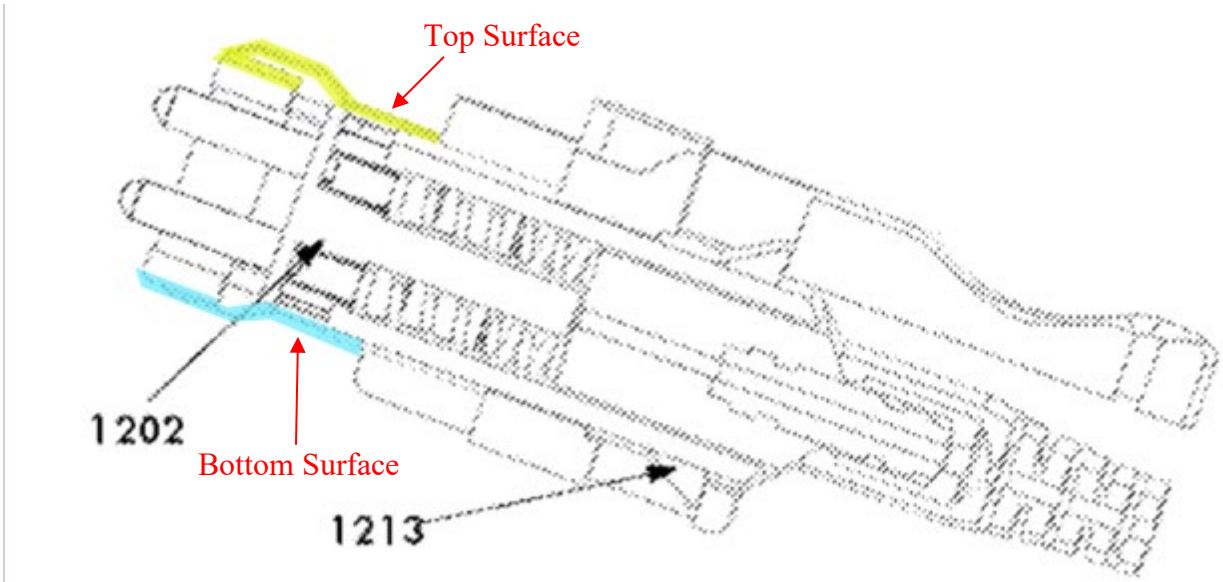


FIG. 12B

EX1003: Figs. 4, 11A, and 12B (annotated).

119. Therefore, in my opinion, Takano'209 meets this limitation.

1.b.1 "two ferrule assemblies disposed within the opening of the housing, each of the ferrule assemblies comprising a fiber

optic ferrule spaced apart from each other along the height and a ferrule holder to hold the fiber optic ferrule,"

120. The optical connector (300, 400, 500, 1100A-B, 1200) includes two ferrule assemblies, each comprising a ferrule (303, 403) and a ferrule flange (304) (i.e., ferrule holder). EX1003: ¶¶[0091]-[0092]. Each ferrule assembly is disposed within the opening of the outer housing (301, 401, 501, 1101, 1201). EX1003: Figs. 3 and 12B. The ferrules (303, 403) of the ferrule assembies are spaced apart from each other along the height of the main body. EX1003: Figs. 3, 4, and 12B.

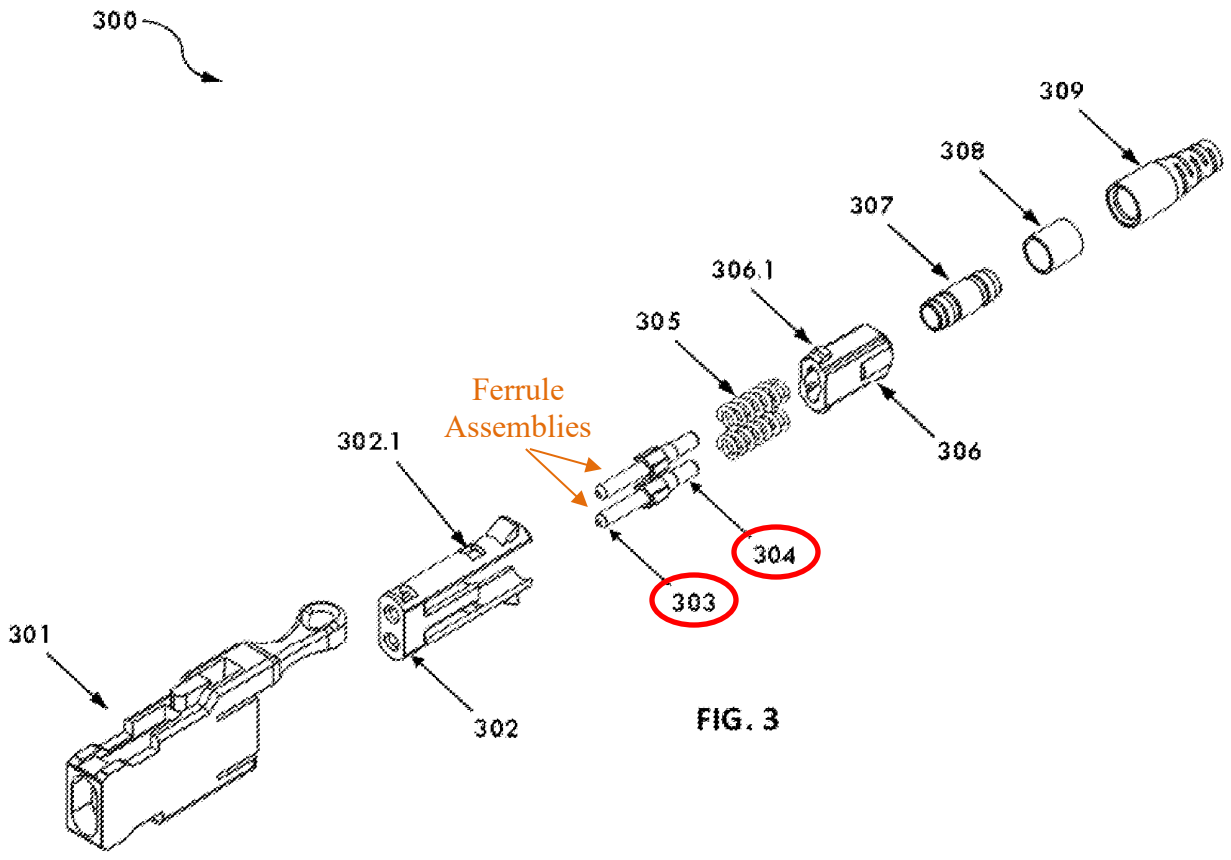


FIG. 3

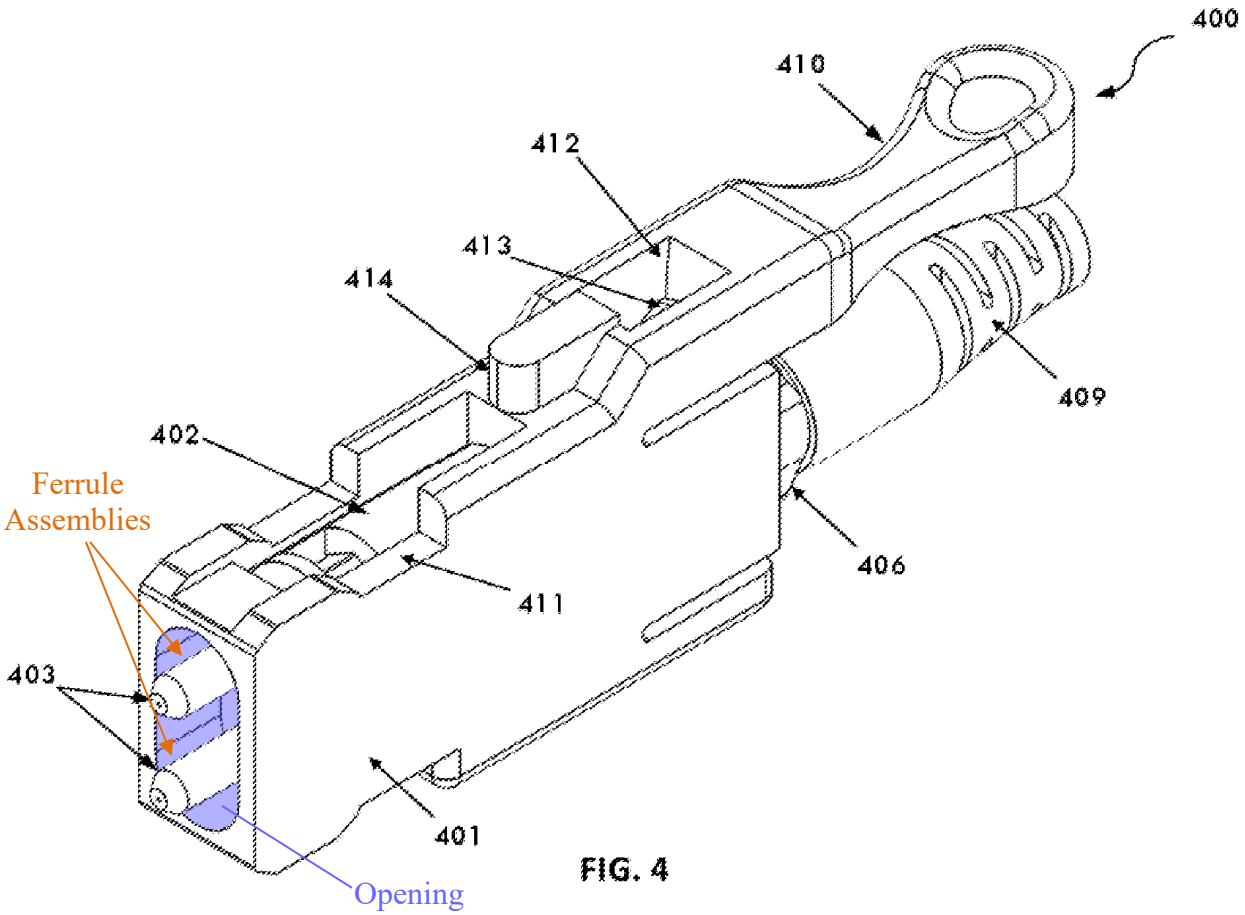

400
410
412
413
414
409
402
Ferrule
Assemblies
406
411
403
401
Opening

FIG. 4

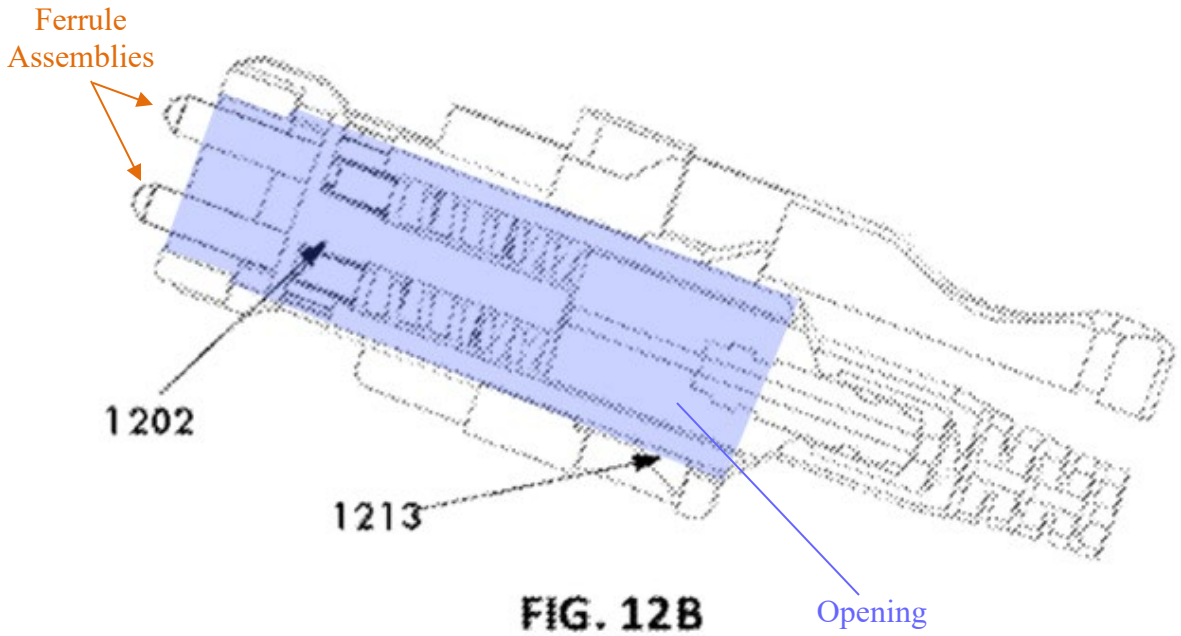


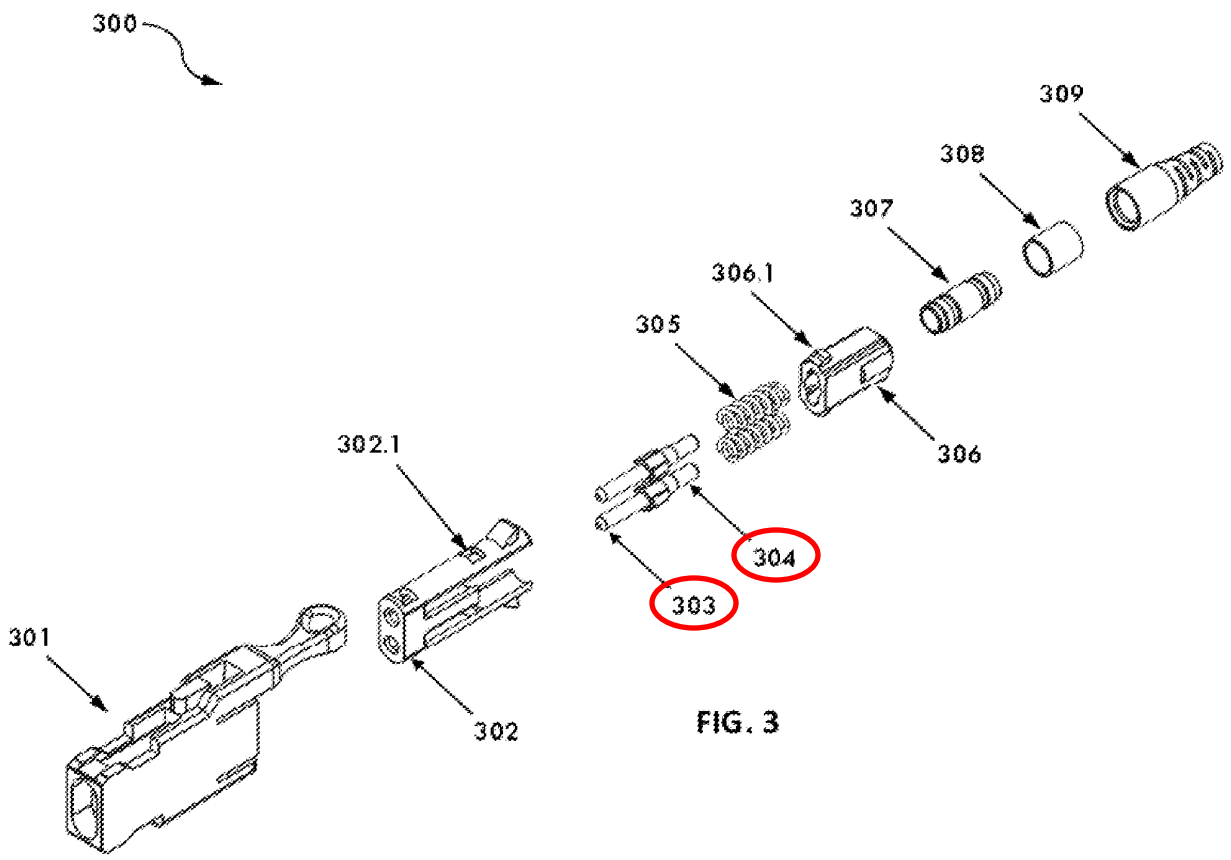
FIG. 12B

EX1003: Figs. 3, 4, and 12B (annotated).

121. Therefore, in my opinion, Takano'209 meets this limitation.

1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;"

122. Each fiber optic ferrule (303, 403) extends forward of and away from the front end of the respective ferrule holder (304). EX1003: Fig. 3.



EX1003: Fig. 3 (annotated).

123. Therefore, in my opinion, Takano'209 meets this limitation.

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;"

124. The optical connector (300, 400, 500, 1100A-B, 1200) includes two springs (305). EX1003: ¶[0091].

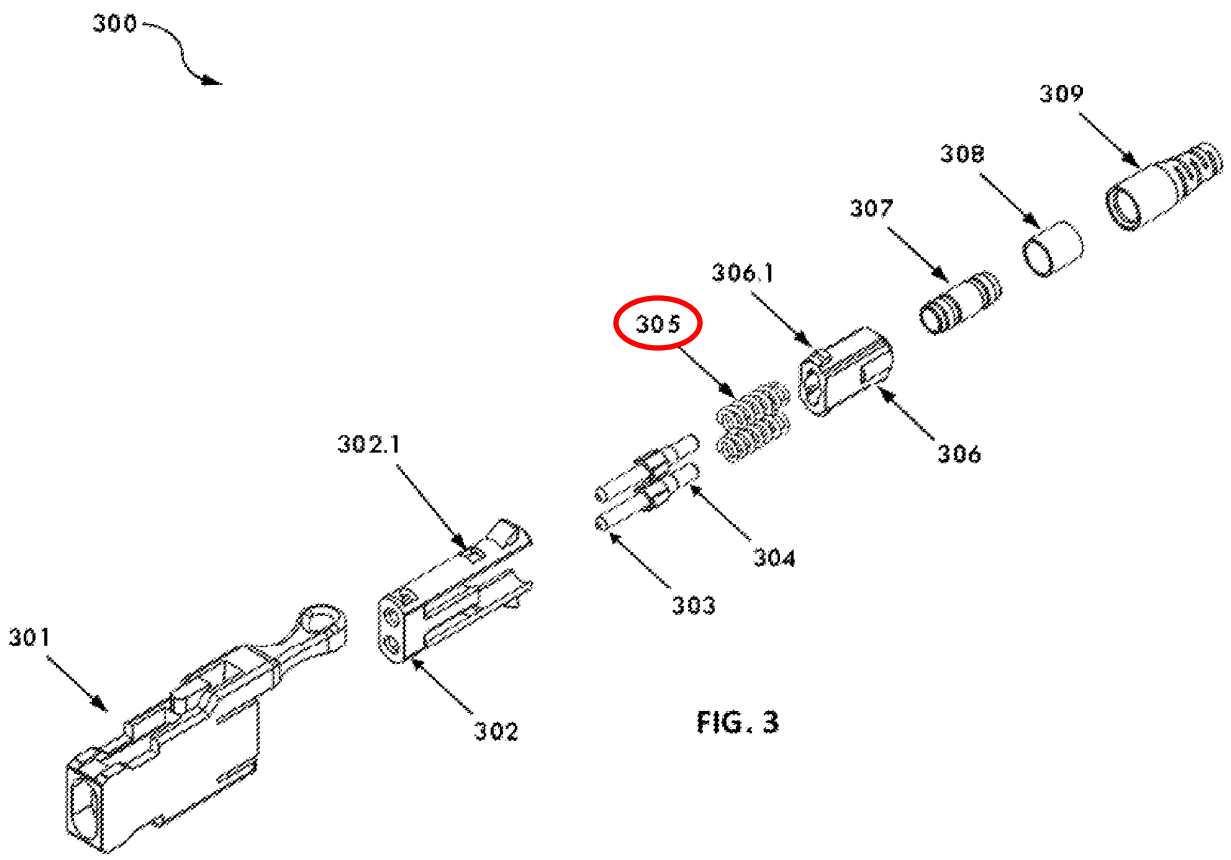
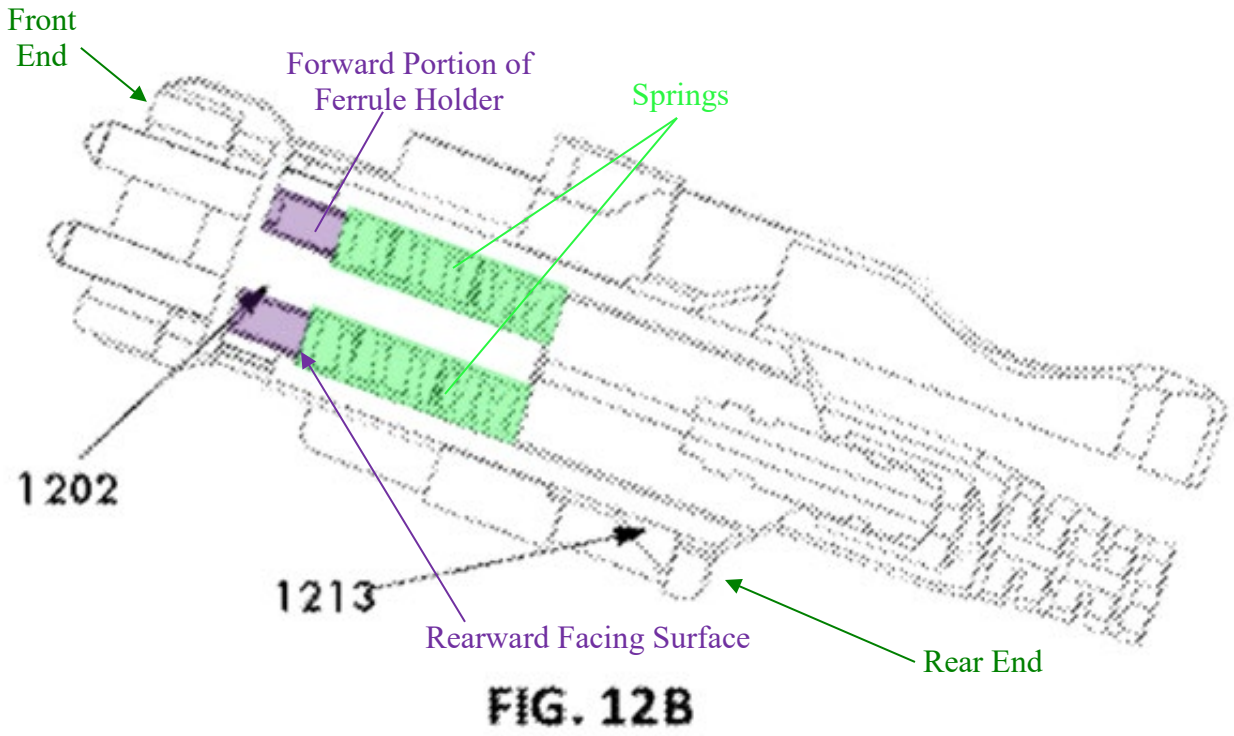


FIG. 3

EX1003: Fig. 3 (annotated).

125. Each spring (305) engages a rearward facing surface of the respective ferrule flange (304) at its front end and extends toward the rear end of the outer housing (301, 401, 501, 1101, 1201) to bias the ferrule assembly forward toward the front end of the outer housing. EX1003: ¶[0091], Fig. 12B. The ferrules (303, 403), the ferrule flanges (304), and the springs (305) are secured between the front body (302, 402, 502, 1202) and the back body (306, 406). EX1003: ¶[0091]-[0093], [0107], Figs. 3-5, and 12B. Each spring (305) is retained within the outer housing (301, 401, 501, 1101, 1201), specifically by being captured between the

ferrule flange (304) and the back body (306, 406). EX1003: ¶[0091]-[0093], [0107], Figs. 3-5, and 12B.



EX1003: Fig. 12B (annotated).

126. Therefore, in my opinion, Takano'209 meets this limitation.

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;"

127. The optical connector (300, 400, 500, 1100A-B, 1200) has a two-piece crimp body made up of the back body (306, 406) and a back post (307) that are secured to one another. EX1003: ¶¶[0091]-[0092]. The '994 Patent explains a crimp body can be two pieces secured together. EX1001: 7:20-23 ("While the crimp body 106 is illustrated as a single, unitary body (i.e., molded at one time

with one material), it could also be molded as two pieces and then later the two pieces secured to one another.").

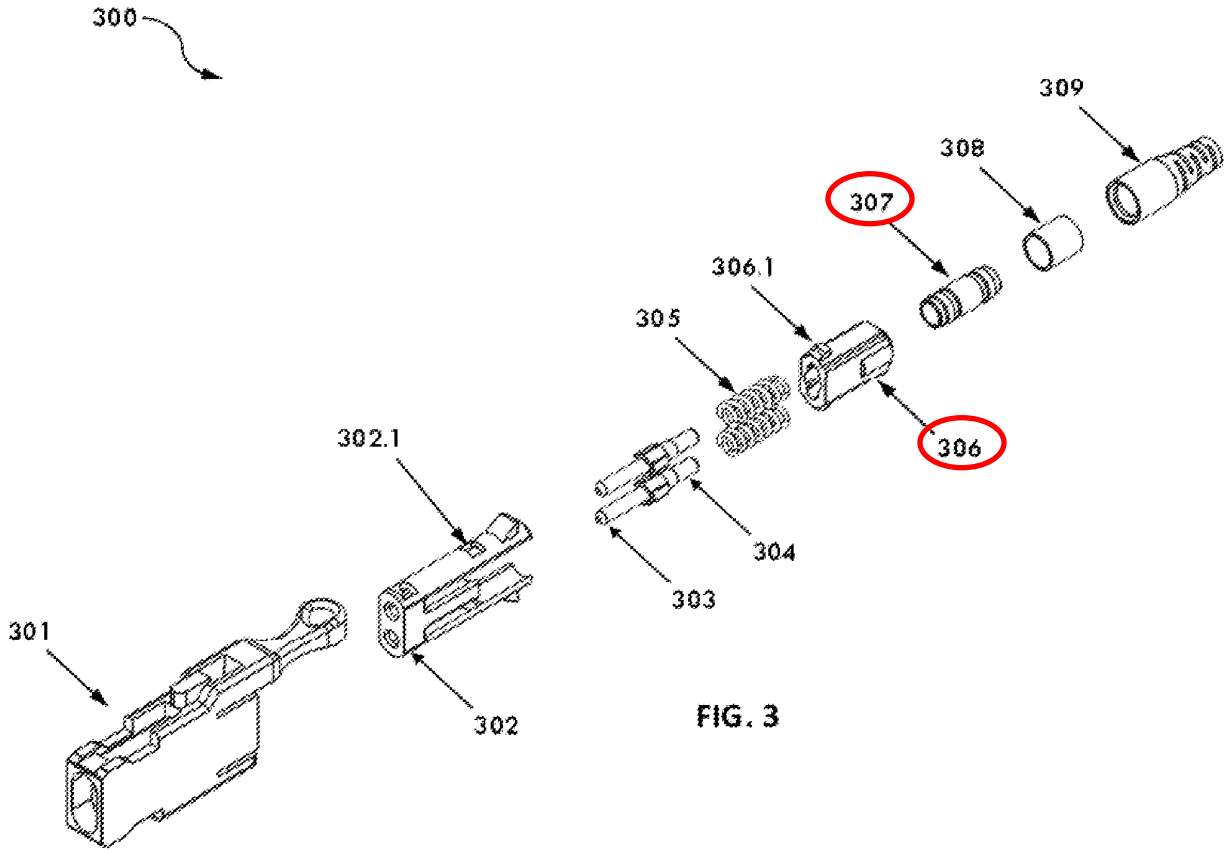


FIG. 3

EX1003: Fig. 3 (annotated).

128. The crimp body (306, 406, 307) is secured to the optical connector (300, 400, 500, 1100A-B, 1200) via protrusions (306.1) that "interlock with a window/cutout 302.1 in the front body 302." EX1003: ¶[0091].

129. The back post (307) of the crimp body has a singular opening for optical fibers at the rear end of the crimp body. EX1004: Figs. 3 and 12B. The cross section in Fig. 12B is taken through a longitudinal plane offset from center

toward the left side wall of the adapter. As a result, only a narrow segment of the singular opening is visible. The inner dimension of the opening is understood to be greater at the middle longitudinal cross sectional plane of the connector.

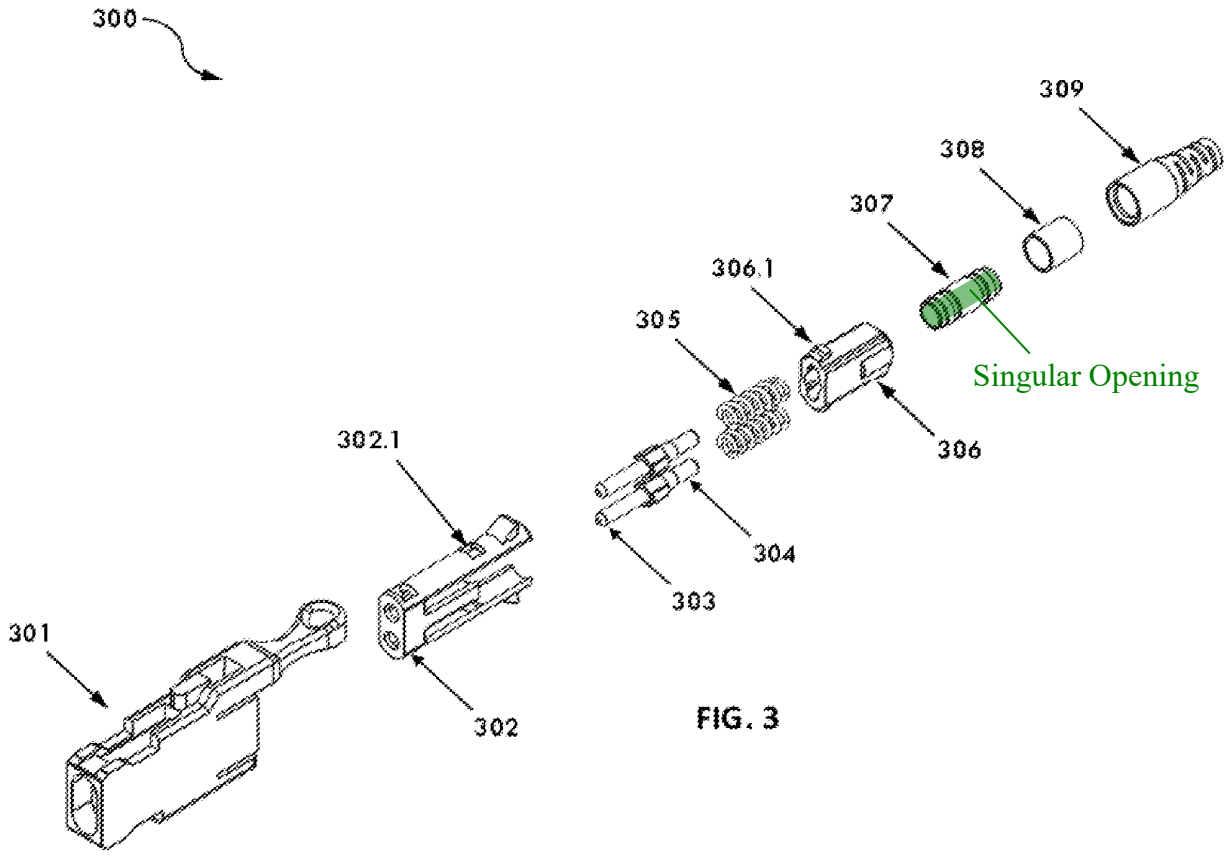


FIG. 3

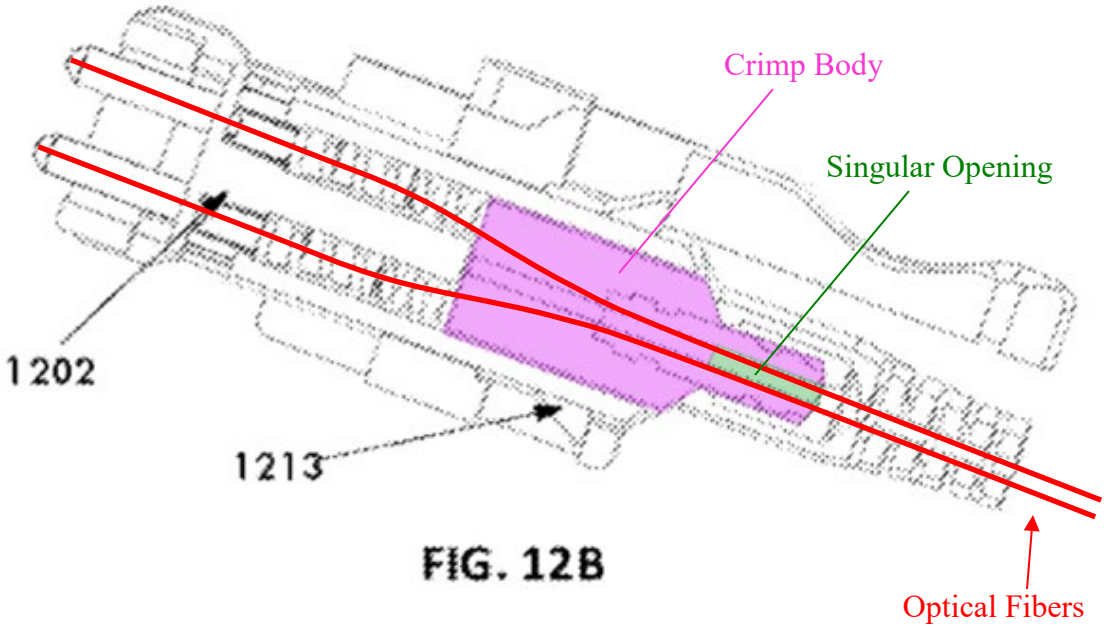


FIG. 12B

EX1003: Figs. 3 and 12B (annotated).

130. Therefore, in my opinion, Takano'209 meets this limitation.

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing,"

131. Takano'209 discloses a first projection (red) on the top surface (yellow) of the outer housing (301, 401, 501, 1101, 1201) and a second projection (orange) on the bottom surface (cyan) of the outer housing. EX1003: Figs. 4, 11A, and 12B. The first projection projects upward from the top surface, and the second projection projects downward from the bottom surface. EX1003: Figs. 4, 11A, and 12B.

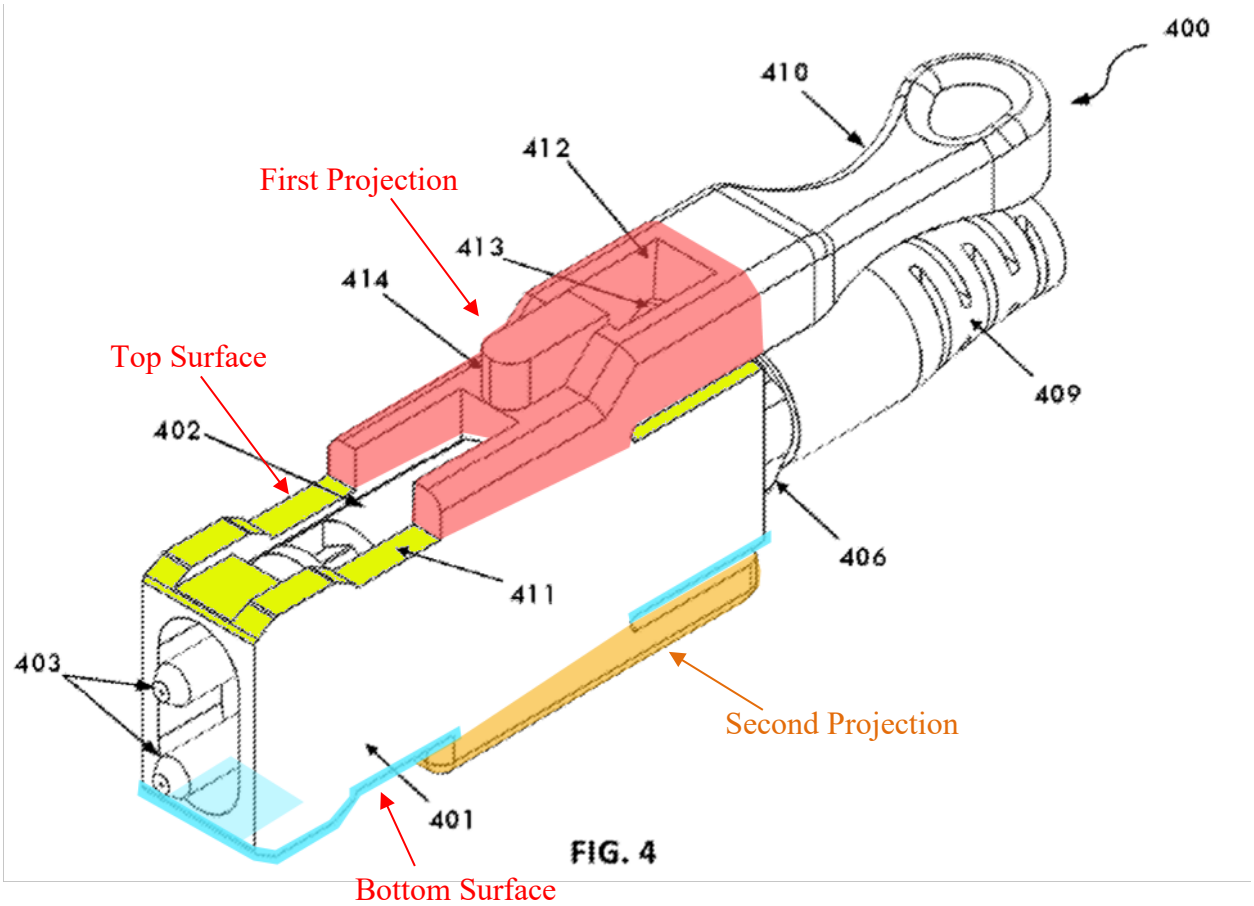

400
410
412
First Projection
413
414
Top Surface
409
402
406
411
403
Second Projection
401
Bottom Surface

FIG. 4

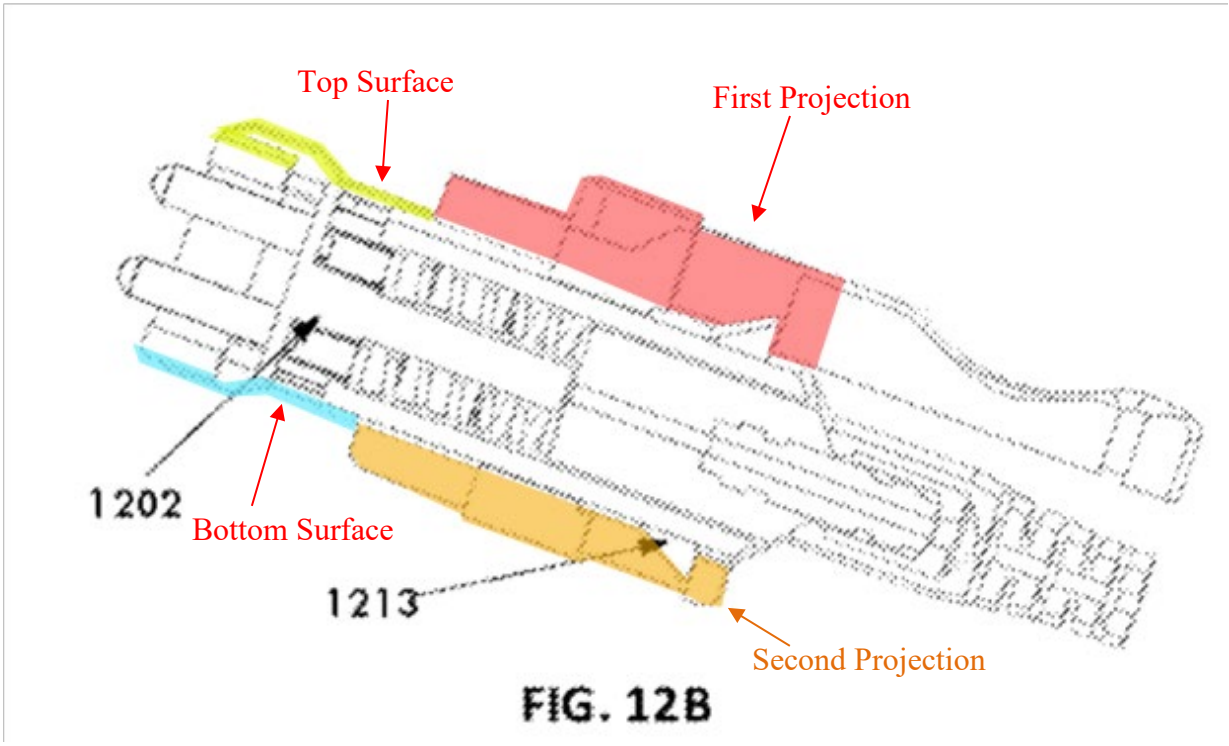
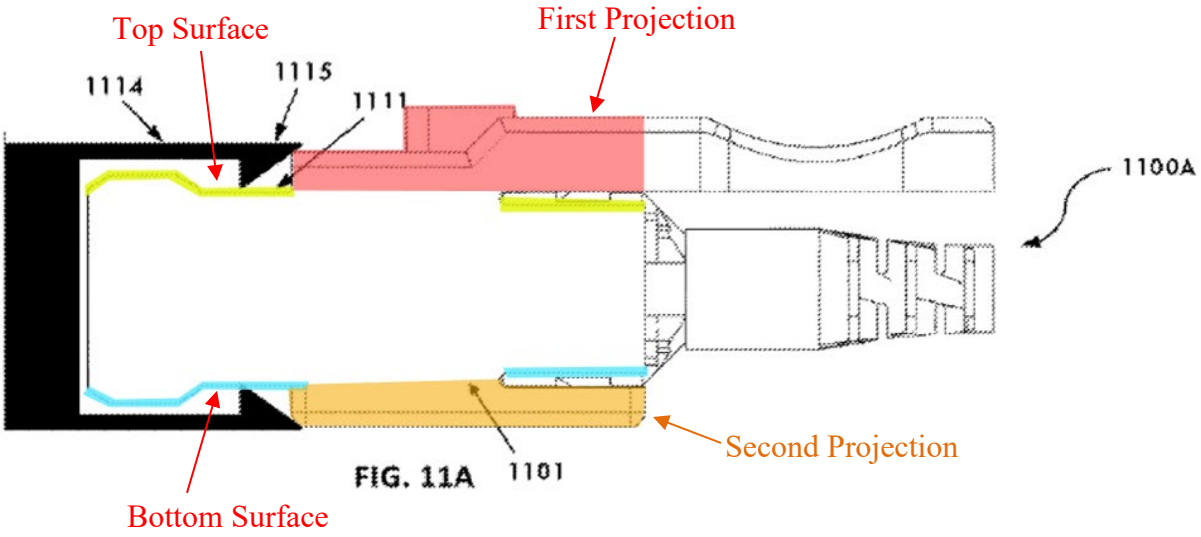

Top Surface
First Projection
1202
Bottom Surface
1213
Second Projection

FIG. 12B



EX1003: Figs. 4, 11A, and 12B (annotated).

132. Therefore, in my opinion, Takano'209 meets this limitation.

1.f "wherein the first projection is of a different size than the second projection; and"

133. The first projection is a different size than the second projection for at least the simple reason that the first projection includes a key (414) that is missing from the second projection. EX1003: ¶[0092], Figs. 4, 11A, and 12B. Takano'209 teaches that the inclusion of the key (414) on the first projection but not the second projection is to "keep the connector in a given orientation when inserted into a receptacle such as an adapter or transceiver." EX1003: ¶[0092].

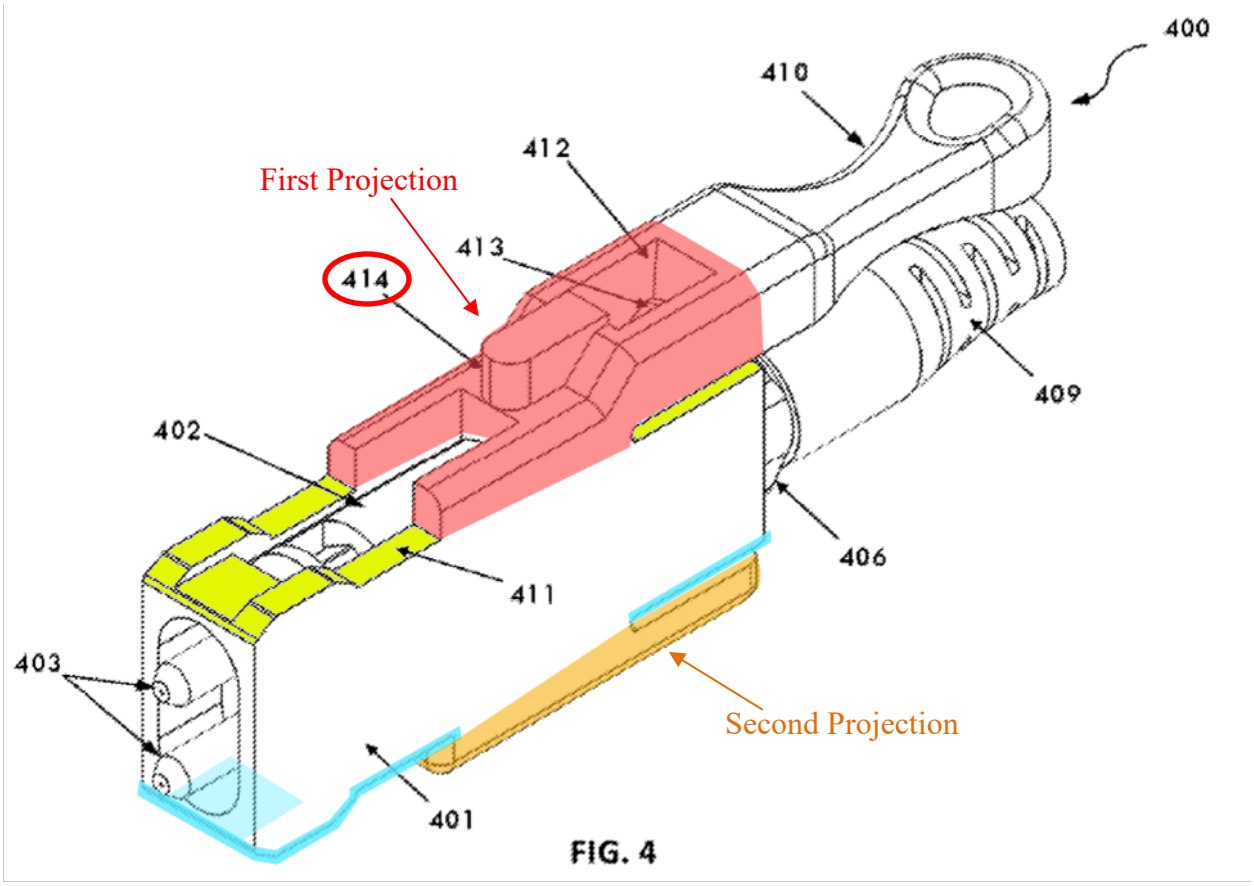

400
410
412
First Projection
413
414
409
402
406
411
403
Second Projection
401

FIG. 4

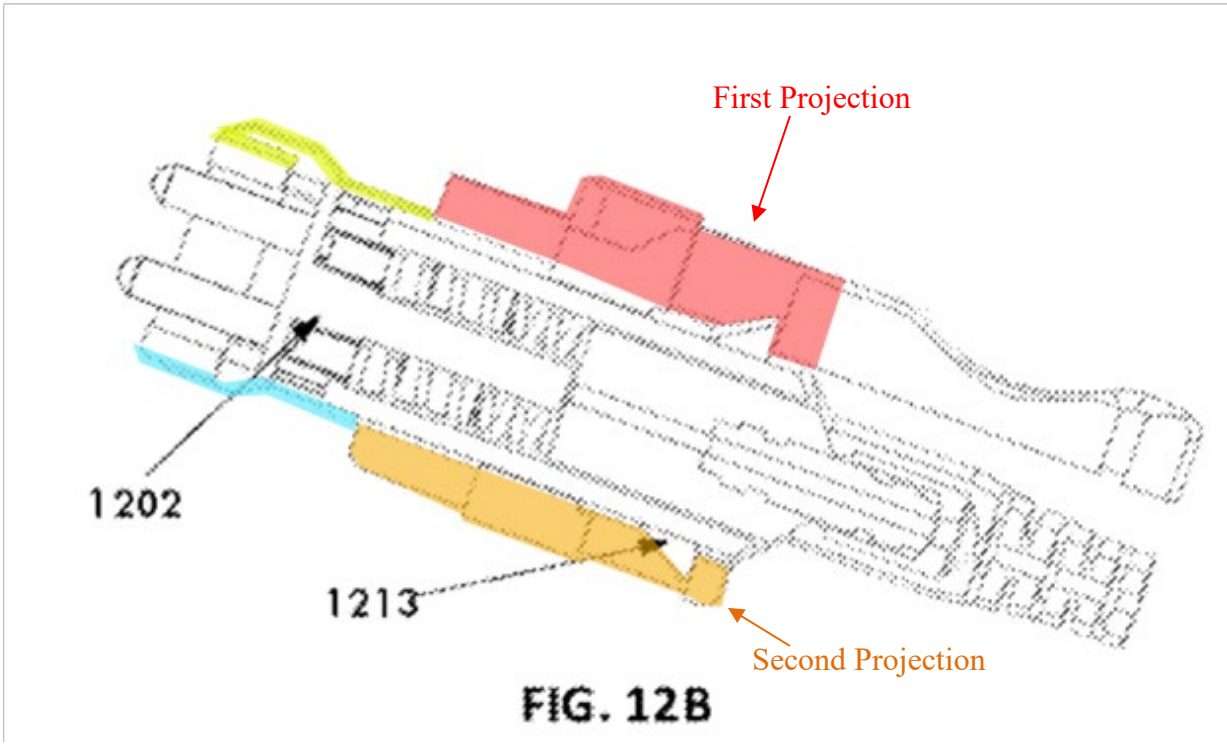
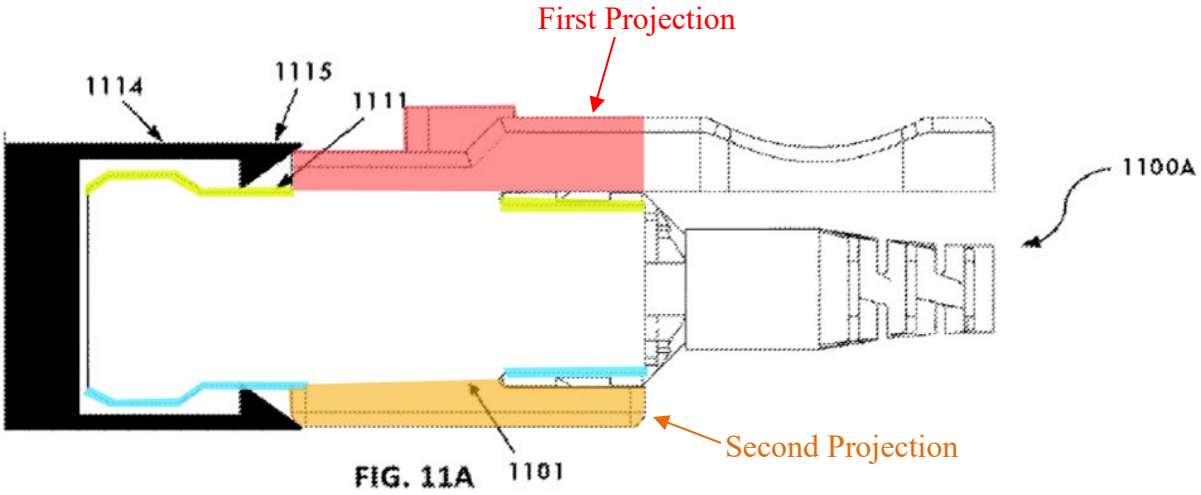

First Projection
1202
1213
Second Projection

FIG. 12B



EX1003: Figs. 4, 11A, and 12B (annotated).

134. Therefore, in my opinion, Takano'209 meets this limitation.

1.g "a strain relief boot having a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass."

135. The optical connector (300, 400, 500, 1100A-B, 1200) includes a boot (309, 409) coupled to the rear end of the crimp body (specifically, back post (307)). EX1003: ¶¶[0091]-[0092]; Figs. 3 and 4. The boot (2145) has a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass from a cable to the ferrules.. EX1003: Figs. 12B, 14B.

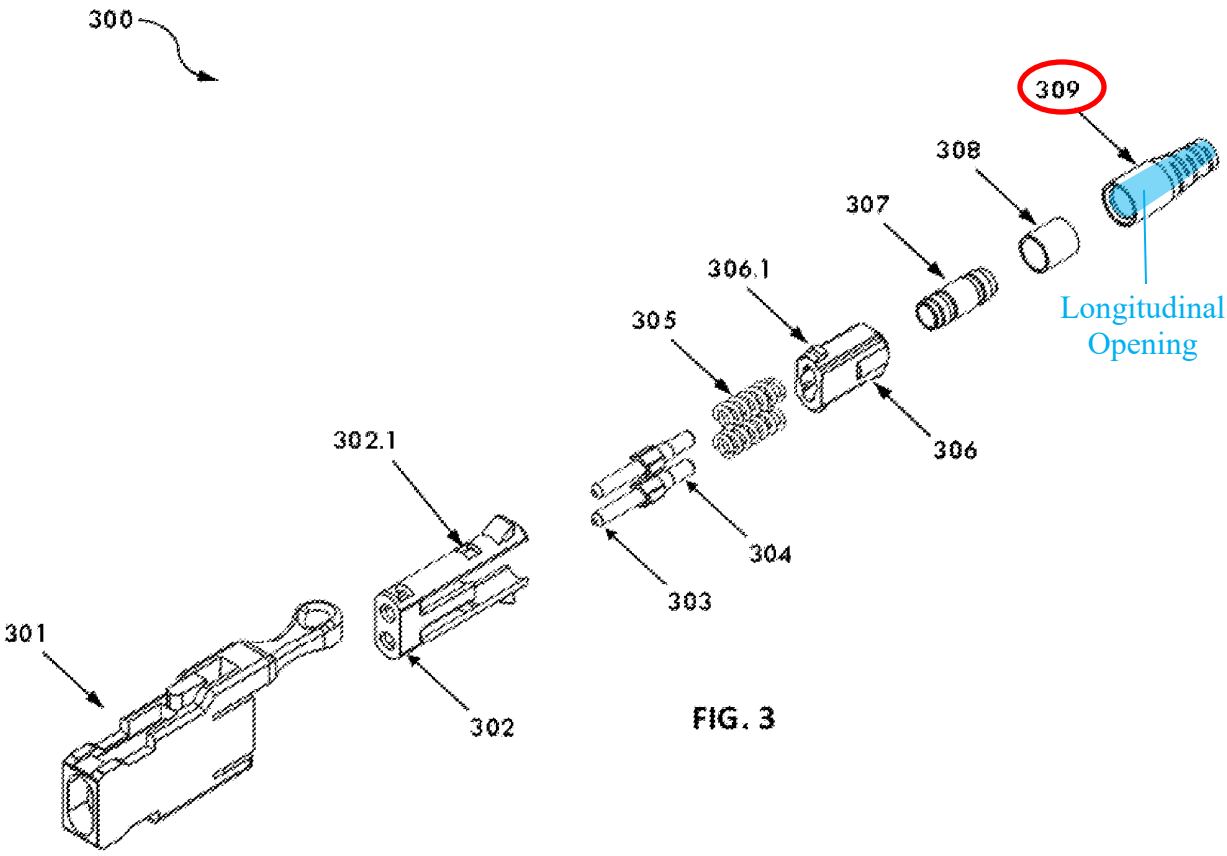

300
309
308
307
306.1
305
306
304
303
302.1
302
301
Longitudinal Opening

FIG. 3

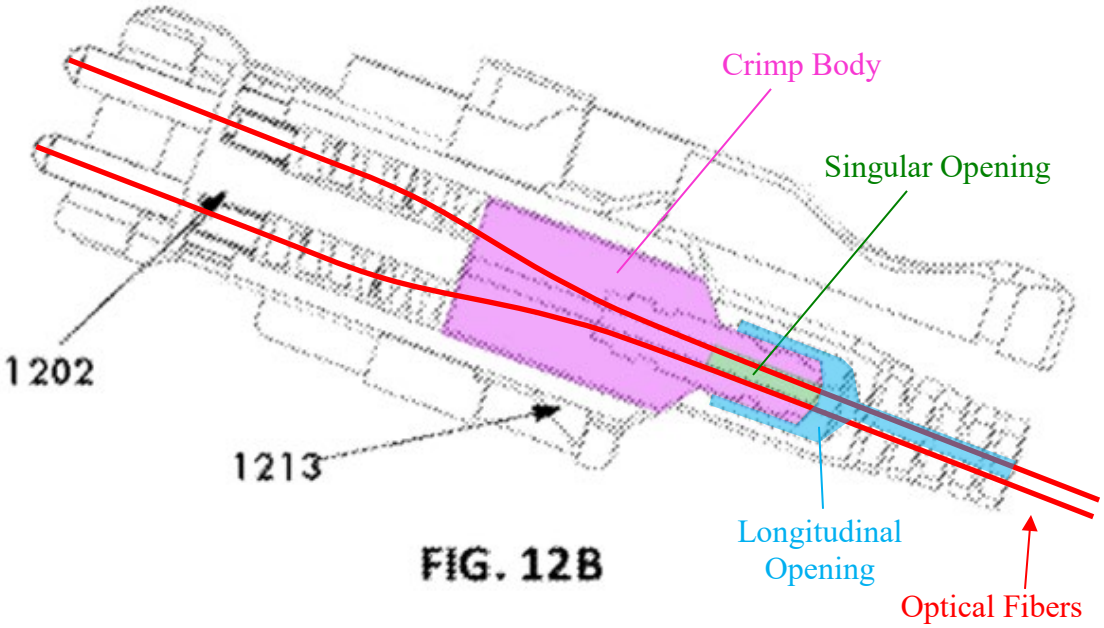

Crimp Body
Singular Opening
1202
1213
Longitudinal Opening
Optical Fibers

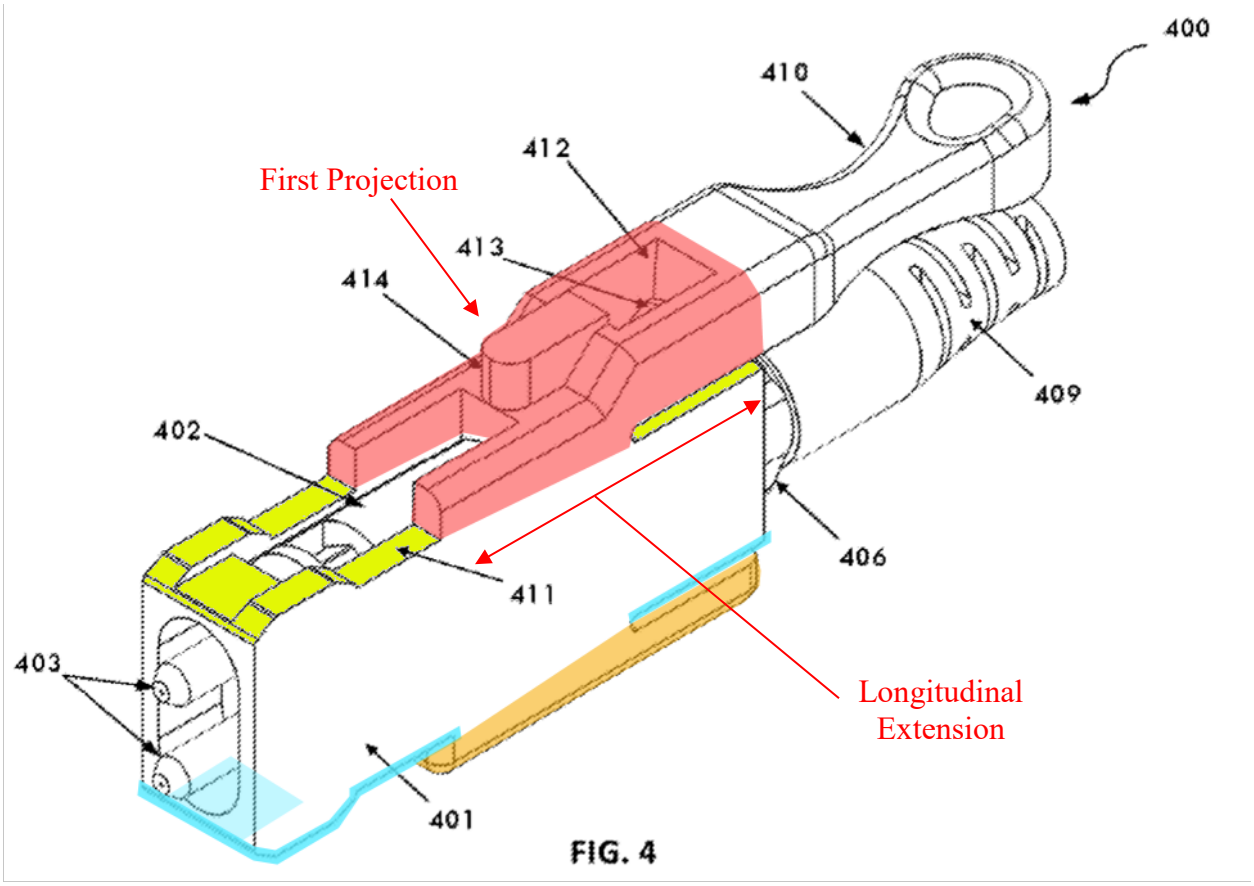
FIG. 12B

EX1003: Figs. 3 and 12B (annotated).

136. Therefore, in my opinion, Takano'209 meets this limitation.

B. Claim 2 "The fiber optic connector according to claim 1, wherein the first projection extends longitudinally along the top surface of the housing."

137. The first projection extends longitudinally along the top surface of the outer housing (301, 401, 501, 1101, 1201). EX1003: Figs. 4, 11A, and 12B.



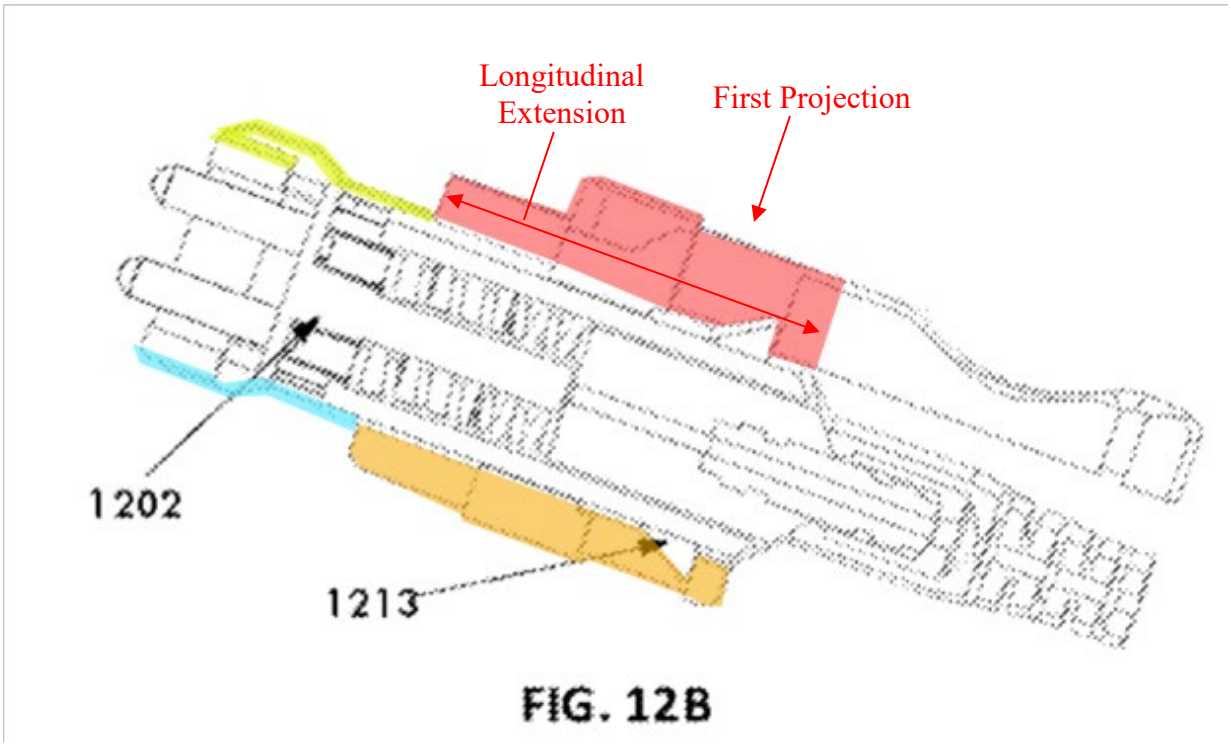


FIG. 12B

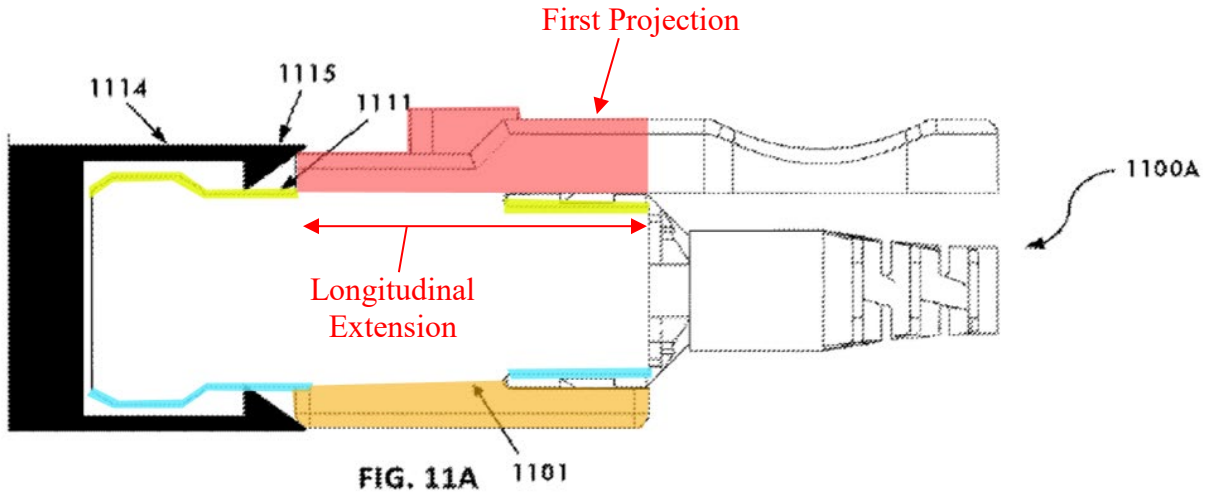


FIG. 11A

EX1003: Figs. 4, 11A, and 12B (annotated).

138. Therefore, in my opinion, Takano'209 meets this claim.

C. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs."

139. The crimp body (particularly, the front portion of the back body (306, 406)) forms a spring push engaging a rear portion of each of the two ferrule springs (305). EX1003: Fig. 12B.

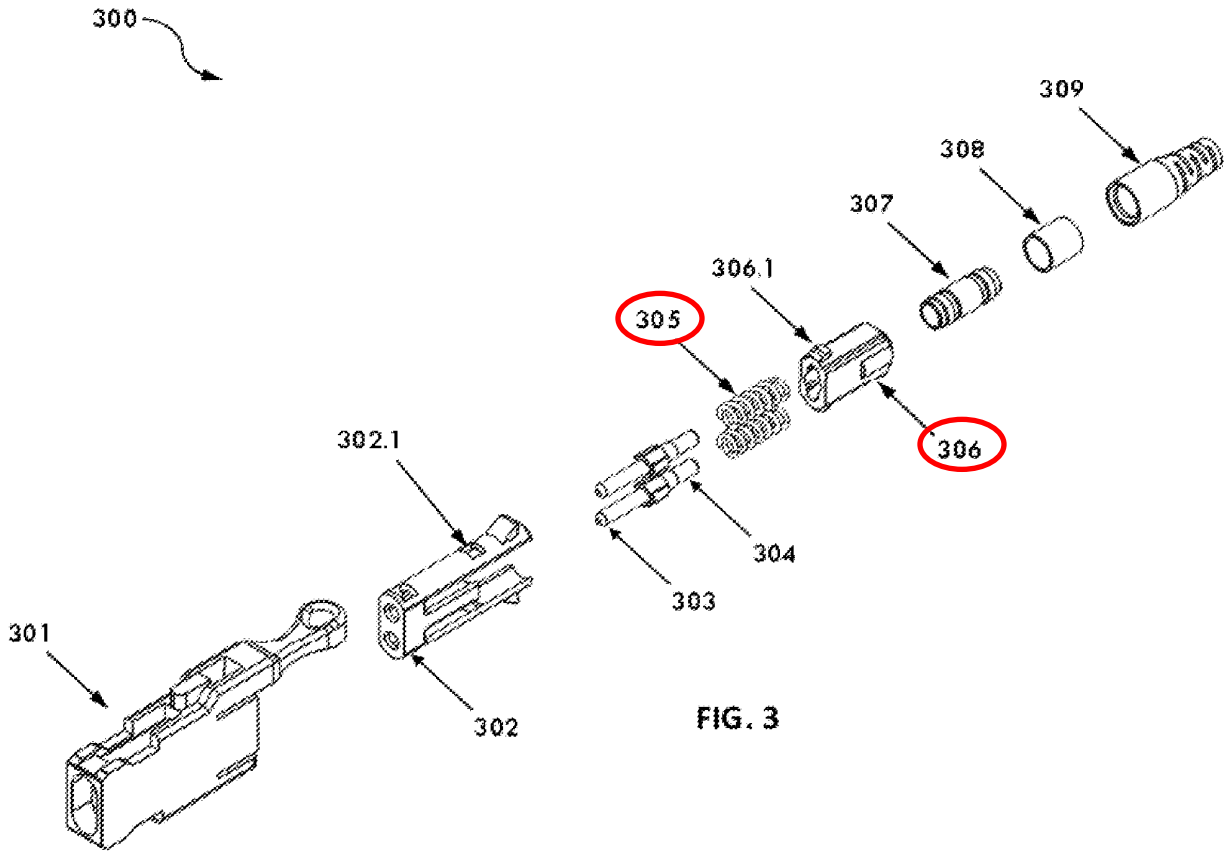


FIG. 3

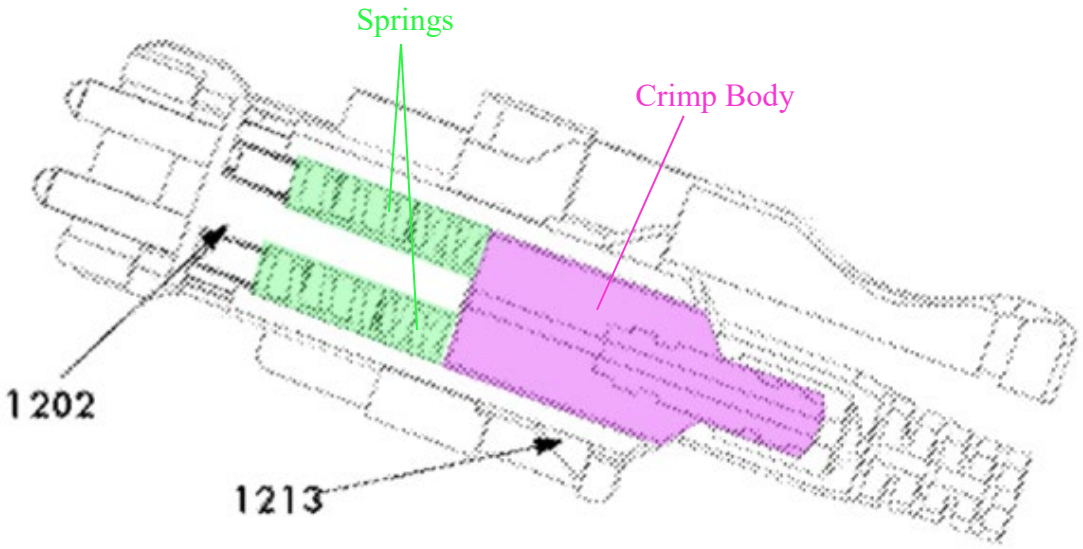


FIG. 12B

EX1003: Figs. 3 and 12B (annotated).

140. I have been informed that there is a presumption that claims having different claim elements have different scope. The difference in meaning and scope between claims is presumed to be significant to the extent that the absence of such difference would render a claim superfluous. This doctrine is especially strong when applied to a dependent claim and the claim from which it depends. The presence of a dependent claim that adds a particular element gives rise to the presumption that the element in question is not present in the parent claim. This doctrine of claim differentiation is not absolute, however, and it cannot broaden claims beyond their proper scope or alter a definition that is otherwise clear from the claim language, specification, and prosecution history.

141. The ‘994 Patent is the child of U.S. Patent No. 11,733,466.

142. Claim 3 of U.S. Patent No. 11,733,466 (EX1021) is identical to this claim 3 of the ‘994 Patent. Further, claim 4 of U.S. Patent No. 11,733,466—which depends from claim 3 of U.S. Patent No. 11,733,466—recites that “the spring push is separate from the crimp body.” Based on the concept of claim differentiation—i.e., claim 4 of U.S. Patent No. 11,733,466 narrows the scope of claim 3 of U.S. Patent No. 11,733,466—the “spring push” recited in claim 3 is not excluded from being part of the crimp body because claim 4 of U.S. Patent No. 11,733,466 will then narrow this scope of claim 3 of U.S. Patent No. 11,733,466 by stating “the spring push is separate from the crimp body.”

143. I have been informed that the interpretation of one patent in a patent family influences the interpretation of all the patents in the patent family and that terms should be interpreted consistently across a series of patents in the same patent family. The ‘994 Patent and U.S. Patent No. 11,733,466 are in the same patent family, as the ‘994 Patent is a child of U.S. Patent No. 11,733,466. Given that the spring push recited in the claims of U.S. Patent No. 11,733,466 is not excluded from being part of the crimp body, due to claim differentiation, based on these legal concepts as explained to me by Petitioner’s counsel, I also interpret the “spring push” recited in claim 3 of the ‘994 Patent as not being excluded from being part of the crimp body.

144. Therefore, in my opinion, Takano'209 meets this claim.

D. Claim 4 "The fiber optic connector according to claim 1, wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter."

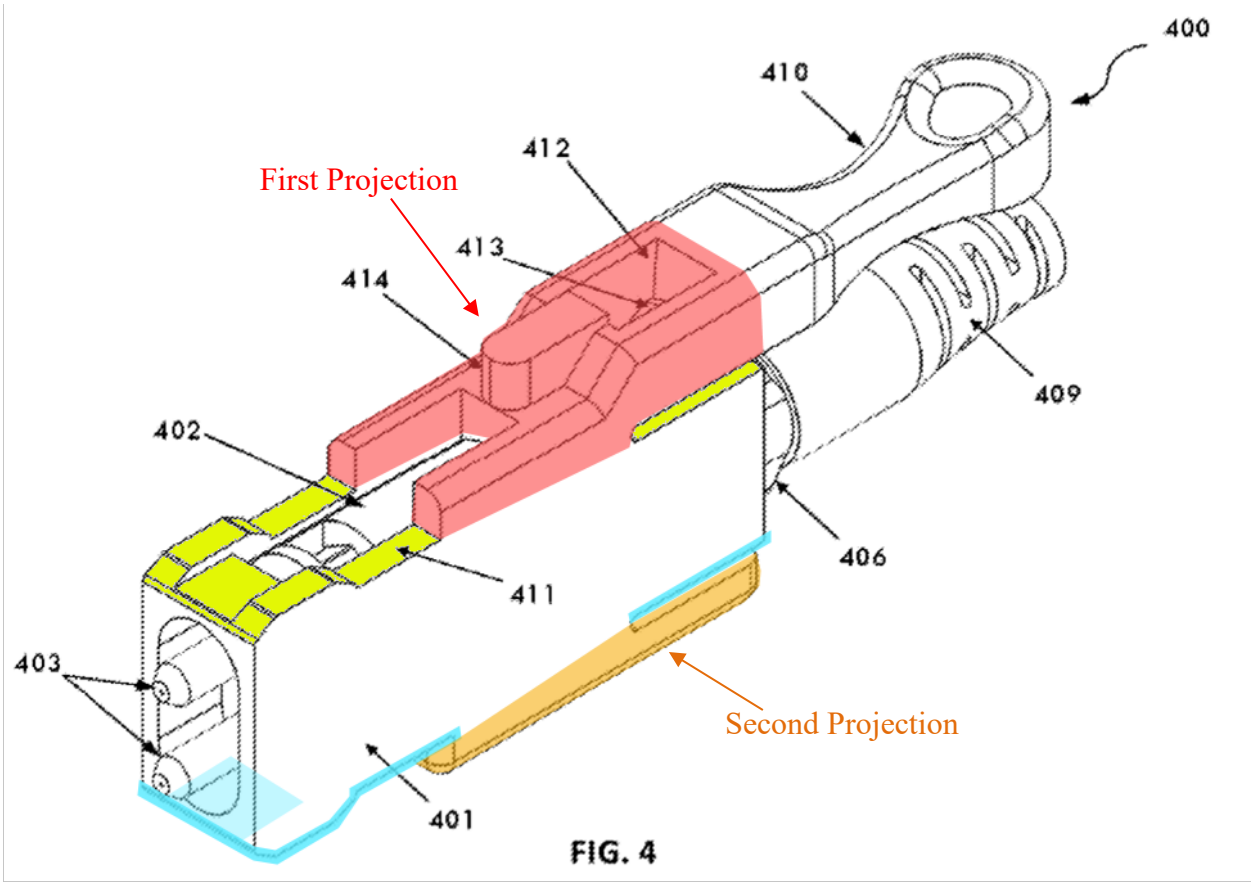
145. I have been informed that there are two types of claims: apparatus claims and method claims. I have also been informed that apparatus claims cover what a device is. I have been informed that when an apparatus claim recites an intended use of the device, a prior art reference meets the intended use if it is capable of performing the intended use.

146. All of the claims of the '994 Patent are apparatus claims. In addition, claim 4's recitation of "wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter," recites an intended use of the claimed invention. Therefore, based on the legal concepts as explained to me by Petitioner's counsel, claim 4 is met by any prior art reference that is capable of meeting the intended use.

147. In my opinion, the first and second projections of the optical connector (300, 400, 500, 1100A-B, 1200) are capable of meeting this intended use of claim 4.

148. For example, the first and second projections determine a correct orientation and/or polarity of the outer housing (301, 401, 501, 1101, 1201) during insertion into an adapter because the key (414) is formed on the first projection but

not the second projection. EX1003: ¶[0092]. As explained by Takano'209, the "key 414 may keep the connector in a given orientation when inserted into a receptacle such as an adapter." EX1003: ¶[0092]. The key (414) is received in a corresponding keyway or groove in a corresponding adapter to set the correct orientation and polarity of the outer housing (301, 401, 501, 1101, 1201). EX1003: Fig. 13.



EX1003: Fig. 4 (annotated).

149. Further, the second projection includes a flat bottom surface which engages a corresponding flat upper surface of a bottom wall in the corresponding

adapter to set the correct orientation of the outer housing (301, 401, 501, 1101, 1201). EX1003: Fig. 13.

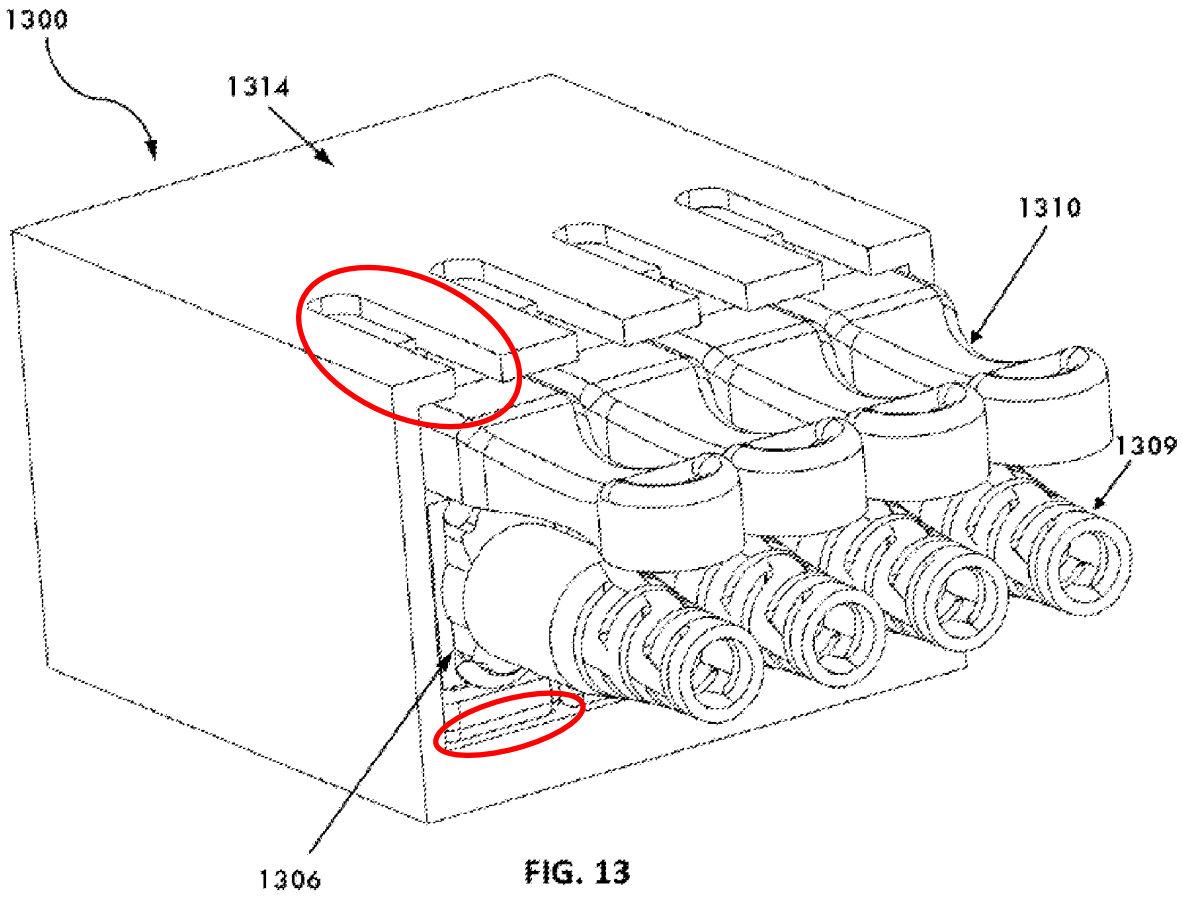


FIG. 13

EX1003: Fig. 13 (annotated).

150. The adapter (1314) of Fig. 13 is described as receiving an optical connector (800) of Fig. 8 with a four body outer housing (801) with four push-pull tabs (1310). EX1003: ¶[0108]. The adapter (1314) includes keyways for the keys (414) and a flat bottom wall. EX1003: Fig. 13. For the reasons I explained in Section VII(A)(1.P), an adapter for the corresponding optical connector (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B would have a similar if not

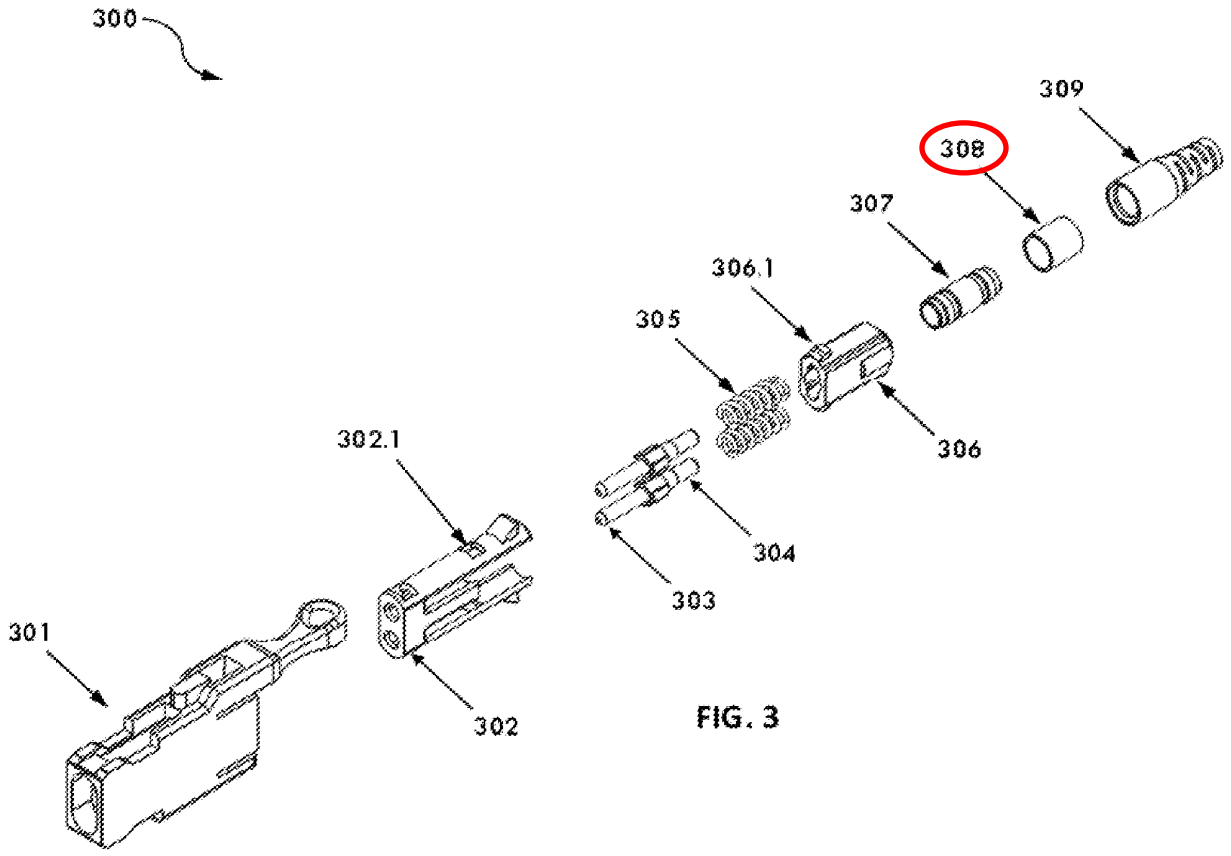
identical configuration—i.e., the same keyway and a flat bottom wall. In fact, the adapter (1314) of Fig. 13 may be in fact for four optical connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B.

151. Therefore, in my opinion, Takano'209 meets this claim.

E. Claim 5

5.a "The fiber optic connector according to claim 1, further comprising: a crimp band secured around an outer surface of the rear end of the crimp body, and"

152. The optical connector (300, 400, 500, 1100A-B, 1200) includes a crimp ring (308), which is a crimp band. EX1003: ¶[0091].



EX1003: Fig. 3 (annotated).

153. The crimp ring (308) is secured around an outer surface of the rear end of the two-piece crimp body (306, 406, 307), specifically by being crimped onto the back post (307) of the crimp body. EX1003: Figs. 3 and 12B.

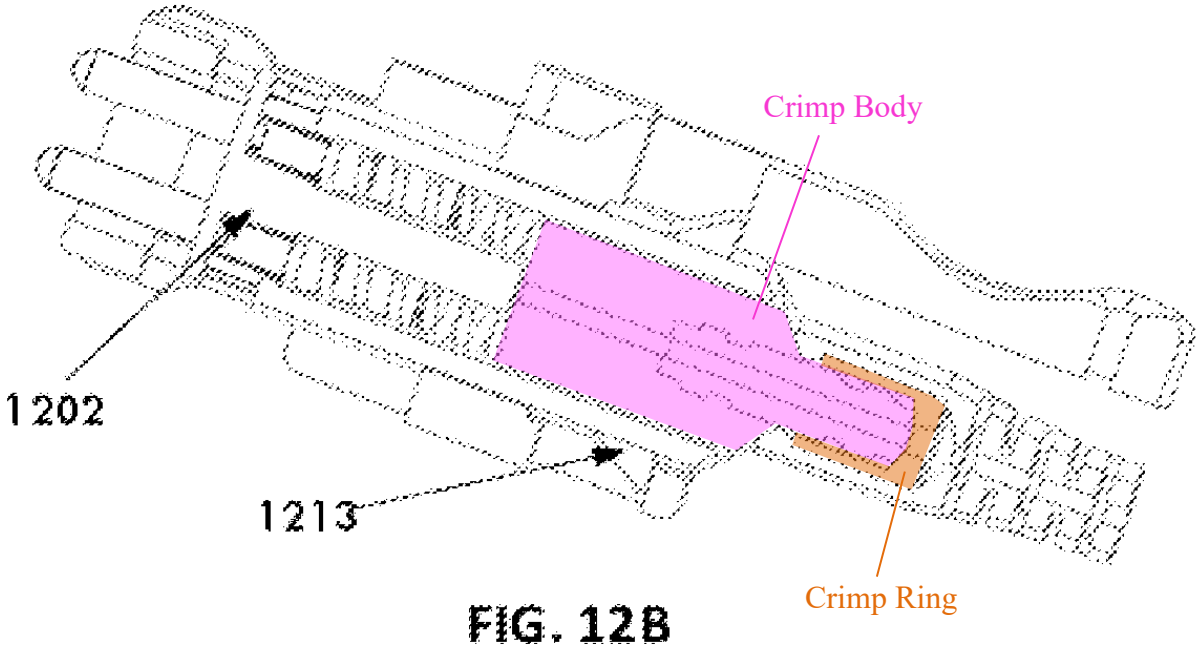


FIG. 12B

EX1003: Fig. 12B (annotated).

154. Therefore, in my opinion, Takano'209 meets this limitation.

5.b "wherein the strain relief boot extends rearwardly away from the housing."

155. The boot (309, 409) extends rearwardly away from the outer housing (301, 401, 501, 1101, 1201), e.g., rearwardly away from the rear end of the main body of the outer housing. EX1003: Figs. 4, 11A-B, and 12A-B.

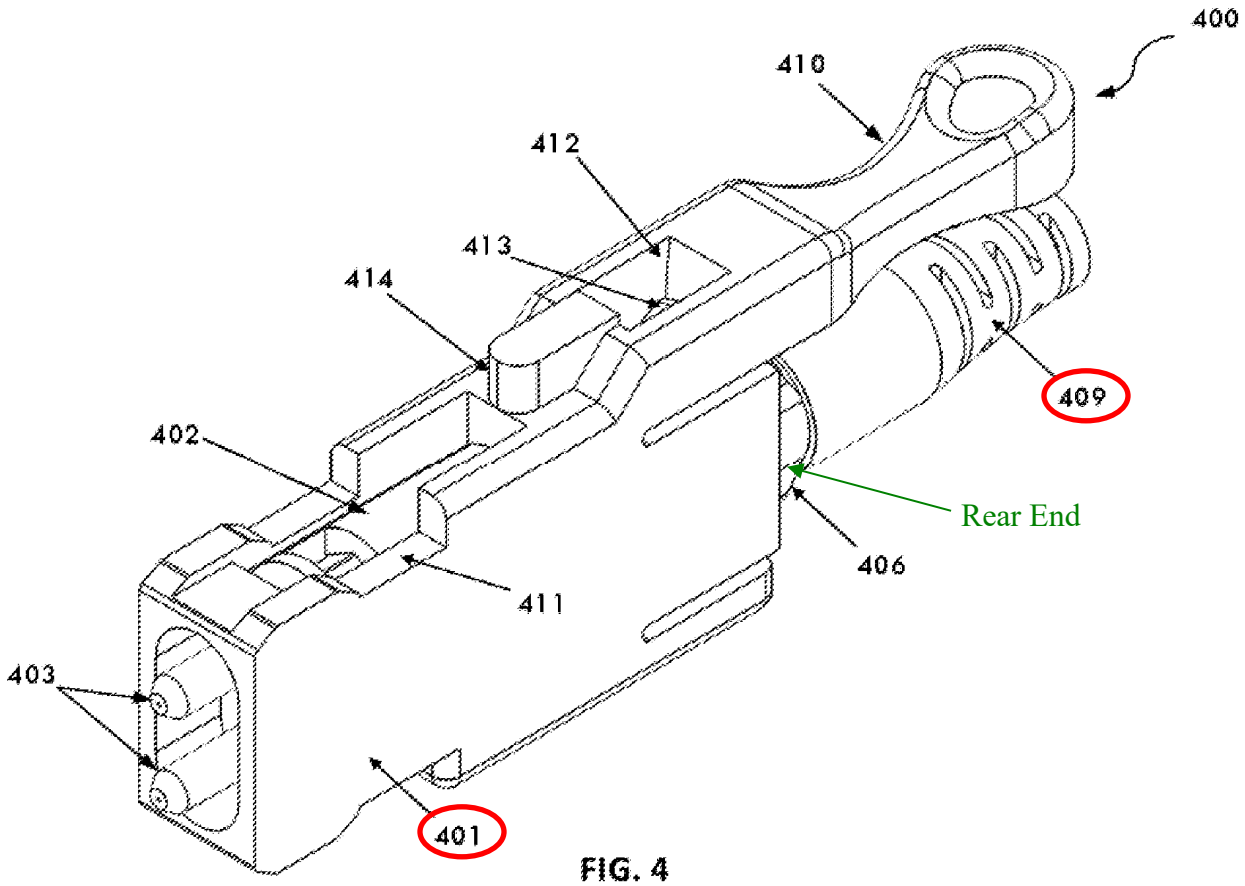


FIG. 4

EX1003: Fig. 4 (annotated).

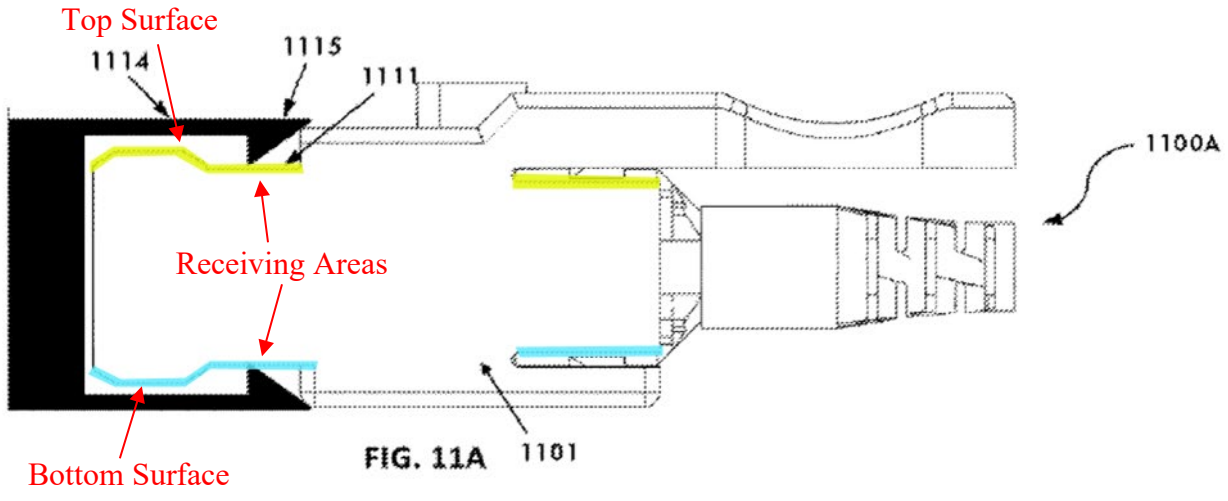
156. If it is argued that the presence of the push-pull tab (410, 510, 1110) prevents Takano'209 from meeting this limitation, Takano'209 teaches an embodiment where the push-pull tab is removed from the optical connector (300, 400, 500, 1100A-B, 1200). Takano'209 states the push-pull tab (410, 510, 1110) is ***optional***. EX1003: ¶¶[0092] ("the assembled connector may have … a push-pull tab 410") ("[a]lternatively, the push-pull tab may be eliminated"), [0106] ("when a push-pull tab is not present"). In other words, Takano'209 teaches an embodiment where the outer housing (301, 401, 501, 1101, 1201) does not have a push-pull tab

(410, 510, 1110). EX1003: ¶¶[0092], [0106]. In this embodiment, the top portion of the outer housing (301, 401, 501, 1101, 1201) would be cut off in-line with where the rear-bottom end of the main body is. In this embodiment, the boot (309, 409) would extend rearward beyond the rearmost point of the outer housing (301, 401, 501, 1101, 1201).

157. Therefore, in my opinion, Takano'209 meets this limitation.

F. Claim 6 "The fiber optic connector according to claim 1, wherein each of the top surface and the bottom surface has a receiving area for a latch component to secure the fiber optic connector to an adapter."

158. The top and bottom surfaces each have a receiving area (recess (1111)) for receiving flexible receptacle hook (1115) of the adapter, which is a latch component that secures the optical connector (300, 400, 500, 1100A-B, 1200) to the adapter. EX1003: ¶¶[0105]-[0106], Figs. 11A-B.



EX1003: Fig. 11A (annotated).

159. Therefore, in my opinion, Takano'209 meets this claim.

G. Claim 7 "The fiber optic connector of claim 6, wherein the fiber optic connector is configured to receive a push force to insert the fiber optic connector into an adapter or a pull force to release the latch component from the adapter."

160. The optical connector (300, 400, 500, 1100A-B, 1200) receives a push force to insert the optical connector into an adapter and a pull force to release the receptacle hooks (1115) from the adapter. EX1003: ¶¶[0105]-[0106]. Takano'209 explains "latching takes place when the outer housing 1101 is ***pushed*** forward into the receptacle." EX1003: ¶[0105]. Takano'209 further states the "connector 1100B may be removed from a receptacle 1114 by ***pulling*** the connector away from the adapter as indicated by the directional arrow…. As shown in FIG. 11B, as the connector 1100B is removed from the receptacle 1114, the flexible receptacle hooks 1115 separate and slide up the slope of the end of the connector and allow for removal of the connector from the receptacle." EX1003: ¶[0106].

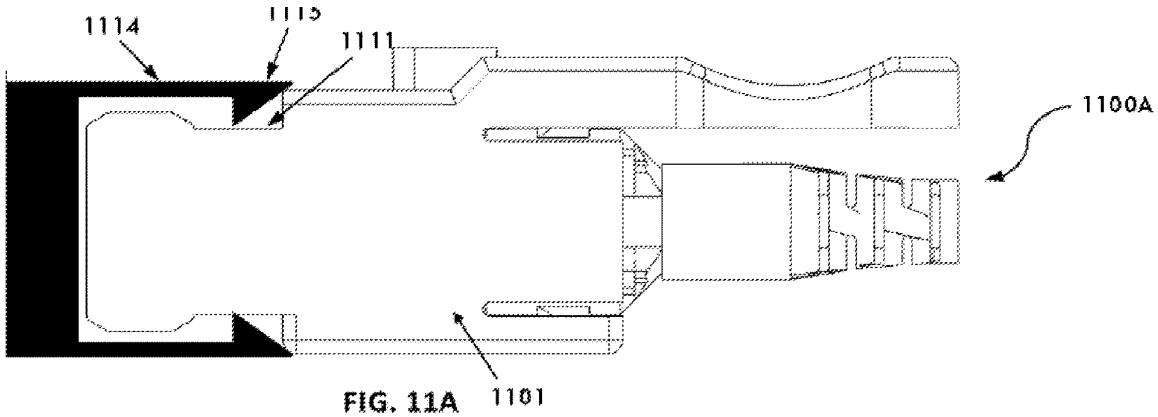


FIG. 11A

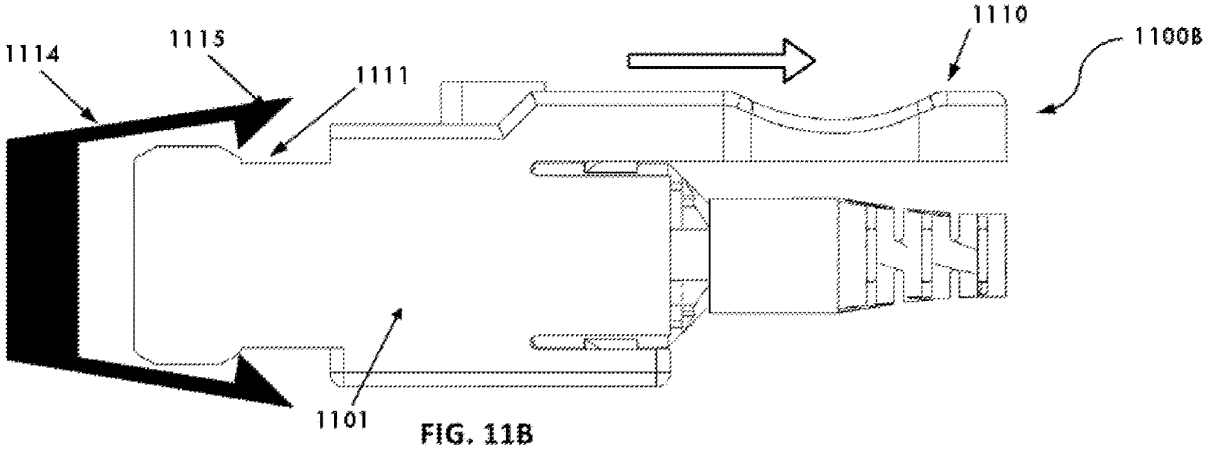


FIG. 11B

EX1003: Figs. 11A-B.

161. Therefore, in my opinion, Takano'209 meets this claim.

H. Claim 8 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a QSFP footprint."

162. Takano'209 explains "[t]he elements of FIG. 3 are configured such that … at least two optical connectors having a total of eight LC-type optical ferrules may be accommodated in a quad small form-factor pluggable (QSFP) transceiver footprint." EX1003: ¶[0091]. Since Fig. 3 depicts a connector with two LC-type optical ferrules, it is understood that "at least two optical connectors having a total of eight LC-type optical ferrules" encompasses four of the optical

connectors (300, 400, 500, 1100A-B, 1200) depicted in Fig. 3. EX1003: ¶[0091]. Accordingly, the optical connector (300, 400, 500, 1100A-B, 1200) fits within a "quad small form-factor pluggable (QSFP) transceiver footprint." EX1003: ¶[0091]. Therefore, the front end of the outer housing (301, 401, 501, 1101, 1201) of the optical connector (300, 400, 500, 1100A-B, 1200) fits in a QSFP footprint. EX1003: ¶[0091].

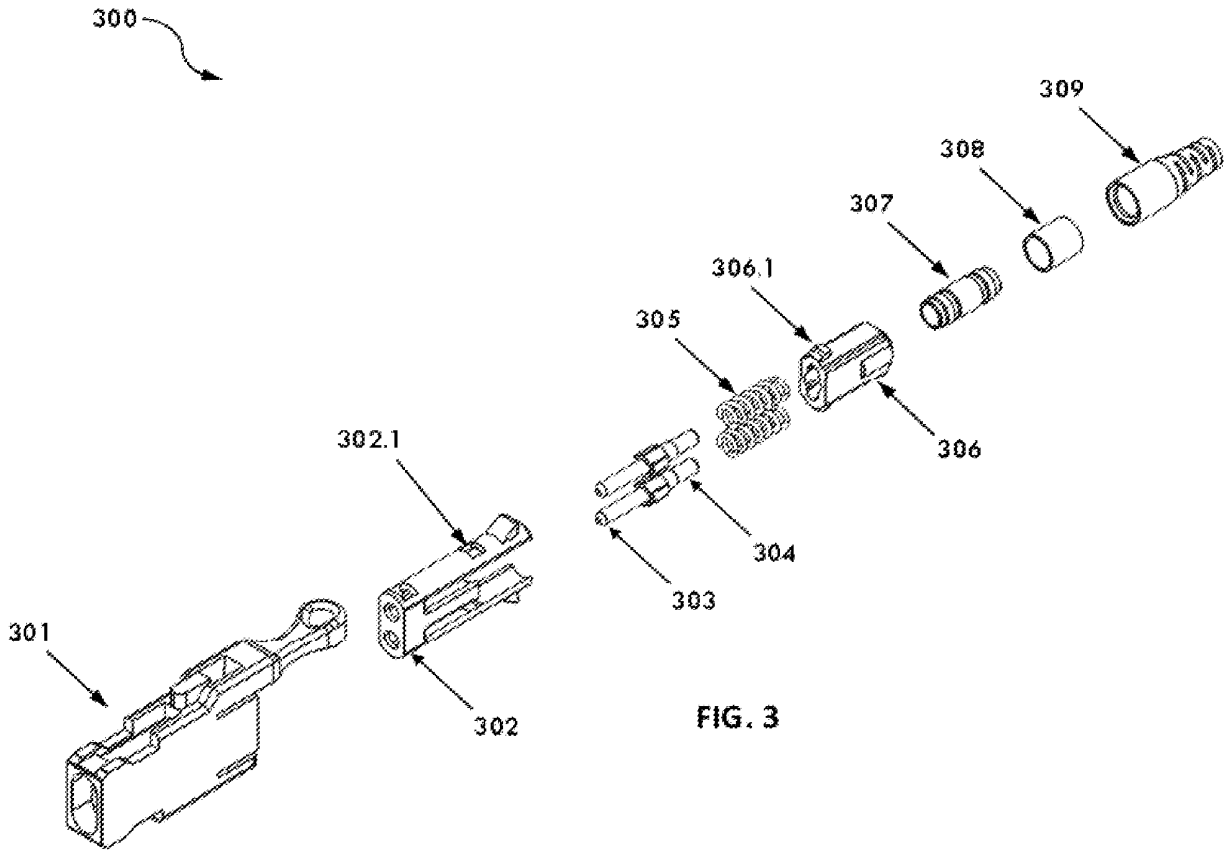


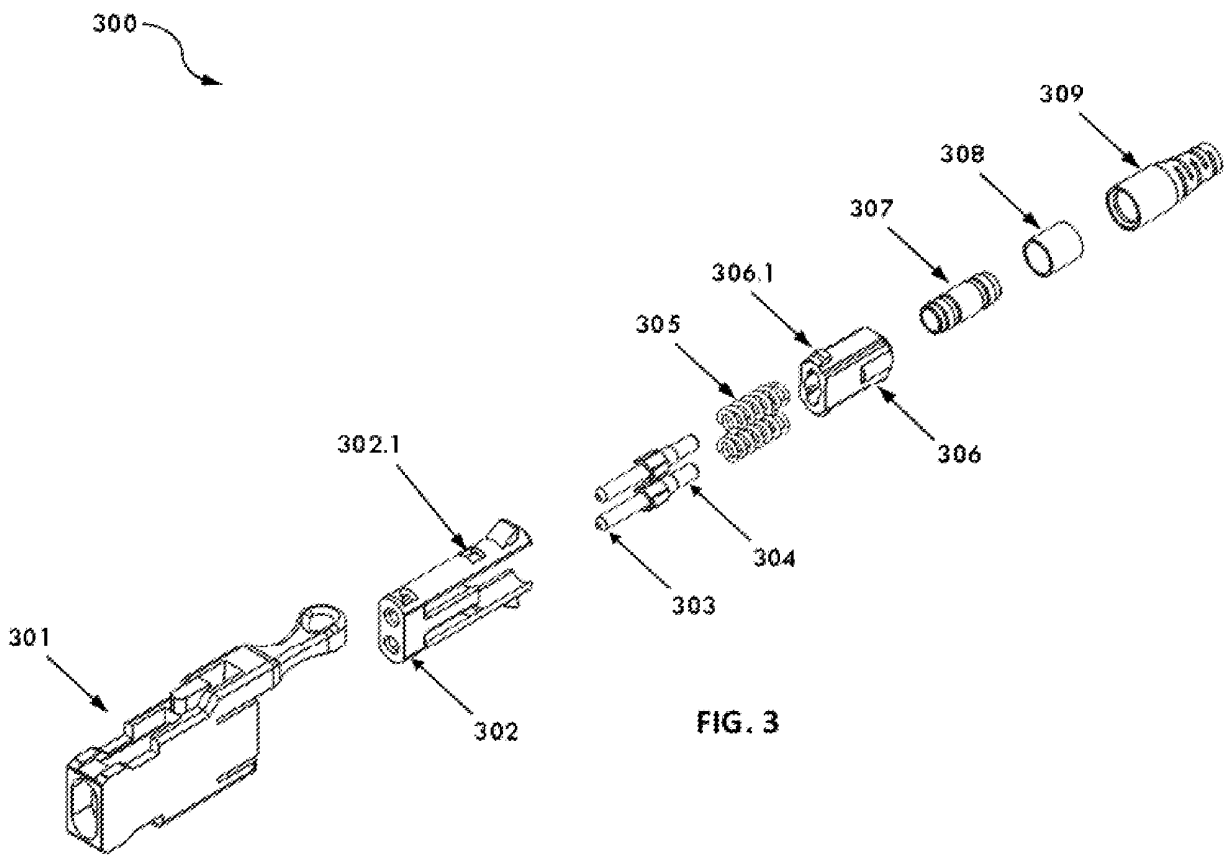
FIG. 3

EX1003: Fig. 3.

163. Therefore, in my opinion, Takano'209 meets this claim.

I. Claim 9 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a SFP footprint."

164. Takano'209 explains "[t]he elements of FIG. 3 are configured such that two optical connectors having four LC-type optical ferrules may be accommodated in a small form-factor pluggable (SFP) transceiver footprint." EX1003: ¶[0091]. Since Fig. 3 depicts a connector with two LC-type optical ferrules, it is understood that "two optical connectors having four LC-type optical ferrules" encompasses two of the optical connectors (300, 400, 500, 1100A-B, 1200) depicted in Fig. 3. EX1003: ¶[0091]. Accordingly, the optical connector (300, 400, 500, 1100A-B, 1200) fits within a "small form-factor pluggable (SFP) transceiver footprint." EX1003: ¶[0091]. Therefore, the front end of the outer housing (301, 401, 501, 1101, 1201) of the optical connector (300, 400, 500, 1100A-B, 1200) fits in a SFP footprint. EX1003: ¶[0091].



EX1003: Fig. 3.

165. Therefore, in my opinion, Takano'209 meets this claim.

J. Claim 10 "The fiber optic connector according to claim 1, wherein the crimp body is located such that the two springs are positioned between a top portion and a bottom portion thereof."

166. The back body (306, 406) of the crimp body has upper and lower protrusions (306.1) received in corresponding windows/cutouts (302.1) in the top and bottom of the front body (302, 402, 502, 1202). EX1003: Fig. 3, ¶¶[0091]-[0092]. The upper protrusion (306.1) is a top portion of the crimp body and the lower protrusion (306.1) is a bottom portion of the crimp body. EX1003: Fig. 3, ¶¶[0091]-[0092]. In the assembled connector, the rear ends of the springs (305)

engage the front face of the back body (306, 406) between the upper and lower protrusions (306.1). EX1003: Figs. 3 and 12B, ¶¶[0091]-[0092]. Therefore, the crimp body is located such that the two springs (305) are positioned between the top and bottom portions (e.g., protrusions (306.1)) of the crimp body. EX1003: Figs. 3 and 12B, ¶¶[0091]-[0092].

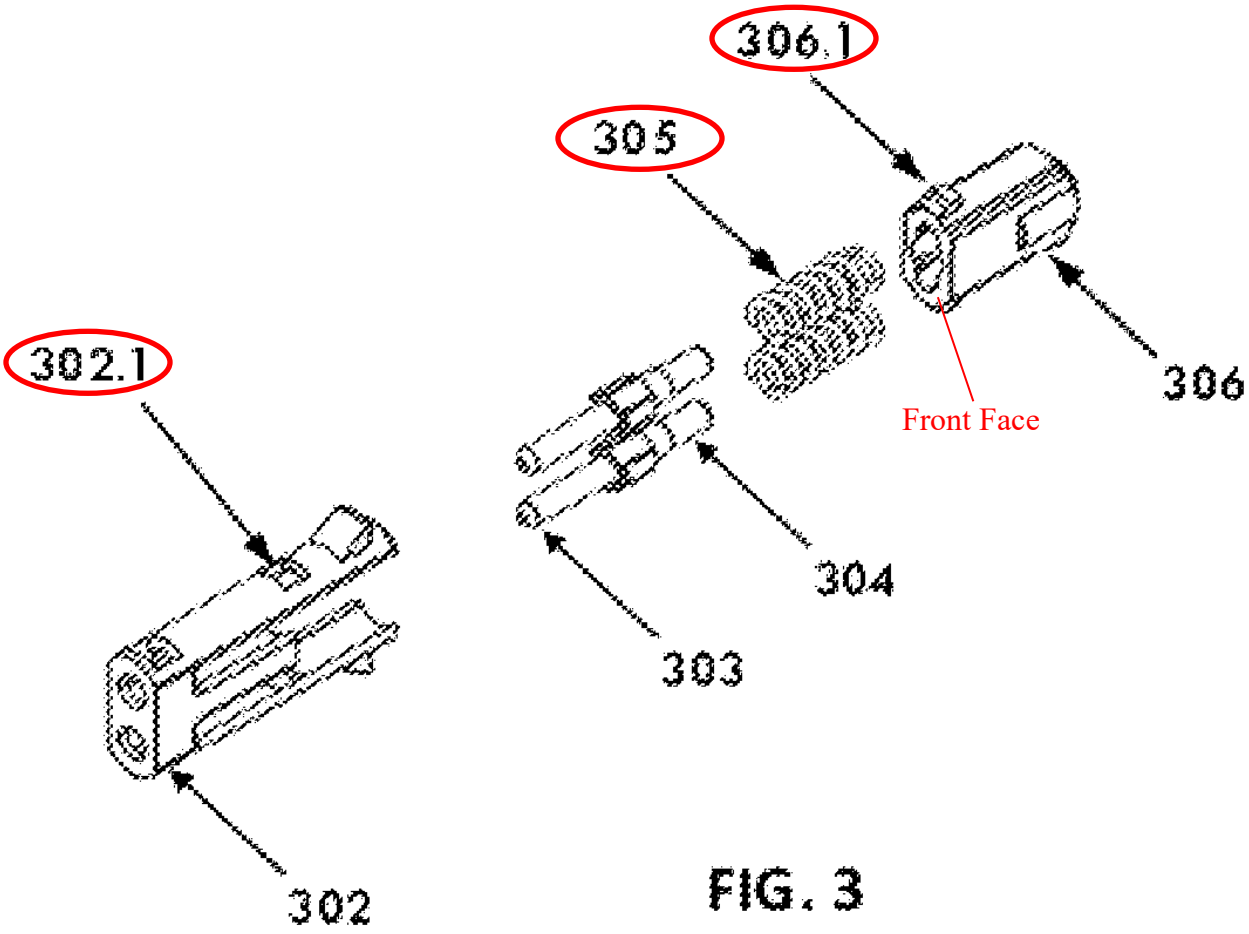


FIG. 3

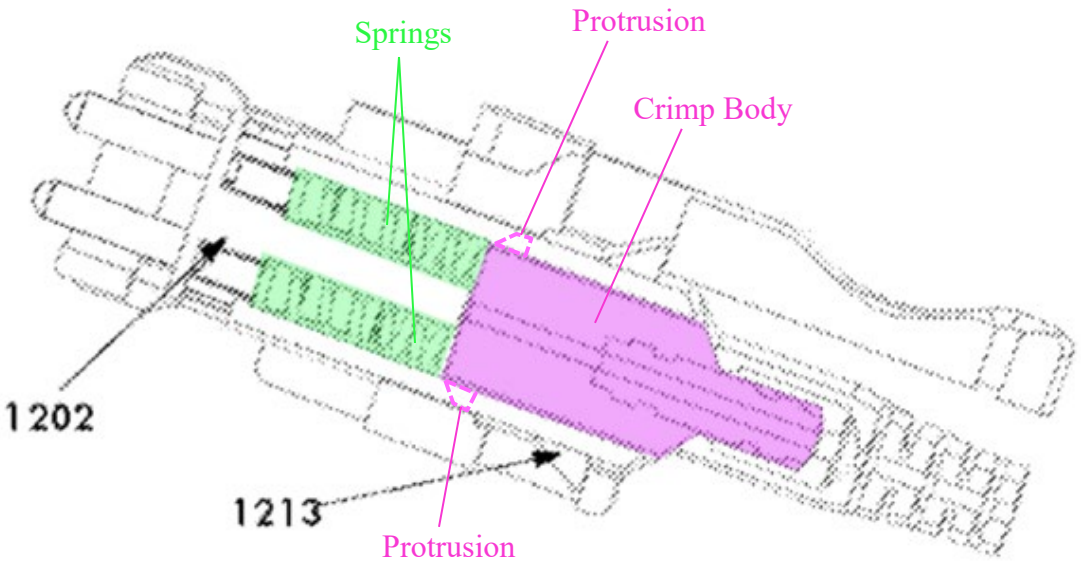


FIG. 12B

EX1003: Figs. 3 and 12B (annotated).

167. I note that this is no different than how the springs (122, 1122) are shown in the '994 patent as being between top and bottom portions of the crimp body (106, 1106).

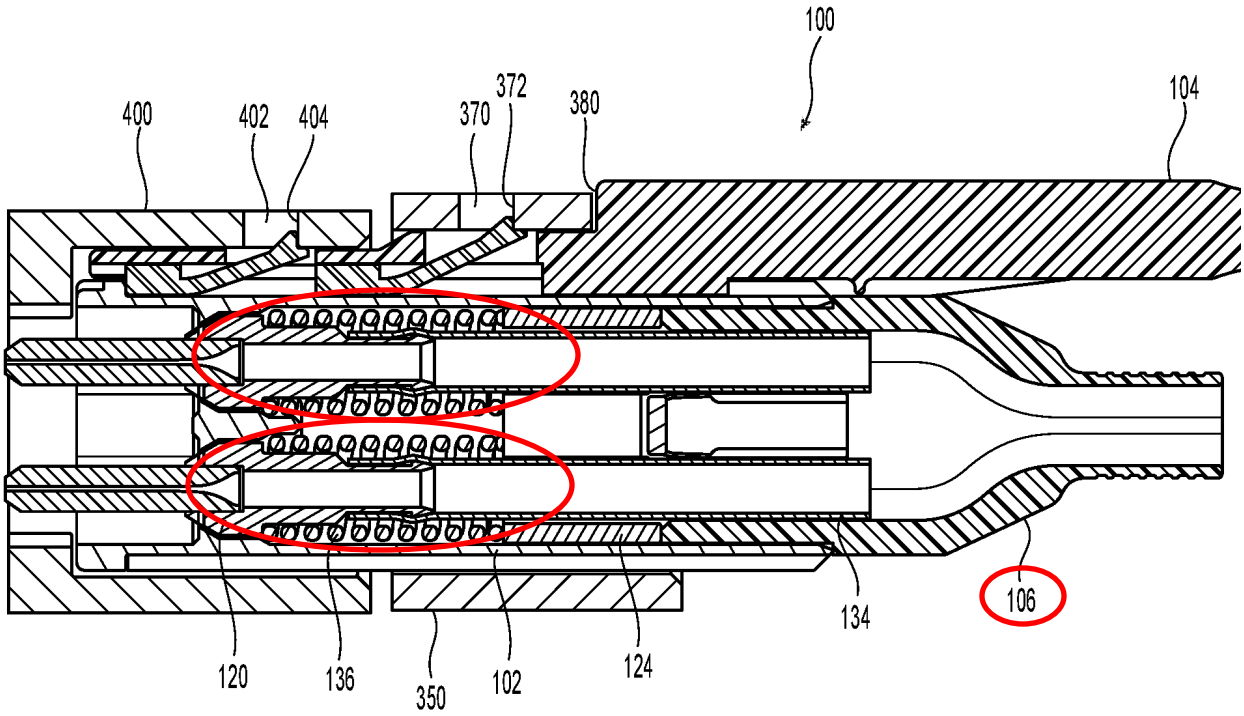


Fig. 21

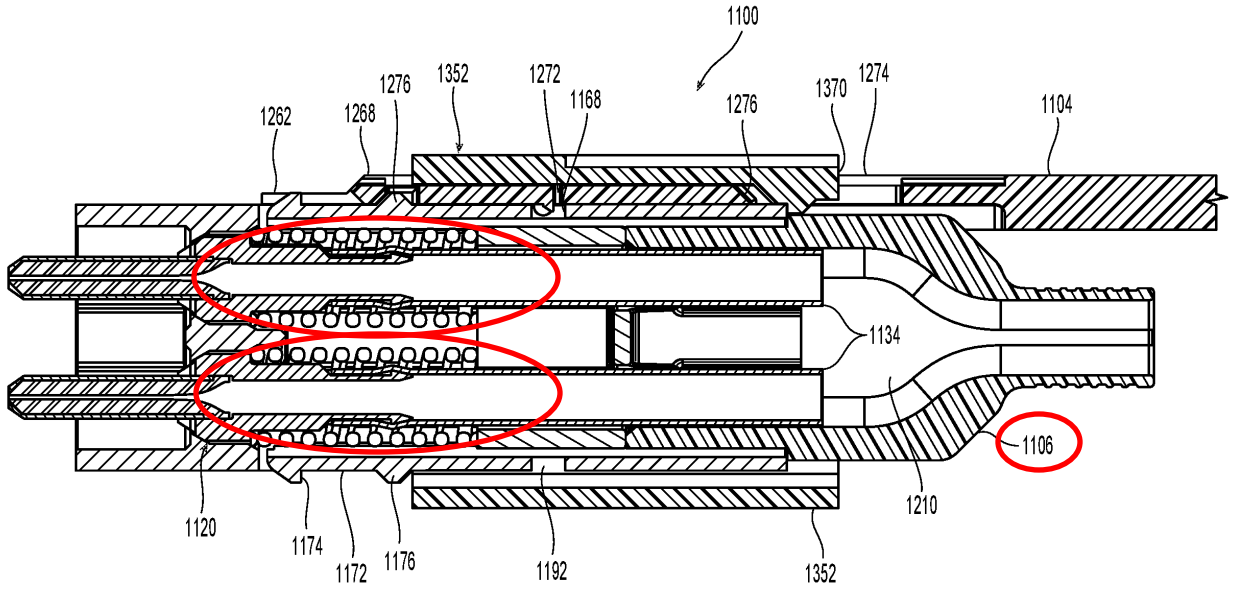


Fig. 33

EX1001: Figs. 21 and 33 (annotated).

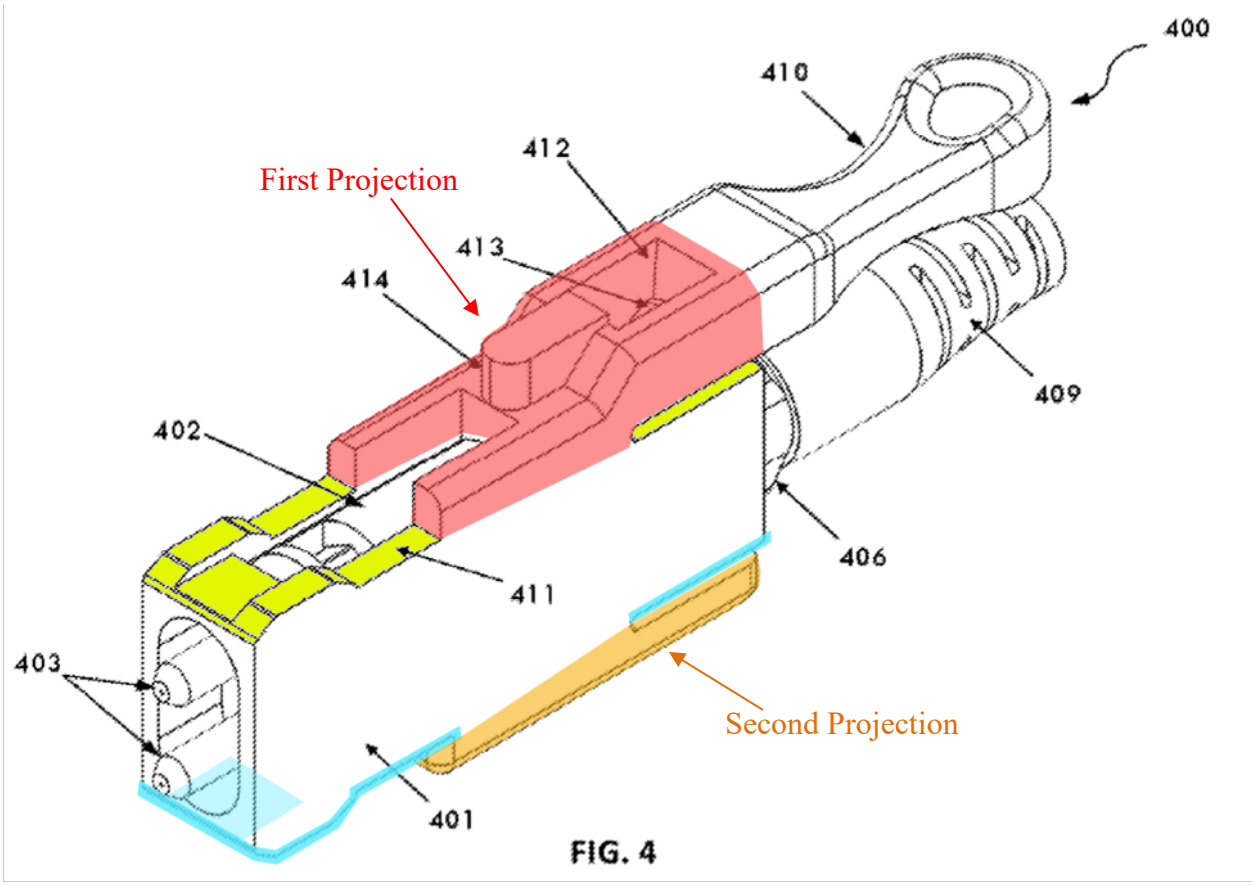
168. Therefore, in my opinion, Takano'209 meets this claim.

K. Claim 11 "The fiber optic connector according to claim 1, wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter."

169. I have been informed that there are two types of claims: apparatus claims and method claims. I have also been informed that apparatus claims cover what a device is. I have been informed that when an apparatus claim recites an intended use of the device, a prior art reference meets the intended use if it is capable of performing the intended use.

170. All of the claims of the '994 Patent are apparatus claims. In addition, claim 11's recitation of "wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter," recites an intended use of the claimed invention. The adapter recited in claim 11 is not being positively claimed but being used in reference to the first and second projections. Therefore, based on the legal concepts as explained to me by Petitioner's counsel, claim 11 is met by any prior art reference that is capable of meeting the intended use.

171. In my opinion, the first and second projections of the optical connector (300, 400, 500, 1100A-B, 1200) are capable of meeting this intended use of claim 11. Such features of the first and second projections are entirely dependent on the construction of the corresponding adapter for a given optical connector.



EX1003: Fig. 4 (annotated).

172. In this case, Takano'209 already explains the "key 414 [of the first projection] may keep the connector in a given orientation when inserted into a receptacle such as an adapter." EX1003: ¶[0092]. The key (414) is received in a corresponding keyway or groove in a corresponding adapter (1314) to set the correct orientation and polarity of the outer housing (301, 401, 501, 1101, 1201). EX1003: Fig. 13. Thus, the first projection (specifically, the key (414) thereof) is sized to fit inside a groove of an adapter.

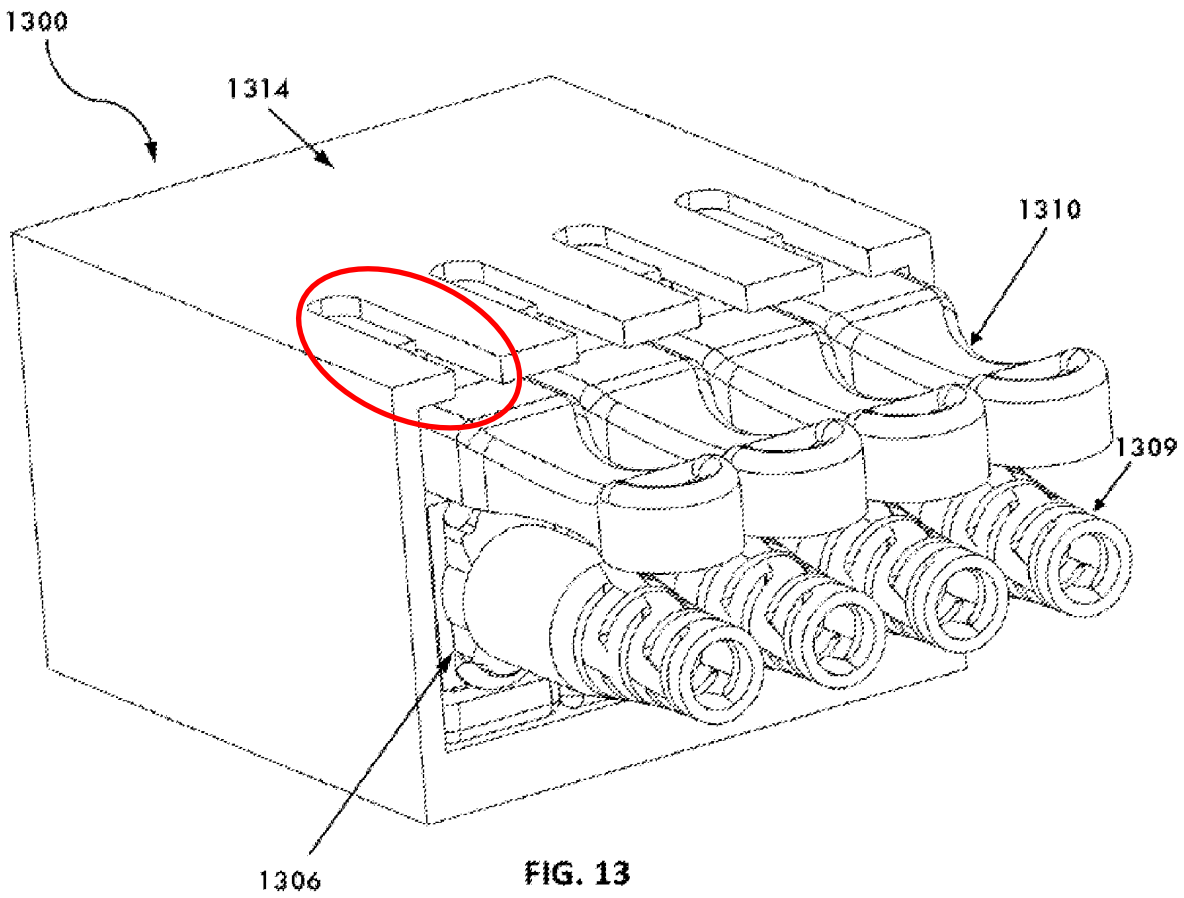
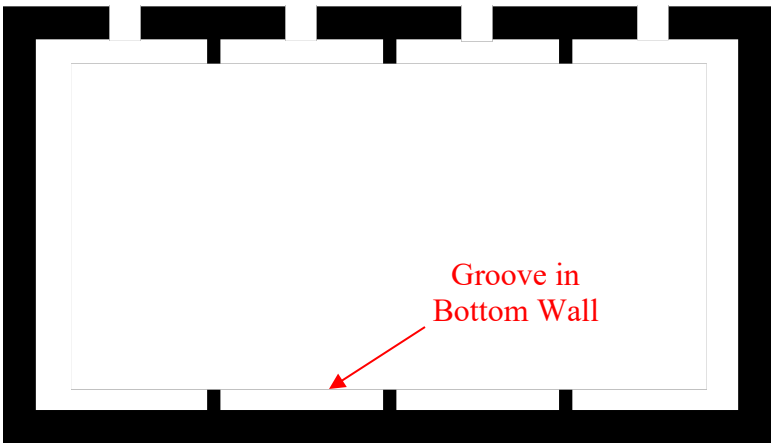


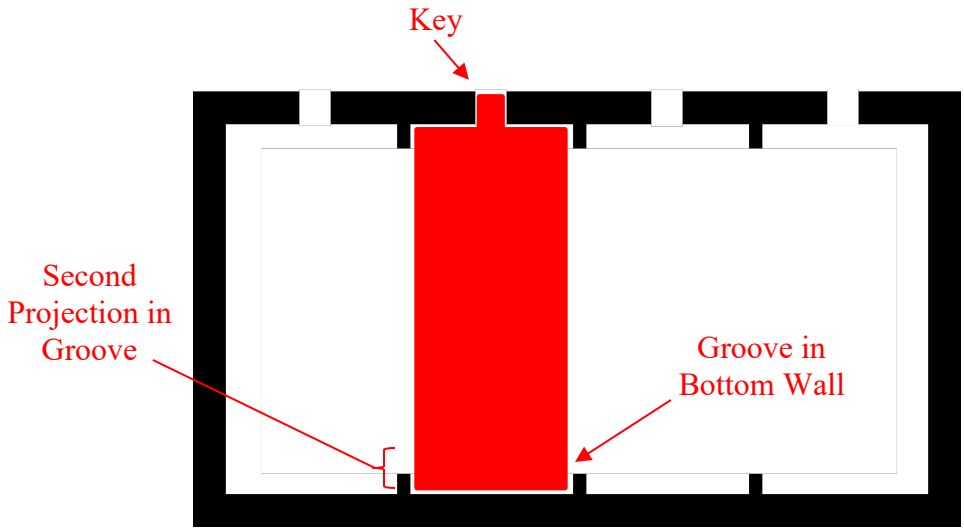
FIG. 13

EX1003: Fig. 13 (annotated).

173. Further, the second projection is capable of fitting inside a groove in a bottom wall of an adapter. For example, schematic illustrations of an adapter having grooves in the bottom wall that the second projection of the optical connector (300, 400, 500, 1100A-B, 1200) is capable of fitting inside are shown below.



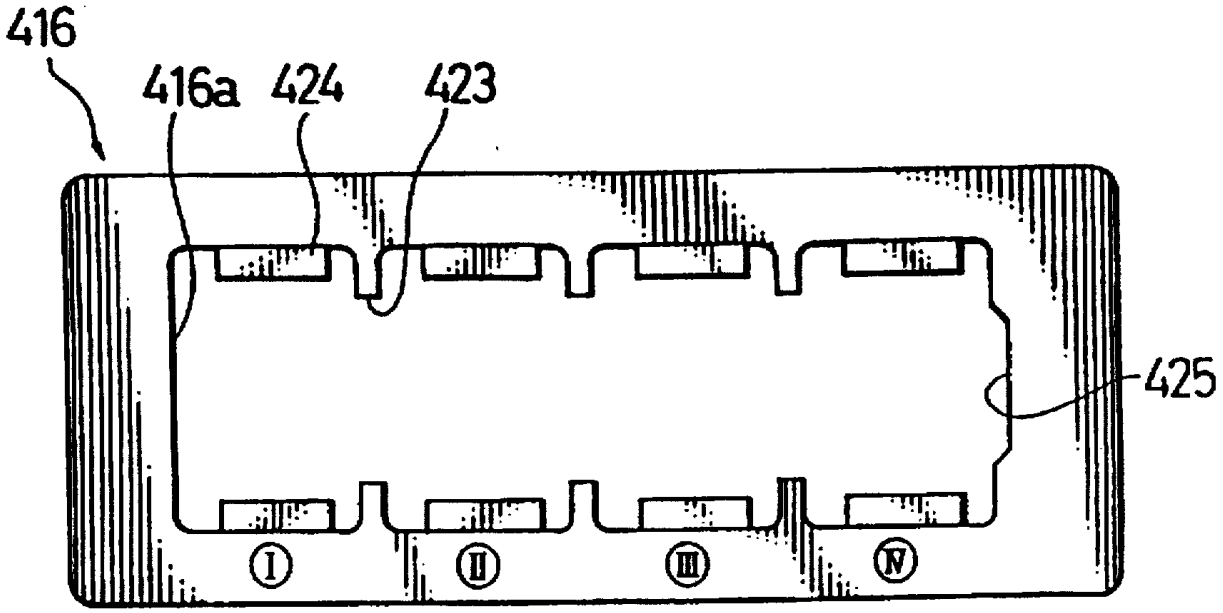
Schematic Illustration of an Adapter for Four Takano'209 Optical Connectors



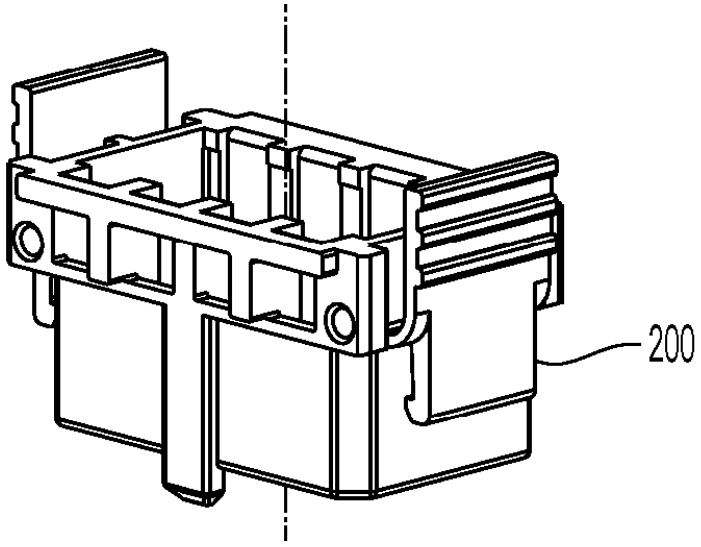
Schematic Illustration of an Adapter with a Takano'209 Optical Connector

174. Adapters with grooves in the bottom wall (and top wall) were commonplace in the art before the '994 Patent:

FIG.30



EX1022: Fig. 30.



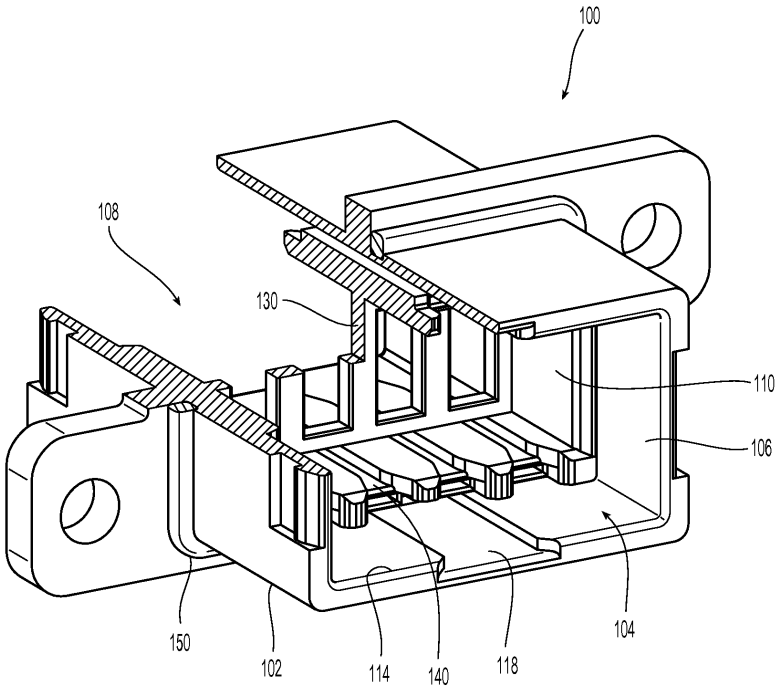
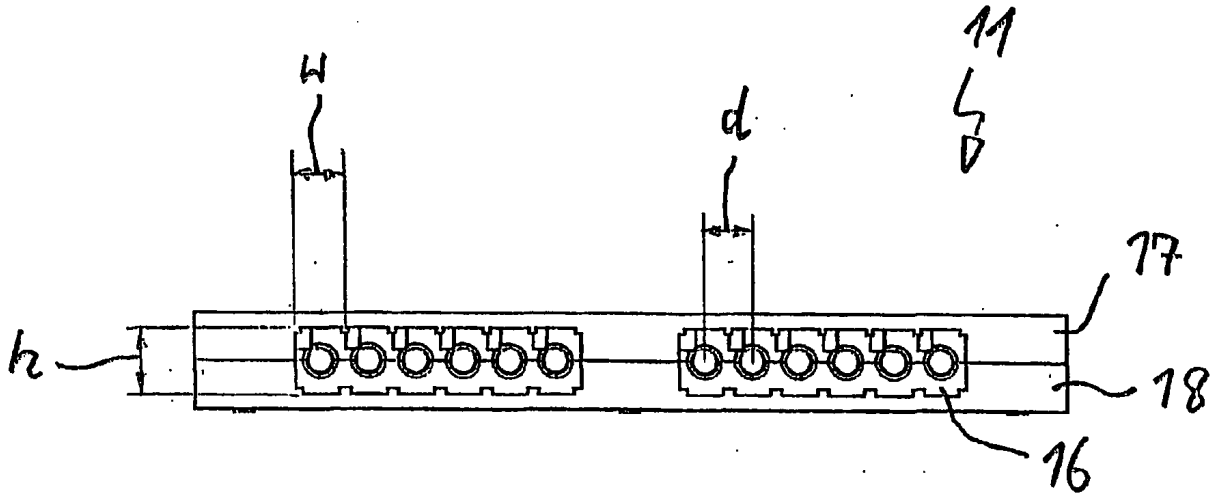


Fig. 3

EX1023: Figs. 2 and 3.



EX1024: Fig. 5.

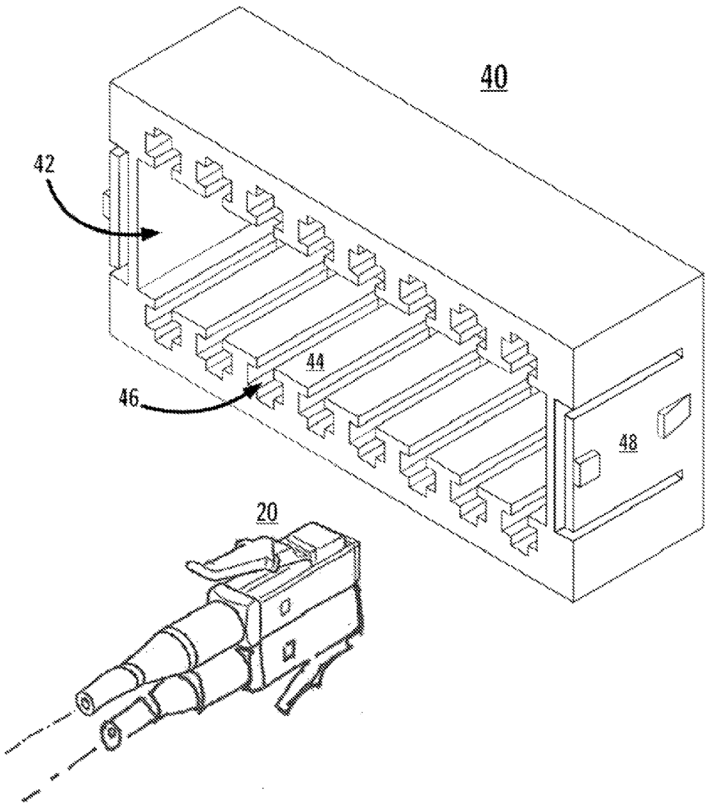
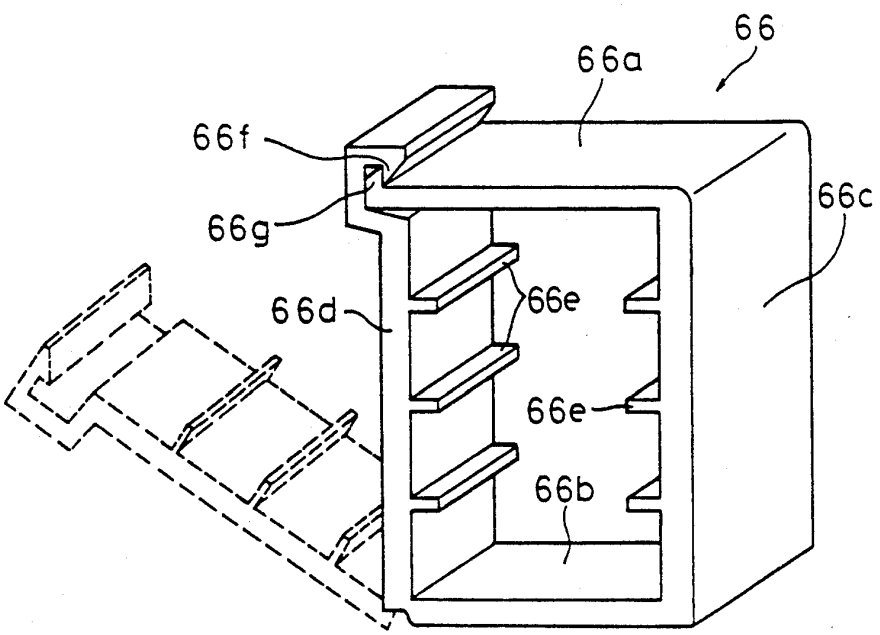


FIG. 4

EX1025: Fig. 4.

FIG. 23



EX1026: Fig. 23.

175. Therefore, in my opinion, Takano'209 meets this claim.

L. Claim 12 "The fiber optic connector according to claim 1, wherein each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ferrule seats of the fiber optic ferrules of each of the ferrule assemblies, the wall located between the top surface and the bottom surface of the main body of the housing."

176. Under any construction of this claim, the two ferrule seats are located in the circled areas below. Section V(A).

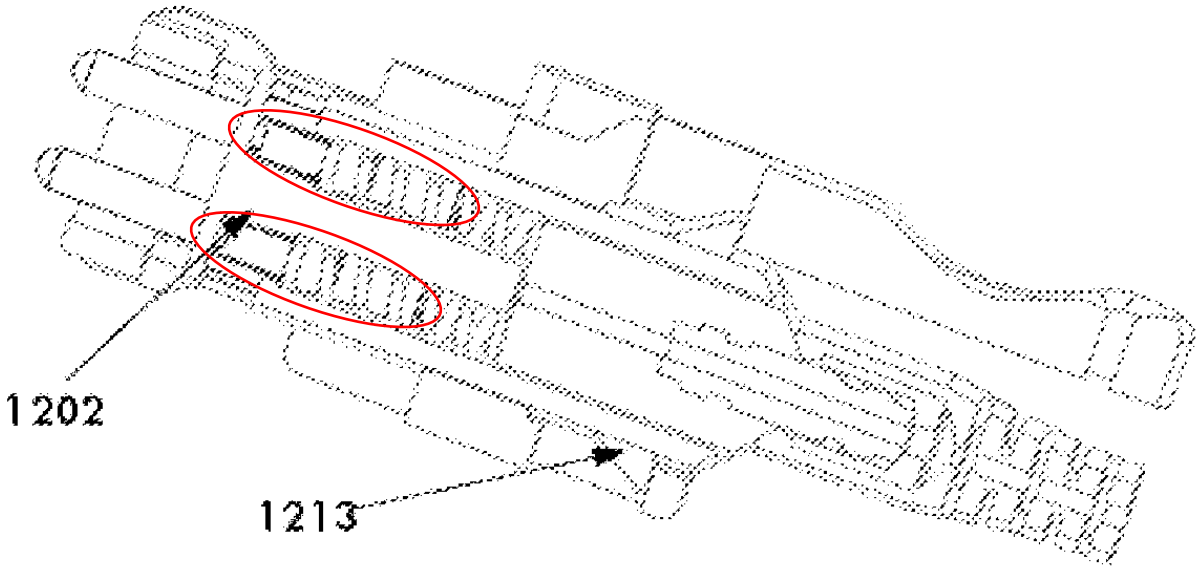
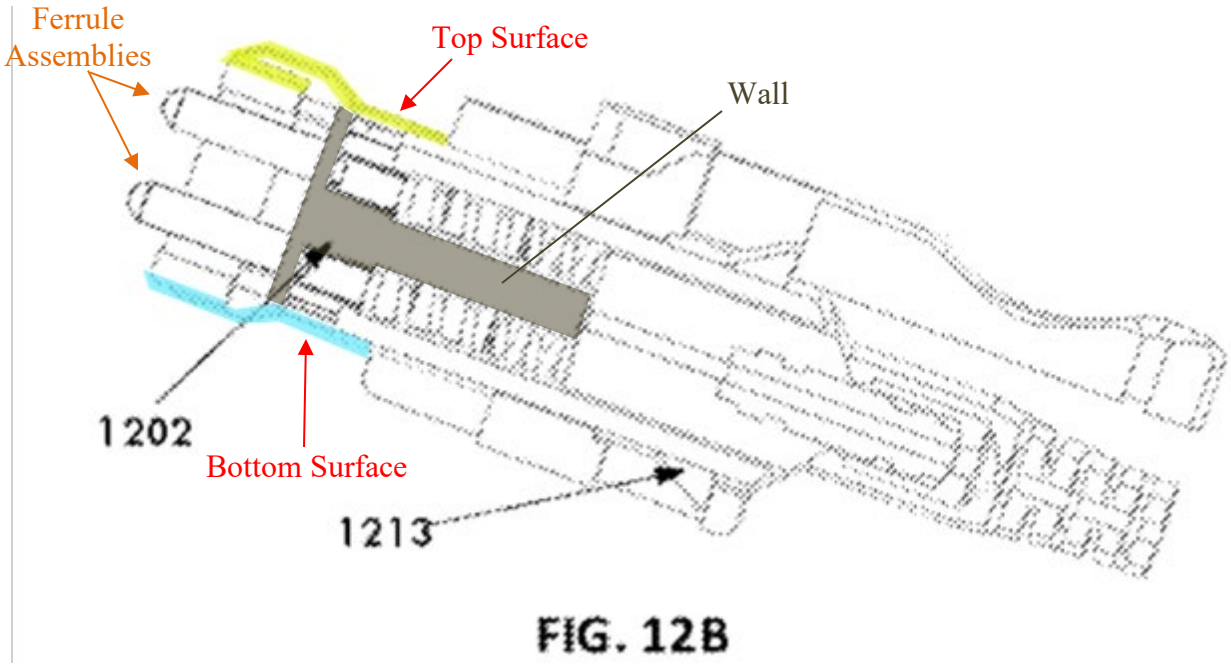


FIG. 12B

EX1003: Fig. 12B(annotated).

177. The front body (302, 402, 502, 1202) includes a wall separating the ferrule assemblies between the locations where the ferrule assemblies are seated in the outer housing (301, 401, 501, 1101, 1201). EX1003: Fig. 12B. The wall is located between the top and bottom surfaces of the outer housing (301, 401, 501, 1101, 1201). EX1003: Fig. 12B.



EX1003: Fig. 12B (annotated).

178. Therefore, in my opinion, Takano'209 meets this claim.

M. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two springs between the crimp body and the first and second ferrule flanges engaged with the wall."

179. As I explained above in Section VII(C), the crimp body (particularly, the front portion of the back body (306, 406)) forms a spring push. The spring push simultaneously compresses each of the two ferrule springs (305) between the crimp body and the ferrule flanges (304). EX1003: Fig. 12B, ¶[0091]. The forward portion of the ferrule flanges (304) is engaged with the wall, as shown in Fig. 12B. EX1003: Fig. 12B. The ferrule flanges (304) are pushed against a rear face of the wall. Further, as known in the art, the hexagonal collar of the ferrule flange (304) engages the wall to prevent the ferrules from rotating and twisting the

optical fibers. EX1003: Figs. 3 and 12B. Such prevention of rotation/twisting is especially important when polishing the ferrules, such as when applying an angle-physical contact (APC) polish.

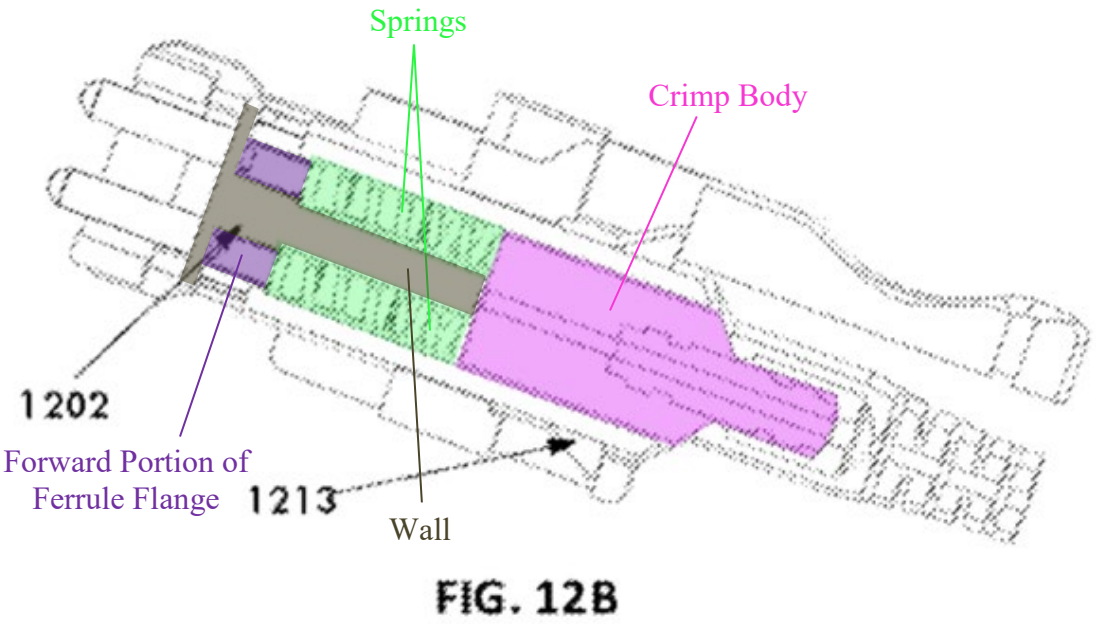


FIG. 12B

EX1003: Fig. 12B (annotated).

180. Therefore, in my opinion, Takano'209 meets this claim.

VIII. OBVIOUS: TAKANO'209 & LEE (GROUND 4)

181. In my opinion, claims 3 and 13 would have further been obvious over Takano'209 in view of Lee.

A. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs."

182. In my opinion, it would have been obvious to modify Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) to include a spring push separate from the crimp body as taught by Lee.

183. Lee teaches an optical connector (10) that, like Takano'209's optical connector (300, 400, 500, 1100A-B, 1200), is taller than it is wide and holds two spring-loaded single-fiber ferrules (20, 22) at vertically spaced apart positions. EX1005: Figs. 2 and 3, ¶¶[0029]-[0030]. Fibers (86, 88) enter the optical connector (10) through a single opening in a two-piece crimp body (36, 110) at a rear end and extend forward through ferrule springs (100, 102) to the ferrules (20, 22). EX1005: Figs. 2 and 3, ¶¶[0030], [0037], [0038], [0040]. Between the two-piece crimp body (36, 110) and the ferrule springs (100, 102) is a separate spring push (104). EX1005: Figs. 2 and 3, ¶[0038]. Lee teaches that the spring push (104) is an E-shaped body with first and second slots (156, 158) for receiving the fibers (86, 88). EX1005: ¶[0052]. The slots (156, 158) are "kept relatively small to help position the first and second optical fibers 86, 88 on or close to the longitudinal axes FA1, FA2 of the first and second ferrules 20, 22." EX1005: ¶[0052]. Spring seats (162, 164) are positioned around the slots (156, 158) on the front side of the spring push. EX1005: ¶[0056]. The spring seats (162, 164) retain

the rear ends of the ferrule springs (100, 102) and help "prevent the first and second inner springs 100, 102 from moving laterally on the spring push 104 and contacting the first and second optical fibers 86, 88." EX1005: ¶[0053]. Lee further teaches that the separate spring push (104) facilitates an improved connectorization of a fiber optic cable by allowing for placement of the spring push onto the cable after the fibers (80, 86) have been installed in the ferrules (20, 22). EX1005: ¶¶[0055]-[0058].

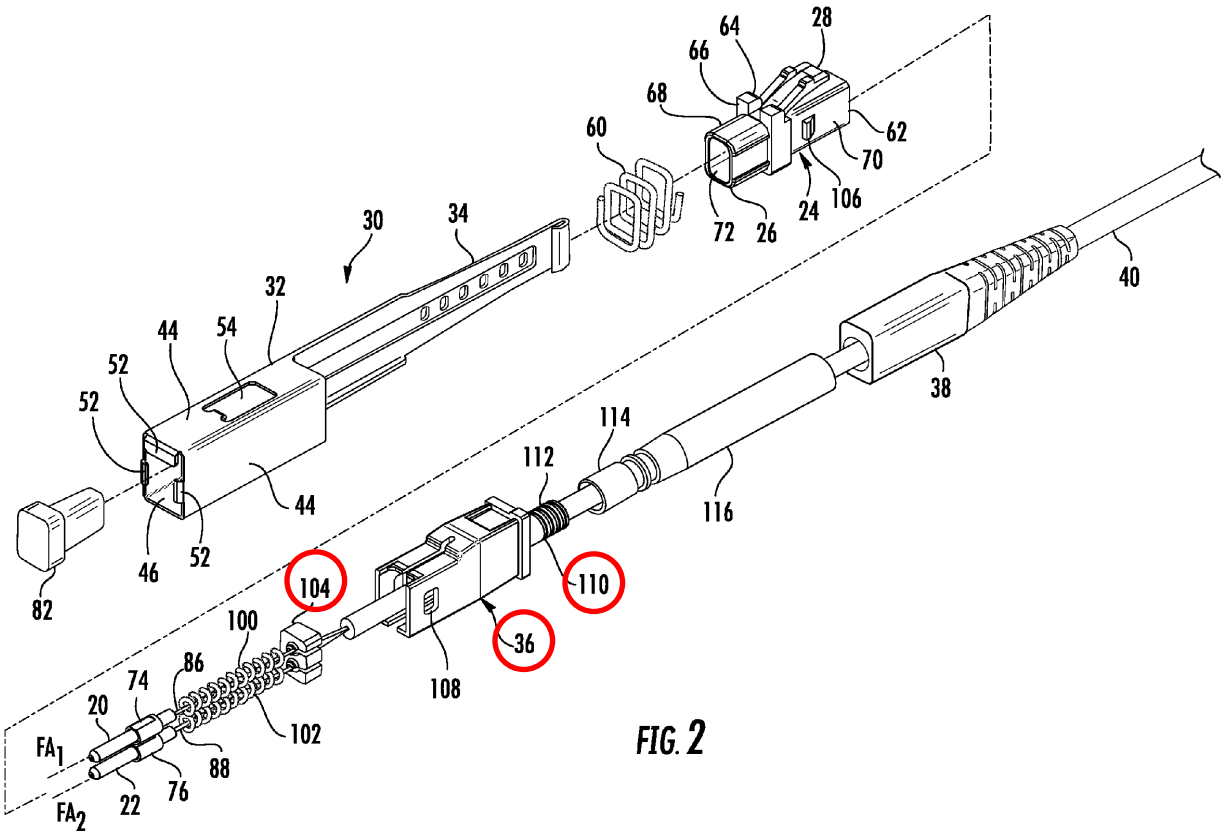
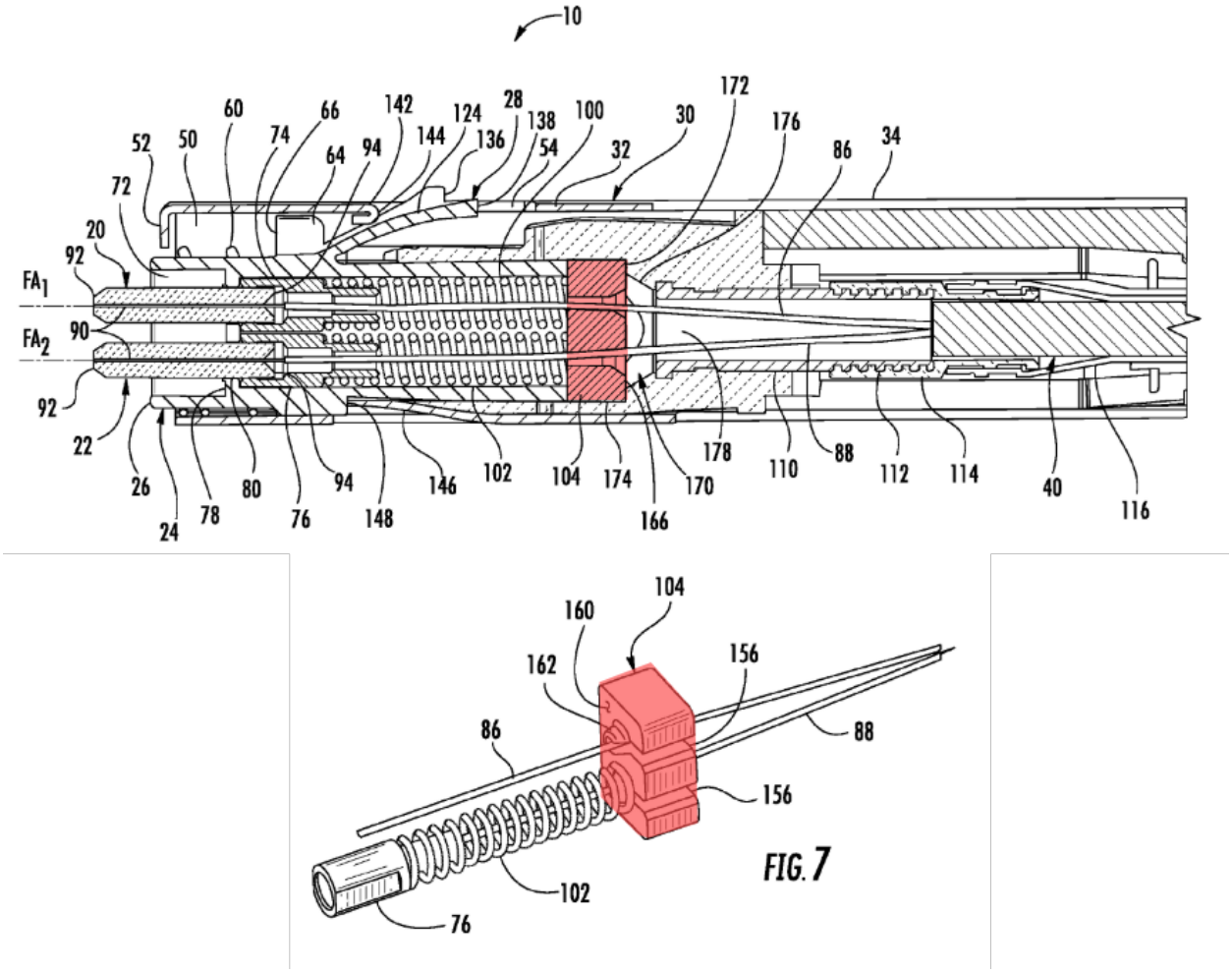


FIG. 2



EX1005: Figs. 2, 3, and 7 (annotated).

184. In my opinion, it would have been obvious to modify Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) to include Lee's spring push (104). A POSA would have been motivated to make the combination based on the express teachings of Lee regarding the advantages of the separate spring push (104). For example, each of the following advantages that are expressly taught by Lee would have served as an independent motivation for the combination: (i) to help position the fibers close to the longitudinal axes of the ferrules; (ii) to protect

the fibers from relative movement in relation to the ferrule springs by aligning spring seats (162, 164) with the slots (156, 158); and (iii) to provide improvements in the process of terminating a fiber optic cable with the connector by allowing for placement of the spring push (104) onto the cable after the fibers have been installed in the ferrules. EX1005: ¶¶[0053], [0055].

185. This modification would have been nothing more than combining known prior art elements (Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) and Lee's spring push (104)) according to known methods (arrangement taught by Lee) to yield predictable results (an optical connector with an independently mountable spring push).

186. This modification would have also been nothing more than the application of a known technique (Lee's spring push (104)) for an optical connector that is taller than it is wide and holds two spring-loaded single-fiber ferrules at vertically spaced apart positions) to improve a similar device (Takano'209's optical connector (300, 400, 500, 1100A-B, 1200)) in the same way to yield predictable results (an optical connector with an independently mountable spring push).

187. This modification would have also been nothing more than the use of a known technique (Lee's separate spring push (104)) to a known device (Takano'209's optical connector (300, 400, 500, 1100A-B, 1200)) ready for

improvement to yield predictable results (an optical connector with an independently mountable spring push). For example, the POSA would recognize that the E-shaped spring push (104) with narrow fiber slots would function better to align the individual fibers with their respective ferrules and ferrule springs than the singular opening formed in the back body (306, 406).

188. There would have been a reasonable expectation of success in making this modification given the function and general placement of Lee's spring push (104) would not change in Takano'209's optical connector (300, 400, 500, 1100A-B, 1200). Further, the POSA would have made only minor structural changes to facilitate this modification such as changing the dimensions of the front body (302, 402, 502, 1202) and/or back body (306, 406) slightly to accommodate an E-shaped spring push between the springs (305) and the front end of the back body and between upper and lower portions of the front body. This modification would only require minor changes in dimensions and shapes of molded parts and is well within the level of ordinary skill in the art.

189. A schematic illustration of this modification is shown below:

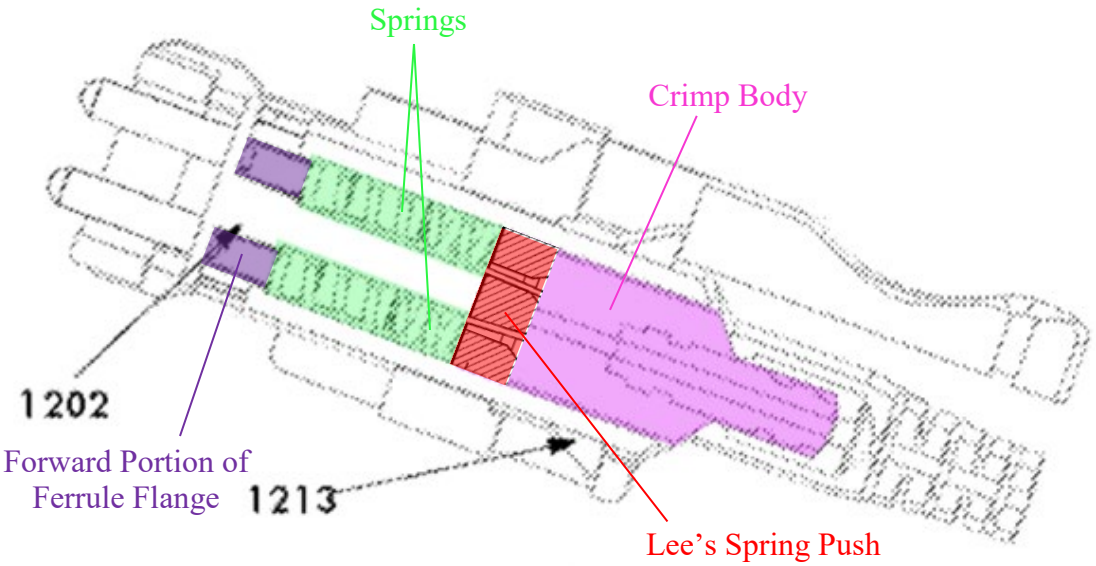


FIG. 12B

EX1003: Fig. 12B (annotated, modified).

190. As a result of this modification, Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) includes Lee's spring push (104), which just like in Lee, would engage the rear portions of each of Takano'209's springs (305) and simultaneously compress the springs between the crimp body and the ferrule flanges (304). EX1005: Fig. 3, ¶¶[0038], [0053].

191. Therefore, in my opinion, the Takano'209/Lee combination renders this claim obvious.

M. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two

springs between the crimp body and the first and second ferrule flanges engaged with the wall."

192. For the reasons I explained above in Section VIII(A), the Takano'209/Lee combination renders the "spring push" portion of claim 13 obvious. The remaining limitations of claim 13 are met by Takano'209 for the reasons I explained above in Section VII(M).

IX. OBVIOUS: TAKANO'209 & MATSUMOTO (GROUND 5)

193. In my opinion, claims 4 and 11 would have further been obvious over Takano'209 in view of Matsumoto.

A. Modification of Takano'209 Based on Matsumoto

194. Takano'209 describes an adapter (1314) as receiving an optical connector (800) of Fig. 8 with a four body outer housing (801) with four push-pull tabs (1310). EX1003: ¶[0108]. An adapter (1314) for receiving four optical connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B would have a very similar if not identical construction to the adapter of Fig. 13, for the reasons I explained above in Section VII(A)(1.P).

195. As I previously explained, the adapter (1314) of Fig. 13 may be for four optical connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B. Fig. 13 shows the rounded edges (annotated below) that would exist between adjacent outer housings (301, 401, 501, 1101, 1201) of four optical connectors (300, 400, 500, 1100A-B, 1200) of Figs. 3-5 and 11A-12B. EX1003: Fig. 13.

Such rounded edges would not be present in the single outer housing (801) of Fig. 8. EX1003: Fig. 8.

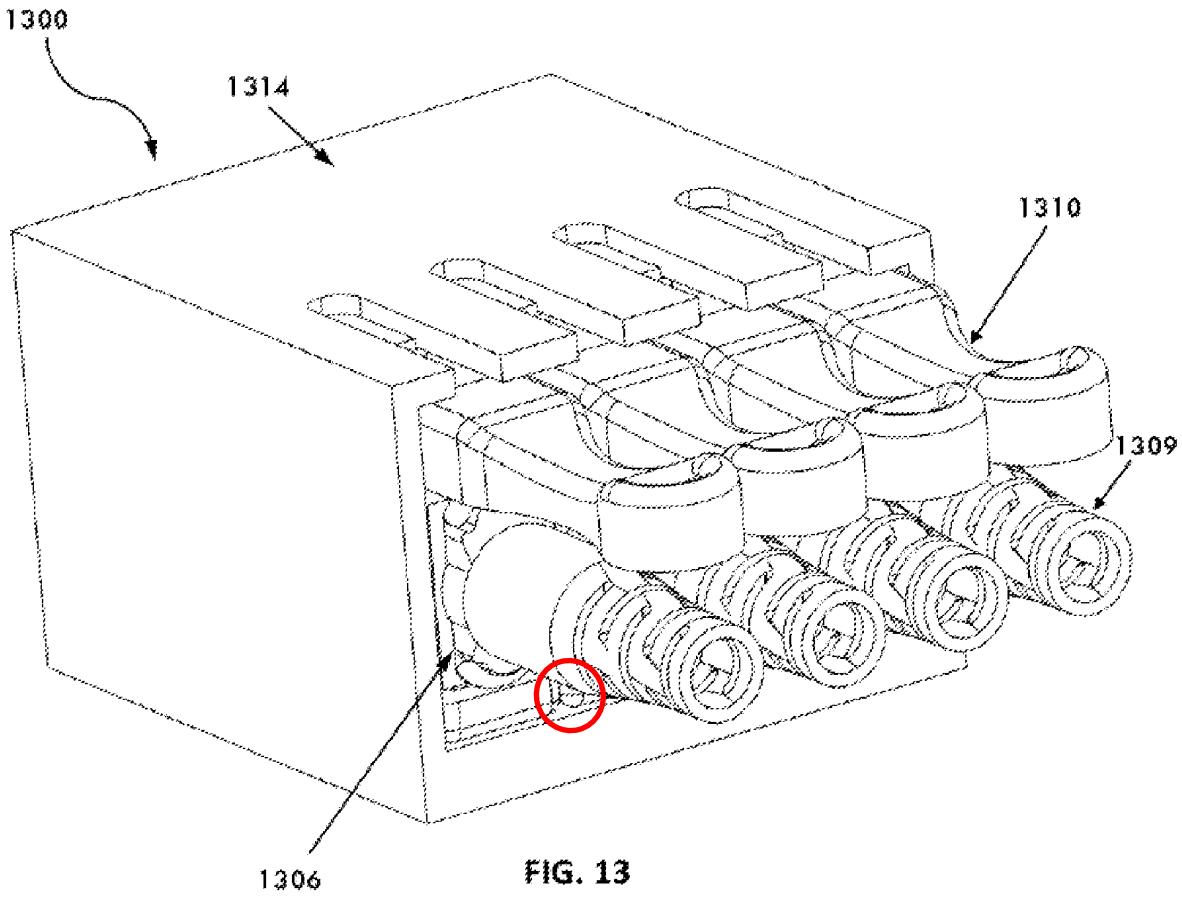


FIG. 13

EX1003: Fig. 13 (annotated).

196. The upper surface of the bottom wall of the adapter (1314) appears to be flat. EX1003: Fig. 13.

197. Matsumoto teaches an adapter (6) comprising a similar rectangular shape to the adapter (1314) of Takano'209. EX1006: Fig. 4, 4:1-3. However, instead of the bottom wall of the Matsumoto adapter being flat, Matsumoto has guides (63) formed at spaced apart locations to separate individual connector ports.

EX1006: Fig. 4, 4:5-7. The guides (63) define four grooves at spaced apart locations along the bottom wall of the adapter (6). EX1006: Fig. 4. Each groove is configured to receive the bottom portion of a respective connector housing (2), whereby the guides ensure proper alignment of the connector into its connector port. EX1006: 4:5-7. Matsumoto teaches that the guides make it "possible to mount a plurality of optical connectors very closely, thus providing high-density mounting." EX1006: 4:9-11.

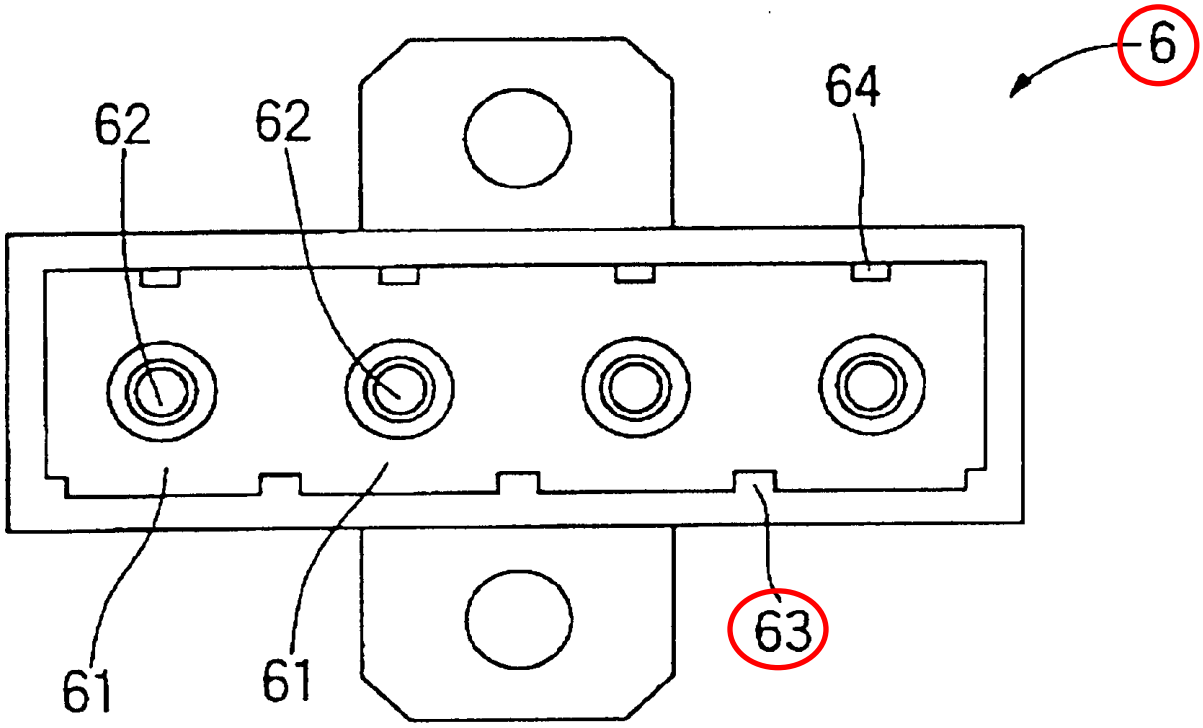


FIG. 4

EX1006: Fig. 4 (annotated).

198. In my opinion, it would have been obvious to modify Takano'209's adapter (1314) to include Matsumoto's guides (63) to the bottom wall of the adapter to facilitate high-density fiber optic interconnects while still ensuring proper alignment of an individual connector into its port, as taught by Matsumoto. EX1003: 4:5-11.

199. The POSA would recognize that adding guides to the bottom wall of the adapter (1314) to provide grooves into which the second projections of the optical connector (300, 400, 500, 1100A-B, 1200) can fitted would improve alignment of the optical connector into the adapter. Because the adapter (1314) lacks partition walls between ports for individual optical connectors (300, 400, 500, 1100A-B, 1200), the POSA would recognize the possibility that an individual optical connector could become misaligned if the user does not exercise care while inserting that optical connector. In particular, because the bottom wall of the adapter (1314) is flat, there is nothing to keep the bottom of the optical connector (300, 400, 500, 1100A-B, 1200) in proper lateral position as the optical connector is inserted. A careless user could twist the optical connector (300, 400, 500, 1100A-B, 1200) such that the bottom of the connector shifts laterally left or right during insertion, especially for the first of the four optical connectors (300, 400, 500, 1100A-B, 1200) inserted into the adapter (1314). This would cause misalignment.

200. Based on the teachings of Matsumoto, the POSA would recognize that providing guides to the bottom wall of the adapter (1314) that complement the geometry of the lower projection on the connector housing would ensure proper lateral alignment of the bottom portion of the optical connector (300, 400, 500, 1100A-B, 1200) during insertion. Moreover, this improvement would have been apparent to the POSA based on prior art that expressly teaches the benefits of including lateral alignment guides on both sides of optical plugs and corresponding keyways to both sides of partition-less mating adapters. EX1011: ¶0050 (describing how adding a guide rail to the bottom side of a connector with a latch structure or other guide rail on the top side aids in properly aligning the connector into a port or a partition-less adapter); EX1023: ¶[0027] (describing how projections on top and bottom walls of a ferrule holder align the ferrule holder with an adapter along horizontal and vertical axes and eliminates the need for side walls in adapters).

201. The added guides (63) would also provide a further visual indication to a user of where each optical connector (300, 400, 500, 1100A-B, 1200) should be positioned relative to the adapter (1314) for insertion into the adapter.

202. This modification would have been nothing more than combining known prior art elements (Takano'209's adapter (1314) and Matsumoto's guides (63)) according to known methods (arrangement taught by Matsumoto) to yield

predictable results (an adapter with guides for guiding insertion of an optical connector to ensure proper alignment).

203. This modification would have also been nothing more than the application of a known technique (Matsumoto's guides (63) for an adapter (6)) to improve a similar device (Takano'209's adapter (1314)) in the same way to yield predictable results (an adapter with guides for guiding insertion of an optical connector to ensure proper alignment).

204. This modification would have also been nothing more than the use of a known technique (Matsumoto's guides (63)) to a known device (Takano'209's adapter (1314)) ready for improvement to yield predictable results (an adapter with guides for guiding insertion of an optical connector to ensure proper alignment).

205. The POSA would have had a reasonable expectation of success in making this modification given the function and general placement of Matsumoto's guides (63) would not change in Takano'209's adapter (1314). Further, this modification is nothing more than minor changes in molded part geometry, the effect of which would be entirely predictable. The changes could be made without effecting any aspect of the connection system besides the shape of the bottom wall of the adapter (and, optionally, the shape of the corner regions of the bottom projection of the optical connector for reasons explained below). This

modification would require only minor changes in dimensions and shapes of molded parts and is well within the level of ordinary skill in the art.

206. The POSA would understand that this modification can be made with only negligible or no enlarging of the width of Takano'209's adapter (1314). The bottom of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) has rounded/chamfered corners (annotated below):

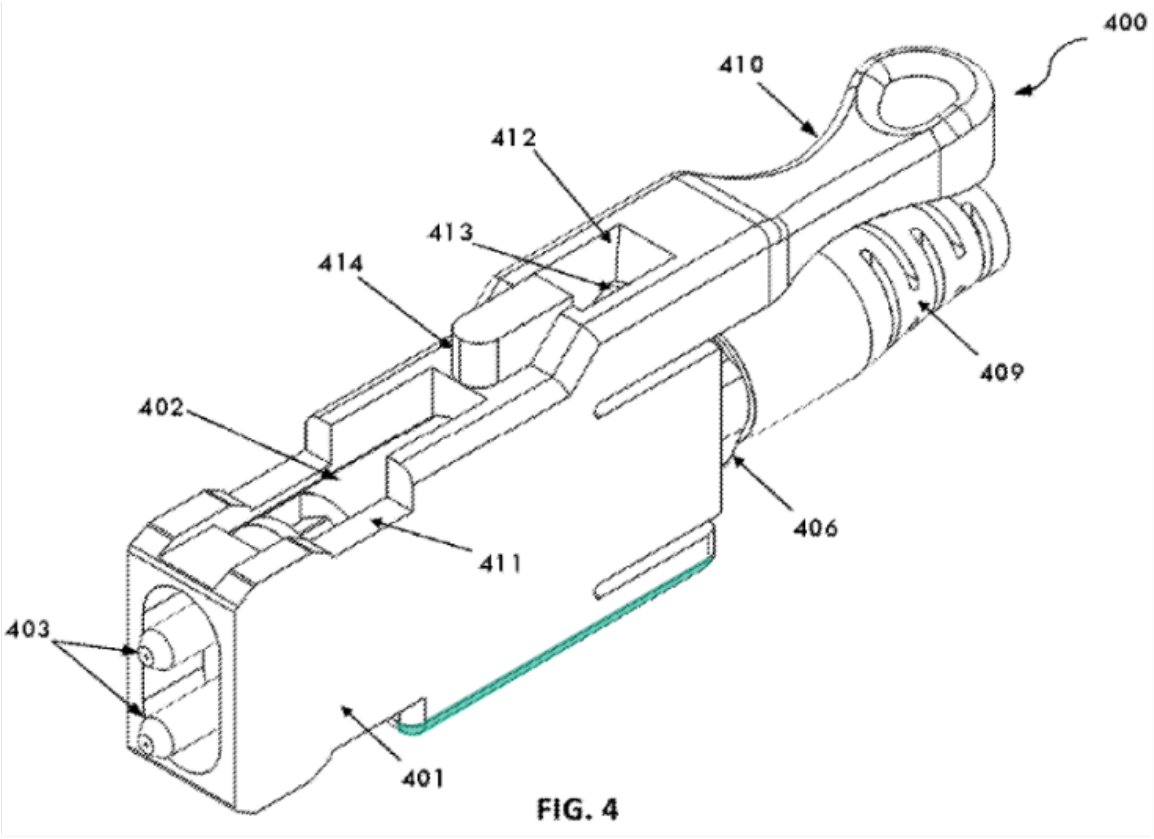


FIG. 4

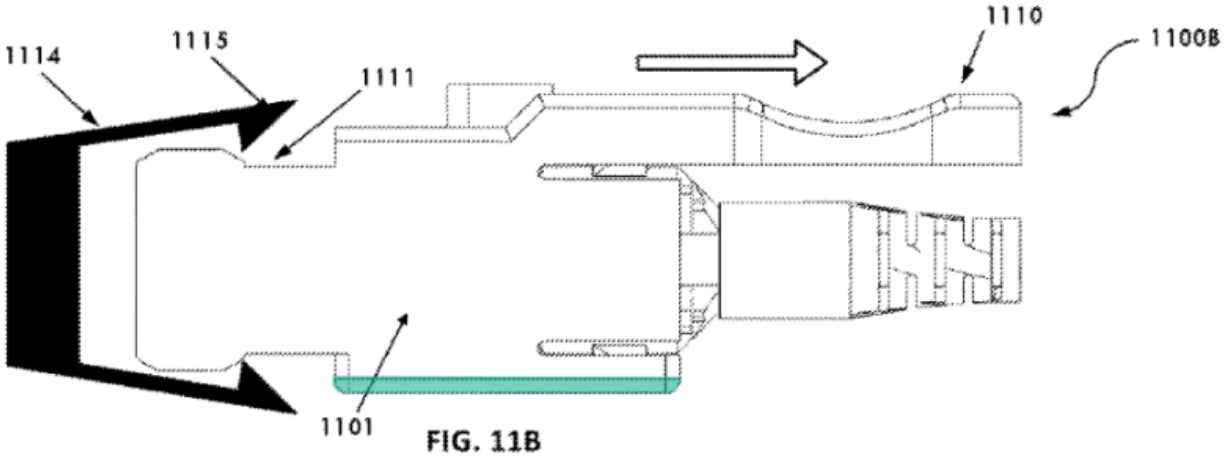


FIG. 11B

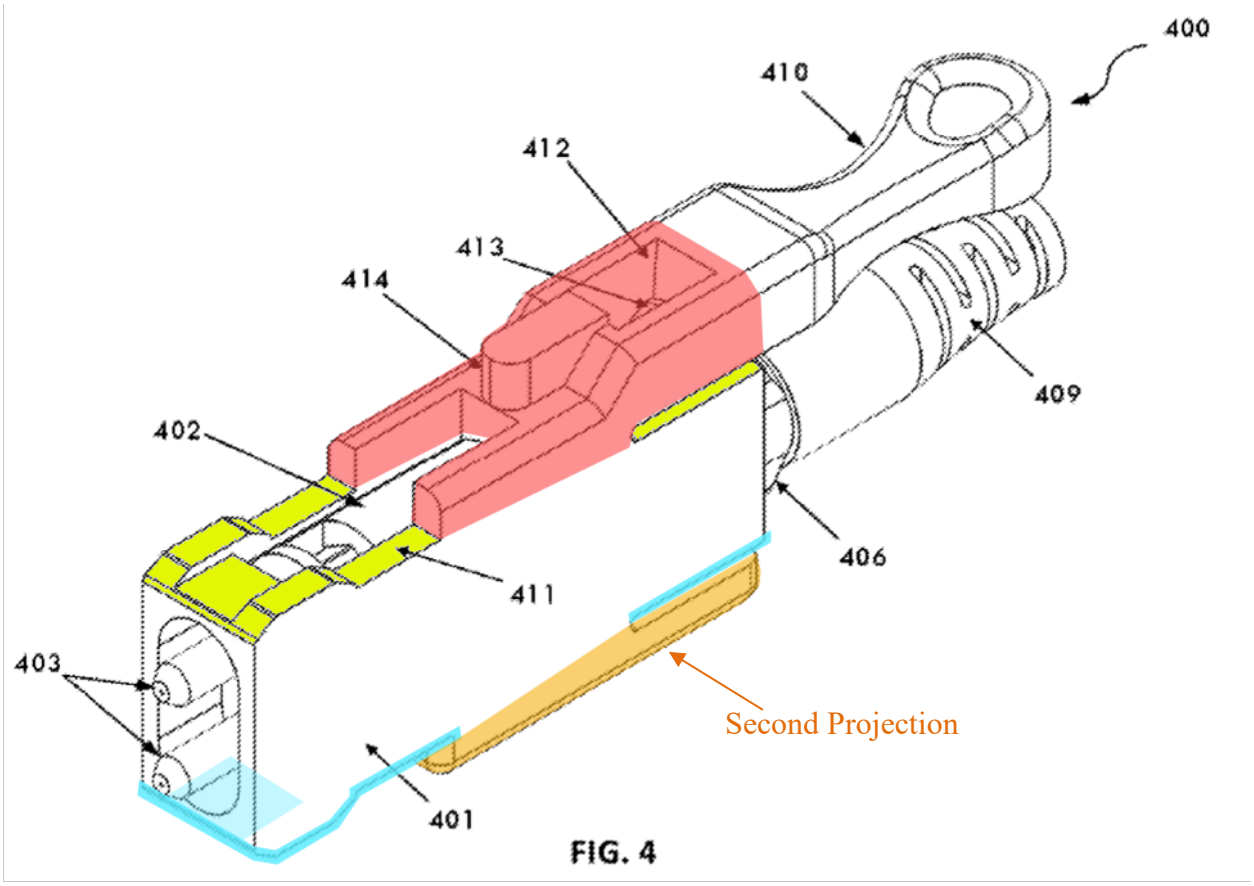
EX1003: Figs. 4 and 11B (annotated).

207. In making the modification, the POSA would simply size and shape the added guides (63) of Matsumoto to fit alongside these rounded/chamfered corner regions of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200).

For example, the POSA would have recognized that the guides (63) of Matsumoto added to the bottom wall of Takano'209's adapter (1314) can be shaped (e.g., triangular) to fit the existing rounded/chamfered corner geometry of the bottom of the optical connector (300, 400, 500, 1100A-B, 1200) without substantial or any modification of the optical connector. Alternatively, the POSA would have found it obvious to modify the shape of these rounded/chamfered corner regions to define small rectangular shoulders to accept the square-shaped guides (63) of Matsumoto used in the adapter of Matsumoto as known in the art. EX1026: Figs. 23 and 28; EX1027: Fig. 1. Either modification would have been obvious based on the combined teachings of Takano'209 and Matsumoto and the POSA's knowledge.

B. Claim 4 "The fiber optic connector according to claim 1, wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter."

208. The Takano'209/Matsumoto combination results in Takano'209's adapter (1314) including Matsumoto's guides (63) along the bottom wall of the adapter for receiving the second projection of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200). This reception of second projection of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) between adjacent guides (63) added to Takano'209's adapter (1314) sets the correct orientation of the outer housing (301, 401, 501, 1101, 1201) relative to the adapter.



EX1003: Fig. 4 (annotated).

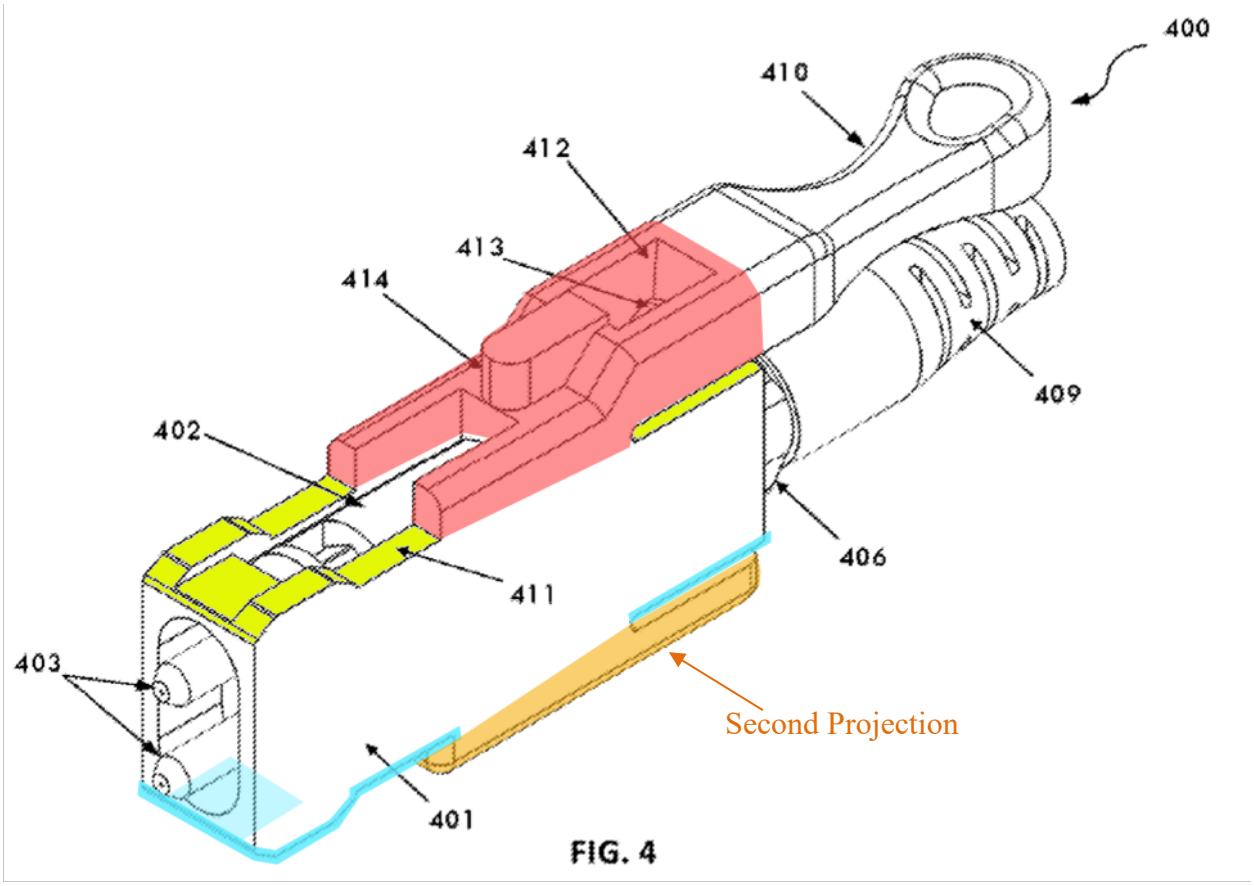
209. Takano'209's first projection meets the limitations of this claim for the reasons I explained above in Section VII(D).

210. Therefore, in my opinion, the Takano'209/Matsumoto combination renders this claim obvious.

C. Claim 11 "The fiber optic connector according to claim 1, wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter."

211. The Takano'209/Matsumoto combination results in Takano'209's adapter (1314) including Matsumoto's guides (63) along the bottom wall of the

adapter for receiving the second projection of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200). The guides (63) define grooves in Takano'209's adapter (1314). Thus, the second projection of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) is sized to fit inside the groove formed by adjacent guides (63) added to Takano'209's adapter (1314).



EX1003: Fig. 4 (annotated).

212. Takano'209's first projection meets the limitations of this claim for the reasons I explained above in Section VII(K).

213. Therefore, in my opinion, the Takano'209/Matsumoto combination renders this claim obvious.

X. OBVIOUS: TAKANO'209 & HILL (GROUND 6)

214. In my opinion, claims 14 and 15 would have been obvious over Takano'209 in view of Hill.

A. Claim 14 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an angled physical contact (APC) ferrule."

215. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Angled physical contact" or APC as recited by claim 14 is a common polish type for the end of fiber optic ferrules. EX1028: 3-4. As known in the art, APC type polish offers the lowest return loss (amount of light reflected back by the end face of the optical fiber). Ex1029: 3.

216. In my opinion, it would have been obvious to modify Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) in view of Hill.

217. Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) has "LC-type optical ferrules." EX1003: ¶[0091]. However, Takano'209 is silent about the type of polishing used for the LC-type ferrules.

218. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

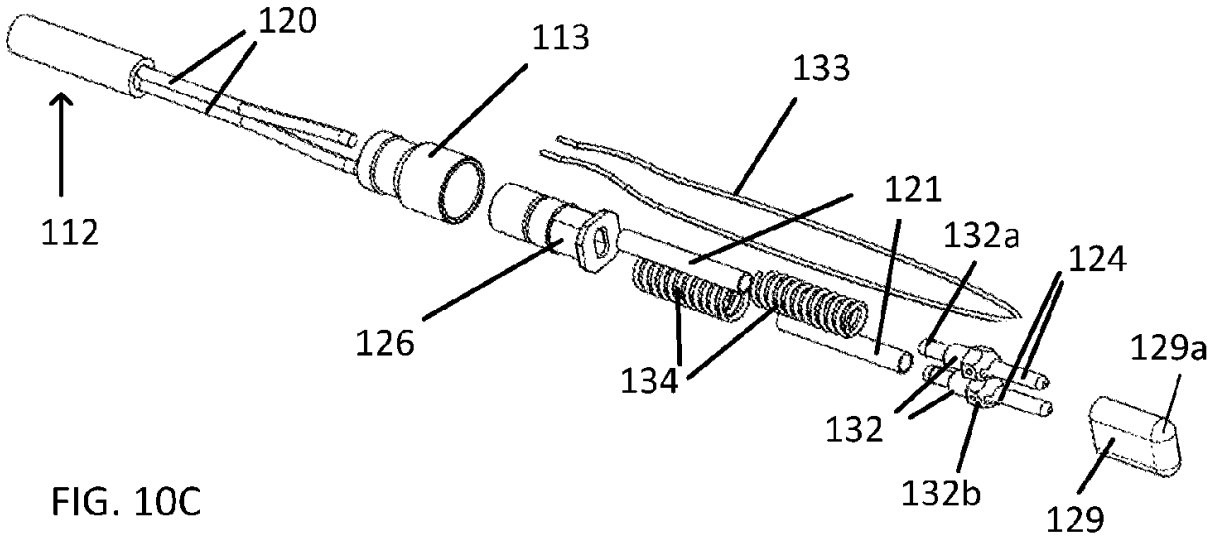


FIG. 10C

EX1007: Fig. 10C.

219. In my opinion, it would have been obvious to make the ferrules (303, 403) of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) an "angled physical contact" type of ferrule in view of Hill. Takano'209 already discloses that its ferrules (303, 403) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well known to be particularly useful for single mode (SM) fiber applications requiring lowest return loss. EX1029: 3; EX1030: 2. Making Takano'209's ferrules (303, 403) an "angled physical contact" type of ferrule makes Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) suitable for single mode, "high bandwidth applications and long haul links" sensitive to return loss, such as "FTTx (fiber to the x), passive optical network (PON) and wavelength-division multiplexing (WDM)" applications. EX1029: 3.

220. This modification is nothing more than a simple substitution of one known element (Hill's LC/APC type ferrule) for another (Takano'209's ferrule) to yield predictable results (an APC optical connector for lowest return loss applications).

221. This modification would have also been nothing more than the application of a known technique (Hill's APC ferrule polish type) to improve a

similar device (Takano'209's ferrules) in the same way to yield predictable results (an APC optical connector for lowest return loss applications).

222. This modification would have also been obvious to try as APC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used. Further, the specific polish type is generally specified by each customer application.

223. There would have been a reasonable expectation of success in making this modification given that both Takano'209's and Hill's ferrules are of LC-type. EX1003: ¶[0091]; EX1007: ¶[0058].

224. As a result of this modification, the ferrules (303, 403) in Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) are APC ferrules.

225. Therefore, in my opinion, the Takano'209/Hill combination renders this claim obvious.

B. Claim 15 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an ultra-physical contact (UPC) ferrule."

226. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Ultra-physical contact" or UPC as recited by claim 15 is another common polish type for the end of fiber optic ferrules. EX1028: 3. As known in the art, UPC type polish offers single mode (SM) fiber applications low return loss at a low cost. EX1029: 3.

227. In my opinion, it would have been obvious to modify Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) in view of Hill.

228. Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) has "LC-type optical ferrules." EX1003: ¶[0091]. However, Takano'209 is silent about the type of polishing used for the LC-type ferrules.

229. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come

to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

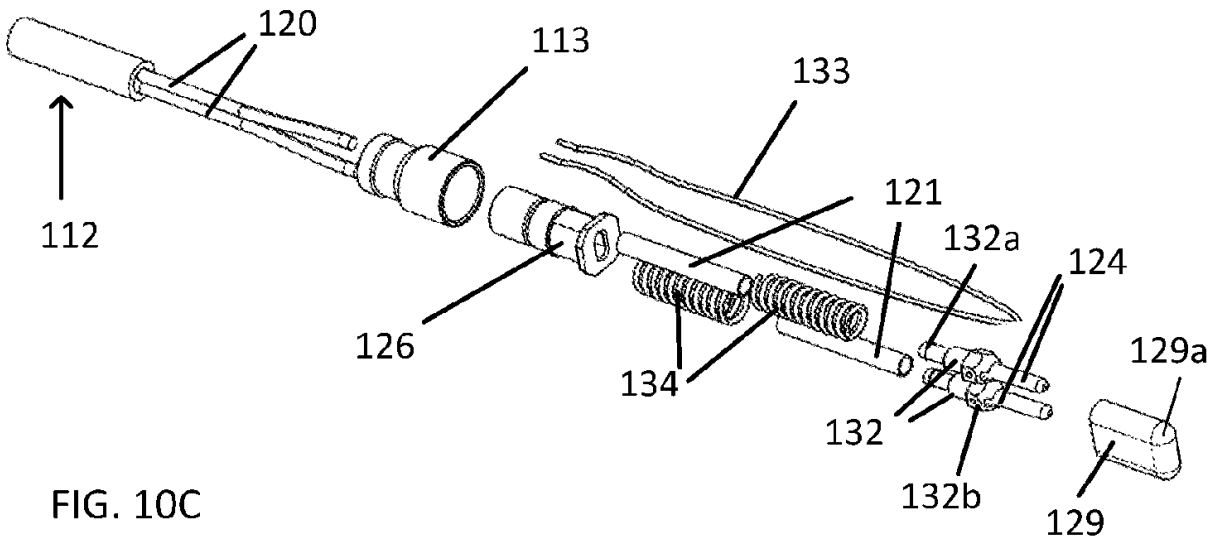


FIG. 10C

EX1007: Fig. 10C.

230. In my opinion, it would have been obvious to make the ferrules (303, 403) of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) an "ultra-physical contact" type of ferrule in view of Hill. Takano'209 already discloses that its ferrules (303, 403) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well known to be particularly useful for single mode (SM)

fiber applications requiring low return loss while being cheaper than other polish types, such as APC. EX1029: 3. Making Takano'209's ferrules (303, 403) an "ultra-physical contact" type of ferrule makes Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) suitable for more budget conscious applications while still providing low return loss. EX1029: 3; EX1030: 2.

231. This modification is nothing more than a simple substitution of one known element (Hill's LC/UPC type ferrule) for another (Takano'209's ferrule) to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

232. This modification would have also been nothing more than the application of a known technique (Hill's UPC ferrule polish type) to improve a similar device (Takano'209's ferrules) in the same way to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications).

233. This modification would have also been obvious to try as UPC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) needs one of these polish types in order to adequately transfer optical signals, and either UPC or

APC are commonly used. Further, the specific polish type is generally specified by each customer application.

234. There would have been a reasonable expectation of success in making this modification given that both Takano'209's and Hill's ferrules are of LC-type. EX1003: ¶[0091]; EX1007: ¶[0058].

235. As a result of this modification, the ferrules (303, 403) in Takano'209's optical connector (300, 400, 500, 1100A-B, 1200) are UPC ferrules.

236. Therefore, in my opinion, the Takano'209/Hill combination renders this claim obvious.

XI. OBVIOUS: TAKANO'209 & SHIMOZU (GROUND 7)

237. In my opinion, claims 1-13 would have been obvious over Takano'209 in view of Shimozu.

238. This ground is based on the second embodiment of the optical connector (2100) shown in Figs. 21A-36B of Takano'209.

A. Modification of Takano'209 Based on Shimozu

239. Takano'209 discloses an optical connector (2100) having an outer housing (2110) and a single connector alignment key (2105) on a top surface of the outer housing. EX1003: ¶¶[0117], [0127]. The connector alignment key (2105) is received in a corresponding connector alignment slots (2403) of the adapter (2400). EX1003: ¶¶[0117], [0127].

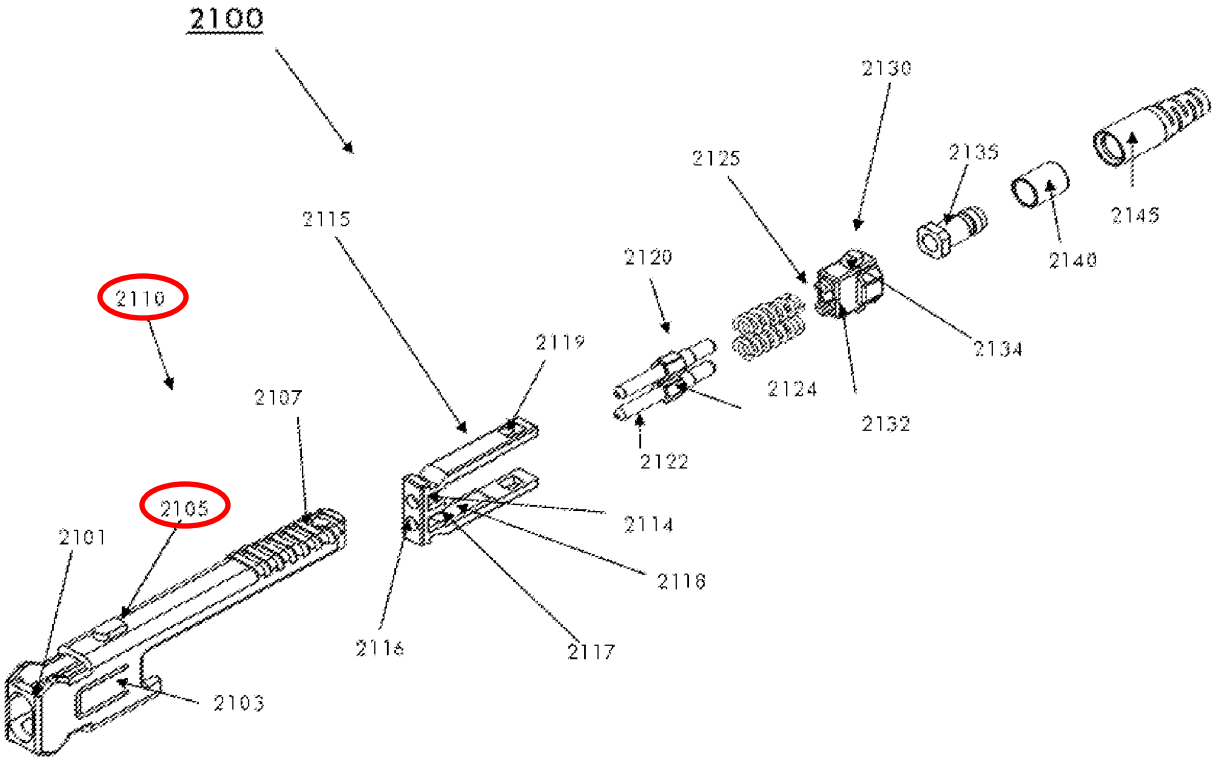


FIG. 21A

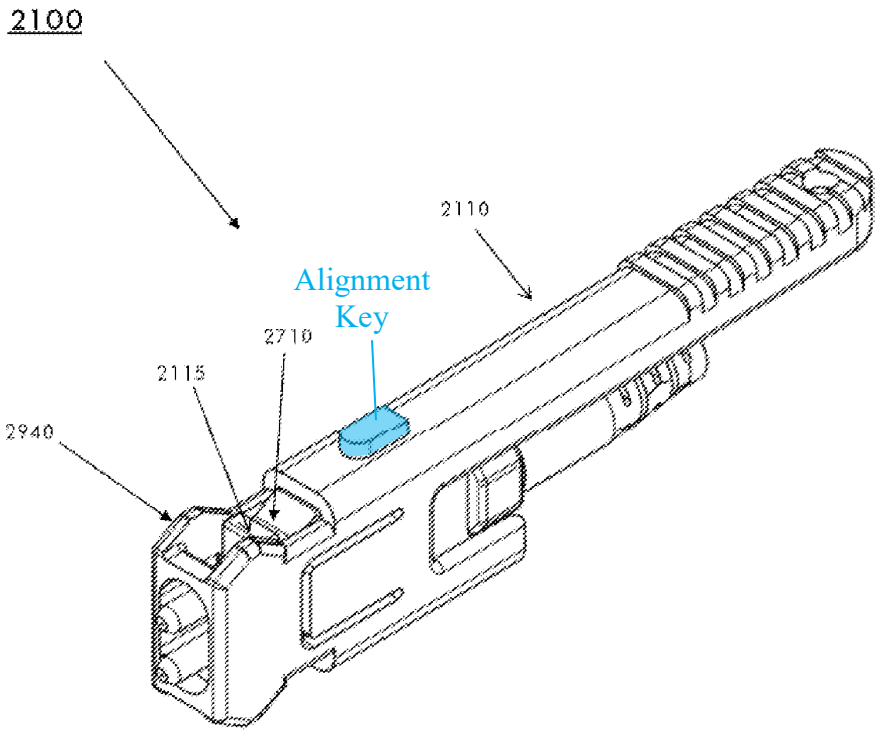


FIG. 21B

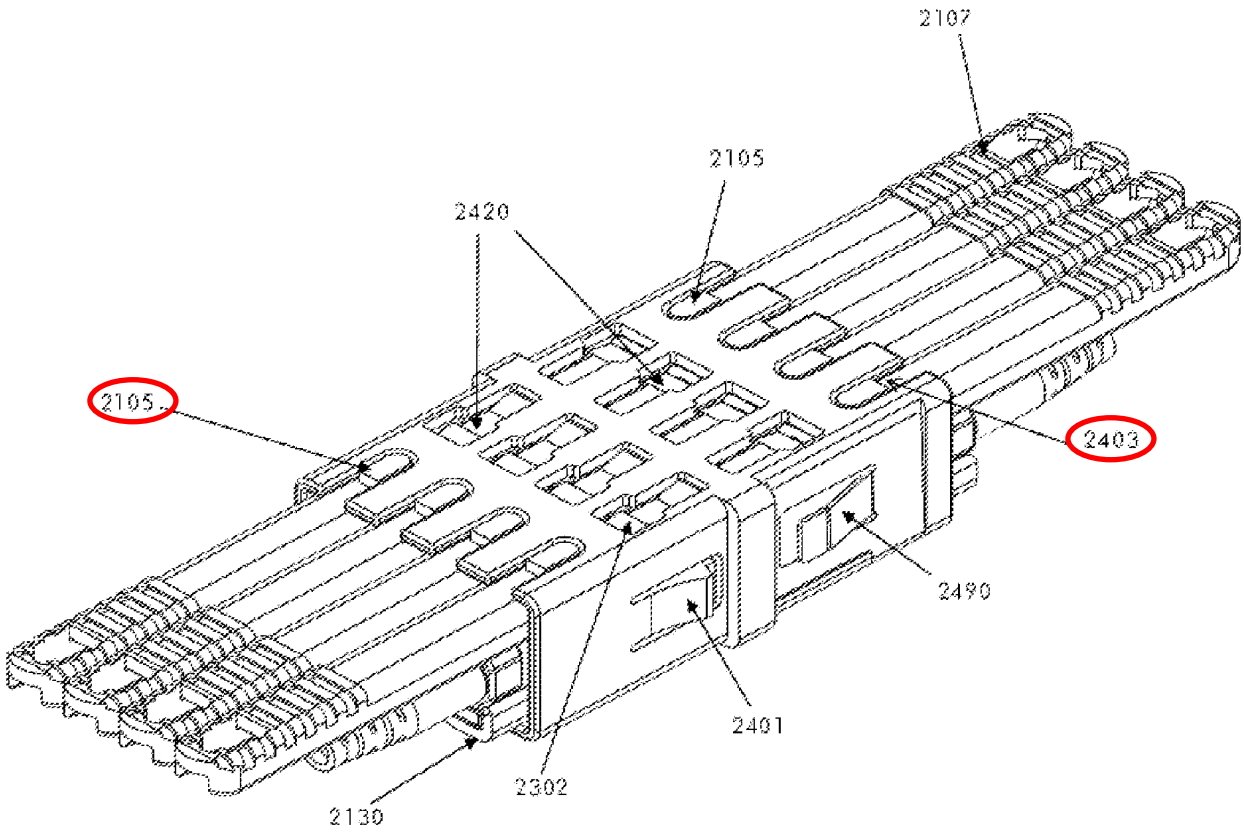
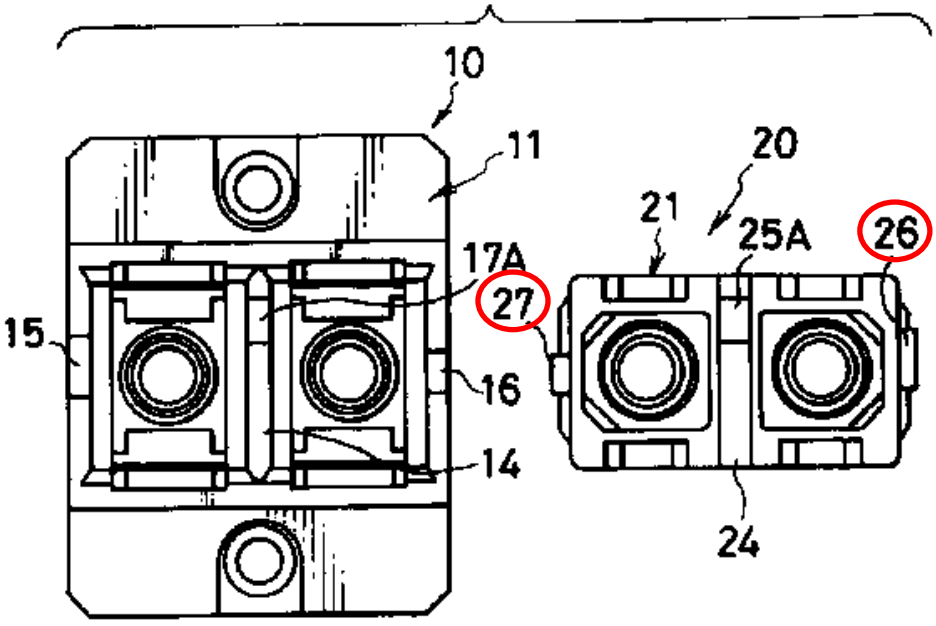


FIG. 31

EX1003: Figs. 21A-B and 31 (annotated).

240. Shimozu discloses a double-core optical connector plug (20) comprising an outer housing (21) with first and second identification guide keys (26, 27) on opposite side walls (22, 23). EX1008: ¶[0011]. The second identification guide key (27) is located in a center of the side wall (23), and the first identification guide key (26) is offset from center. EX1008 ¶[0012]. In addition, the first identification guide key (26) is wider than the second identification guide key (27). EX1008: ¶[0012].

【図２】

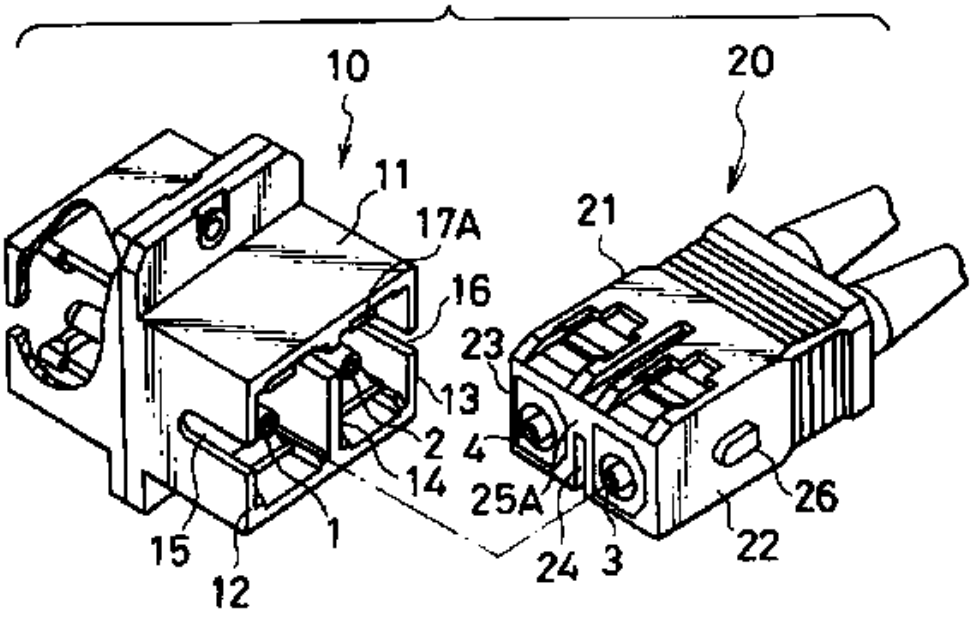


EX1008: Fig. 2 (annotated).

241. The different size identification guide keys (26, 27) on opposite sides of the outer housing (21) are configured to fit into corresponding first and second identification guide keyways (15, 16) formed on opposite sides of a housing (11) of a mating adapter (10). EX1008: ¶[0014]. The connector plug (20) will only fit in the mating adapter (10) if the wider first identification guide key (26) is aligned with the wider first identification guide keyway (15) and the narrower second identification guide key (27) is aligned with the narrower second identification guide keyway (16). EX1008: ¶[0014]. The identification guide keys (26, 27) will

not fit into the incorrect identification guide keyways (15, 16) if the connector plug (20) is inserted upside down. EX1008: ¶[0014].

【図１】



EX1008: Fig. 1.

242. Shimozu teaches the positions of the identification guide keys (26, 27) and corresponding identification guide keyways (15, 16) could be shifted for similar connectors terminating different types of optical fibers. EX1008: ¶[0015]. This would create keyed fiber type-specific connection systems, so that a connector of one fiber type could not be inadvertently plugged into an adapter meant for a different fiber type.

243. In my opinion, it would have been obvious to add a second alignment key on the bottom side of Takano'209's outer housing (2110), opposite the first alignment key (2105) in view of Shimozu.

244. This modification would facilitate high-density fiber optic interconnects while still ensuring proper alignment of an individual connector into its port. EX1003: 4:5-11. The POSA would recognize that adding a second alignment key to the bottom of Takano'209's outer housing (2110) which can be inserted into a corresponding keyway added to the bottom of the adapter (2400) would improve alignment of the optical connector into the adapter. Because the adapter (2400) lacks partition walls between ports for individual optical connectors (2100), the POSA would recognize the possibility that an individual optical connector could become misaligned if the user does not exercise care while inserting that optical connector. In particular, because the bottom wall of the adapter (2400) is flat, there is nothing to keep the bottom of the optical connector (2400) in proper lateral position as the optical connector is inserted. EX1003: Fig. 24. A careless user could twist the optical connector (2100) such that the bottom of the connector shifts laterally during insertion, especially for the first of the four optical connectors (2100) inserted into the adapter (2400). This would cause misalignment and potential damage.

245. Providing a second alignment key on the bottom of the optical connector (2100) that is received in a complementary groove added to the bottom wall of the adapter (2400) would ensure proper lateral alignment of the bottom portion of the optical connector (2100) during insertion. Moreover, this improvement would have been apparent to the POSA based on prior art that expressly teaches the benefits of including lateral alignment guides on both sides of optical plugs and corresponding keyways to both sides of partition-less mating adapters. See EX1011: ¶[0050] (describing how adding a guide rail to the bottom side of a connector with a latch structure or other guide rail on the top side aids in properly aligning the connector into a port or a partition-less adapter); EX1023: ¶[0027] (describing how projections on top and bottom walls of a ferrule holder align the ferrule holder with an adapter along horizontal and vertical axes and eliminates the need for side walls in adapters).

246. This modification would have been nothing more than combining known prior art elements (Takano'209's outer housing (2110) and the wider, off-center identification guide key (26) of Shimozu) according to known methods (arrangement taught by Shimozu) to yield predictable results (Takano'209's optical connector (2100) with dual alignment keys for guiding insertion into and ensuring proper alignment in the adapter).

247. This modification would have also been nothing more than the application of a known technique (Shimozu's two identification guide keys) to improve a similar device (Takano'209's optical connector (2100)) in the same way to yield predictable results (Takano'209's optical connector (2100) with dual alignment keys for guiding insertion into and ensuring ensure proper alignment in the adapter). Taking Takano'209 as a base device, Shimozu's technique of adding a second, wider and off-center guide key (26) on the opposite side from the first guide key is applicable to the base device, given that the two devices are very similar types of optical connectors.

248. The POSA would have had a reasonable expectation of success in making this modification given the function and general arrangement of Shimozu's identification guide keys (26, 27) and keyways (15, 16) would not change in the modified versions of Takano'209's optical connector and adapter.

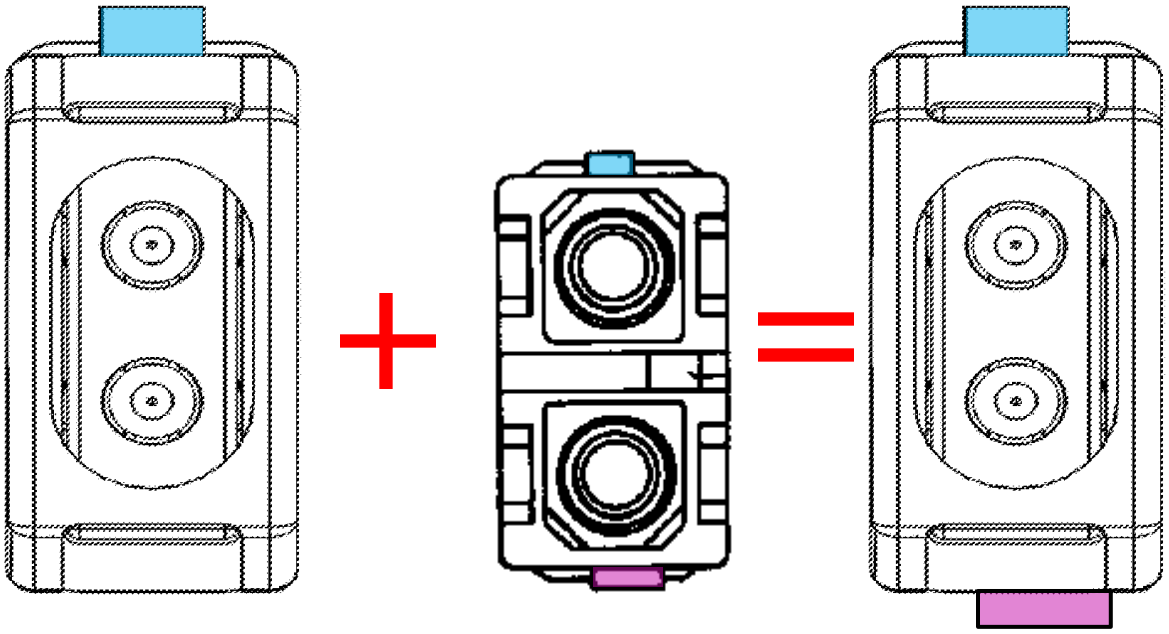
249. Further, the POSA would have had reasonable expectation of success given the similarities between the Takano'209's optical connector (2100) and the Shimozu's connector (20). Both references pertain to optical connectors with two ferrules in an integrated outer housing. EX1003: Fig. 21B; EX1008: Fig. 2. Both connectors have similar push/pull latch mechanism made up of an inner housing that latches with a mating adapter and an outer housing with latch release features that are displaceable relative to the inner housing to unlatch the connector from the

mating adapter. EX1003: Fig. 34B; EX1008: Fig. 1. Both connectors locate alignment keys on one of the narrow walls of the outer housing at a location that is set back rearward from the front end of the housing. EX1003: Fig. 34B; EX1008: Fig. 2. The difference is that Shimozu teaches adding a second key (26) on the opposite side from the first that is wider and offset from center in relation to the first key. EX1008: Fig. 2. A similar second alignment key can be added to the bottom wall of the of the Takano'209 optical connector (2100) opposite the first alignment key (2105) using conventional manufacturing techniques and would not have changed any aspect of the connector except for how it aligns to a mating adapter. Moreover, the effect of the added second alignment key on how the connector aligns to the adapter would have been entirely predictable.

250. Further, the POSA would have been motivated to modify Takano'209's optical connector (2100) in view of Shimozu to allow for several keyed fiber type-specific connection systems that prevent inadvertent insertion of a connector of one fiber type into an adapter meant for a different fiber type. As explained above, Shimozu teaches the identification guide keys (26, 27) and corresponding identification guide keyways (15, 16) could be shifted for similar connectors terminating different types of optical fibers. EX1008: ¶[0015]. By adding the second alignment key to the bottom side of Takano'209's optical connector (2100), the POSA could similarly shift the position of the alignment

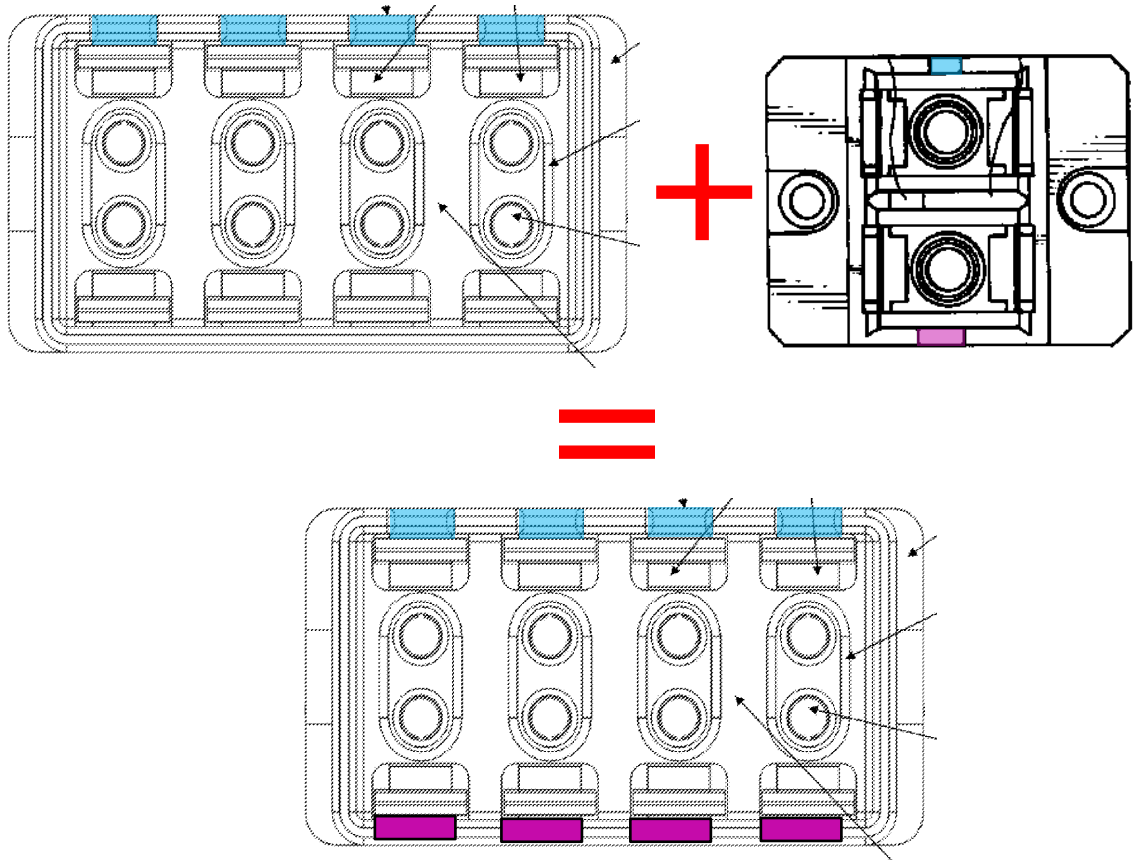
keys and corresponding keyways in the adapter to provide several keyed fiber type-specific connection systems based on Takano'209's optical connector.

251. This modification results in a second alignment key being added on the bottom side of Takano'209's outer housing (2110) opposite the first alignment key (2105), and to make the second alignment key differ from the first alignment key (2105) in both width and position, as taught by Shimozu. EX1008: Fig. 2. For example, Shimozu teaches a relatively narrow key (27) that is centered on one side of the outer housing (21) and a wider key (26) that is offset from center on the opposite side of the outer housing. EX1008: Fig. 2, ¶[0011]. A schematic illustration of Takano'209's modified optical connector (2100) is shown below:



EX1003: Fig. 22 (annotated, modified); EX1008: Fig. 2 (annotated).

252. When making the modification to Takano'209's optical connector (2100), the POSA would have also made a corresponding modification to Takano'209's adapter (2400), by forming second adapter alignment slots along the bottom wall of the adapter housing (2402) that correspond in size and shape with the second alignment keys added to the bottom wall of the connector, as indicated below:



EX1003: Fig. 26 (annotated, modified); EX1008: Fig. 1 (annotated).

B. Independent Claim 1

1.P "A fiber optic connector comprising:"

253. Takano'209 discloses an optical connector (2100). EX1003: ¶[0117] ("21B depicts the optical connector 2100 in an assembled view"); EX1004: ¶[111], Fig. 21B.

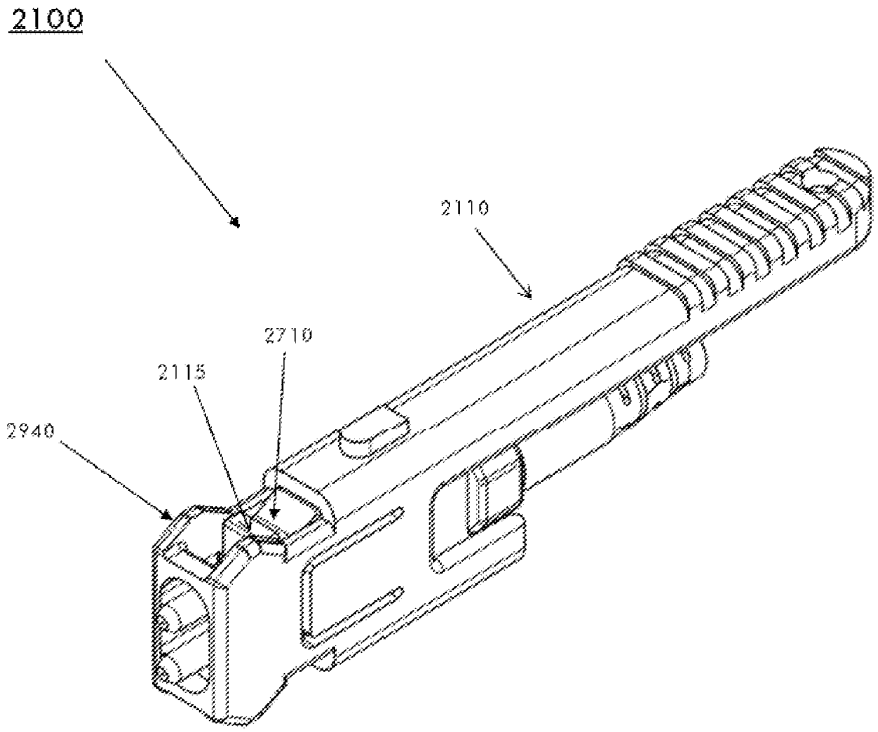


FIG. 21B

EX1003: Fig. 21B.

254. Therefore, in my opinion, Takano'209 meets this limitation.

1.a.1 "a housing having a main body extending between a front end and a rear end and having an opening extending therebetween,"

255. Takano'209's optical connector (2100) includes an outer housing (2110). EX1003: ¶[0117] ("Optical connector 2100 may include an outer housing

2110"). The outer housing (2110) includes a main body that houses the internal components of the optical connector (2100). EX1003: Fig. 21A. The main body of the outer housing (2110) extends between a front end and a rear end. EX1003: Fig. 21A.

256. The POSA would understand that the "main body" of the outer housing (2110) is the portion of the housing piece that surrounds, protects, and houses the internal components. The pull tab (2107) extending rearward from the main body serves a different purpose and therefore would not be considered part of the "main body" of a housing as set forth in claim 1. In addition, the Takano'209 repeatedly teaches that the pull tab (2107) is optional. EX1003: ¶¶[0117], [0124]; EX1004: ¶¶[111], [118]. So Takano'209 expressly teaches an outer housing (2110) consists of the green-highlighted main body and an alignment key (2105) that is devoid of a pull tab (2107), and in this embodiment, the "main body" is the entire outer housing (2110), save for the alignment key (2105).

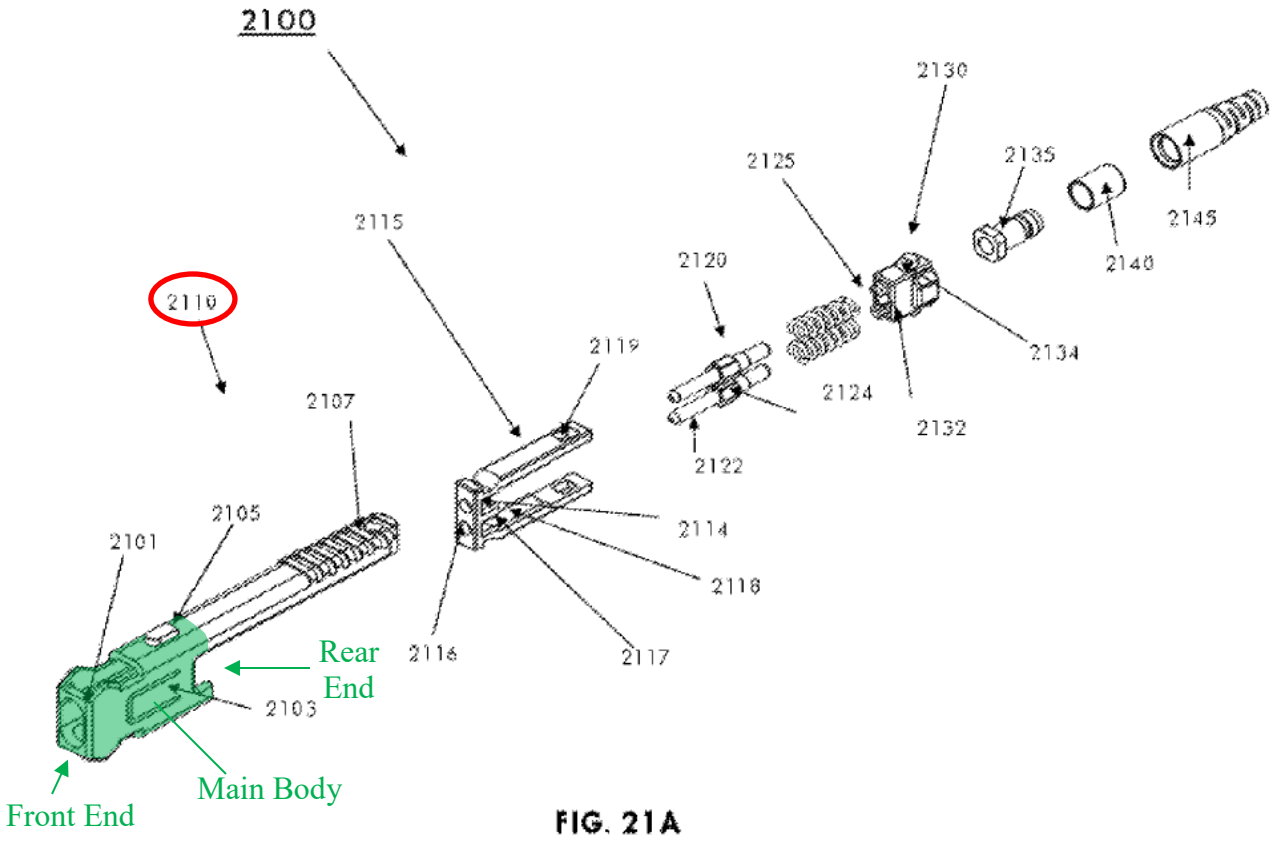


FIG. 21A

EX1003: Fig. 21A (annotated).

257. The outer housing (2110) has an opening (which Takano'209 calls a "longitudinal bore") extending between the front end and the rear end of the main body. EX1003: ¶[0117] ("The outer housing 2110 may include a longitudinal bore for accommodating the front body 2115 and a ferrule assembly 2120"), ¶[0120] ("the front body is inserted within the longitudinal bore 2101 of outer housing 2110"); EX1004: ¶¶[111], [114], Figs. 29A, 29B, and 29E.

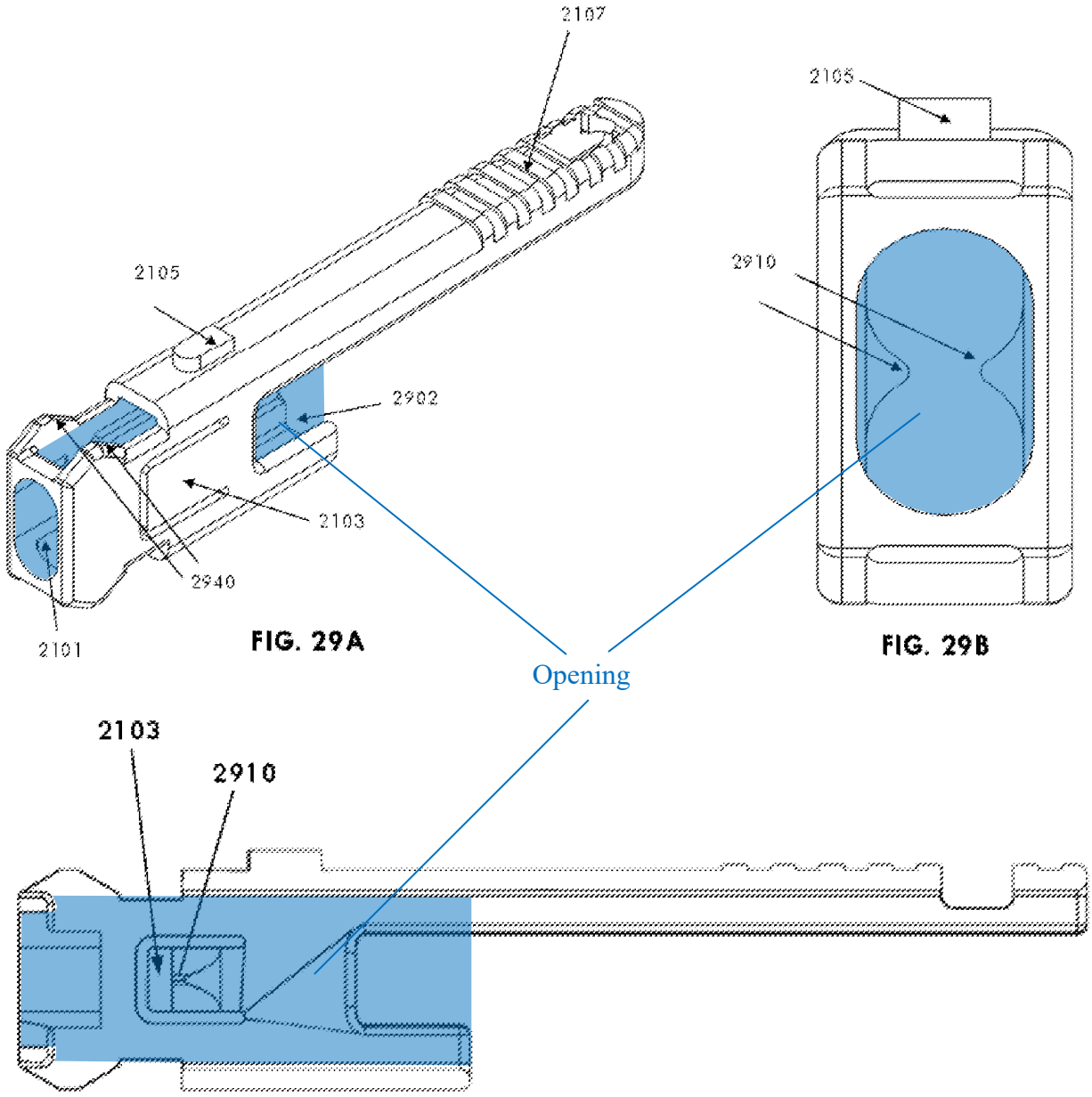


FIG. 29A

FIG. 29B

FIG. 29E

EX1003: Figs. 29A, 29B, and 29E (annotated).

258. Therefore, in my opinion, Takano'209 meets this limitation.

1.a.2 "the housing having a top surface and a bottom surface joined by two opposing side surfaces such that a lateral

width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body;"

259. The outer housing (2110) has a top surface and a bottom surface bound by two opposing side surfaces such that a lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body. EX1003: ¶[0124] ("The connector size 4.2×8.96×30.85 mm (excluding optional pull tab 2107 and connector alignment key 2105)"); EX1004: ¶[118], Fig. 22. Takano'209 specifically teaches a lateral width between the opposing side surfaces of 4.2mm that is less than the separation between the top and bottom surfaces of 8.96mm. EX1003: ¶[0124].

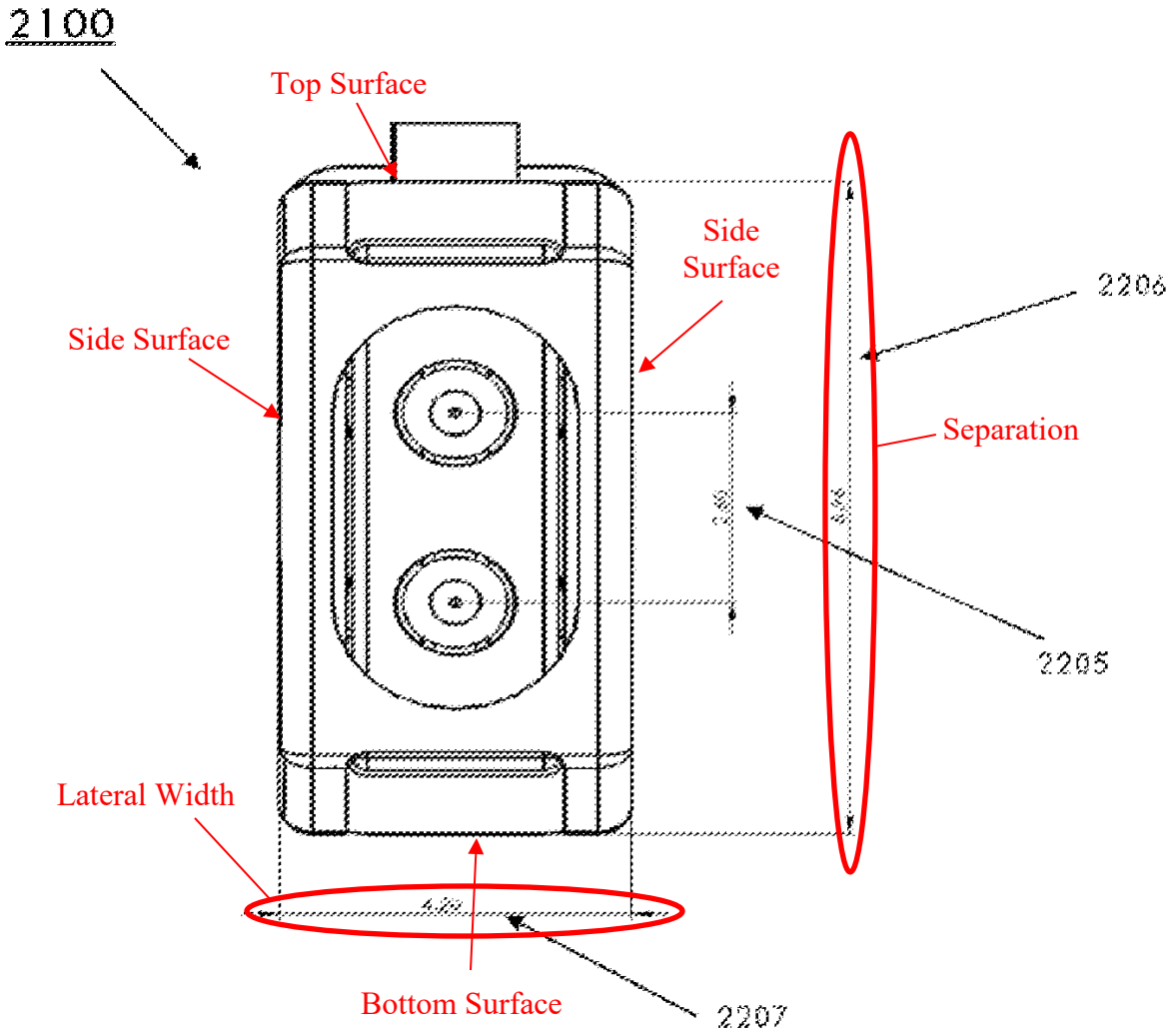


FIG. 22

EX1003: Fig. 22 (annotated).

260. Therefore, in my opinion, Takano'209 meets this limitation.

1.b.1 "two ferrule assemblies disposed within the opening of the housing, each of the ferrule assemblies comprising a fiber optic ferrule spaced apart from each other along the height and a ferrule holder to hold the fiber optic ferrule,"

261. The optical connector (2100) includes two ferrule assemblies (2120) disposed within the opening of the outer housing (2110). EX1003: ¶[0117] ("The

housing 2110 may include a longitudinal bore for accommodating . . . a ferrule assembly 2120."); EX1004: ¶[111], Fig. 21B.

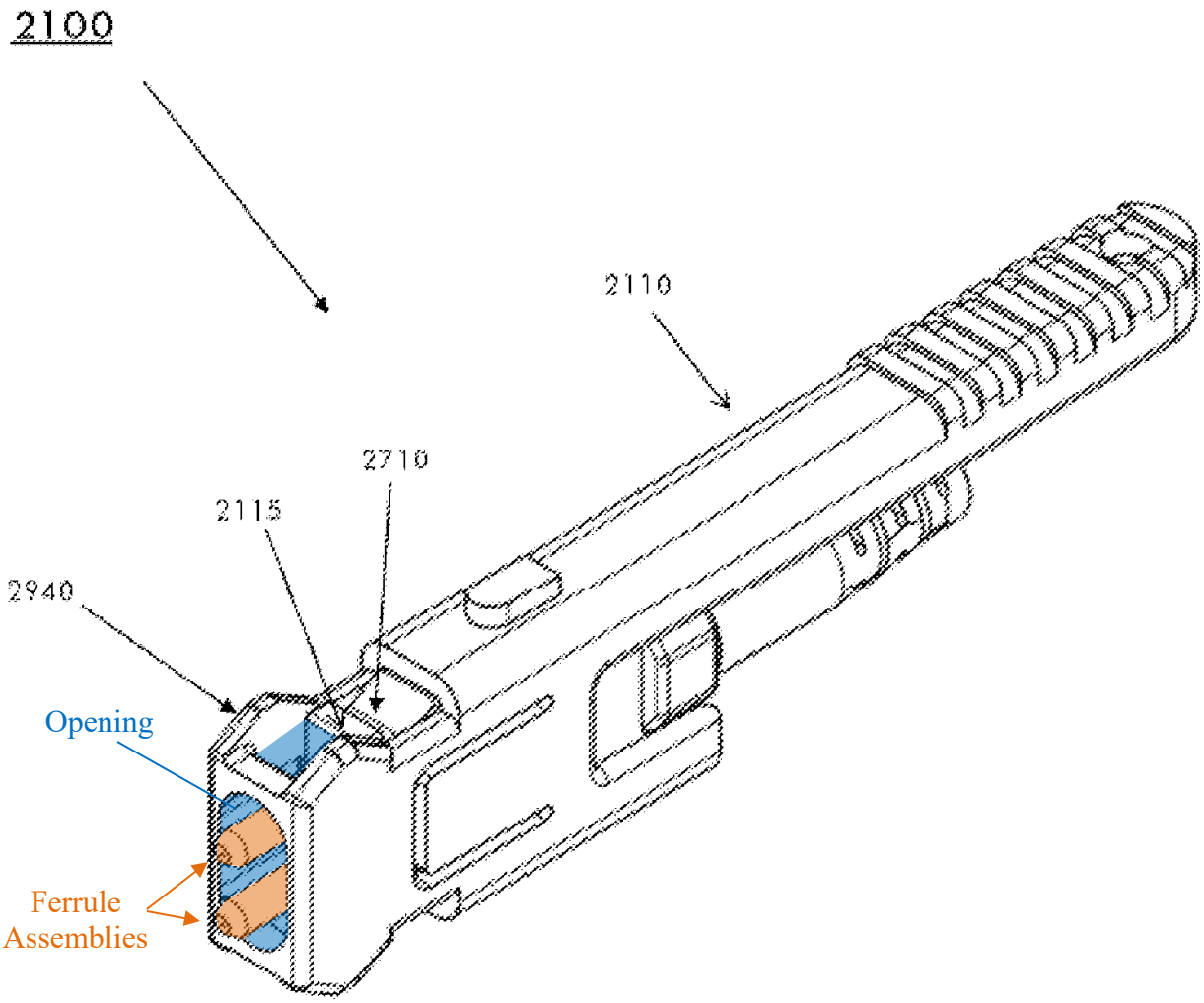
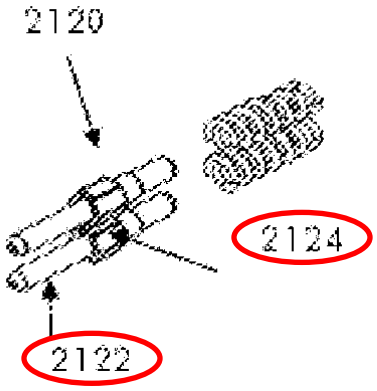


FIG. 21B

EX1003: Fig. 21B (annotated).

262. Each ferrule assembly (2120) includes a fiber optic ferrule (2122) and a ferrule holder (2124) (e.g., ferrule flange) to precisely hold the fiber optic ferrule. EX1003: ¶[0117] ("Optical connector 2100 may include ... one or more ferrules 2122, one or more ferrule flanges 2124"); EX1004: ¶[111], Fig. 21A. The ferrules

(2122) of the ferrule assembies are spaced apart from each other along the height of the main body. EX1003: Fig. 21B.

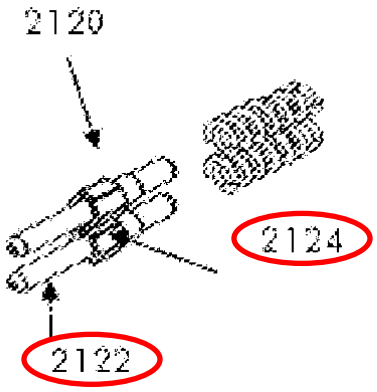


EX1003: Fig. 21A (annotated).

263. Therefore, in my opinion, Takano'209 meets this limitation.

1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;"

264. As shown below, each fiber optic ferrule (2122) extends forward of and away from the front end of the respective ferrule holder (2124). EX1003: Fig. 21A; EX1004: Fig. 21A.



EX1003: Fig. 21A (annotated).

265. Therefore, in my opinion, Takano'209 meets this limitation.

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;"

266. The optical connector (2100) includes two springs (2125). EX1003: ¶[0117]; EX1004: Fig. 21A.

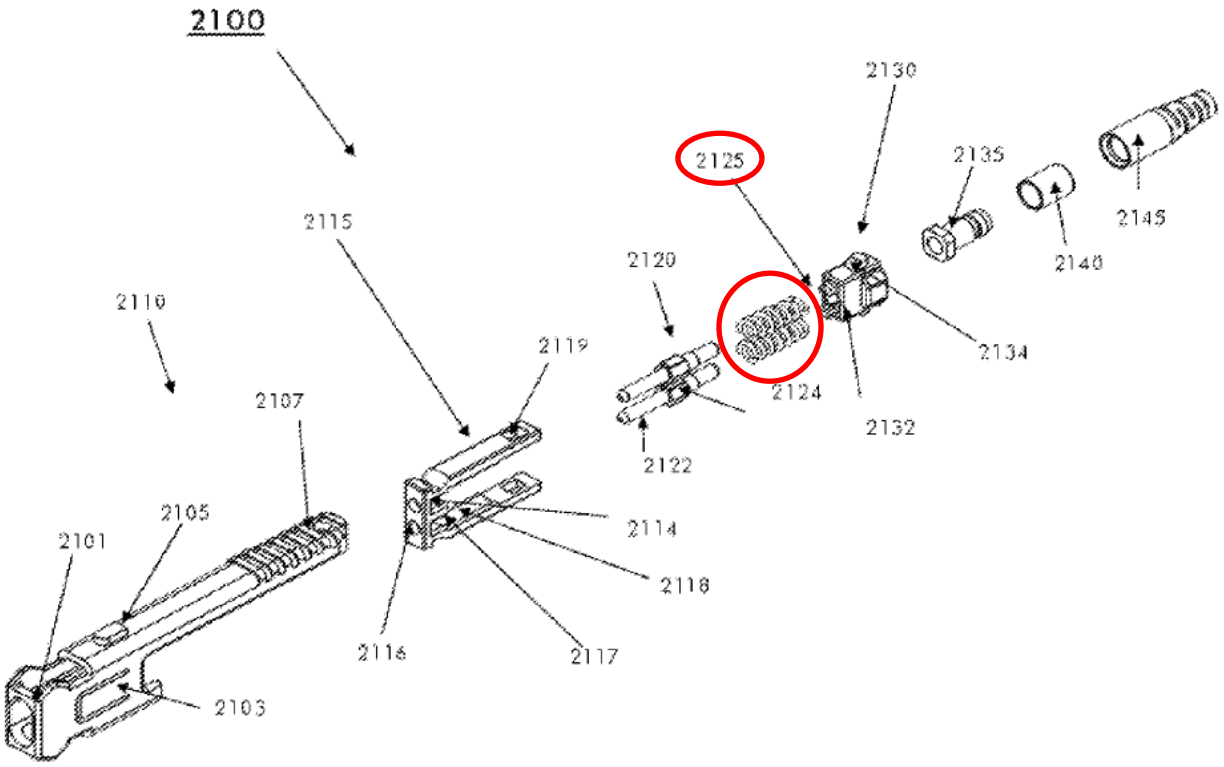
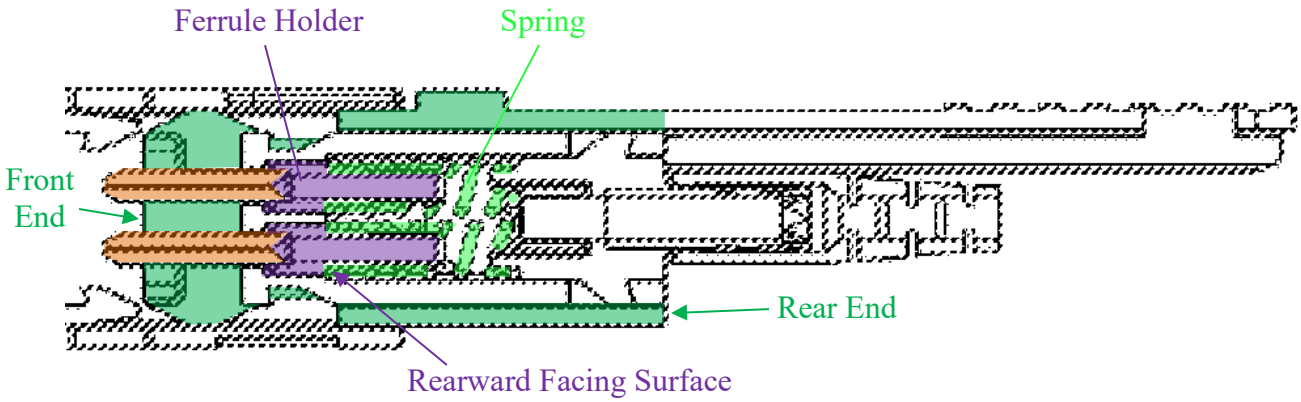


FIG. 21A

EX1003: Fig. 21A (annotated).

267. Each spring (2125) engages a rearward facing surface of the respective ferrule holder (2124) at its front end and extends toward the rear end of the outer housing (2110) to bias the ferrule assembly forward toward the front end

of the outer housing. EX1003: Fig. 23B. Each spring (2125) is retained within the outer housing (2110), specifically by being captured between the ferrule holders (2124) (fitted into ferrule alignment slots (2117) of front body (2115)) and the back body (2130). EX1003: ¶[0123] ("During assembly, the ferrule flanges 2124 fit into ferrule flange alignment slots 2117 (see FIGS. 27A and 27B) adjacent the ferrule openings 2116 of the front body, compressing the springs 2125 (preload). . . . As seen in the assembled cross-sectional views of FIGS. 23A and 23B, the springs 2125 are positioned to urge the ferrules 2122 into contact with mating connectors or transceiver optics, ensuring minimum insertion loss."); EX1004: ¶[117], Fig. 21A.



EX1003: Fig. 23B (annotated).

268. Therefore, in my opinion, Takano'209 meets this limitation.

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;"

269. The optical connector (2100) has a two-piece crimp body made up of the back body (2130) and a back post (2135) that are secured to one another. EX1003: ¶[0117]; EX1004: Fig. 21A. The '994 Patent explains a crimp body can be two pieces secured together. EX1001: 7:20-23 ("While the crimp body 106 is illustrated as a single, unitary body (i.e., molded at one time with one material), it could also be molded as two pieces and then later the two pieces secured to one another.").

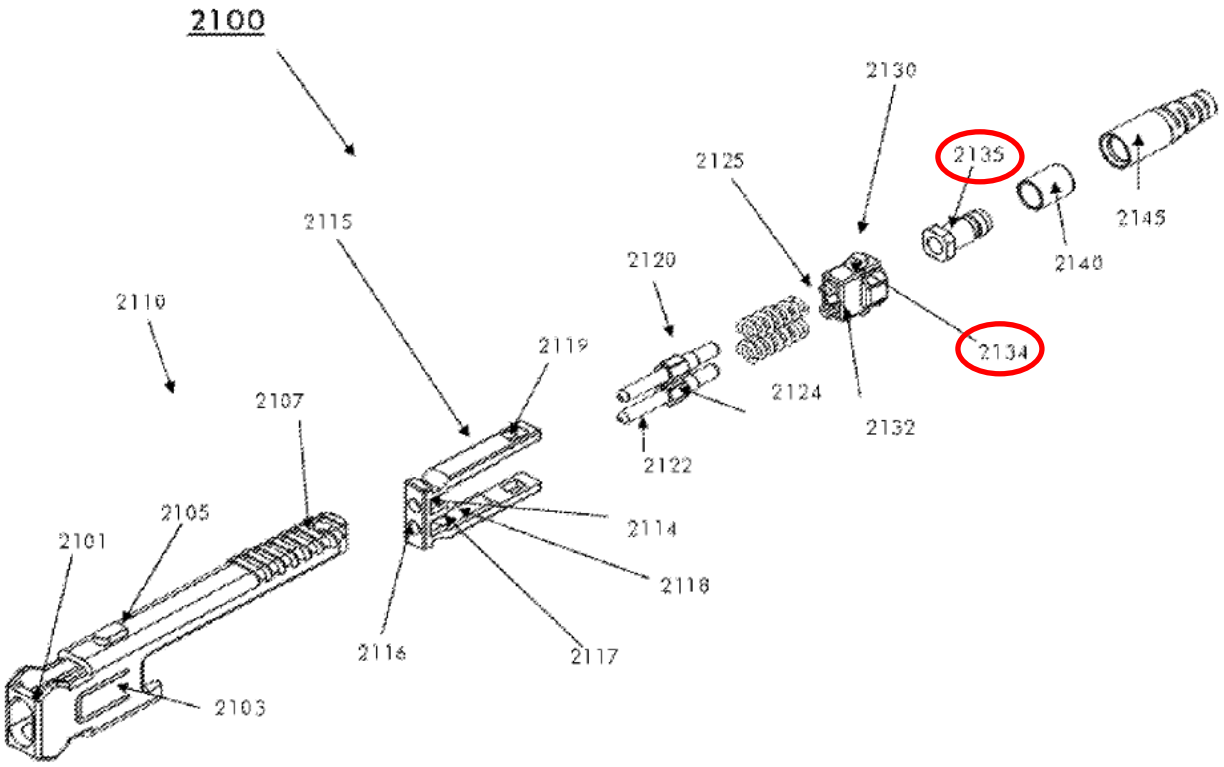
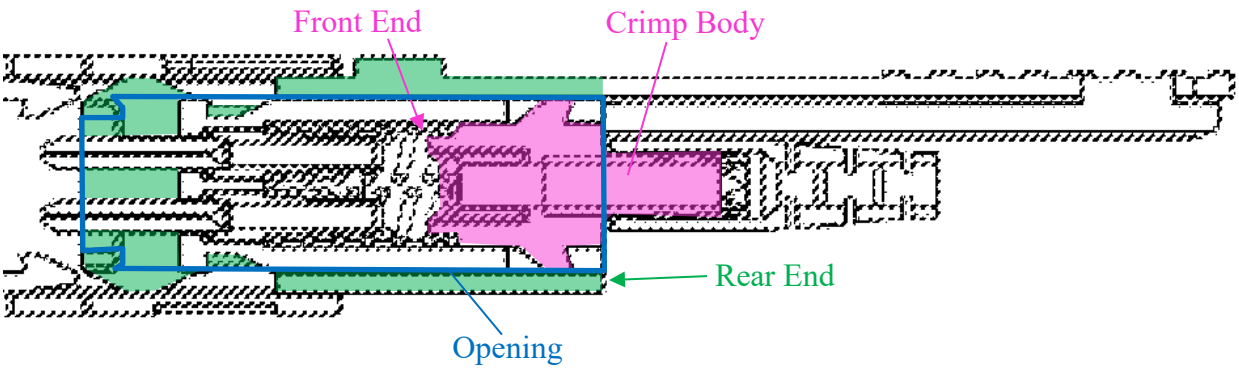


FIG. 21A

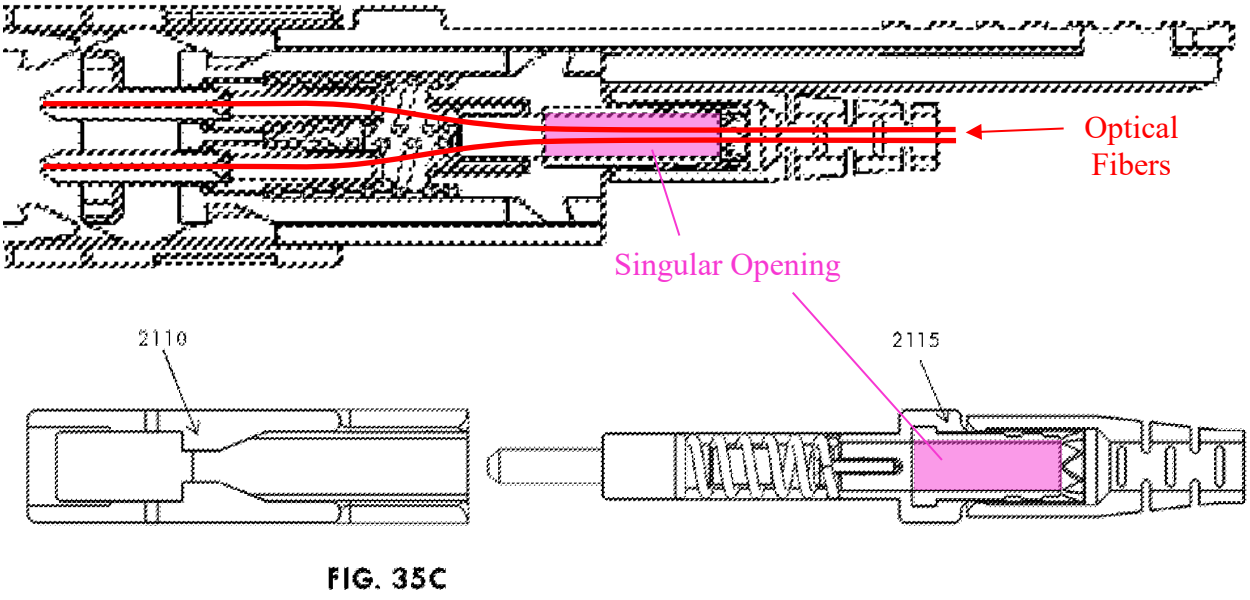
EX1003: Fig. 21A (annotated).

270. The crimp body (2130, 2135) is secured to the optical connector (2100) via protrusions (2134) that "interlock with a back body hook window/cutout 2119 in the front body 2115." EX1003: ¶[0122]; EX1004: ¶[116].



EX1003: Fig. 23B (annotated).

271. The back post (2135) of the crimp body has a singular opening for optical fibers at the rear end of the crimp body. EX1003: Figs. 23B and 35C.



EX1003: Figs. 23B and 35C (annotated).

272. Therefore, in my opinion, Takano'209 meets this limitation.

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing,"

273. The "outer housing 2110 may include . . . a connector alignment key 2105 used during interconnection." EX1003: ¶[0117]; EX1004: ¶[111]. The connector alignment key (2105) is a first projection on the top surface of the outer housing (2110). EX1003: ¶[0117], Fig. 21B. Takano'209 explains the "adapter housing 2402 further includes connector alignment slots 2403 that mate with the connector alignment key 2105." EX1003: [0127]; EX1004: ¶[121].

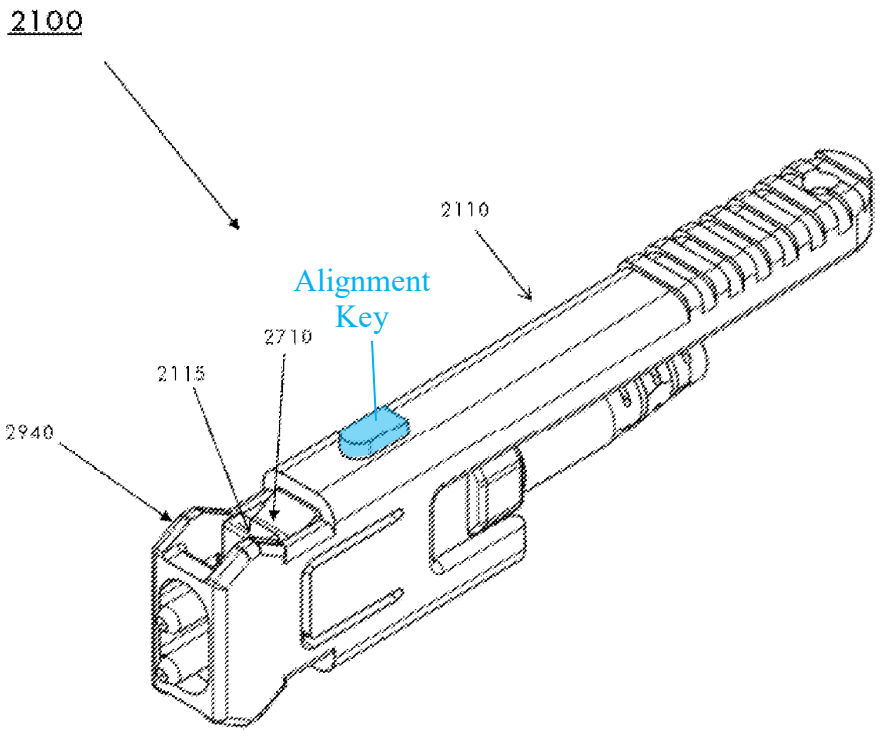


FIG. 21B

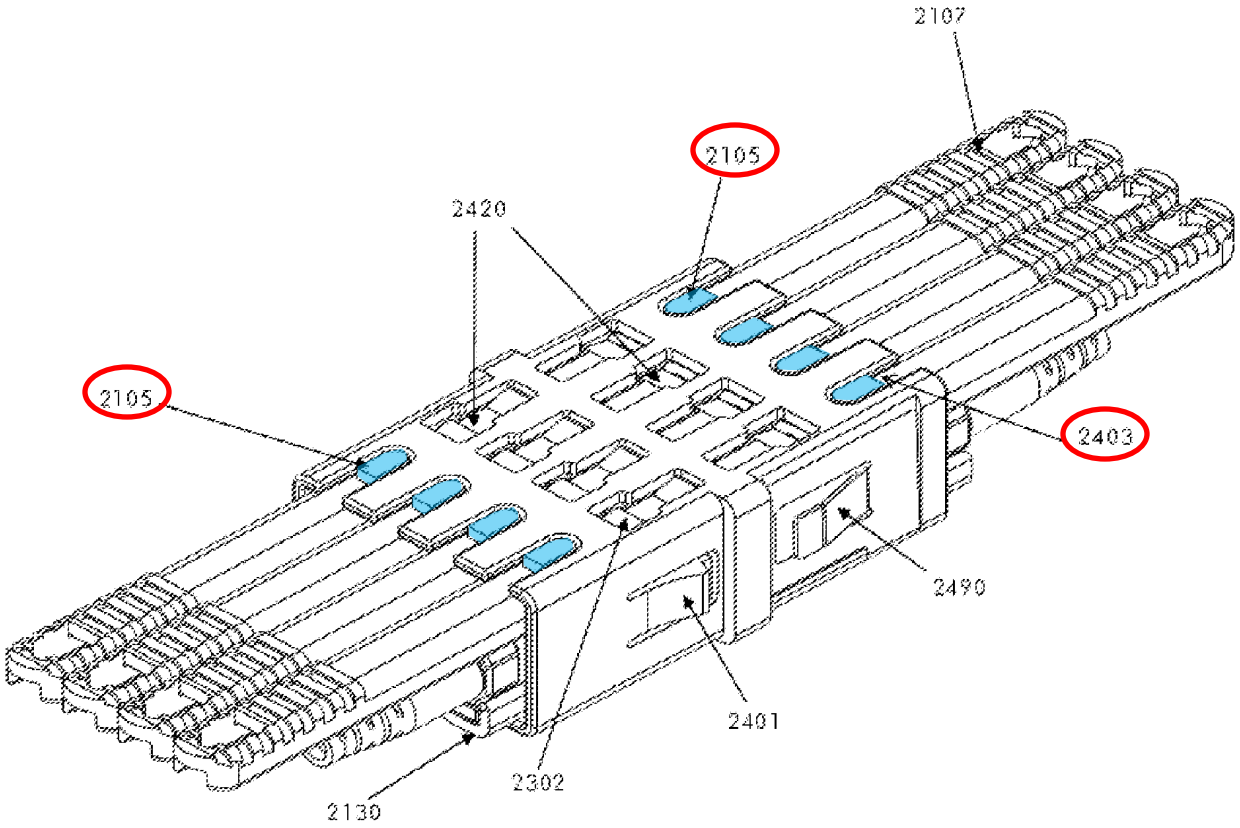
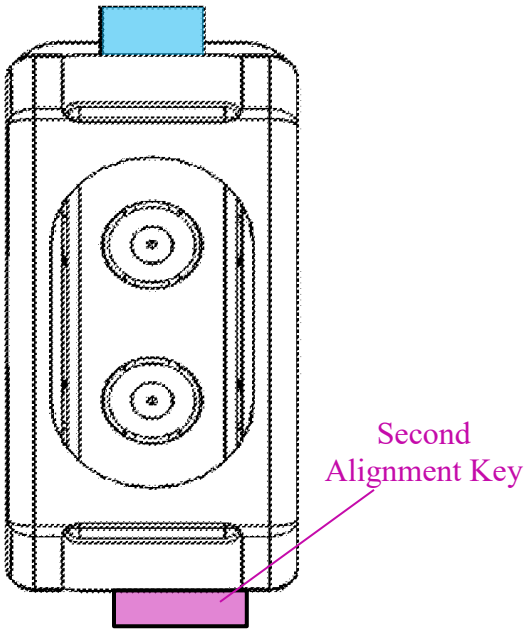


FIG. 31

EX1003: Figs. 21B and 31.

274. As a result of the modification of Takano'209 in view of Shimozu—as I explained above in Section XI(A)—, Takano'209's modified optical connector (2100) includes a second alignment key on the bottom of the outer housing (2110). The added second alignment key is a second projection on the bottom surface of the outer housing (2110).

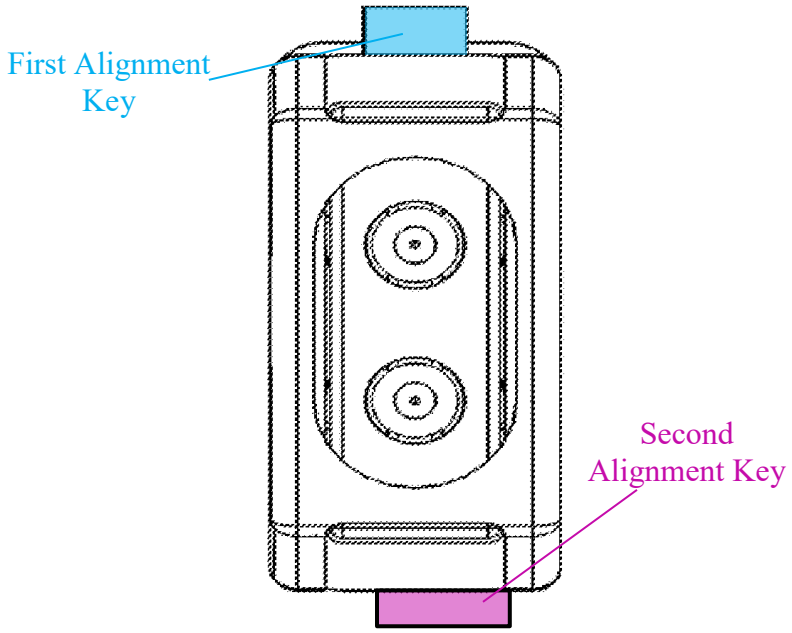


EX1003: Fig. 22 (annotated, modified).

275. Therefore, in my opinion, the Takano'209/Shimozu combination renders this limitation obvious.

1.f "wherein the first projection is of a different size than the second projection; and"

276. As I explained above in Section XI(A), the added second alignment key (i.e., second projection) to Takano'209's optical connector (2100) has a different size (i.e., width) than the first alignment key (2105) (i.e., first projection).



EX1003: Fig. 22 (annotated, modified).

277. Therefore, in my opinion, the Takano'209/Shimozu combination renders this limitation obvious.

1.g "a strain relief boot having a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass."

278. The optical connector (2100) includes a boot (2145) coupled to the rear end of the crimp body (specifically, the back post (2135)). EX1003: ¶[0117]. The boot (2145) has a longitudinal opening visible in Fig. 21A.

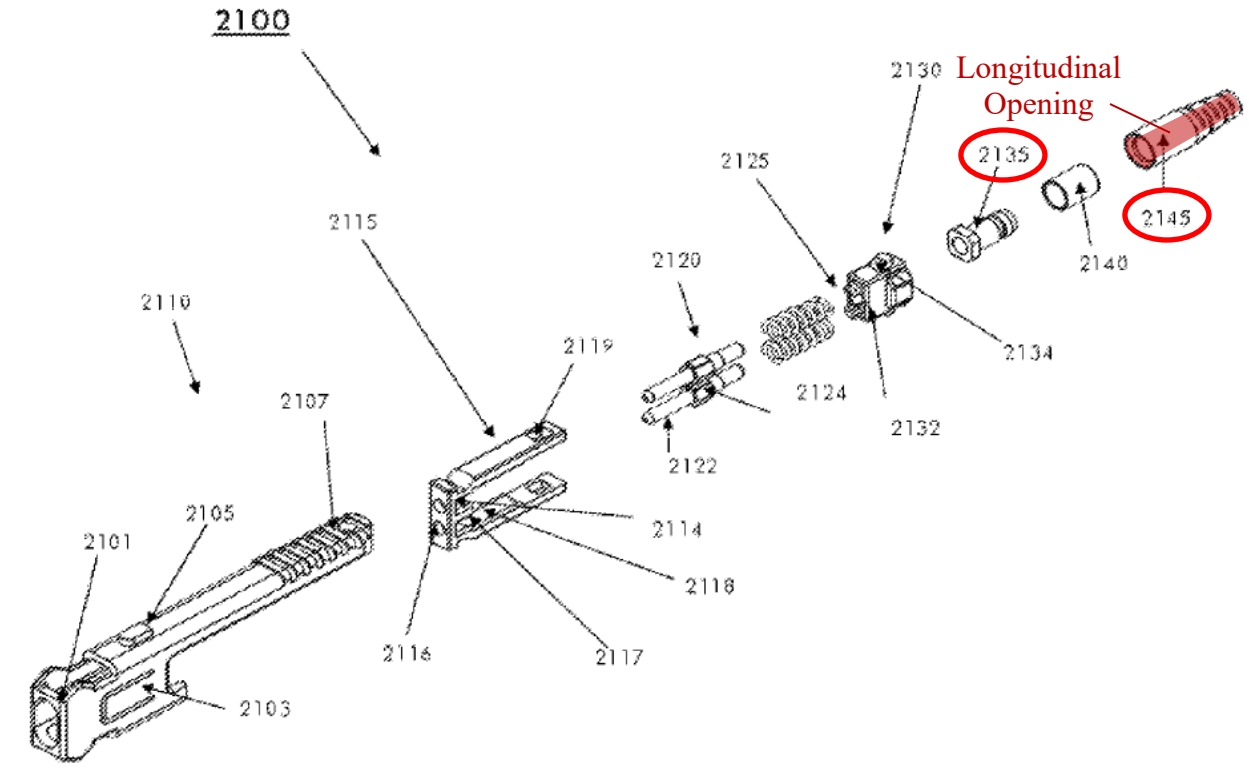
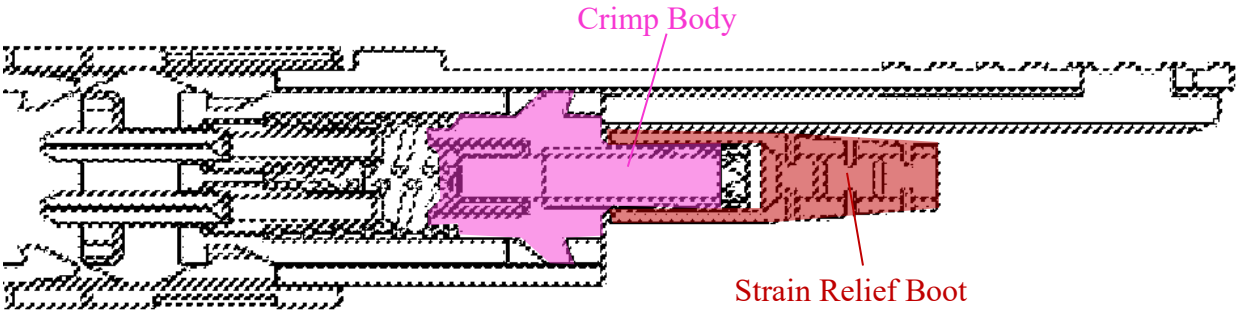


FIG. 21A



EX1003: Figs. 21A and 23B (annotated).

279. The longitudinal opening of the boot (2145) is in continuum with the singular opening of the crimp body through which optical fibers pass from a cable to the ferrules. EX1003: Figs. 23B and 35C; EX1004: Figs. 23B and 35C.

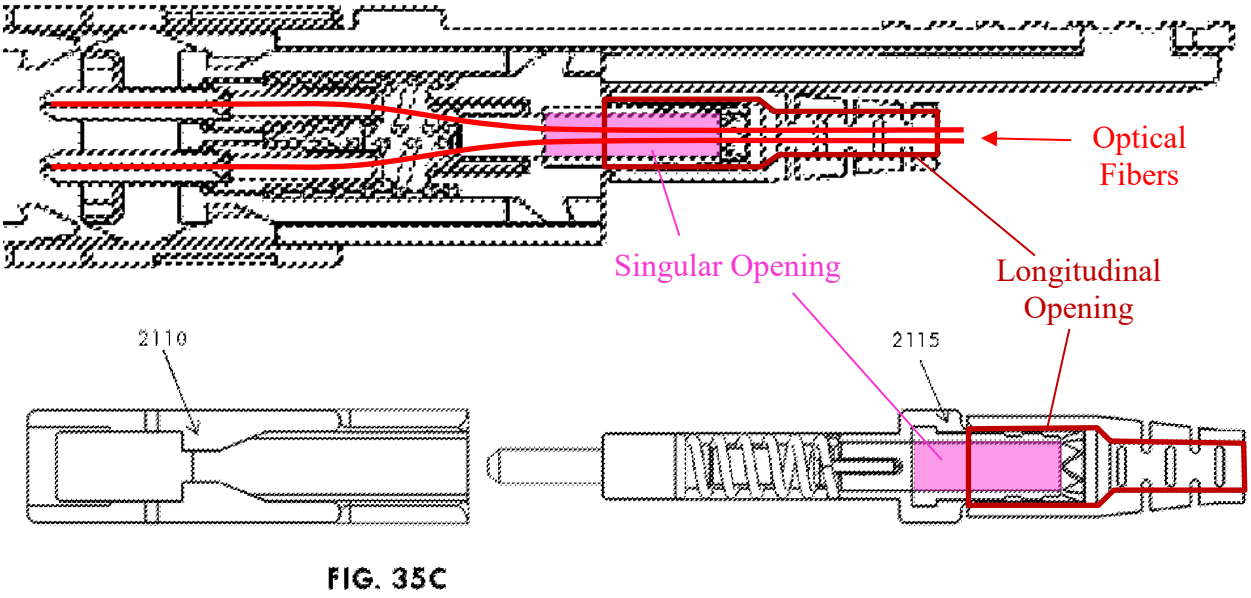


FIG. 35C

EX1003: Figs. 23B and 35C (annotated).

280. Therefore, in my opinion, Takano'209 meets this limitation.

C. Claim 2 "The fiber optic connector according to claim 1, wherein the first projection extends longitudinally along the top surface of the housing."

281. The first alignment key (2105) (i.e., first projection) extends longitudinally along the top surface of the outer housing (2110). EX1003: Fig. 21B; EX1004: Fig. 21B.

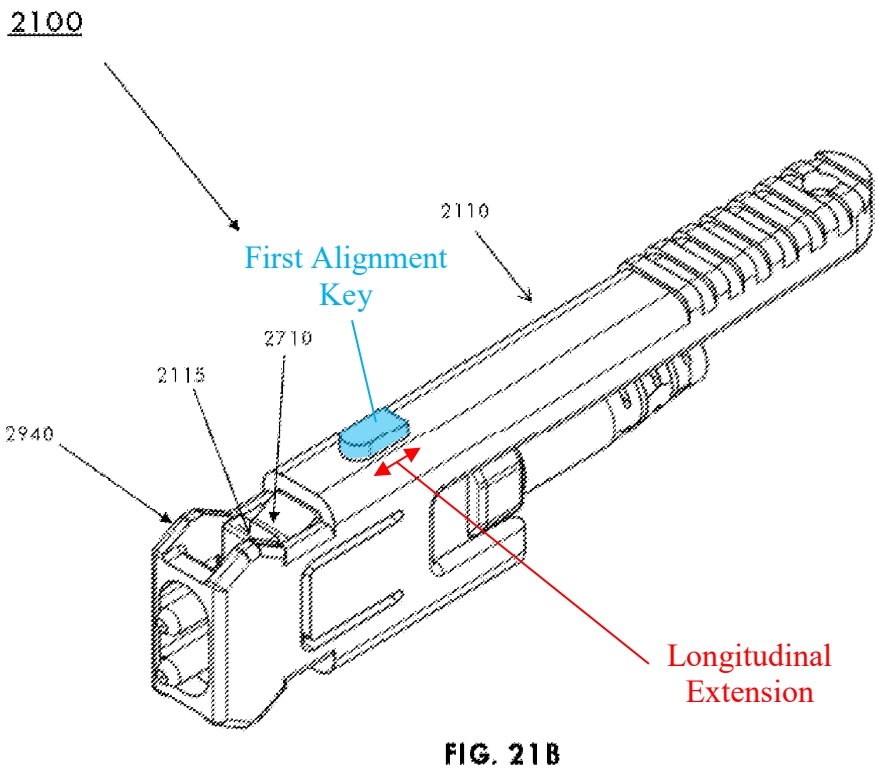


FIG. 21B

EX1003: Fig. 21B (annotated).

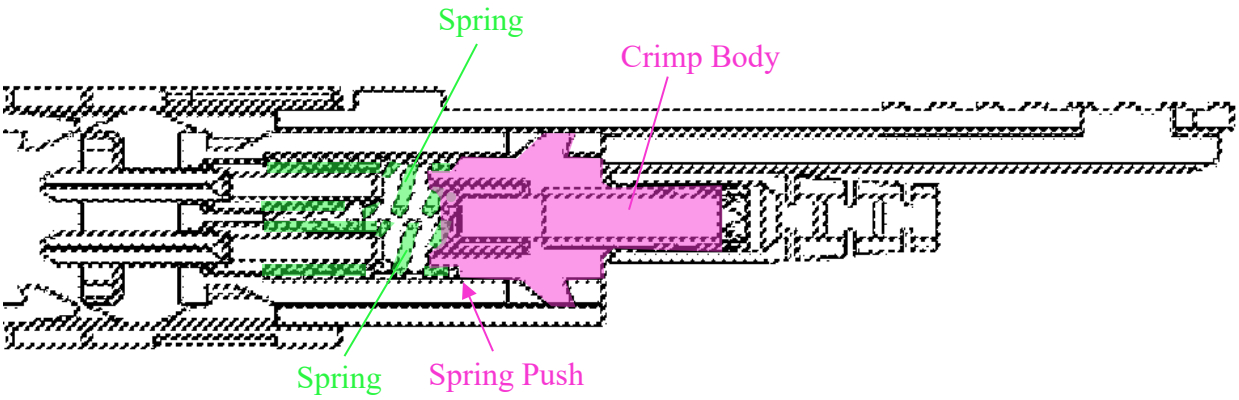
282. Therefore, in my opinion, Takano'209 meets this claim.

D. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs."

283. As I explained above in Section VII(C), the claimed "spring push" recited in claim 3 may be part of the crimp body.

284. The crimp body (particularly, back body (2130)) forms a spring push engaging a rear portion of each of the two ferrule springs (2125). EX1003: Fig. 23B, ¶[0123] ("The ends of the springs are secured on spring guides (FIGS. 28A, 28B) of back body 2130 by spring tension. As seen in the assembled cross-

sectional views of FIGS. 23A and 23B, the springs 2125 are positioned to urge the ferrules 2122 into contact with mating connectors or transceiver optics, ensuring minimum insertion loss."); EX1004: ¶[117], Fig. 23B.

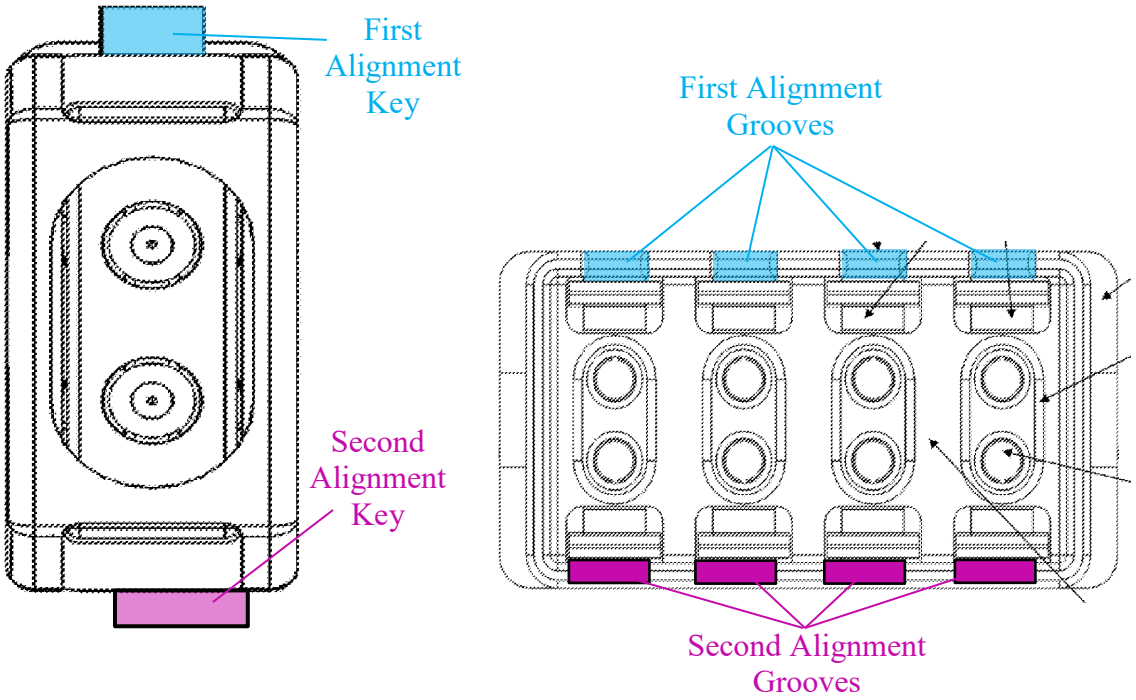


EX1003: Fig. 23B (annotated).

285. Therefore, in my opinion, Takano'209 meets this claim.

E. Claim 4 "The fiber optic connector according to claim 1, wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter."

286. The first alignment key (2105) and the added second alignment key of the modified Takano'209 optical connector (2100) determine a correct orientation and/or polarity of the outer housing (2110) during insertion into the modified adapter (2400). EX1003: ¶¶[0117], [0127]; EX1008: ¶¶[0011]-[0012], [0014].



EX1003: Figs. 22 and 26 (annotated, modified).

287. The first and second alignment keys must be oriented so that the top (first) alignment key (2105) fits into a narrower centered alignment groove (2403) of the adapter (2400) and the added bottom (second) alignment key is oriented to fit in an opposite alignment groove on the bottom wall of the adapter. EX1008: ¶[0014]. If the modified optical connector (2100) is inserted upside down, the alignment keys will not fit in the alignment grooves. EX1008: ¶[0014].

288. Therefore, in my opinion, the Takano'209/Shimozu combination renders this claim obvious.

F. Claim 5

5.a "The fiber optic connector according to claim 1, further comprising: a crimp band secured around an outer surface of the rear end of the crimp body, and"

289. The optical connector (2100) includes a crimp ring (2140), which meets "a crimp band" recited in claim 7. EX1003: ¶[0117]; EX1004: ¶[111], Fig. 21A.

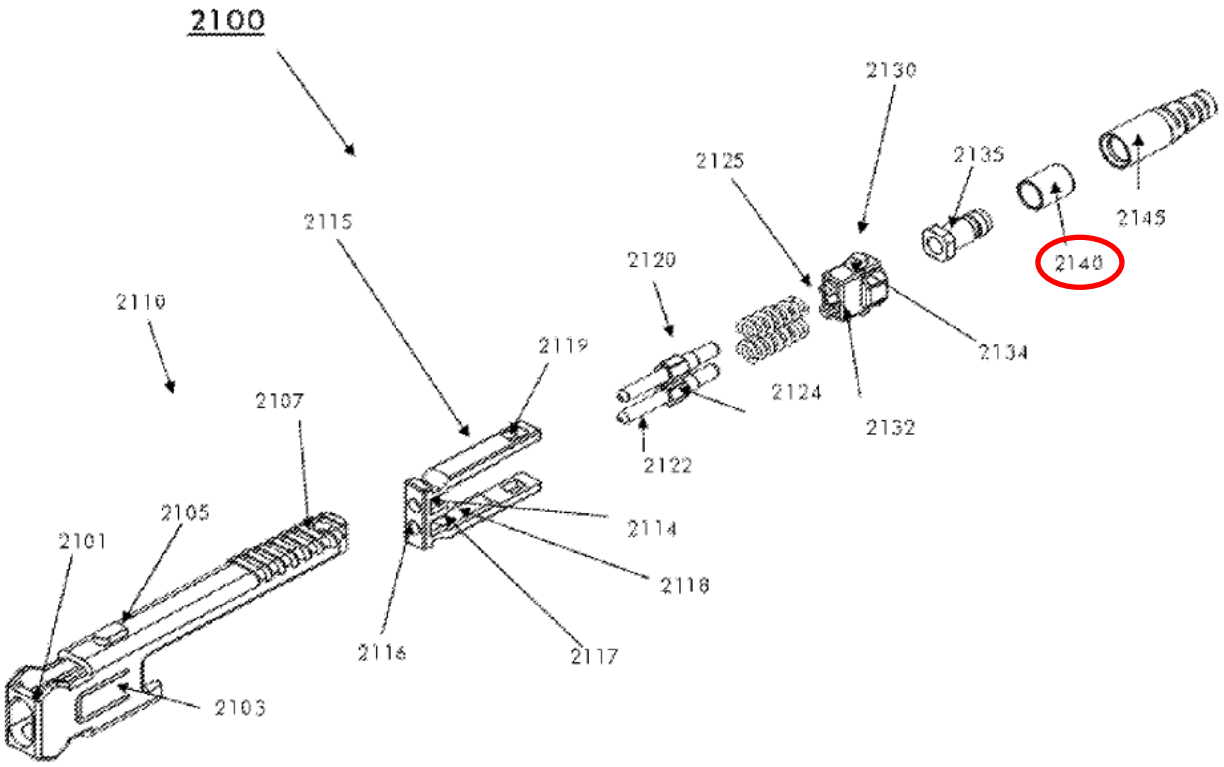
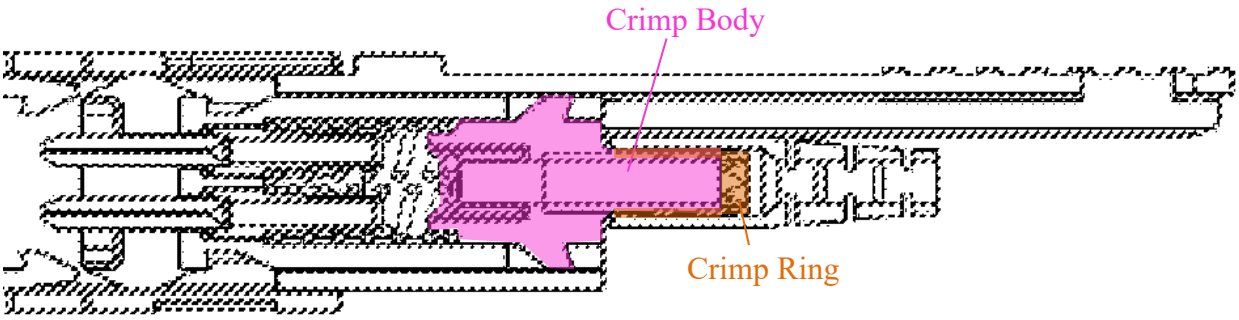


FIG. 21A

EX1003: Fig. 21A (annotated).

290. The crimp ring (2140) is secured around an outer surface of the rear end of the two-piece crimp body (2130, 2135), specifically by being crimped onto the back post (2135) of the crimp body. EX1003: Fig. 23B; EX1004: Fig. 23B.



EX1003: Fig. 23B (annotated).

291. Therefore, in my opinion, Takano'209 meets this limitation.

5.b "wherein the strain relief boot extends rearwardly away from the housing."

292. The boot (2145) extends rearward away from the rear end of the main body of the outer housing (2110), which meets "strain relief boot extends rearwardly away from the housing" as recited by limitation 7.b. EX1003: Fig. 21B; EX1004: Fig. 21B.

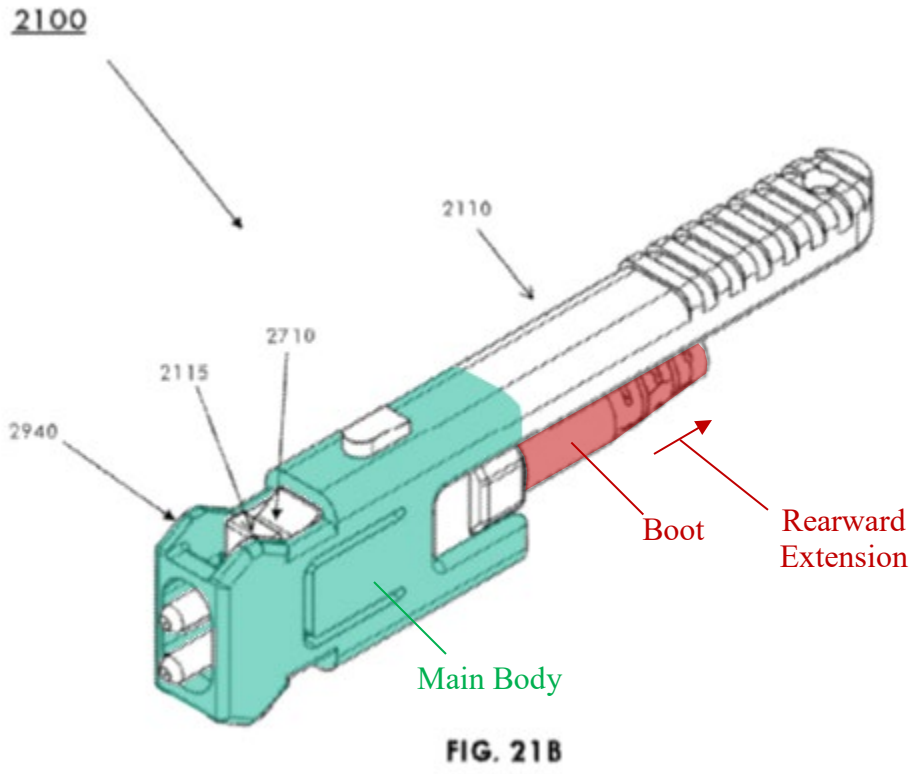


FIG. 21B

EX1003: Fig. 21B (annotated).

293. In my opinion, the presence of the pull tab (2107) does not prevent Takano'209's optical connector (2100) from meeting this limitation.

294. Takano'209 teaches an embodiment where the pull tab is removed from the optical connector. Takano'209 repeatedly states that the pull tab (2107) is an ***optional*** feature of the optical connector (2100). EX1003: ¶¶[0117] ("The outer housing 2110 ***may*** include … an ***optional*** pull tab 2107 to facilitate removal of the connector 2100 when connected in a dense array of optical connectors."), [0124] ("***optional*** pull tab 2107"); EX1004: ¶¶[111], [118]. In other words, Takano'209

expressly teaches an embodiment where the outer housing (2110) does not have a pull tab (2107). EX1003: ¶¶[0117], [0124]; EX1004: ¶¶[111], [118].

295. Following Takano'209's teaching to remove the pull tab (2107), the top portion of the outer housing (2110) would be cut off in-line with where the bottom portion of the connector is (i.e., the outer housing above would only include the green main body and the alignment key (2105)). In this embodiment, the boot (2145) extends rearward beyond the rearmost point on any piece of the outer housing (2110). In this embodiment, a user would still be able to grab the outer housing (2110) to remove the optical connector (2100) from the adapter because the outer housing extends out of the adapter and therefore can be grabbed by the user, such as by squeezing the top and bottom surfaces of the outer housing.

296. Therefore, in my opinion, Takano'209 meets this limitation.

G. Claim 6 "The fiber optic connector according to claim 1, wherein each of the top surface and the bottom surface has a receiving area for a latch component to secure the fiber optic connector to an adapter."

297. The top and bottom surfaces each have a receiving area (e.g., recess) for receiving flexible receptacle hook (2302) of the adapter (2400), which is a latch component that secures the optical connector (2100) to the adapter. EX1003: ¶¶[0129]-[0106], Figs. 21B, 29E, and 34C.

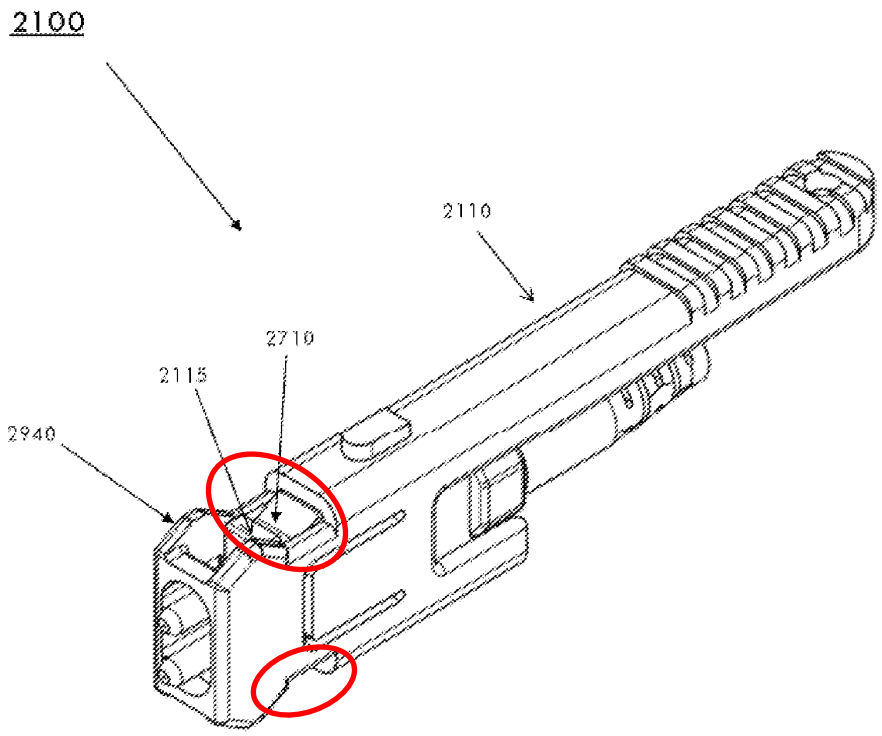


FIG. 21B

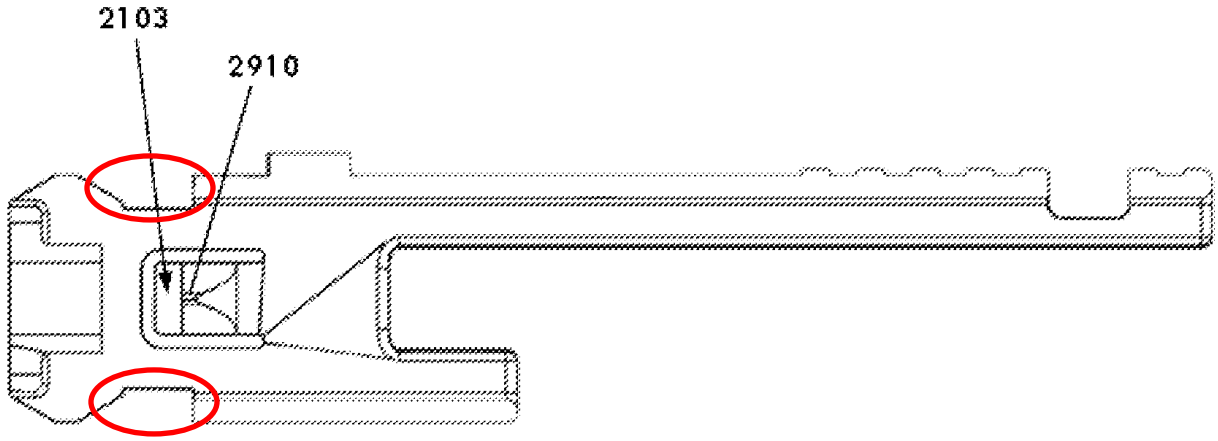


FIG. 29E

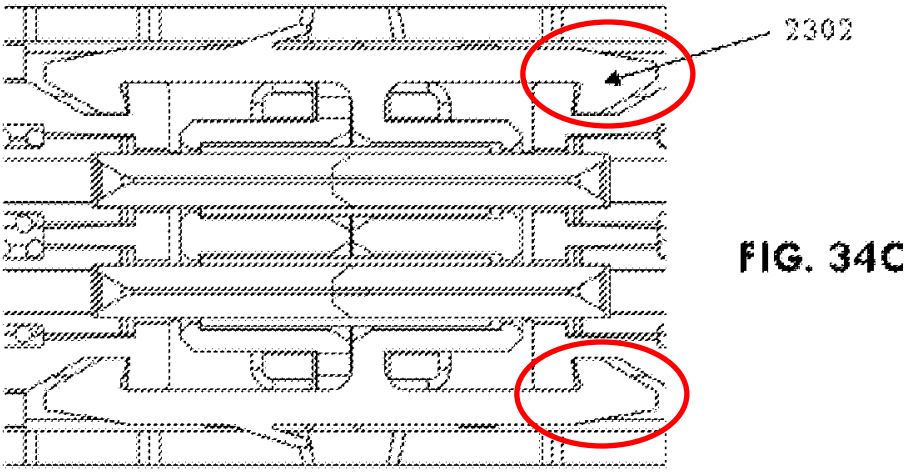


FIG. 34C

EX1003: Figs. 21B, 29E, and 34C (annotated).

298. Each receiving area encompasses flats immediately rearward of the triangular projections on the top and bottom surfaces of the outer housing (2110). EX1003: Fig. 29E. Takano'209 explains how the triangular projections define receptacle ramps (2940, 2490) that push against receptacle hook inner surfaces (3110) to lift the receptacle hooks (2302) as the optical connector (2100) is inserted into the adapter housing (2402). EX1003: Fig. 34B, ¶¶[0125], [0129].

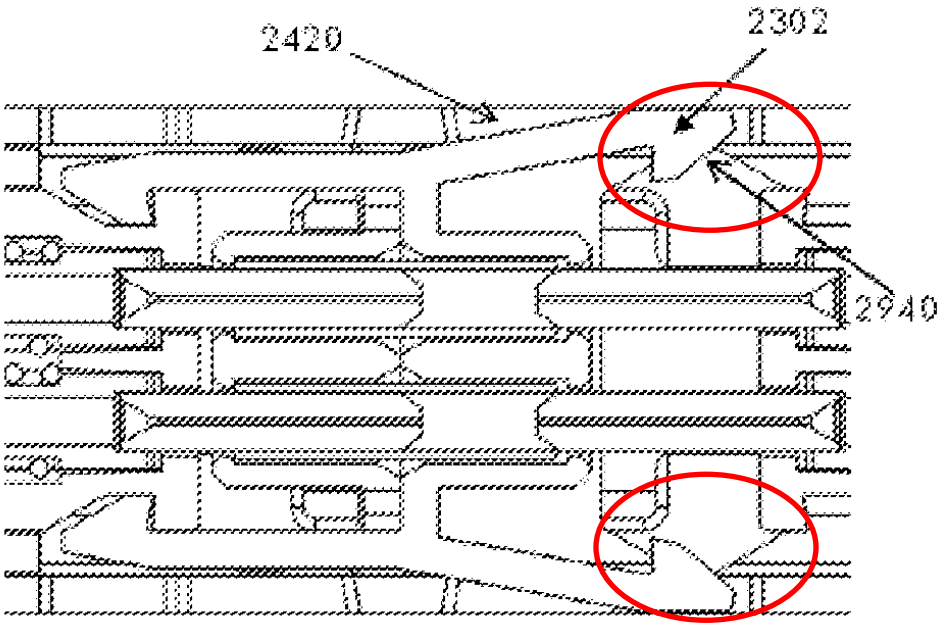


FIG. 34B

EX1003: Fig. 34B (annotated).

299. The receptacle ramps (2940, 2490) push on the outwardly projecting wing structures of the receptacle hooks (2302) circled below to lift the receptacle hooks. EX1003: Fig. 34B, ¶¶[0125], [0129]. The wing structures and catch of the receptacle hooks (2302) are then received in the receiving areas of the outer housing (2110) when the optical connector (2100) is fully inserted and latched in the adapter (2400), as shown in Figs. 34C above. EX1003: Fig. 34C.

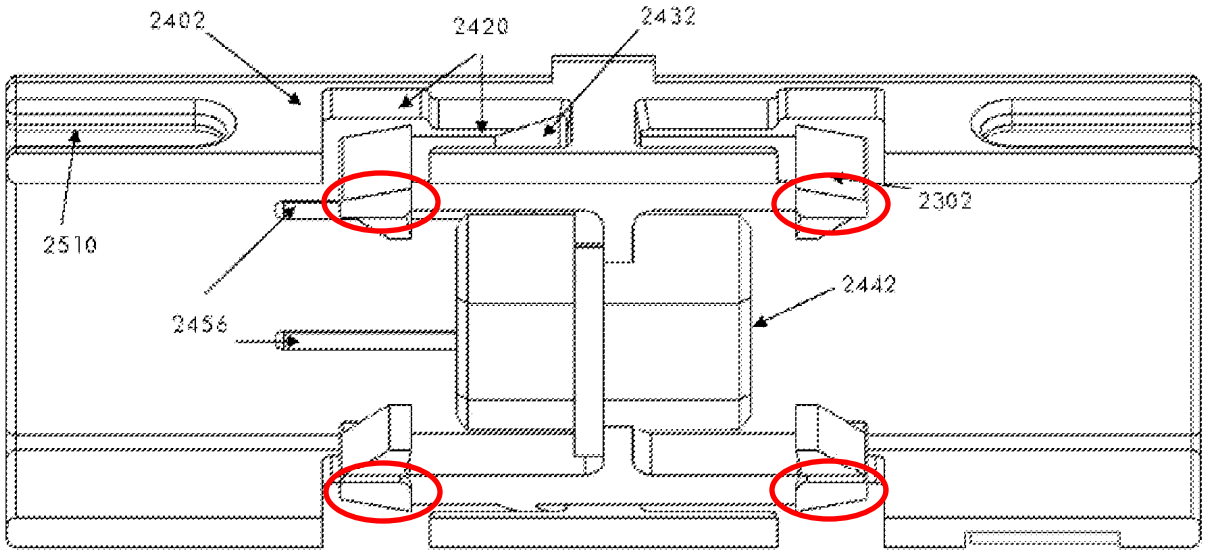


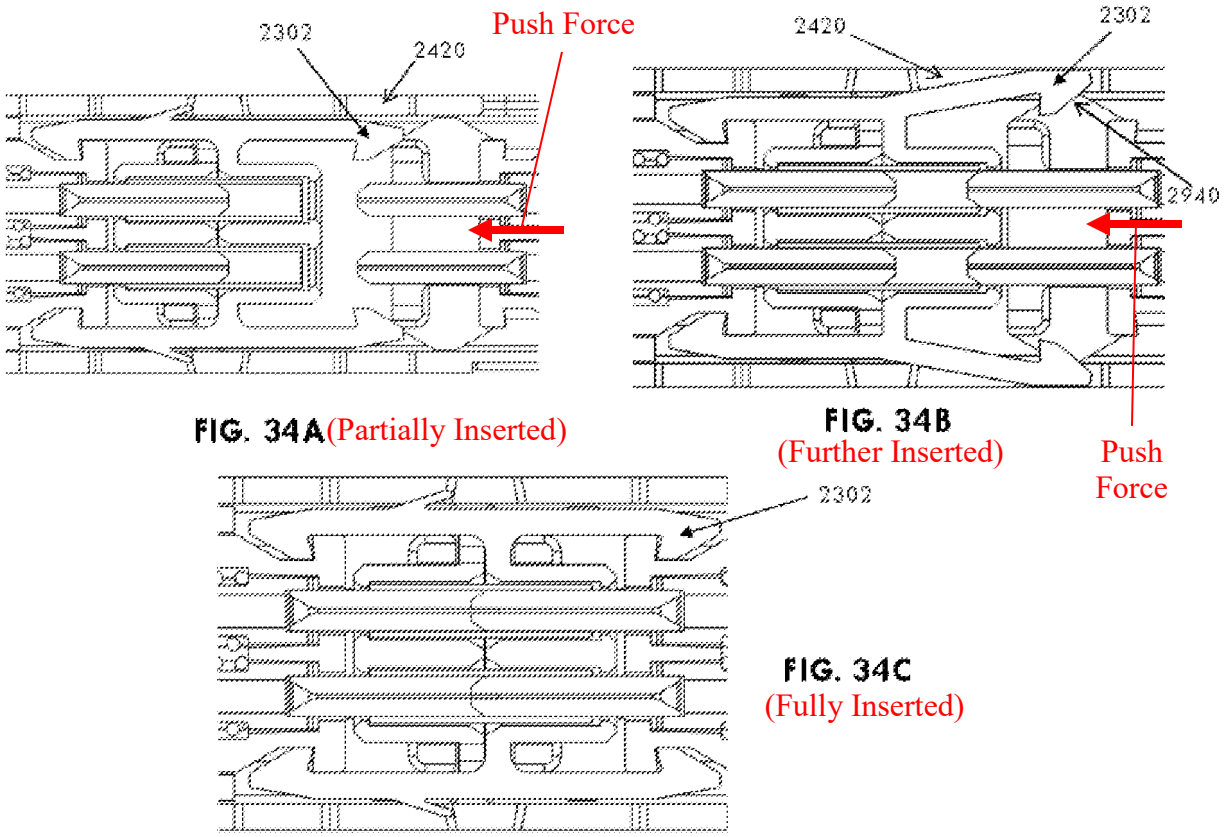
FIG. 25A

EX1003: Fig. 25A (annotated).

300. Therefore, in my opinion, Takano'209 meets this claim.

H. Claim 7 "The fiber optic connector of claim 6, wherein the fiber optic connector is configured to receive a push force to insert the fiber optic connector into an adapter or a pull force to release the latch component from the adapter."

301. Takano'209's optical connector (2100) receives a push force to insert the optical connector into the adapter (2400). EX1003: Figs. 34A-C, ¶¶[0117] ("pull tab 2107"), [0129] ("the connector 2100 is inserted into the adapter housing 2402").



EX1003: Figs. 34A-C (annotated).

302. The outer housing (2110) and/or the optional pull tab (2107) is pushed forward to insert the optical connector into the mating adapter. EX1003: ¶[0129]. As the outer housing (2110) is pushed forward, the ramp (2940, 2490) at the front end of the outer housing engages and lifts the adapter hooks (2302) of the adapter (2400), thereby permitting the front end of the micro connector to be fully inserted into the adapter. EX1003: ¶[0129]. As the optical connector is pushed forward, the hook recesses (2710) become aligned with the adapter hooks (2302) and the adapter hooks spring back and into the hook recesses, thereby holding the optical connector in the adapter (2400). EX1003: ¶¶[0123], [0125].

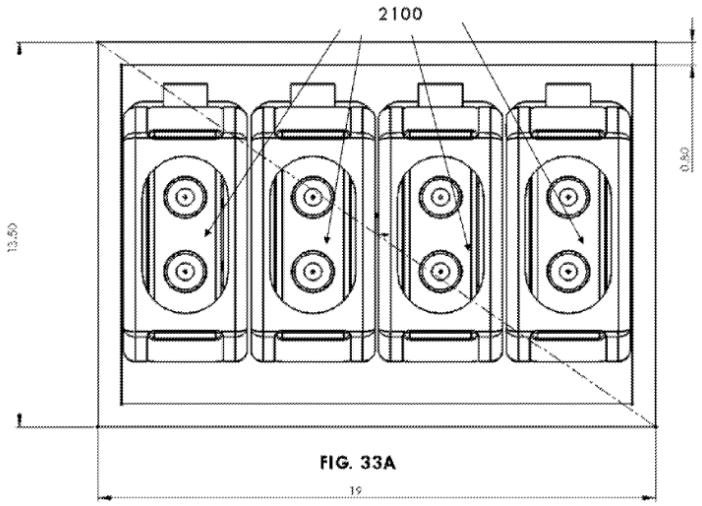
303. The optical connector (2100) also receives a pull force to release the latch component from the adapter (2400): "an optional pull tab 2107 to facilitate removal of the connector 2100 when connected in a dense array of optical connectors." EX1003: ¶[0117].

304. The outer housing (2110) and/or the optional pull tab (2107) is pulled rearward to extract the optical connector from the mating adapter. EX1003: ¶[0106]. Pulling the outer housing (2110) rearward disengages the adapter hooks (2302) of the adapter (2400) from the micro connector (2100), thereby permitting the micro connector to be withdrawn from the adapter. EX1003: ¶[0106]. As the outer housing (2110) moves rearward within the adapter (2400) due to the pull force, the outer housing is displaced rearward relative to the front body (2115), ferrules (2122), ferrule springs (2125), back body (2130), and boot (2145) (these components do not initially move rearward with the outer housing), thereby lifting the adapter hooks (2302) of the adapter out of the recesses (2710) in the front body (2115) to unlatch the adapter hooks (2302) of the adapter (2400) from the optical connector (2100). EX1003: ¶[0106]. With the adapter hooks (2425) lifted clear of the front body (2115), the entire optical connector (2100) moves rearward to disconnect the optical connector from the adapter (2400), due to the continued rearward pulling of the outer housing (2110). EX1003: ¶[0106].

305. Therefore, in my opinion, Takano'209 meets this claim.

I. Claim 8 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a QSFP footprint."

306. Takano'209 explains the optical connector (2100) fits within a "quad small form factor pluggable (QSFP) footprint." EX1003: ¶[0132] ("in a quad small form factor pluggable (QSFP) footprint of 13.5×19 mm, four connectors 2100 having a total of eight LC-type ferrules 2122 may be accommodated as seen in FIG. 33A"). Therefore, the front end of the outer housing (2110) of the optical connector (2100) fits in the QSFP footprint.



EX1003: Fig. 33A.

307. Therefore, in my opinion, Takano'209 meets this claim.

J. Claim 9 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a SFP footprint."

308. Takano'209 explains the optical connector (2100) fits within a "small form factor pluggable (SFP) footprint." EX1003: ¶[0132] ("in a small form factor pluggable (SFP) footprint of 14×12.25 mm, two connectors 2100 having four LC-

type ferrules 2122 of 1.25 mm outer diameter may be accommodated as seen in FIG. 33B"). Therefore, the front end of the outer housing (2110) of the optical connector (2100) fits in an SFP footprint.

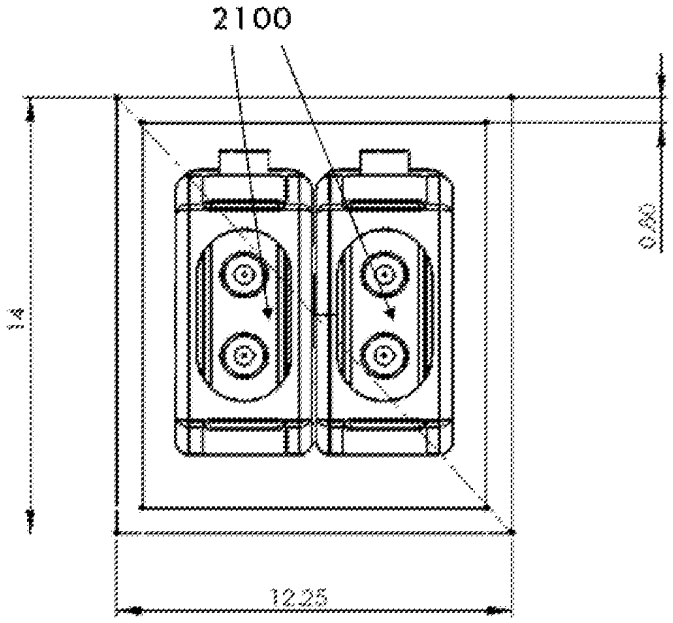


FIG. 33B

EX1003: Fig. 33B.

309. Therefore, in my opinion, Takano'209 meets this claim.

K. Claim 10 "The fiber optic connector according to claim 1, wherein the crimp body is located such that the two springs are positioned between a top portion and a bottom portion thereof."

310. The back body (2130) of the crimp body has upper and lower protrusions (2134) received in corresponding windows/cutouts (2119) in the top and bottom of the front body (2115). EX1003: Figs. 27A and 28B, ¶[0122]. The upper protrusion (2134) is a top portion of the crimp body and the lower protrusion

(2134) is a bottom portion of the crimp body. EX1003: Figs. 27A and 28B, ¶[0122].

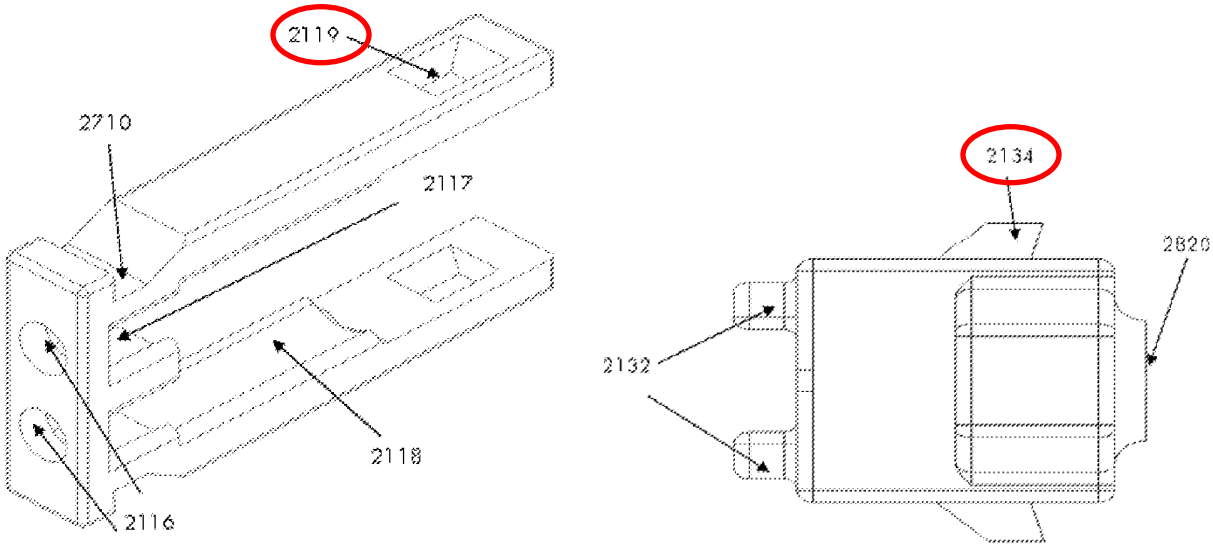
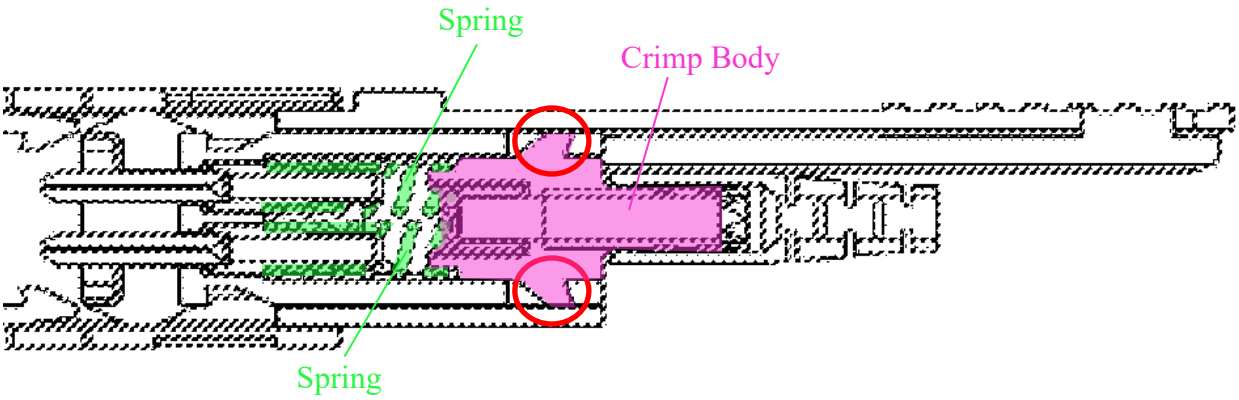


FIG. 27A

FIG. 28B

EX1003: Figs. 27A and 28B (annotated).

311. In the assembled connector, the rear ends of the springs (2125) engage the front face of the back body (2130) between the upper and lower protrusions (2134). EX1003: Figs. 27A and 28B, ¶[0122]. Therefore, the crimp body is located such that the two springs (2125) are positioned between the top and bottom portions (i.e., protrusions (2134)) of the crimp body. EX1003: Figs. 27A and 28B, ¶[0122].



EX1003: Fig. 23B (annotated).

312. I note that this is no different than how the springs (122, 1122) are shown in the '994 patent as being between top and bottom portions of the crimp body (106, 1106).

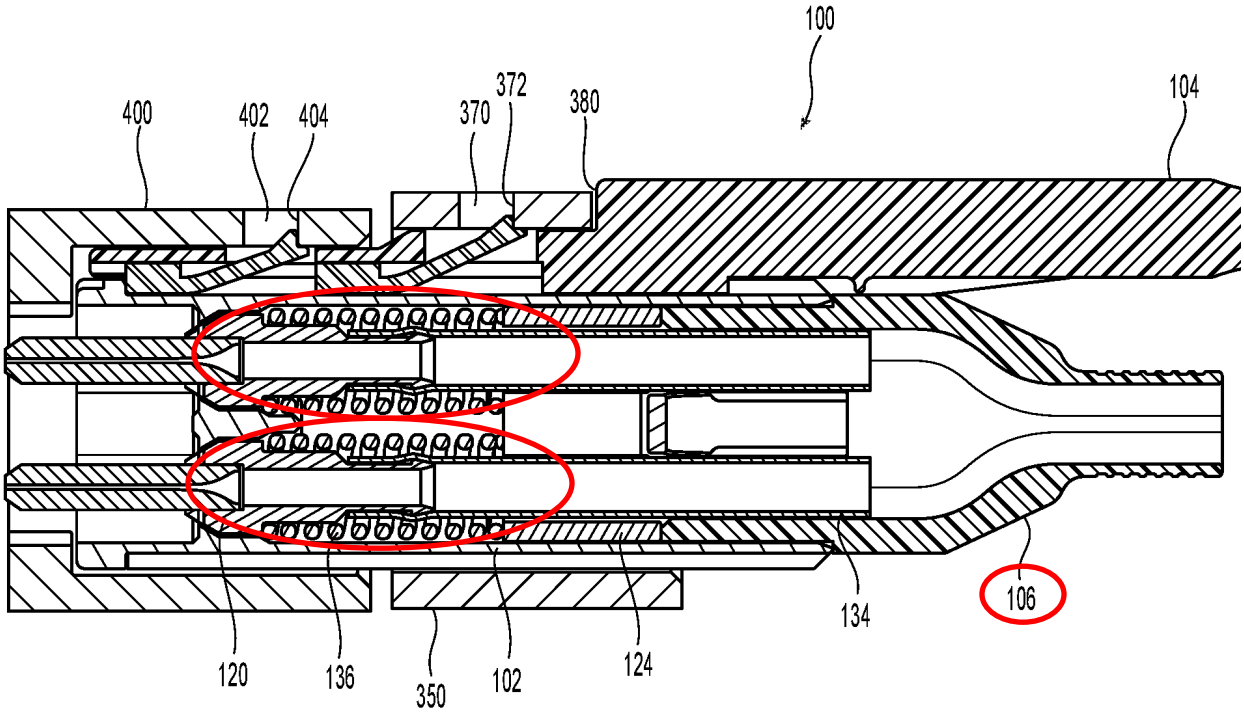


Fig. 21

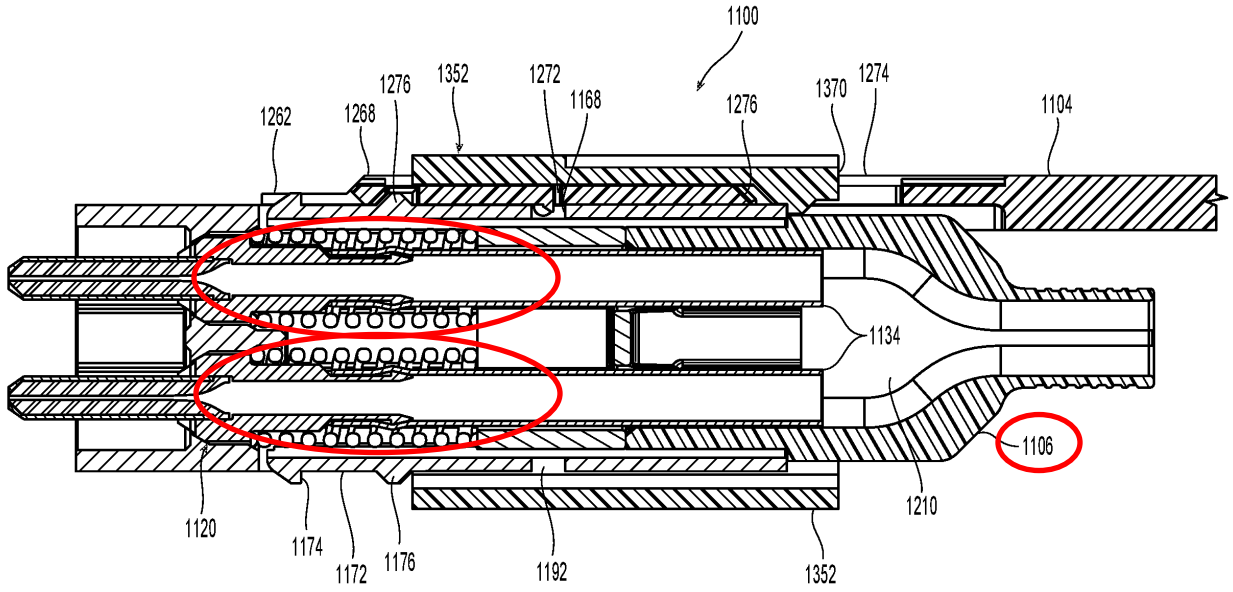
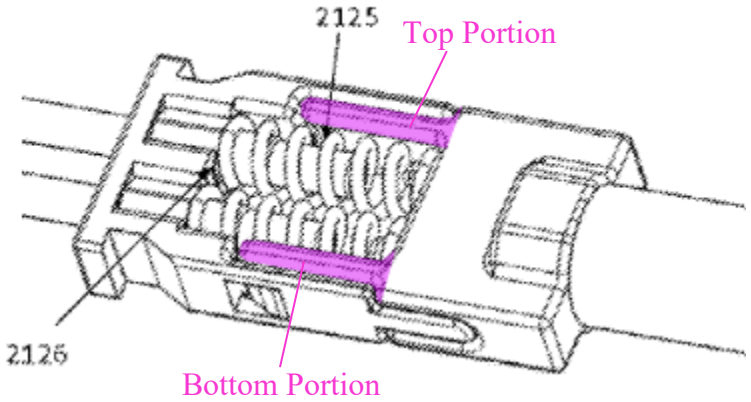


Fig. 33

EX1001: Figs. 21 and 33 (annotated).

313. Alternatively or in addition, Fig. 29D of Takano'209 discloses an alternative embodiment of the back body (2130) for the optical connector (2100) in which the back body has top and bottom portions (annotated below) with the springs (2125) therebetween.

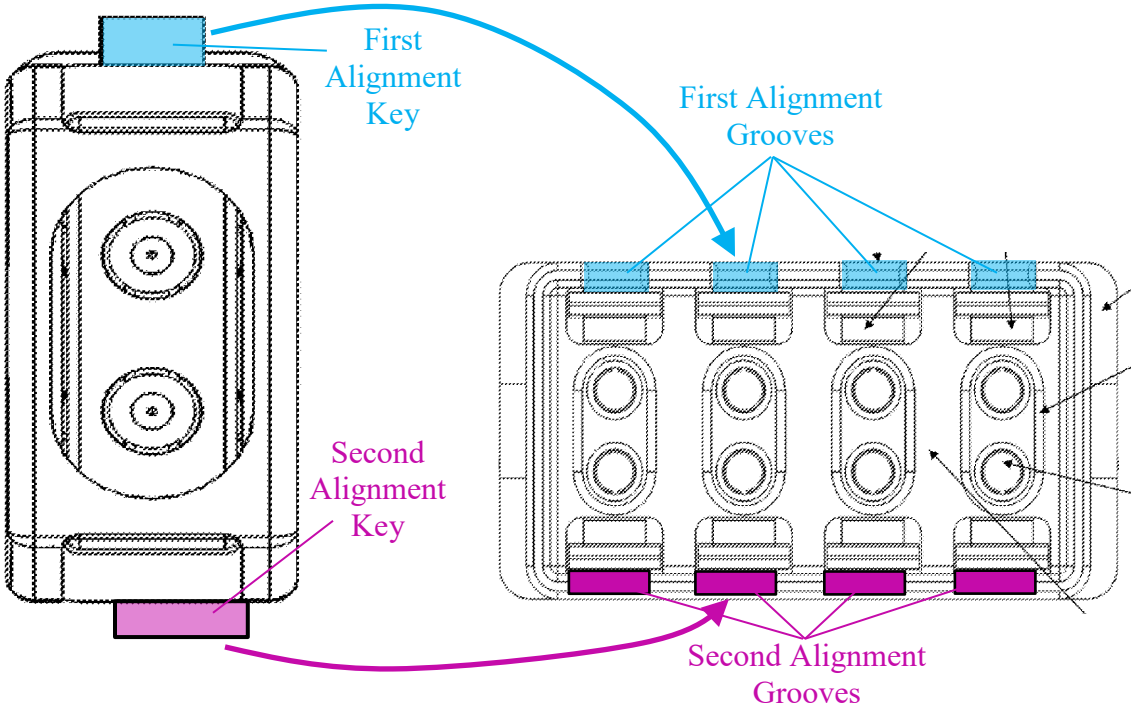


EX1003: Fig. 29D (annotated).

314. Therefore, in my opinion, Takano'209 meets this claim.

L. Claim 11 "The fiber optic connector according to claim 1, wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter."

315. As I explained above in Section XI(A), the result of the modified Takano'209 optical connector (2100) and modified adapter (2400) is that the first alignment key (2105) (i.e., first projection) is received in one of the first alignment grooves of the adapter and the added second alignment key (i.e., second projection) is received in a corresponding one of the added second alignment grooves of the modified adapter. EX1003: ¶¶[0117], [0127]; EX1008: ¶¶[0011]-[0012], [0014].



EX1003: Figs. 22 and 26 (annotated, modified).

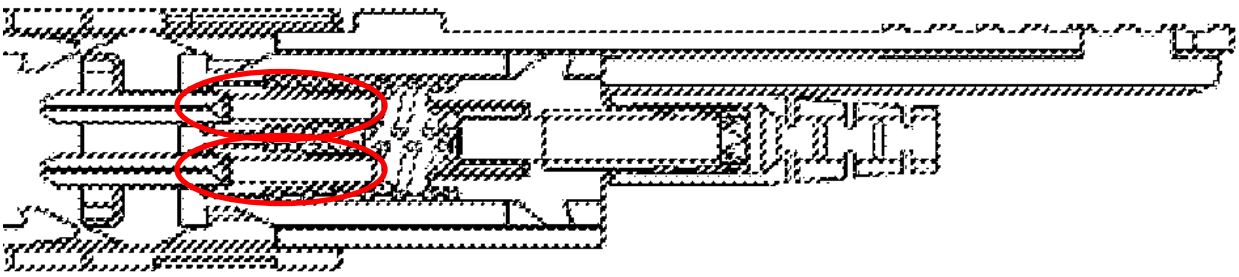
316. If it is argued that the Takano'209/Shimozu combination does not render this claim obvious because Takano'209's modified adapter (2400) does not

have “grooves” that receive the first and second alignment keys of Takano’209’s modified optical connector (2100), I note that “grooves” is part of the intended use of claim 11. As I have already stated, I have been informed that when an apparatus claim recites an intended use of the device, a prior art reference meets the intended use if it is capable of performing the intended use. The first and second alignment keys of Takano’209’s modified optical connector (2100) are capable of being fitted in any corresponding receiving structure of an adapter, whether that corresponding receiving structure is a “slot,” “groove,” “recess,” “channel,” “bore,” “depression,” “cut,” etc.

317. Therefore, in my opinion, the Takano’209/Shimozu combination renders this claim obvious.

M. Claim 12 “The fiber optic connector according to claim 1, wherein each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ferrule seats of the fiber optic ferrules of each of the ferrule assemblies, the wall located between the top surface and the bottom surface of the main body of the housing.”

318. Under any construction of this claim, the two ferrule seats are located somewhere in the circled areas below. Section V(A).



EX1003: Fig. 23B (annotated).

319. The front body (2115) includes a wall separating the ferrule assemblies (2150) between the locations where the ferrule assemblies are seated in the outer housing (2110). EX1003: Figs. 27A-B and 23B, ¶[0123]. The wall is located between the top and bottom surfaces of the outer housing (2110). EX1003: Fig. 23B.

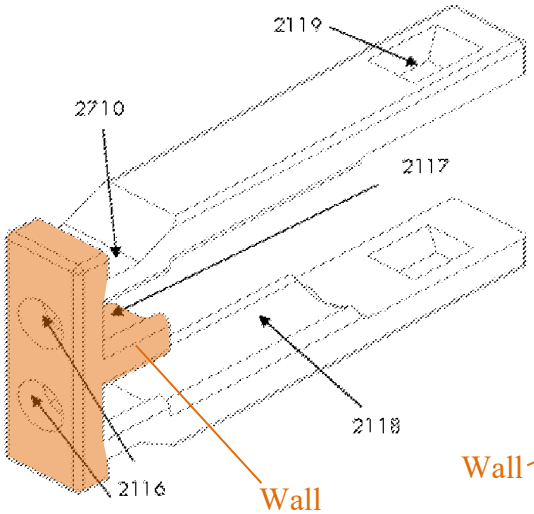


FIG. 27A

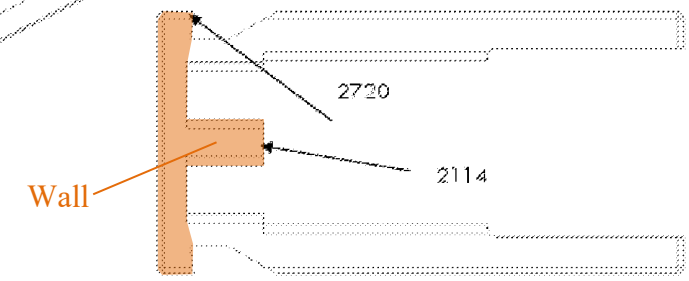
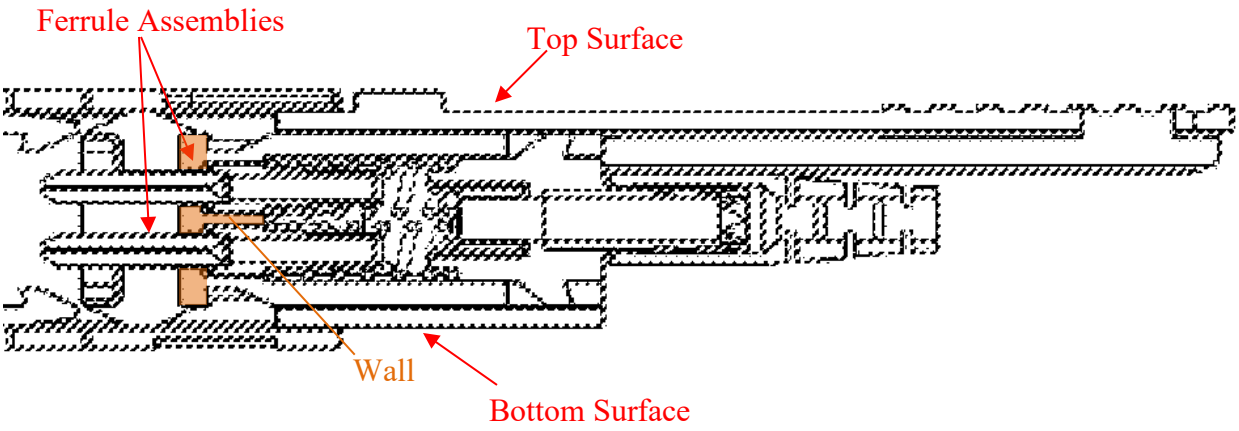


FIG. 27B

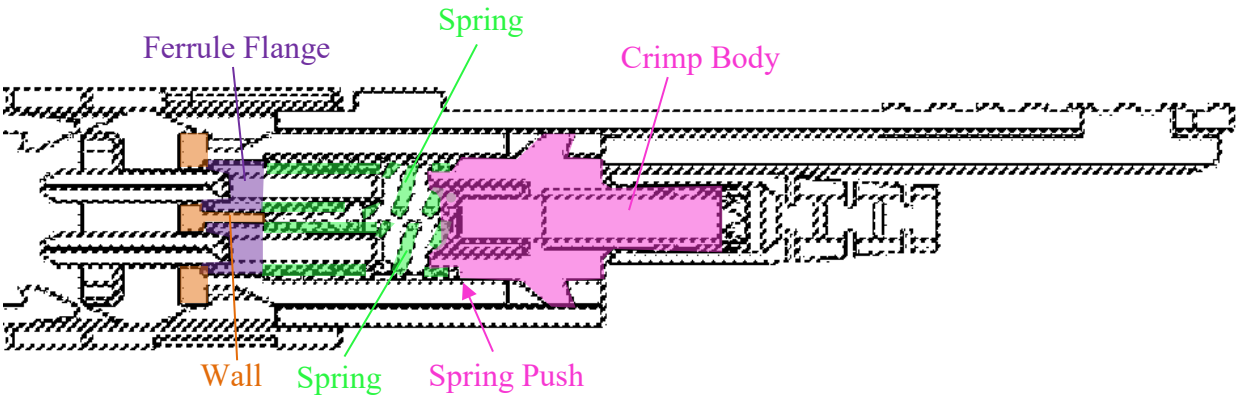


EX1003: Figs. 27A&B and 23B (annotated).

320. Therefore, in my opinion, Takano'209 meets this claim.

N. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two springs between the crimp body and the first and second ferrule flanges engaged with the wall."

321. As I explained above in Section VII(C), the crimp body (particularly, the front portion of the back body (2130)) forms a spring push. The spring push simultaneously compresses each of the two ferrule springs (2125) between the crimp body and the ferrule flanges (2124). EX1003: Fig. 23B, ¶[0123]. The forward portion of the ferrule flanges (2124) is engaged with the wall, as shown in Fig. 23B. EX1003: Fig. 23B. The ferrule flanges (304) are pushed against a rear face of the wall. Further, as known in the art, the hexagonal collar of the ferrule flange (2124) engages the wall to prevent the ferrules from rotating and twisting the optical fibers. EX1003: Figs. 21A and 23B. Such prevention of rotation/twisting is especially important when polishing the ferrules, such as when applying an angle-physical contact (APC) polish.



EX1003: Fig. 23B (annotated).

322. Therefore, in my opinion, Takano meets this claim.

XII. OBVIOUS: TAKANO'209, SHIMOZU & LEE (GROUND 8)

323. In my opinion, claims 3 and 13 would have further been obvious over Takano'209 in view of Shimozu and Lee.

A. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs."

324. In my opinion, it would have been obvious to modify Takano'209's optical connector (2100) (as already modified in view of Shimozu) to include a spring push separate from the crimp body as taught by Lee.

325. Lee teaches an optical connector (10) that, like Takano'209's optical connector (2100), is taller than it is wide and holds two spring-loaded single-fiber ferrules (20, 22) at vertically spaced apart positions. EX1005: Figs. 2 and 3, ¶¶[0029]-[0030]. Fibers (86, 88) enter the optical connector (10) through a single opening in a two-piece crimp body (36, 110) at a rear end and extend forward through ferrule springs (100, 102) to the ferrules (20, 22). EX1005: Figs. 2 and 3, ¶¶[0030], [0037], [0038], [0040]. Between the two-piece crimp body (36, 110) and the ferrule springs (100, 102) is a separate spring push (104). EX1005: Figs. 2 and 3, ¶[0038]. Lee teaches that the spring push (104) is an E-shaped body with first and second slots (156, 158) for receiving the fibers (86, 88). EX1005: ¶[0052]. The slots (156, 158) are "kept relatively small to help position the first and second

optical fibers 86, 88 on or close to the longitudinal axes FA1, FA2 of the first and second ferrules 20, 22." EX1005: ¶[0052]. Spring seats (162, 164) are positioned around the slots (156, 158) on the front side of the spring push. EX1005: ¶[0056]. The spring seats (162, 164) retain the rear ends of the ferrule springs (100, 102) and help "prevent the first and second inner springs 100, 102 from moving laterally on the spring push 104 and contacting the first and second optical fibers 86, 88." EX1005: ¶[0053]. Lee further teaches that the separate spring push (104) facilitates an improved connectorization of a fiber optic cable by allowing for placement of the spring push onto the cable after the fibers (80, 86) have been installed in the ferrules (20, 22). EX1005: ¶¶[0055]-[0058].

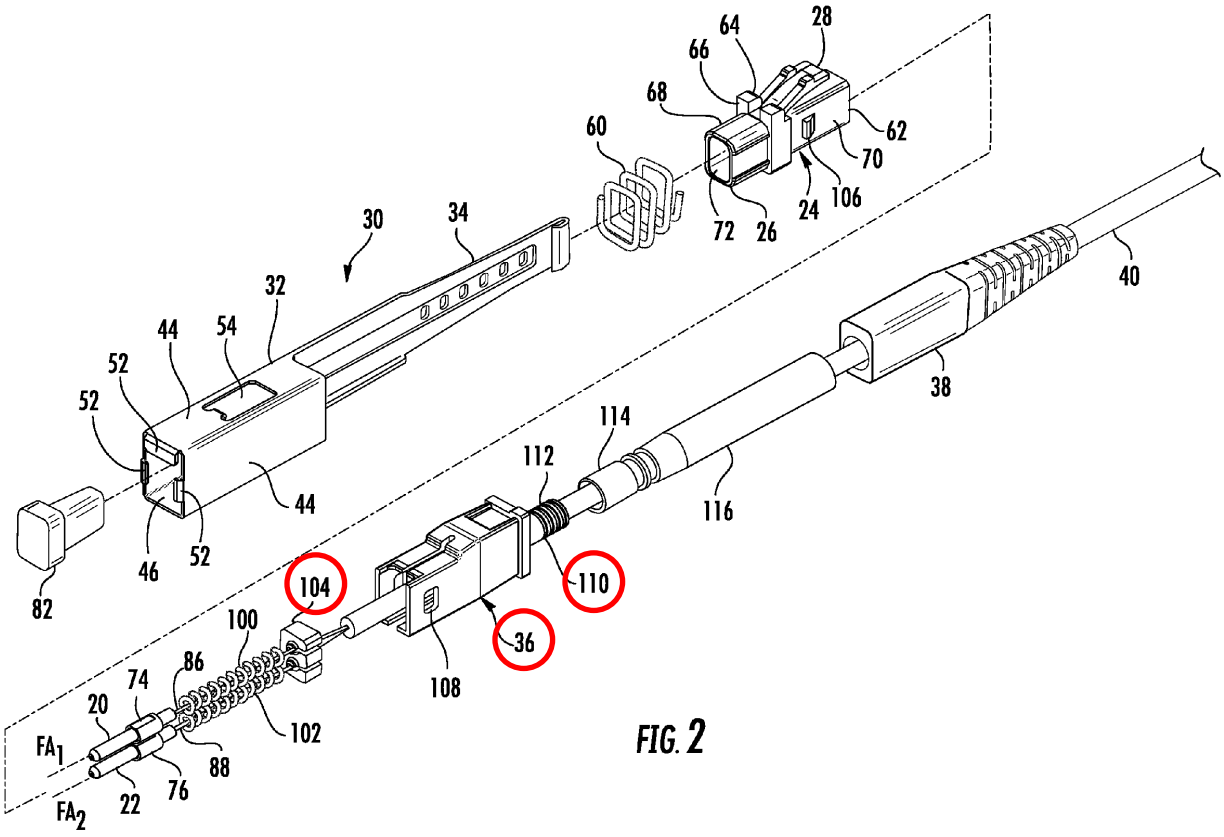
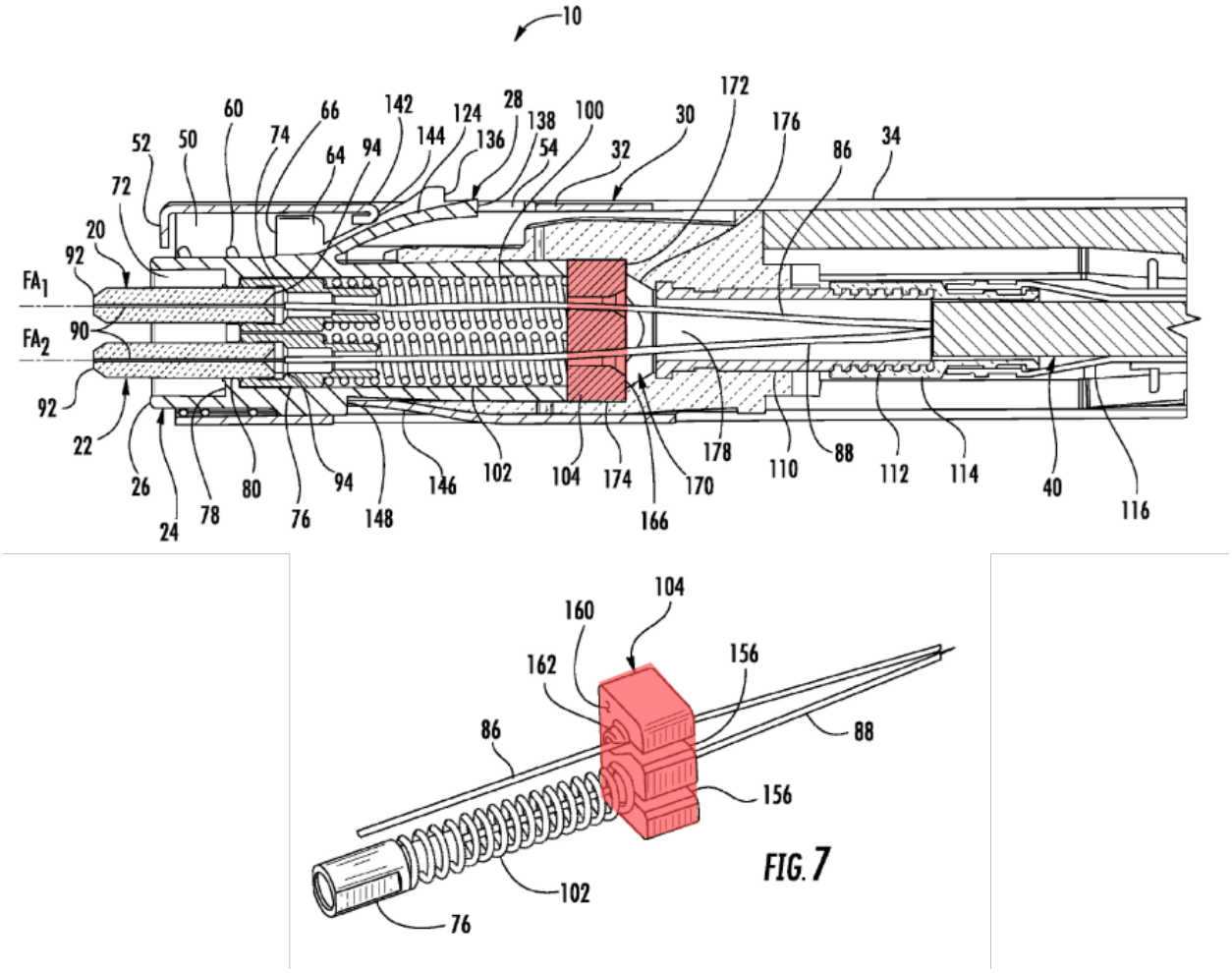

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102
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76
22
FA1
FA2

FIG. 2



EX1005: Figs. 2, 3, and 7 (annotated).

326. In my opinion, it would have been obvious to modify Takano'209's optical connector (2100) to include Lee's spring push (104). A POSA would have been motivated to make the combination based on the express teachings of Lee regarding the advantages of the separate spring push (104). For example, each of the following advantages that are expressly taught by Lee would have served as an independent motivation for the combination: (i) to help position the fibers close to the longitudinal axes of the ferrules; (ii) to protect the fibers from relative

movement in relation to the ferrule springs by aligning spring seats (162, 164) with the slots (156, 158); and (iii) to provide improvements in the process of terminating a fiber optic cable with the connector by allowing for placement of the spring push (104) onto the cable after the fibers have been installed in the ferrules. EX1005: ¶¶[0053], [0055].

327. This modification would have been nothing more than combining known prior art elements (Takano'209's optical connector (2100) and Lee's spring push (104)) according to known methods (arrangement taught by Lee) to yield predictable results (an optical connector with an independently mountable spring push).

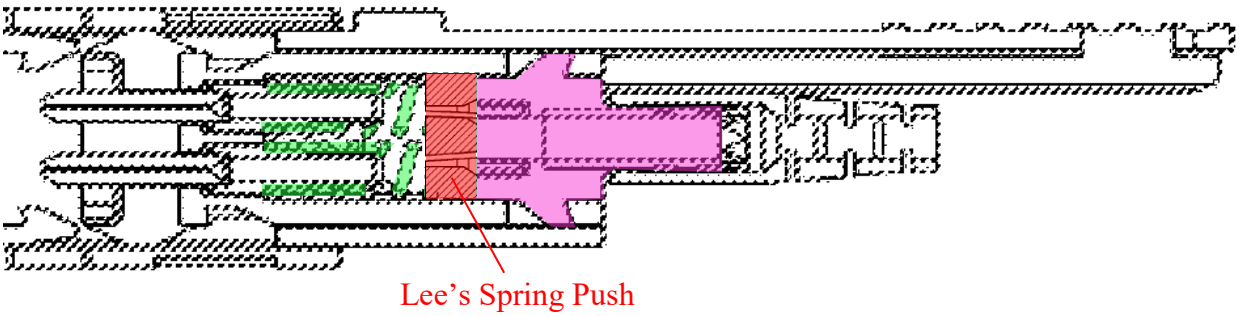
328. This modification would have also been nothing more than the application of a known technique (Lee's spring push (104)) for an optical connector that is taller than it is wide and holds two spring-loaded single-fiber ferrules at vertically spaced apart positions) to improve a similar device (Takano'209's optical connector (2100)) in the same way to yield predictable results (an optical connector with an independently mountable spring push).

329. This modification would have also been nothing more than the use of a known technique (Lee's separate spring push (104)) to a known device (Takano'209's optical connector (2100)) ready for improvement to yield predictable results (an optical connector with an independently mountable spring

push). For example, the POSA would recognize that the E-shaped spring push (104) with narrow fiber slots would function better to align the individual fibers with their respective ferrules and ferrule springs than the singular opening formed in the back body (2130).

330. There would have been a reasonable expectation of success in making this modification given the function and general placement of Lee's spring push (104) would not change in Takano'209's optical connector (2100). Further, the POSA would have made only minor structural changes to facilitate this modification such as making the font end of the back body (2130) flat and changing the dimensions of the front body (2115) and/or back body slightly to accommodate an E-shaped spring push between the ferrule springs (2125) and the front end of the back body and between upper and lower portions of the front body. This modification would only require minor changes in dimensions and shapes of molded parts and is well within the level of ordinary skill in the art.

331. A schematic illustration of this modification is shown below:



EX1003: Fig. 23B (annotated, modified).

332. As a result of this modification, Takano'209's optical connector (2100) includes Lee's spring push (104), which is separate from the crimp body (back body (2130) and back post (2135)). Just like in Lee, the spring push (104) would engage the rear portions of each of Takano'209's springs (2125) and simultaneously compress the springs between the crimp body and the ferrule flanges (2124). EX1005: Fig. 3, ¶¶[0038], [0053].

333. Therefore, in my opinion, the Takano'209/Shimozu/Lee combination renders this claim obvious.

B. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two springs between the crimp body and the first and second ferrule flanges engaged with the wall."

334. For the reasons I explained above in Section XII(A), the Takano'209/Lee combination renders the "spring push" portion of claim 13 obvious. The remaining limitations of claim 13 are met by Takano'209 for the reasons I explained above in Section XI(N).

XIII. OBVIOUS: TAKANO'209, SHIMOZU & HILL (GROUND 9)

335. In my opinion, claims 14 and 15 would have been obvious over Takano'209 in view of Shimozu and Hill.

A. Claim 14 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an angled physical contact (APC) ferrule."

336. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Angled physical contact" or APC as recited by claim 14 is a common polish type for the end of fiber optic ferrules. EX1028: 3-4. As known in the art, APC type polish offers the lowest return loss (amount of light reflected back by the end face of the optical fiber). EX1029: 3.

337. In my opinion, it would have been obvious to modify Takano'209's optical connector (2100), as modified in view of Shimozu, in further view of Hill.

338. Takano'209's optical connector (2100) has "LC-type ferrules having an outer diameter of 1.25 mm." EX1003: ¶[0117]. However, Takano'209 is silent about the type of polishing used for the LC-type ferrules.

339. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-

4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

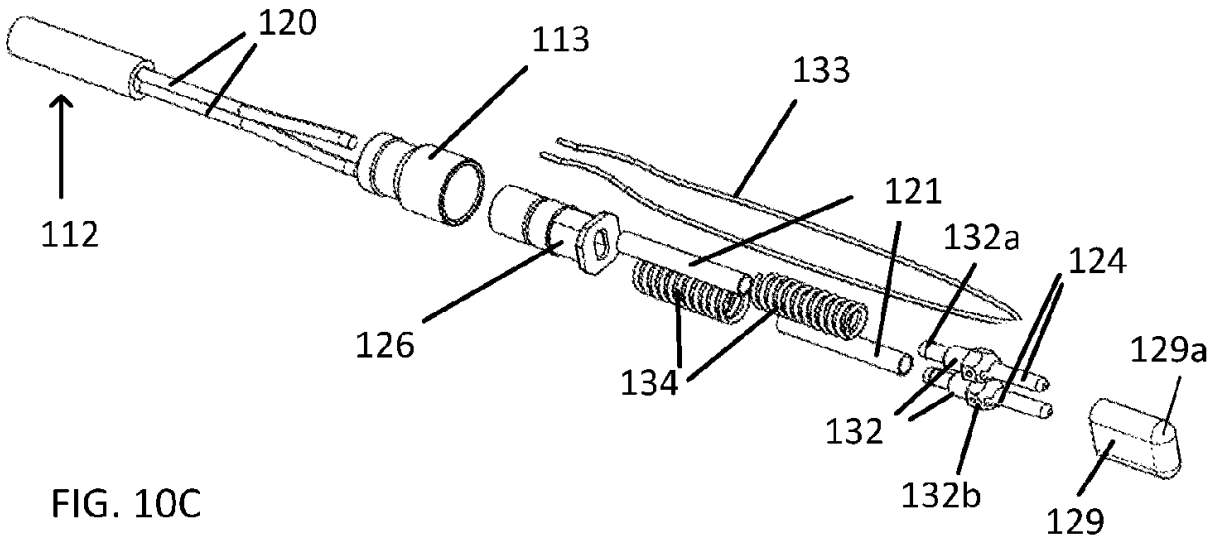


FIG. 10C

EX1007: Fig. 10C.

340. In my opinion, it would have been obvious to make the ferrules (2122) of Takano'209's optical connector (2100) an "angled physical contact" type of ferrule in view of Hill. Takano'209 already discloses that its ferrules (2122) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well

known to be particularly useful for single mode (SM) fiber applications requiring lowest return loss. EX1029: 3; EX1030: 2. Making Takano'209's ferrules (2122) an "angled physical contact" type of ferrule makes Takano'209's optical connector (2100) suitable for single mode, "high bandwidth applications and long haul links" sensitive to return loss, such as "FTTx (fiber to the x), passive optical network (PON) and wavelength-division multiplexing (WDM)" applications. EX1029: 3.

341. This modification is nothing more than a simple substitution of one known element (Hill's LC/APC type ferrule) for another (Takano'209's ferrule) to yield predictable results (an APC optical connector for lowest return loss applications).

342. This modification would have also been nothing more than the application of a known technique (Hill's APC ferrule polish type) to improve a similar device (Takano'209's ferrules) in the same way to yield predictable results (an APC optical connector for lowest return loss applications).

343. This modification would have also been obvious to try as APC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Takano'209's optical connector (2100) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used.

Further, the specific polish type is generally specified by each customer application.

344. There would have been a reasonable expectation of success in making this modification given that both Takano'209's and Hill's ferrules are of LC-type. EX1003: ¶[0117]; EX1007: ¶[0058].

345. As a result of this modification, the ferrules (2122) in Takano'209's optical connector (2100) are APC ferrules.

346. Therefore, in my opinion, the Takano'209/Shimozu/Hill combination renders this claim obvious.

B. Claim 15 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an ultra-physical contact (UPC) ferrule."

347. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Ultra-physical contact" or UPC as recited by claim 15 is another common polish type for the end of fiber optic ferrules. EX1028: 3. As known in the art, UPC type polish offers single mode (SM) fiber applications low return loss at a low cost. EX1029: 3.

348. In my opinion, it would have been obvious to modify Takano'209's optical connector (2100), as modified in view of Shimozu, in further view of Hill.

349. Takano'209's optical connector (2100) has "LC-type ferrules having an outer diameter of 1.25 mm." EX1003: ¶[0117]. However, Takano'209 is silent about the type of polishing used for the LC-type ferrules.

350. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

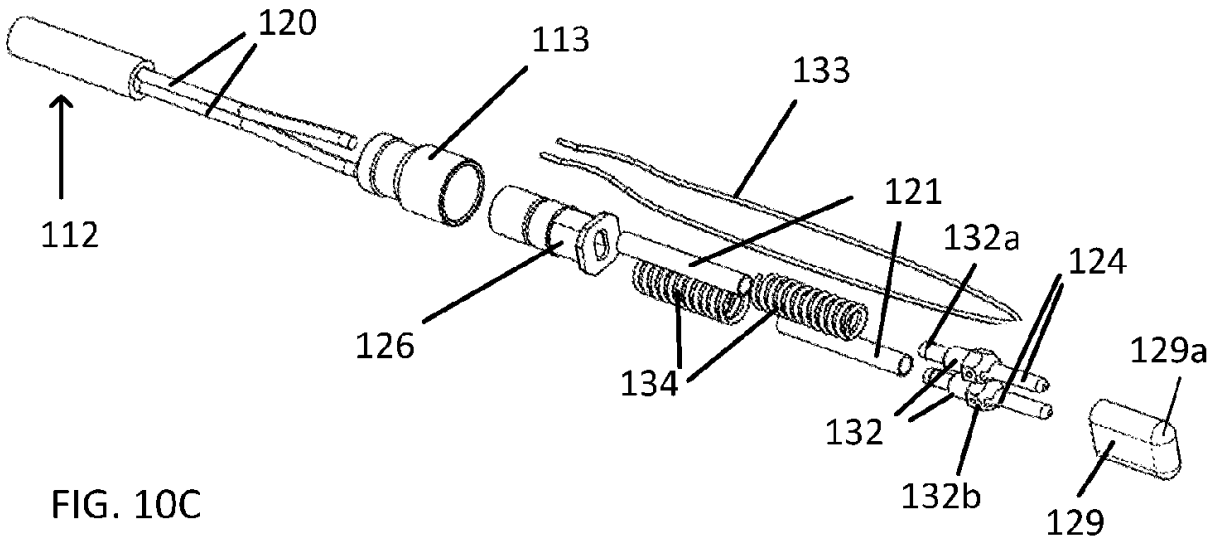


FIG. 10C

EX1007: Fig. 10C.

351. In my opinion, it would have been obvious to make the ferrules (2122) of Takano'209's optical connector (2100) an "ultra-physical contact" type of ferrule in view of Hill. Takano'209 already discloses that its ferrules (2122) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well known to be particularly useful for single mode (SM) fiber applications requiring low return loss while being cheaper than other polish types, such as APC. EX1029: 3. Making Takano'209's ferrules (2122) an "ultra-physical contact" type of ferrule makes Takano'209's optical connector (2100) suitable for more budget conscious applications while still providing low return loss. EX1029: 3; EX1030: 2.

352. This modification is nothing more than a simple substitution of one known element (Hill's LC/UPC type ferrule) for another (Takano'209's ferrule) to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

353. This modification would have also been nothing more than the application of a known technique (Hill's UPC ferrule polish type) to improve a similar device (Takano'209's ferrules) in the same way to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

354. This modification would have also been obvious to try as UPC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Takano'209's optical connector (2100) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used. Further, the specific polish type is generally specified by each customer application.

355. There would have been a reasonable expectation of success in making this modification given that both Takano'209's and Hill's ferrules are of LC-type. EX1003: ¶[0117]; EX1007: ¶[0058].

356. As a result of this modification, the ferrules (2122) in Takano'209's optical connector (2100) are UPC ferrules.

357. Therefore, in my opinion, the Takano'209/Shimozu/Hill combination renders this claim obvious.

XIV. OBVIOUS: TAKANO'369 & WATANABE (GROUND 10)

358. In my opinion, claims 1-5 and 8-13 would have been obvious over Takano'369 in view of Watanabe.

A. Modification of Takano'369 Based on Watanabe

359. Takano'369's connector (10300, 10400, 10500) has an outer housing (10301, 10401, 10501) with symmetrically curved top and bottom walls. EX1009: Fig. 53, 19:1, 14-15, 34-41. As shown in Fig. 61, the curvature on the bottom wall of the connector (10300, 10400, 10500) accommodates small triangular dividers on the bottom wall of the adapter (101114) so that four connectors can be inserted side-by-side into the adapter without being separated by full-height partition walls. EX1009: Fig. 61.

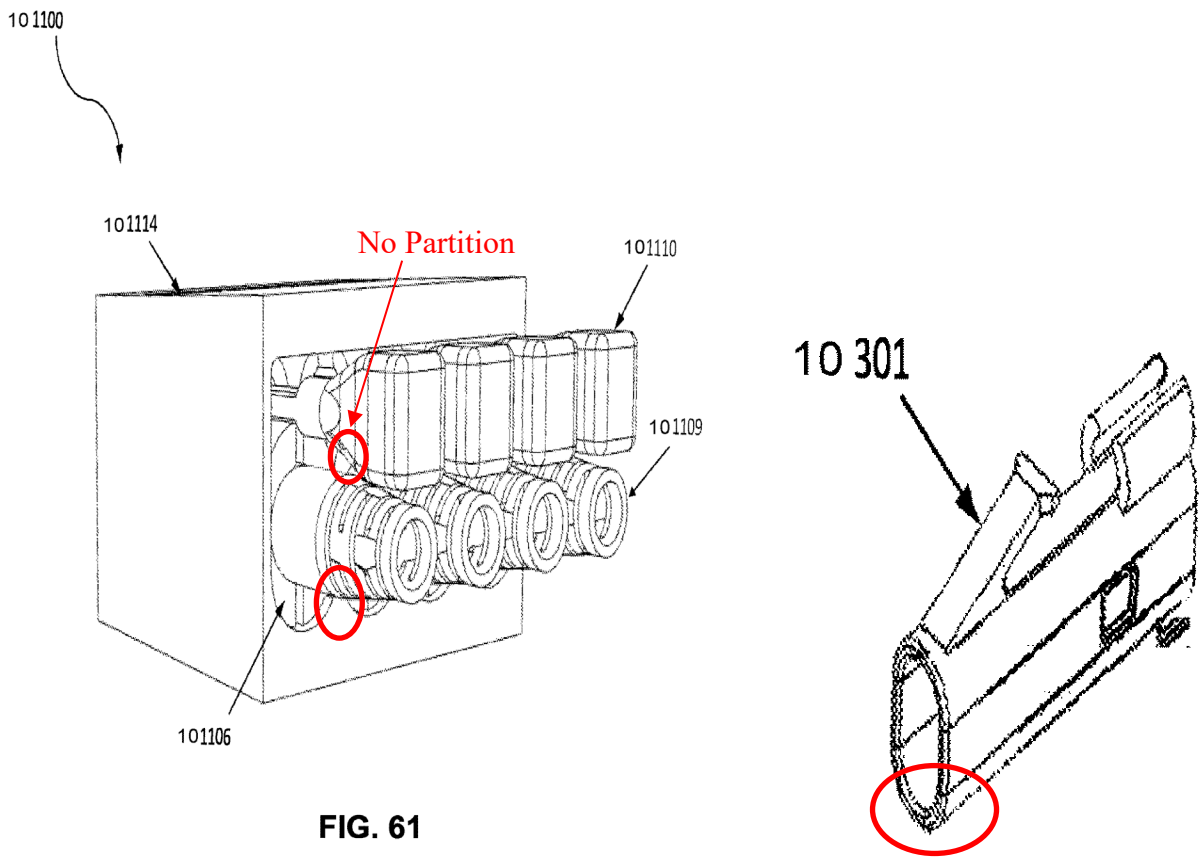


FIG. 61

EX1009: Figs. 53 and 61 (annotated).

360. Watanabe discloses a fiber optic connector comprising a main body with alignment features that are easier to manufacture at tight tolerances and still allow for high density arrays with no partition walls between adjacent connectors. EX1011: Figs. 1-3, ¶[0050]. In particular, Watanabe discloses a plug connector (10A) comprising a "plug housing 11A having a rectangular parallelpiped shape" with a latch (13) on the top wall and a guide rail (21) on the bottom wall. EX1011: ¶¶[0032], [0038], [0040]. "When the plug connector 10A is inserted into the backplane housing 3, the guide rail 21 is inserted (fitted) into a guide rail fitting section 22 from the end 21d." EX1011: ¶[0039]. The guide rail (21) is configured

to fit into a guide rail fitting section (22) on the bottom wall of an adapter (backplane housing (3)): "When the guide rail 21 is inserted into the guide rail fitting section 22, the pair of side surfaces 21a and 21b of the guide rail 21 face the corresponding pair of side surfaces 22a and 22b of the guide rail fitting section 22, and the bottom surface 21c of the guide rail 21 faces the bottom surface 22c of the guide rail fitting section 22. In the state where the guide rail 21 is fitted to the guide rail fitting section 22, the plug housing 11A is moved frontward in the Z direction in the connector hole 6 of the backplane housing 3." EX1011: ¶[0042]. Watanabe teaches that the guide rail (21) on the plug housing (11) and guide rail fitting section (22) on the backplane housing (3) facilitate high density connections by guiding multiple connectors into position in an adapter without the need for inner partition walls between adjacent connectors. EX1011: ¶[0050].

Fig.1

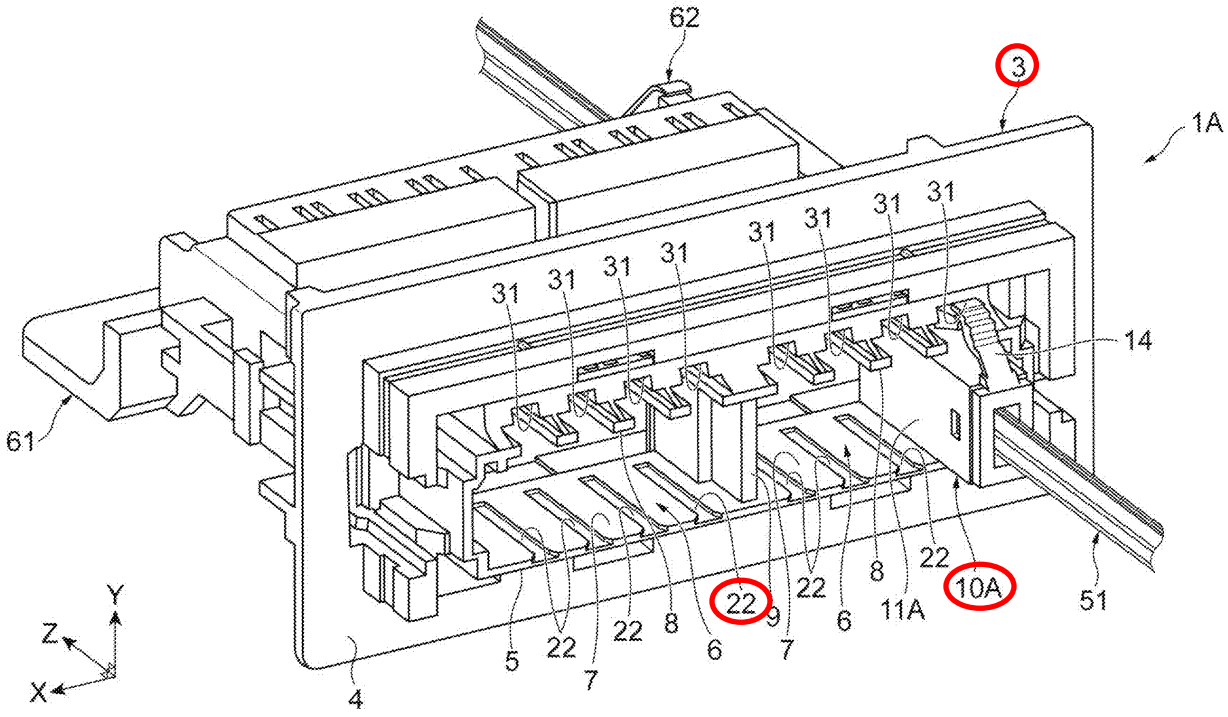
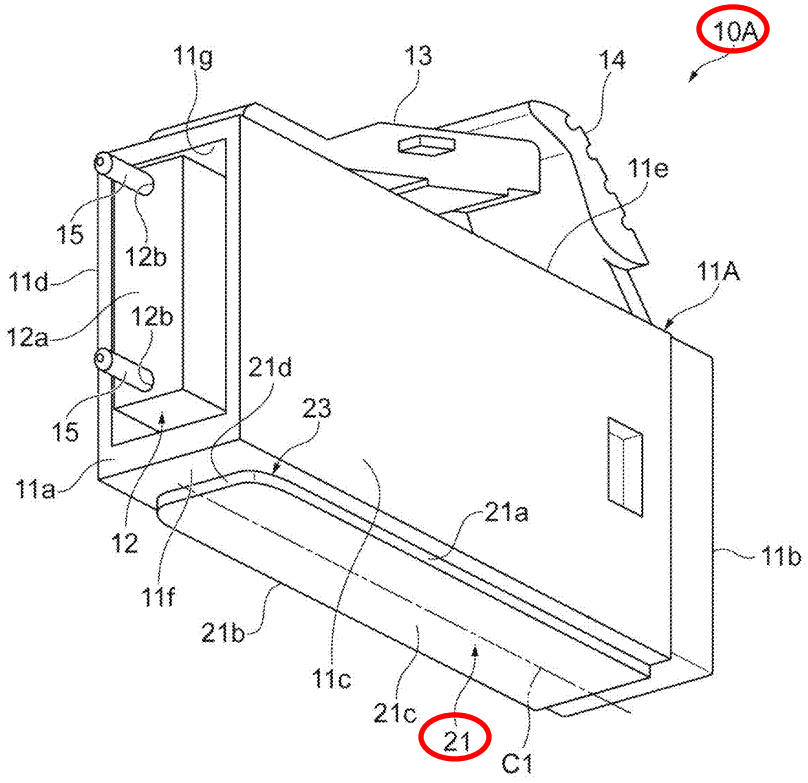

62
3
1A
31
14
61
22
10A
51
Y
Z
X
4
5
7
9
11A

Fig.3


10A
11g
13
14
11e
11A
15
12b
11d
12a
21d
23
11a
12
11f
21a
11b
21b
11c
21c
21
C1

EX1011: Figs. 1 and 3 (annotated).

361. In my opinion, it would have been obvious to alter Takano'369's outer housing (10301, 10401, 10501) to be rectangular and to include a guide rail (21) on the bottom surface, in view of Watanabe.

362. This modification results in Takano'369's outer housing (10301, 10401, 10501) having a shape that is easier to manufacture at tight tolerances while still allowing for high density multi-port interconnects that do not require partition walls between side-by-side connectors. EX1011: ¶[0050]. The POSA would recognize that arcuate structures like the curved top and bottom walls of Takano'369 outer housing (10301, 10401, 10501) are difficult to manufacture at the tight tolerances required for precision optical interconnects. In this case, the curved bottom wall of the Takano'369 outer housing (10301, 10401, 10501) appears to be the primary reference surface for alignment to the mating adapter (101114), so tight tolerances are critical for the bottom wall. In view of this, the POSA would have been motivated to seek out alternative shapes that are easier to manufacture at tight tolerances. Further, the POSA would have been motivated to seek out housing geometry that still allows the connector to be used in high-density arrays without partition walls between adjacent connectors, as shown in Fig. 61.

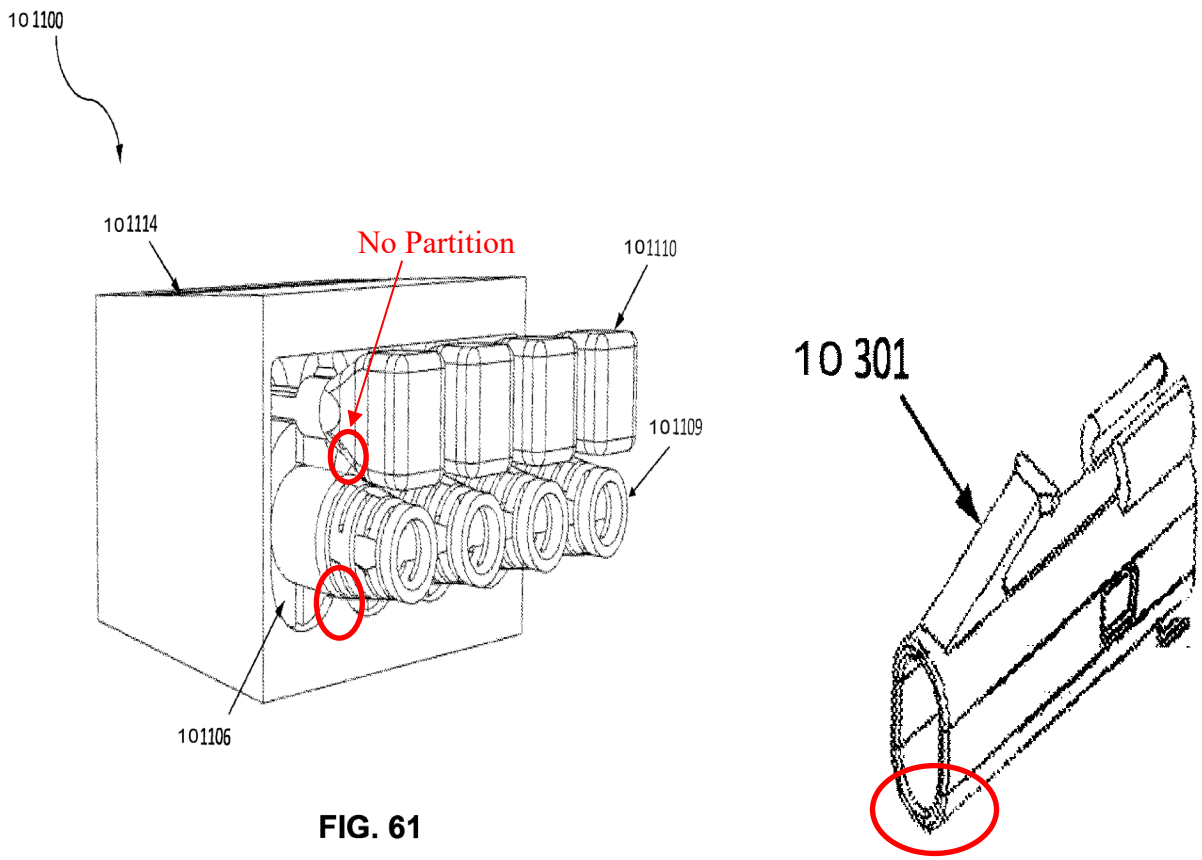


FIG. 61

EX1009: Figs. 53 and 61 (annotated).

363. This modification would have also been nothing more than the application of a known technique (Watanabe's rectangular connector housing with a bottom guide rail for a connector) to improve a similar device (Takano'369's optical connector (10300, 10400, 10500)) in the same way to yield predictable results (an optical connector for high density applications).

364. This modification would have also been nothing more than the use of a known technique (Watanabe's rectangular connector housing with a bottom guide rail for a connector) to a known device (Takano'369's optical connector

(10300, 10400, 10500)) ready for improvement to yield predictable results (an optical connector for high density applications).

365. There would have been a reasonable expectation of success in making this modification because it requires only changes in the geometry of Takano'369's optical connector (10300, 10400, 10500) and its components. For example, the back body (10306, 10406) would be modified so that the exposed rear portion has the same cross-sectional shape as the now rectangular outer housing (10301, 10401, 10501). It would have been obvious to do so because the cross-sectional shape of the exposed rear portion of the back body (10306, 10406) matches the cross sectional housing in the unmodified version of the Takano'369. EX1009: Figs. 53 and 54. The changes to the shape of the bottom wall of Takano'369's outer housing (10301, 10401, 10501) do not have a significant impact on any other component of the connector. And the changes to the shape of the top wall of Takano'369's outer housing (10301, 10401, 10501) would result in at most minor modifications to the size and shape of the locking tab or latch (10411), push-pull tab (10310, 10410, 10510), and/or the guide (dark purple, below) that secures the push-pull tab to the outer housing. These changes would amount to minor adjustments in part geometry to ensure proper fit atop the new connector housing shape. But such changes are well within the level of skill in the art, and the results of any such modifications would have been entirely predictable.

366. A schematic illustration of Takano'369's modified optical connector (10300, 10400, 10500) is shown below:

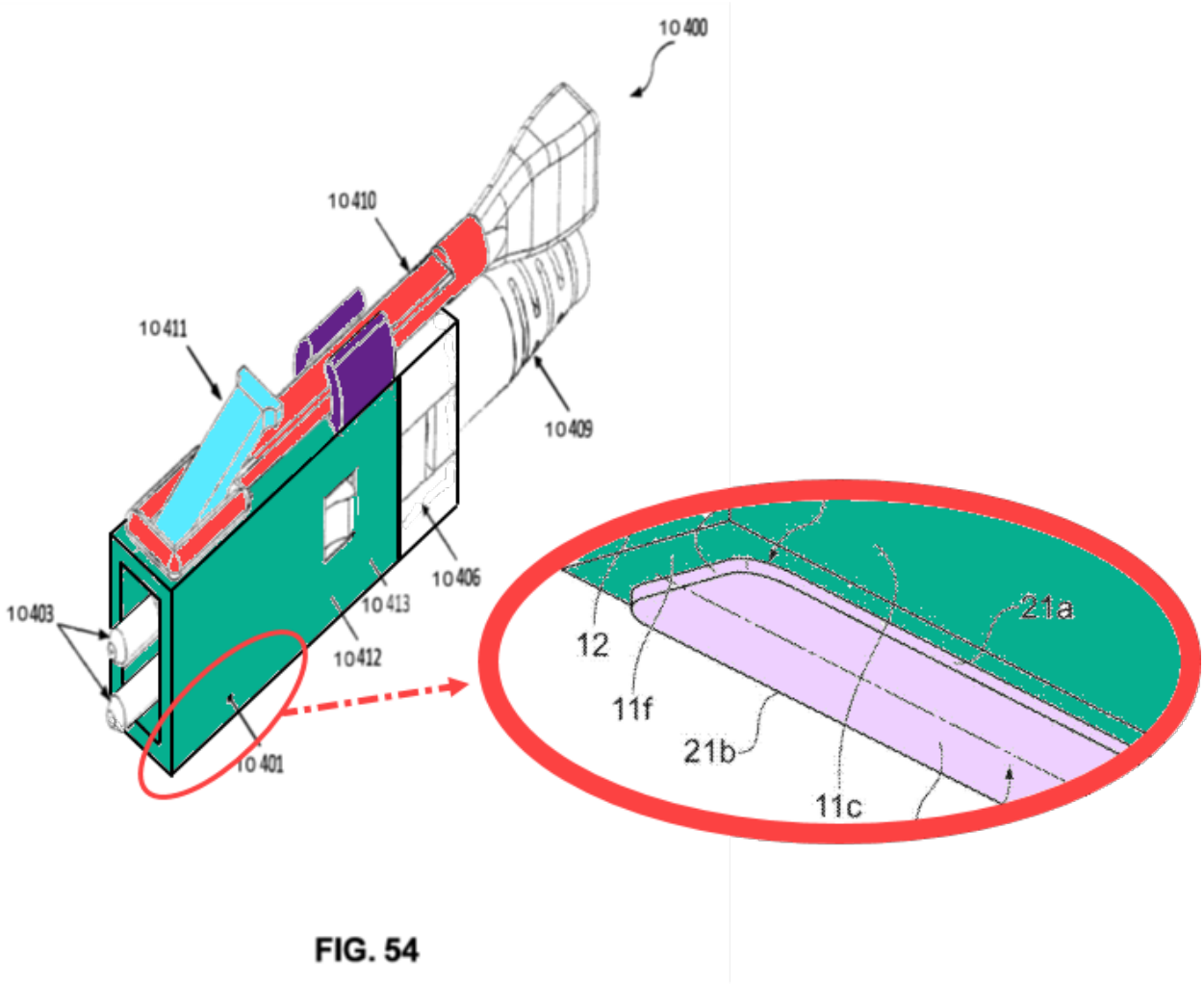


FIG. 54

EX1009: Fig. 54 (annotated, modified).

367. When making the modification to Takano'369's optical connector (10300, 10400, 10500), the POSA would have also made a corresponding modification to Takano'369's adapter (101114) to accept Takano'369's modified optical connector. For example, the bottom wall of Takano'369's adapter (101114) would be modified to be flat with recessed guide rail fitting sections (as

taught by Watanabe) for the added bottom guide rail on the modified Takano'369's outer housing (10301, 10401, 10501).

B. Independent Claim 1

1.P "A fiber optic connector comprising:"

368. Takano'369 discloses a fiber optic connector (10300, 10400, 10500). EX1009: Figs. 53-55, 18:63-64, 19:12-13, 19:32-34.

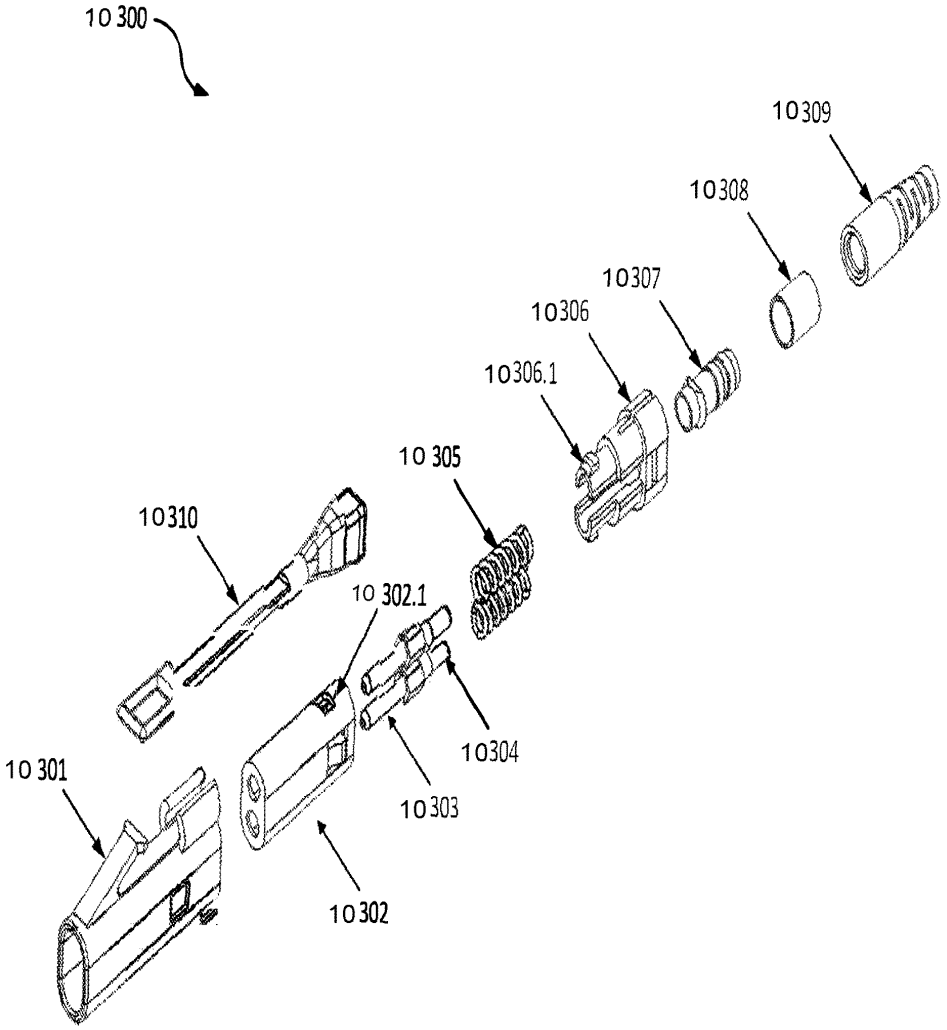


FIG. 53

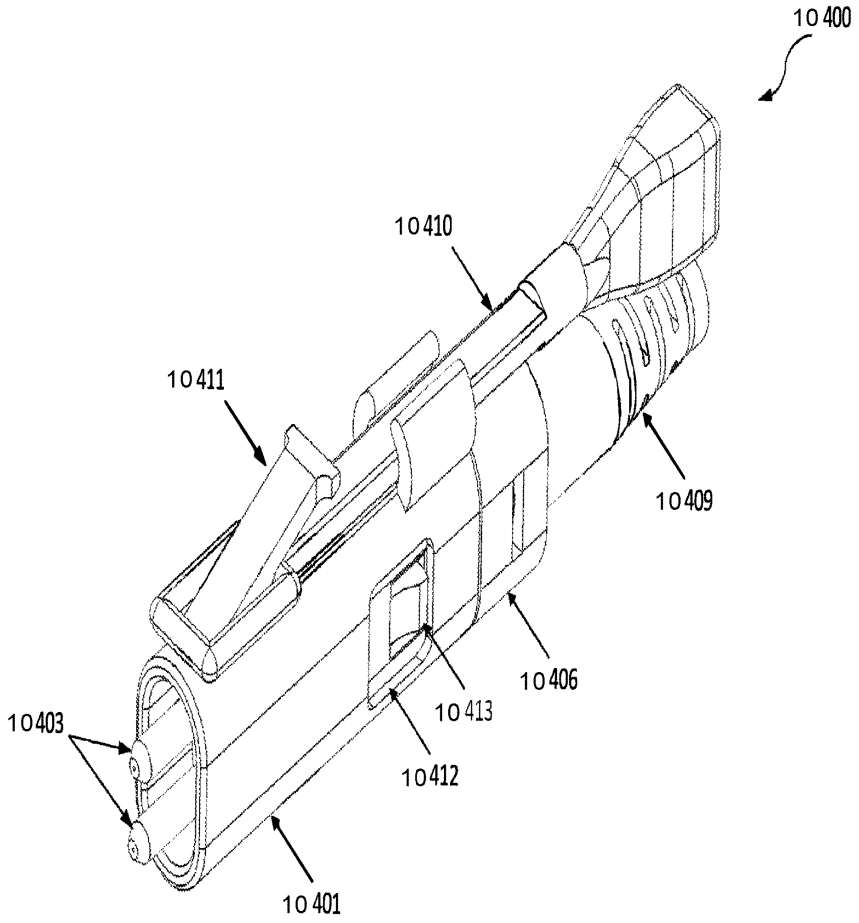


FIG. 54

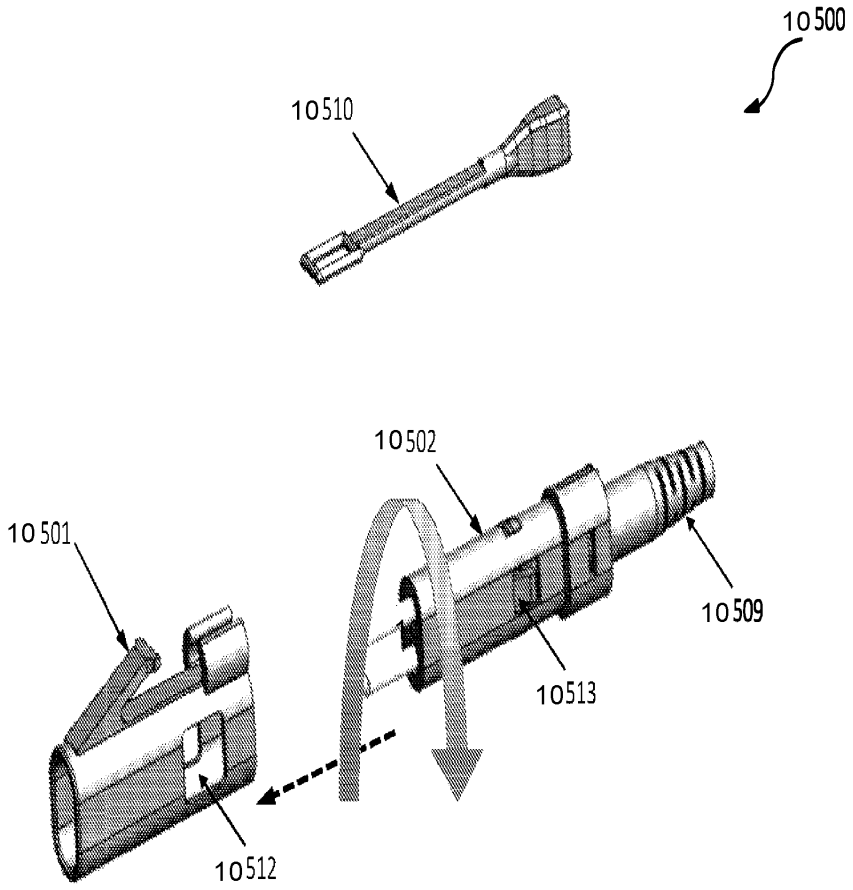


FIG. 55

EX1009: Fig. 54.

369. Although different reference numbers are used in Figures 53-55, the POSA would recognize that each of the connectors (10300, 10400, 10500) is the same connector, just shown in a different configuration. As illustrated, the components of the connectors (10300, 10400, 10500) are essentially identical. Likewise, the description of these connectors (10300, 10400, 10500) uses the same

names for identical component parts. EX1009: 18:63-10:50. The description also builds on itself when describing these connectors (10300, 10400, 10500). EX1009: 18:63-10:50. For example, when explaining the connector (10400) of Fig. 54, the description explains its front body can be seen in Figs. 53 and 55. EX1009: 19:15. Likewise, when explaining the connection of the front body to the outer housing for the connector (10500) of Fig. 55, the description states to "refer to FIG. 54 for an illustrated example of the outer housing being attached to the front body via the latching mechanism." EX1009: 19:39-41. Further, when introducing the connector (10300) of Fig. 53, the description states "a connector 10300." EX1009: 18:65. But when introducing the subsequent connectors (10400, 10500) of Figs. 54 and 55, the description states "an embodiment is shown wherein the connector 10400" and "in some embodiments, the latching mechanism of the connector 10500" thereby telling the reader that the description is referencing and adding more description pertaining to the earlier described connectors.

370. The POSA would understand that Fig. 61 shows a connection system (101100) and illustrates how four of the same connector (10300, 10400, 10500) would mate with a quad adapter (101114). While described in relation to the connector (10800) of Fig. 58, the POSA understands that Fig. 61 also illustrates how four connectors (10300, 10400, 10500) of Figs. 53-55 would look when mounted in the adapter (101106). EX1009: 21:19-28. This is apparent given the

similar construction of the connector (10300, 10400, 10500) of Figs. 53-55 and the connector (101100), especially with respect to the push-pull tabs, the back bodies, and the boot. EX1009: 20:33-37, 21:19-28. And upon closer examination, Fig. 61 may in fact show four separate duplex connectors (10300, 10400, 10500) of Figs. 53-55 mounted in the adapter (101106), given that the adapter is shown with bottom partitions between the back bodies of adjacent connectors and there is no corresponding negative space on the front end of the connector (10800) of Fig. 58 that would allow the outer quad-connector housing (10801) of Fig. 58 to be inserted past these bottom partitions.

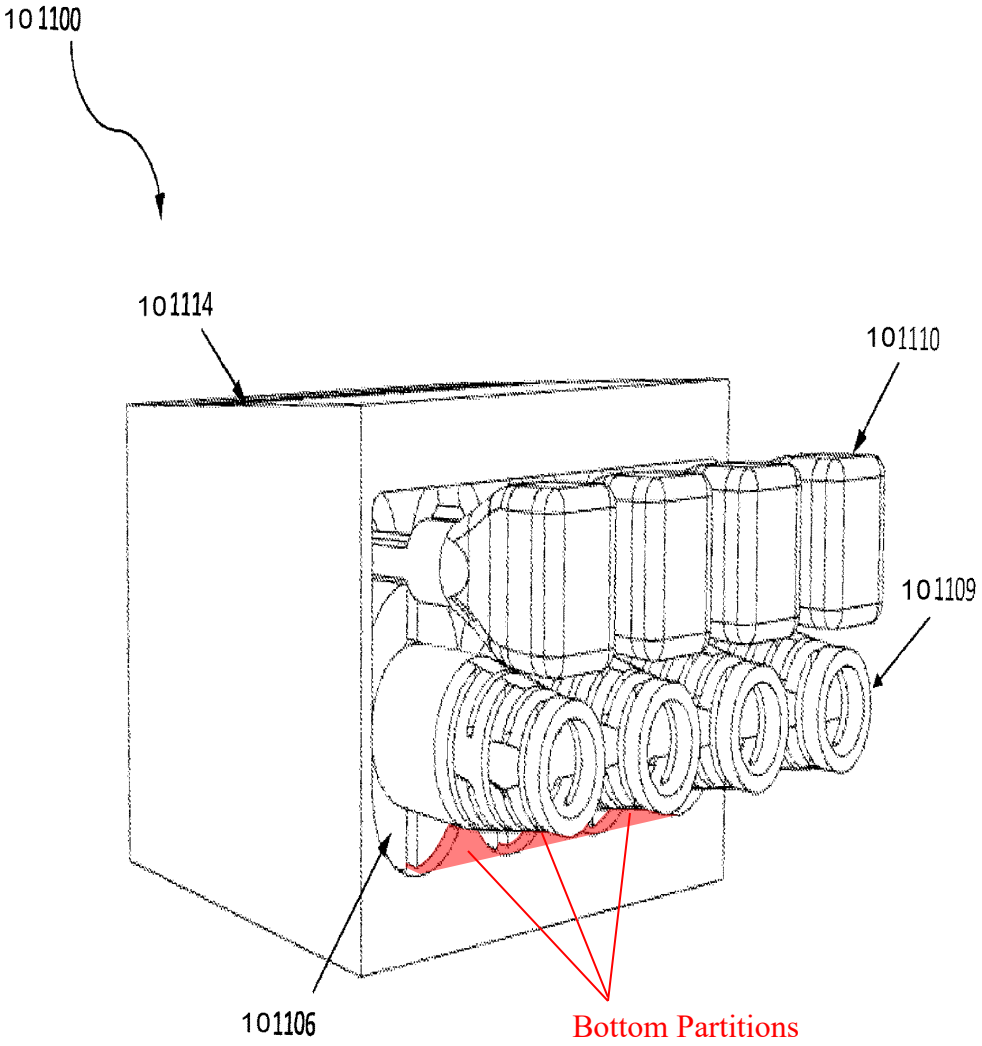


FIG. 61

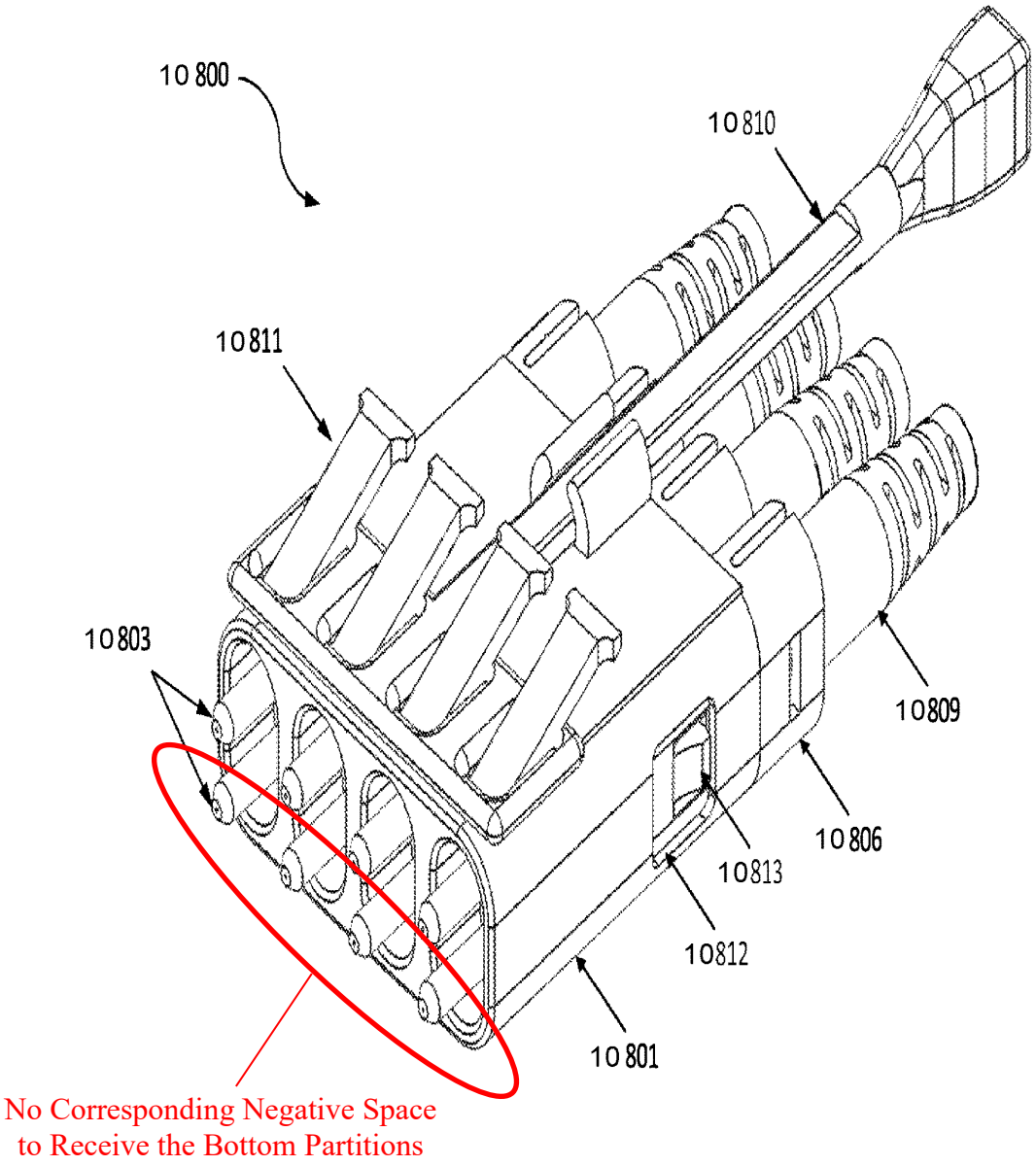


FIG. 58

EX1009: Figs. 58 and 61 (annotated).

371. In Figs. 64 and 65, the POSA would appreciate that the connectors labeled "Mini CS Simplex" are examples of the connector (10300, 10400, 10500)

of Figs. 53-55. The connectors labeled “Mini CS Simplex” in Figs. 64 and 65 are visually identical to the connector (10300, 10400, 10500) of Figs. 53-55.

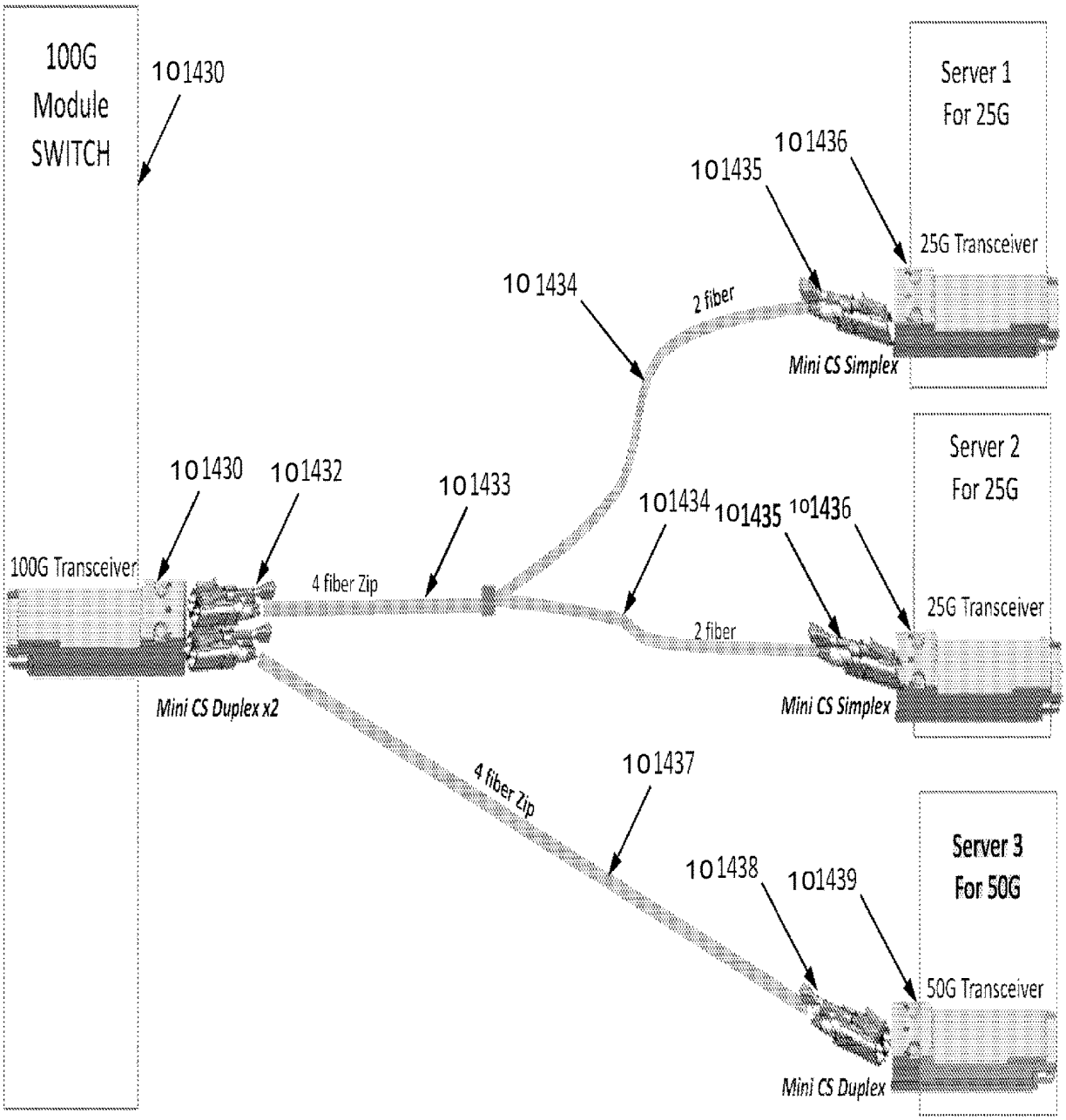


FIG. 64

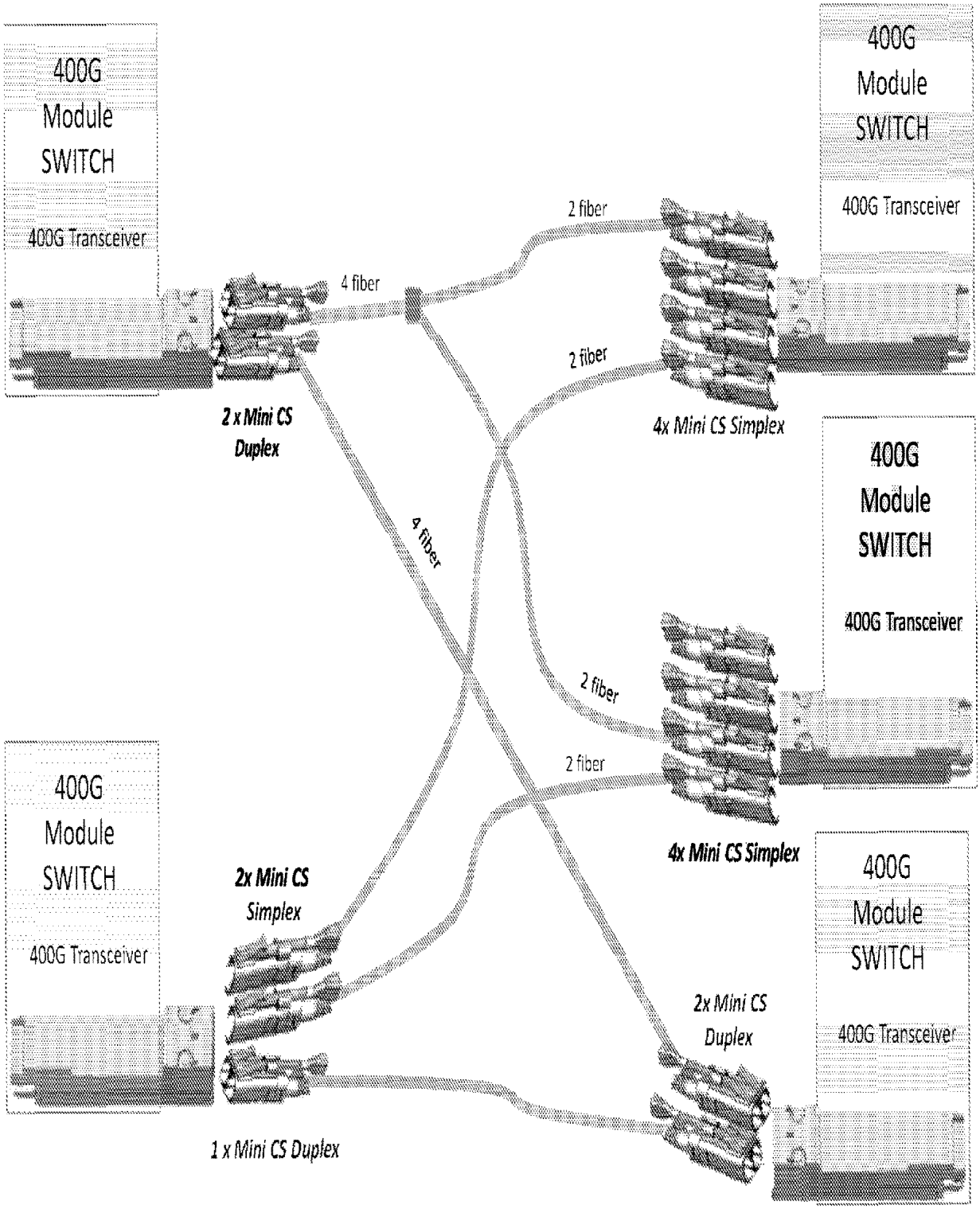


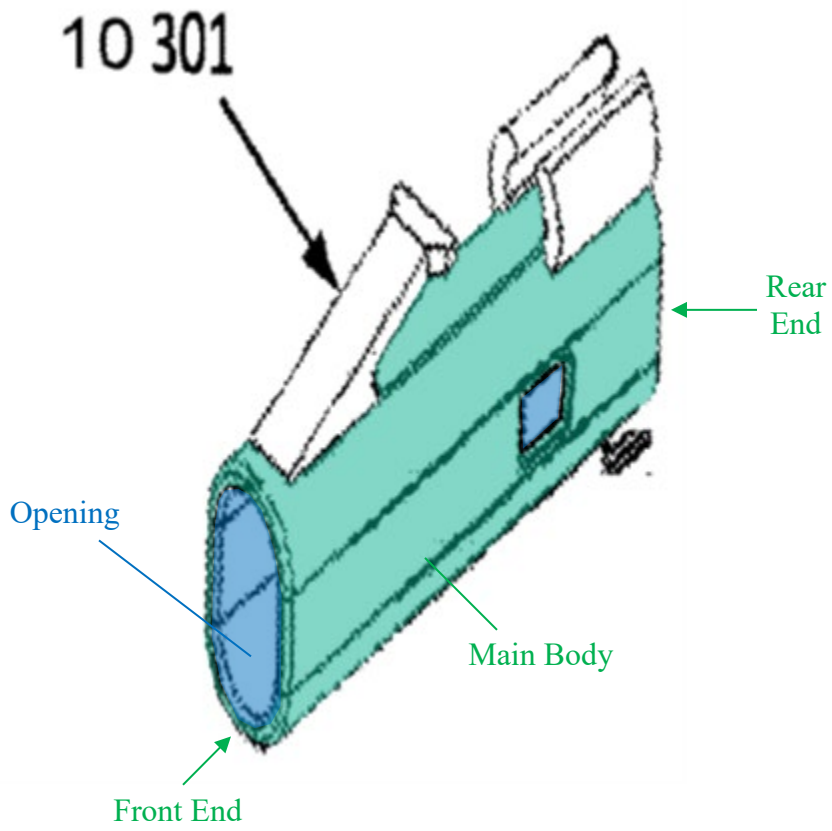
FIG. 65

EX1009: Figs. 64 and 65.

372. Therefore, in my opinion, Takano'369 meets this limitation.

1.a.1 "a housing having a main body extending between a front end and a rear end and having an opening extending therebetween,"

373. Takano'369's connector (10300, 10400, 10500) includes an outer housing (10301, 10401, 10501). EX1009: 19:1, 14-15, 34-41. The outer housing (10301, 10401, 10501) is the main body. As shown below, the main body has a front end and a rear end, and an opening extending between the front end and the rear end. The front portion of the opening is visible below. It is clear that the opening extends through the rear end of the main body based on Takano'369's description of how "the outer housing 10501 can slide on to or be removed from the front body 10502," by insertion/withdrawal of the front body (10502) through the open rear end as depicted in Fig. 55. EX1009: 19:35-36.

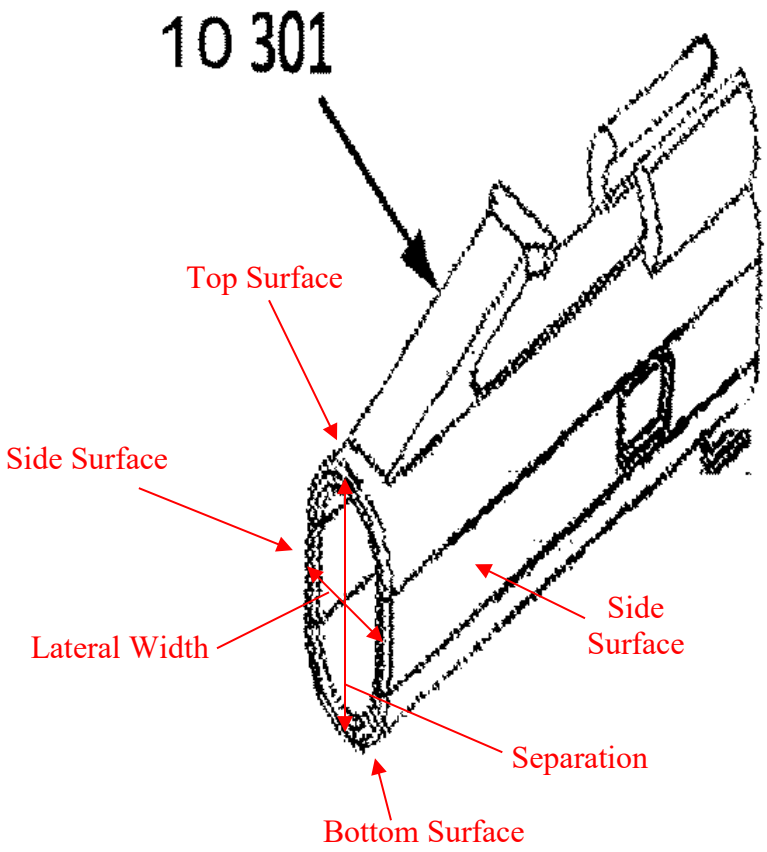


EX1009: Fig. 53 (annotated).

374. Therefore, in my opinion, Takano'369 meets this limitation.

1.a.2 "the housing having a top surface and a bottom surface joined by two opposing side surfaces such that a lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body;"

375. The outer housing (10301, 10401, 10501) has a top surface, a bottom surface, and two opposing side surfaces. EX1009: Fig. 53. The lateral width between the two opposing side surfaces is less than the separation between the top and bottom surfaces along the height of the main body. EX1009: Fig. 53.



EX1009: Fig. 53 (annotated).

376. Therefore, in my opinion, Takano'369 meets this limitation.

1.b.1 "two ferrule assemblies disposed within the opening of the housing, each of the ferrule assemblies comprising a fiber optic ferrule spaced apart from each other along the height and a ferrule holder to hold the fiber optic ferrule,"

377. Takano'369's connector (10300, 10400, 10500) includes two ferrule assemblies disposed within the opening of the outer housing (10301, 10401, 10501). EX1009: 19:14-17.

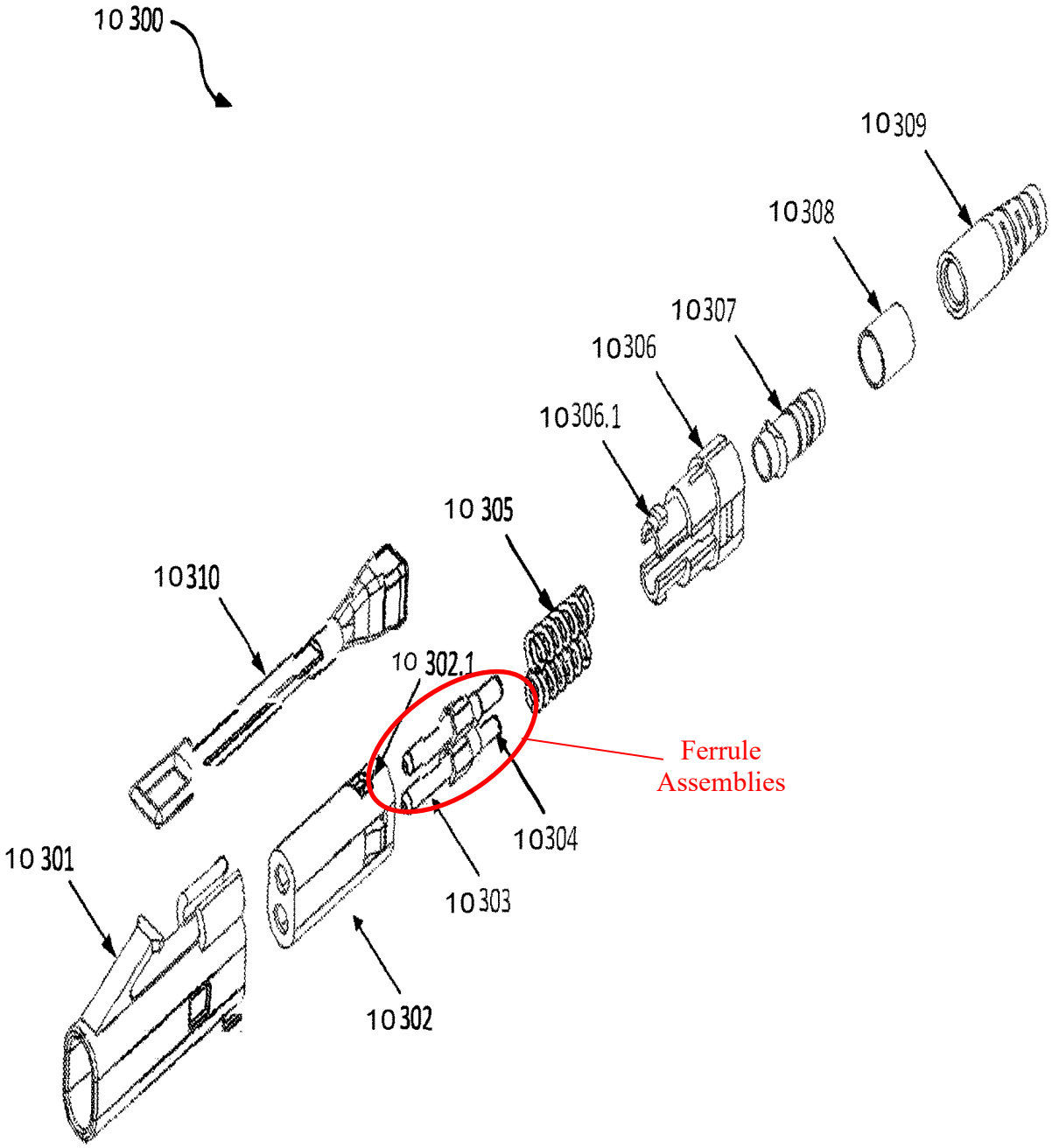
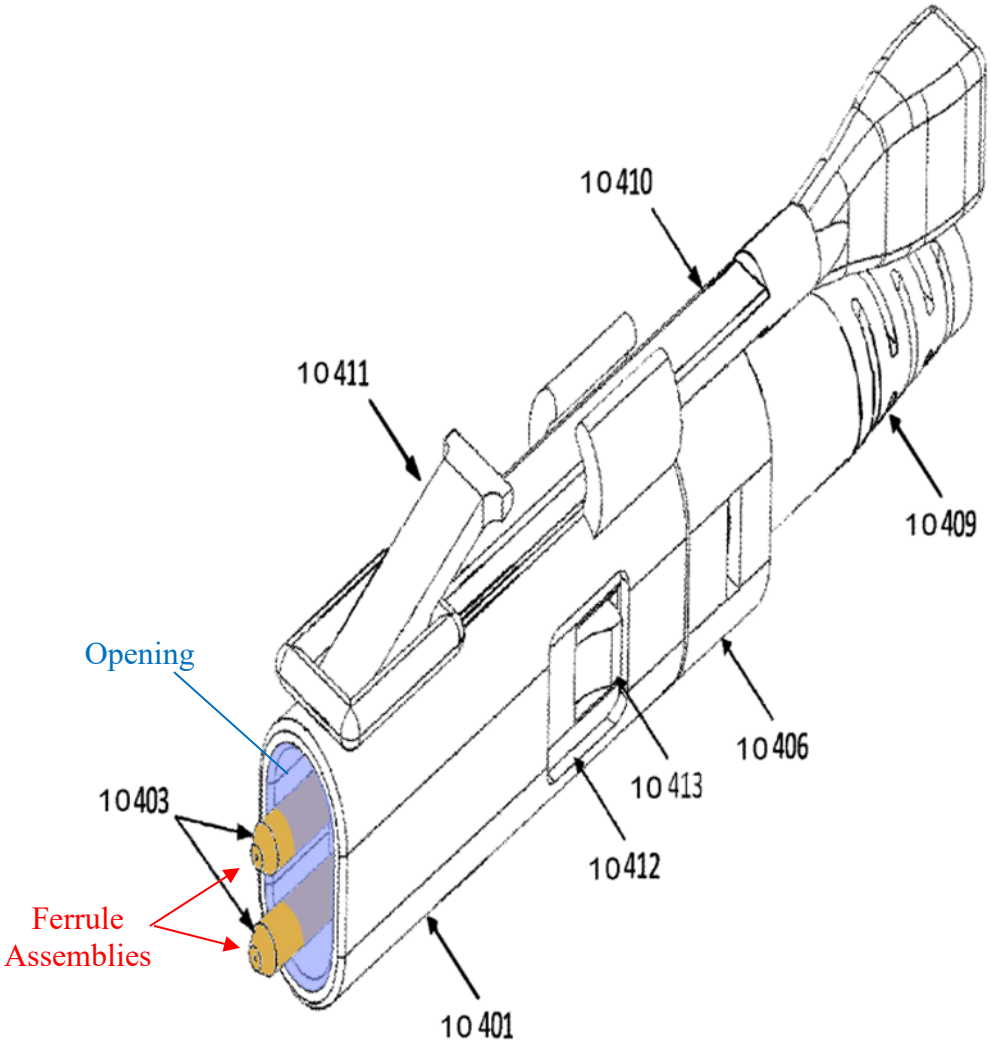
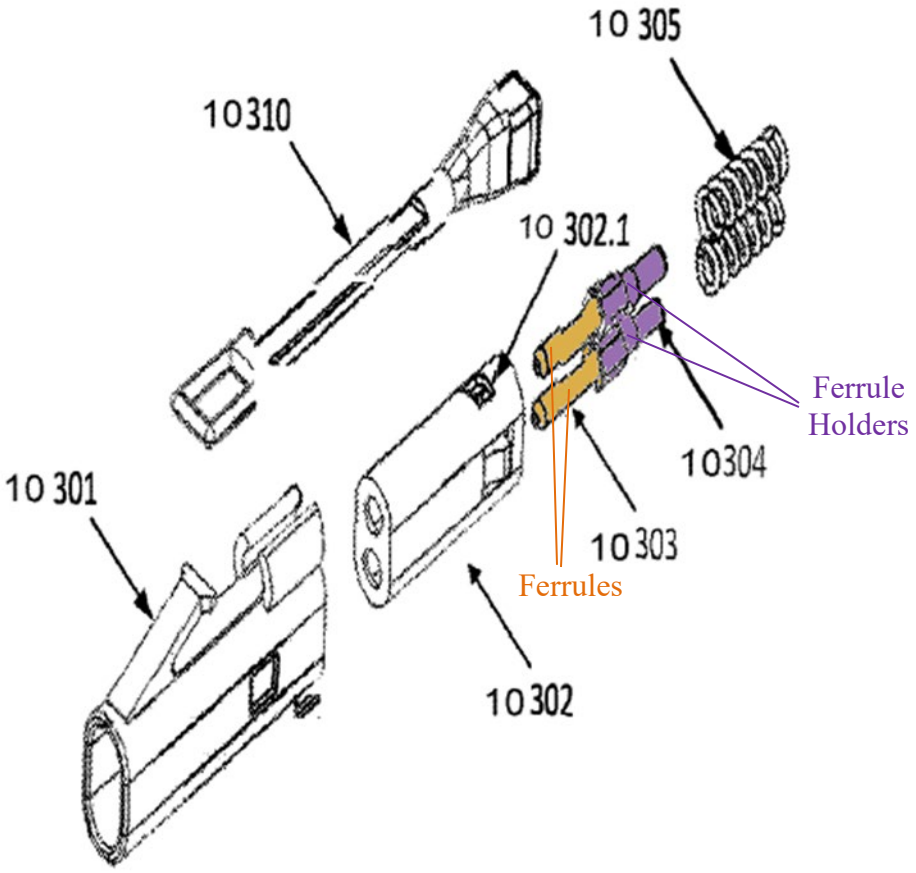

10 300
10309
10308
10307
10306
10306.1
10 305
10310
10 302.1
Ferrule
Assemblies
10304
10 301
10303
10302

FIG. 53



EX1009: Figs. 53 and 54 (annotated).

378. Each ferrule assembly includes a fiber optic ferrule (10303, 10403) and a ferrule holder (10304) (e.g., ferrule flange) to hold the fiber optic ferrule. EX1009: 19:2-3, 19:15-17. As shown in Fig. 54, the ferrules (10303, 10403) are spaced apart along the height of the main body when the connector is assembled. EX1009: Fig. 54.

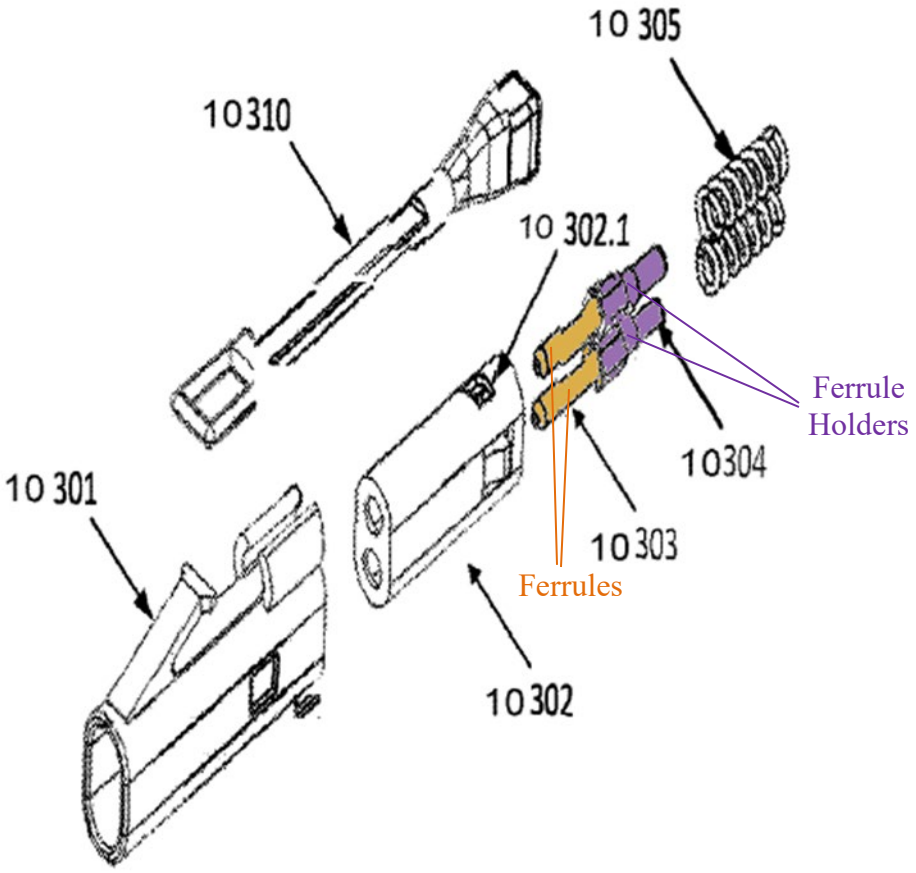


EX1009: Fig. 53 (annotated).

379. Therefore, in my opinion, Takano'369 meets this limitation.

1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;"

380. Each fiber optic ferrule (10303, 10403) extends forward away from the front end of the ferrule holder (10304). EX1009: Fig. 54.



EX1009: Fig. 53 (annotated).

381. Therefore, in my opinion, Takano'369 meets this limitation.

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;"

382. Takano'369's connector (10300, 10400, 10500) includes two ferrule springs (10305). EX1009: 19:3, 19:17. Takano'369 teaches that "the back body 10306 and the front body 10302 [can] be securely fastened together around the ferrule(s) 10303, ferrule flange(s) 10304, and the spring(s) 10305." EX1009: 19:8-

11. Based on this teaching and what is shown in Fig. 53, as indicated below, the POSA would understand that the springs (10305) fit over the rear cylindrical portions of the ferrule flanges (10304) and the front ends of the springs engage the rearward facing surfaces of the larger hexagonal portions of the ferrule flanges. From their front ends, the springs (10305) extend rearward. The POSA would further understand that the springs (10305) are used to bias the ferrule assemblies toward the front end of the housing. EX1009: Abstract ("ferrule springs for urging the optical ferrules towards a mating receptacle"). Last, Takano'369 discloses that the springs (10305) are retained within the connector housing (10301, 10401, 10501). Specifically, the springs are securely fastened between the front body (10302, 10502) and the back body (10306), and in turn, the front body (10302, 10503) is attached to the outer housing (10301, 10401, 10501). EX1009: 19:8-11, 19:34-41.

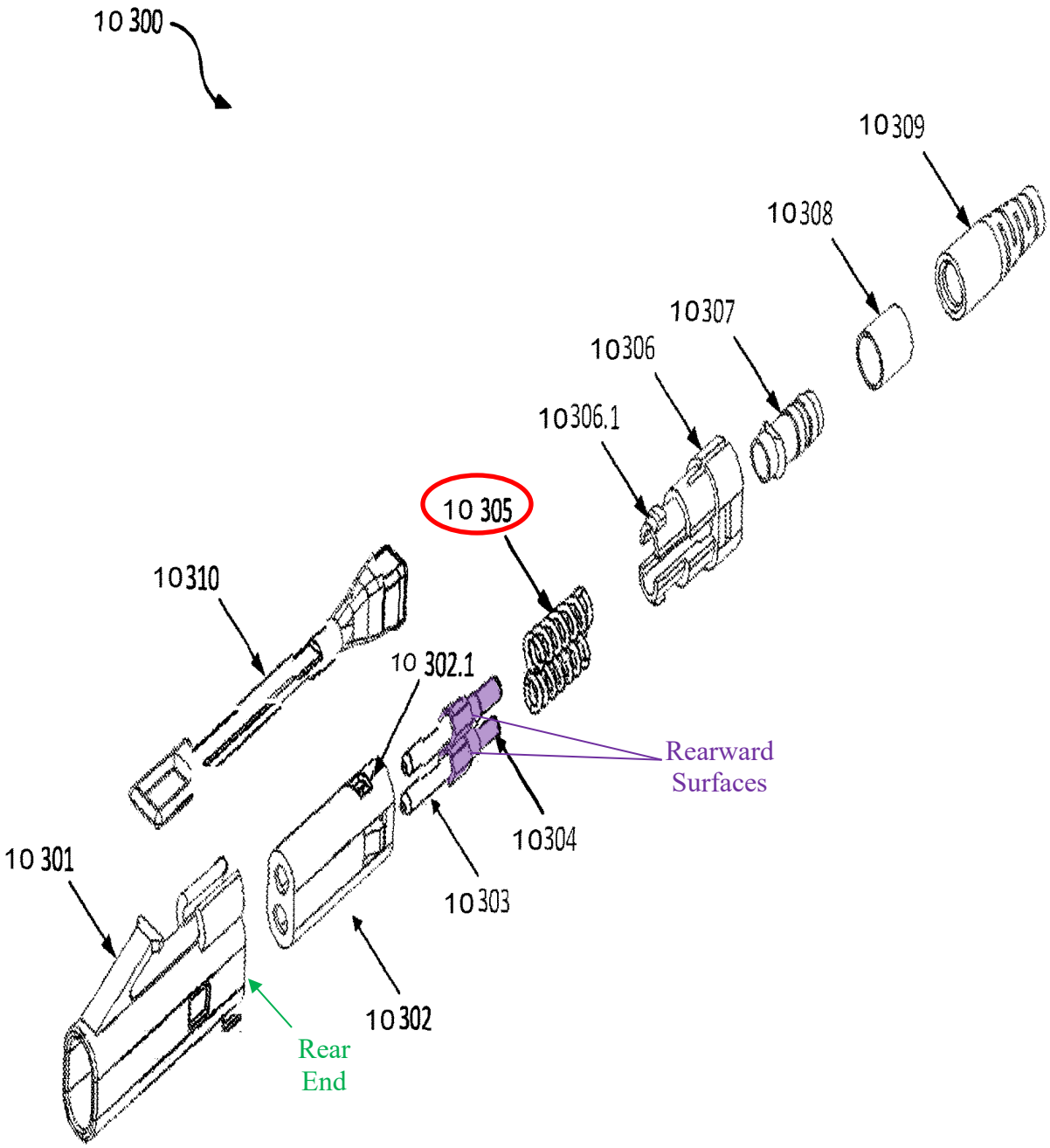


FIG. 53

EX1009: Fig. 53 (annotated).

383. One of ordinary skill in the art understands that the springs (10305) of Takano'369's connector (10300, 10400, 10500) meet this limitation. For example,

Fig. 23A show this limitation is nothing more than the conventional way ferrule springs are arranged in these types of connectors. Fig. 23A provides an internal view of another connector indicating how ferrule springs would likewise be positioned in assembled Takano'369 connector. Fig. 23A of Takano’369 depicts how the ferrule springs (2125) are loaded in a connector (2100) between a front body (2115) and a back body (2130) to contact rearward facing surfaces of ferrule flanges and thereby bias the ferrule assemblies forward in the housing. EX1009: 14:19-29. The ferrule springs (10305) of the Takano’369 connector would be loaded against the ferrule flanges (10304) in the same way to bias the ferrules in the forward direction using the components already part of the Takano’369 connector. This is nothing more than the conventional way of employing such ferrule springs in fiber optic connectors.

384. Therefore, in my opinion, Takano’369 meets this limitation.

1.d “a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;”

385. Takano’369’s connector (10300, 10400, 10500) includes a two-piece crimp body made up of a back body (10306, 10406) and a back post (10307). EX1009: 19:1-4, 19:13-18. As explained above, the front end portion of the back body (10306, 10406) is secured to the front body (10302, 10502), and in turn, the front body (10302, 10502) is secured to the outer housing (10301, 10401, 10501).

EX1009: 19:8-11, 19:34-41. As indicated in the annotated version of Fig. 53 below, the POSA would recognize that the back post (10307) defines a singular opening for optical fibers at the rear end of the crimp body. This is apparent because Figs. 64 and 65 depict singular jacketed cables entering each simplex Takano'369's connector (10300, 10400, 10500) through the boot. EX1009: 21:50-54, 22:3-6.

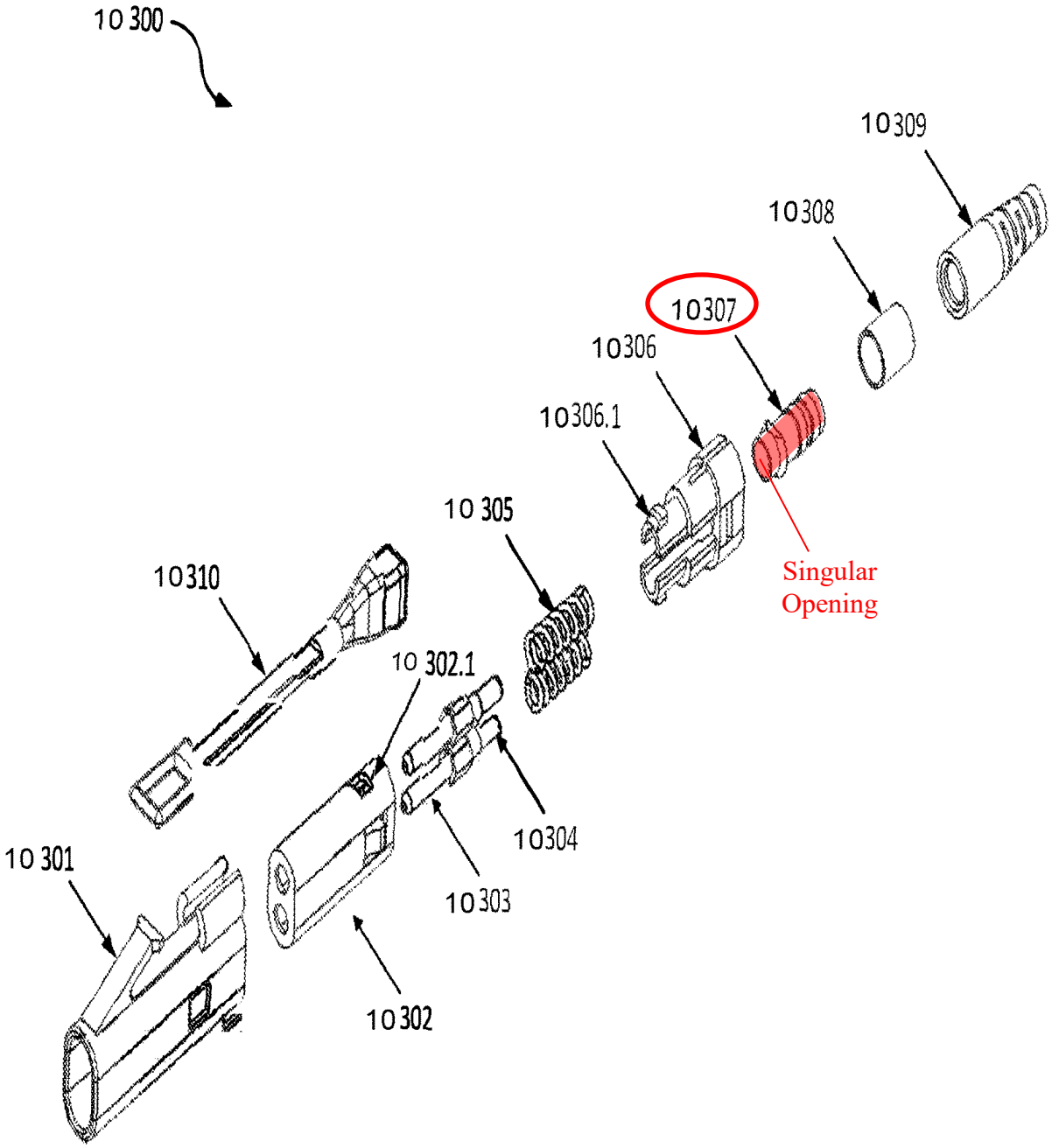

10 300
10309
10308
10307
10306
10306.1
10 305
Singular
Opening
10310
10 302.1
10304
10 301
10303
10302

FIG. 53

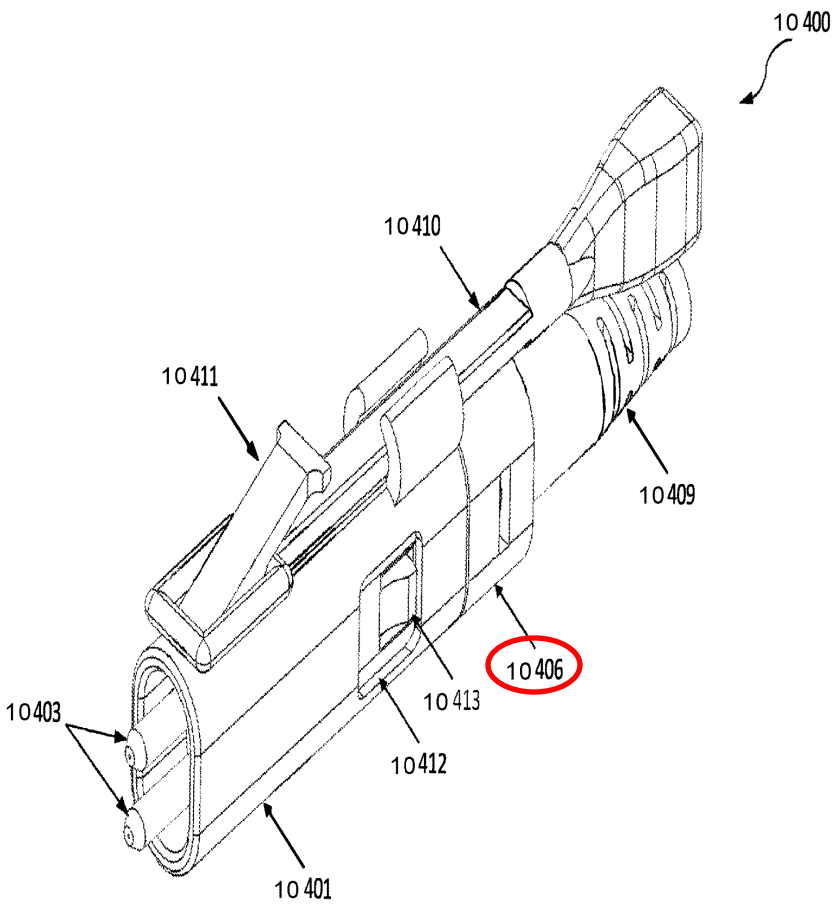


FIG. 54

EX1009: Figs. 53 and 54 (annotated).

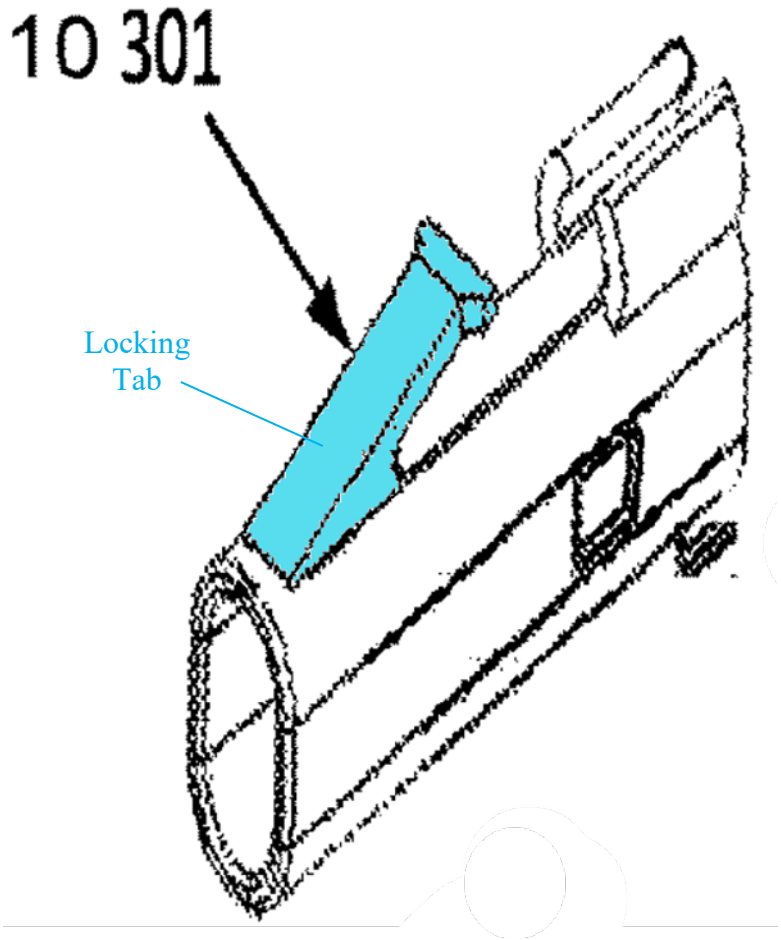
386. One of ordinary skill in the art understands that the crimp body (10306, 10406, 10307) of Takano'369's connector (10300, 10400, 10500) meet this limitation. For example, Fig. 23A show this limitation is nothing more than a conventional feature crimp bodies have in these types of connectors. Fig. 23A provides an internal view of another connector indicating how a similar crimp

body has a single opening. Fig. 23A shows this limitation (e.g., a singular opening) is nothing more than the conventional configuration of crimp bodies in these types of connectors. Fig. 23A of Takano'369 depicts how a similar two-piece crimp body made up of a back body (2130) and a cylindrical back post defines a singular opening for passing two fibers to the ferrules (2122). EX1009: 13:22-25; Fig. 48; 18:33-39. In the same way, the rear end of the back post (10307) would have a singular opening to receive multiple optical fibers from a single cable jacket. This is nothing more than the conventional configuration for a cylindrical back post that receives a two-fiber, single-jacket cable like the two fiber cable used with the Takano'369 connector. EX1009: 21:50-54.

387. Therefore, in my opinion, Takano'369 meets this limitation.

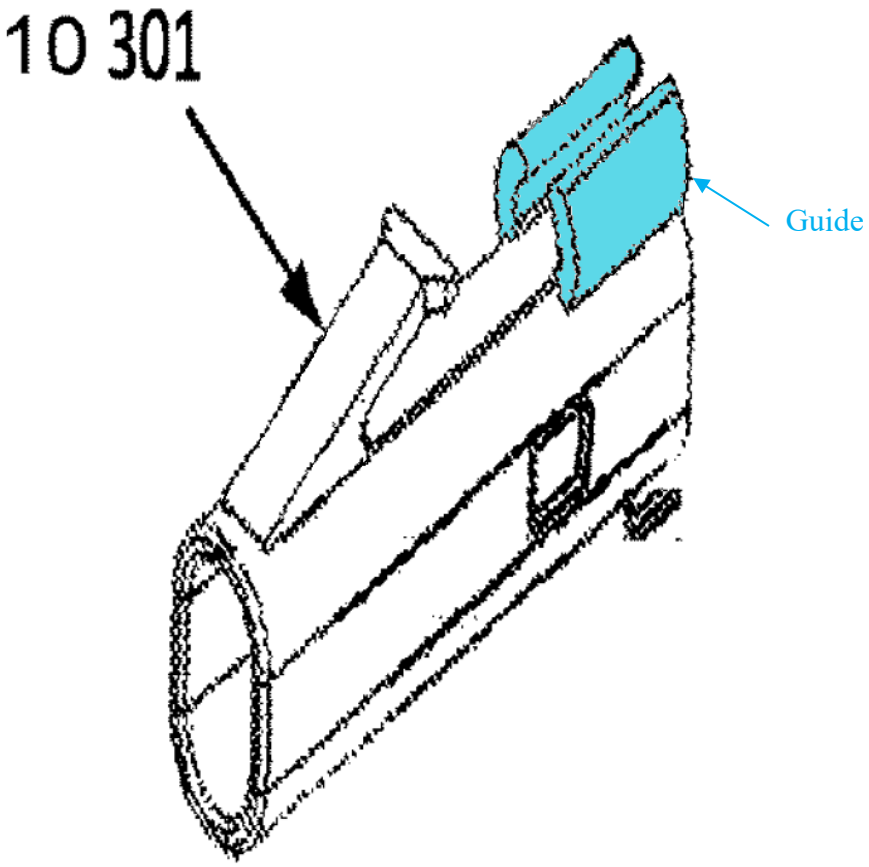
1.e "a first projection on the top surface and a second projection on the bottom surface of the housing,"

388. Takano'369's connector (10300, 10400, 10500) has a locking tab (10411) "used to interlock with an adapter (not shown) to secure the connector in to the adapter." EX1009: 19:25-27. The locking tab (10411) is on the top surface of the outer housing (10411), and is used to both (i) "interlock with an adapter" and (ii) "secure the connector in to the adapter." EX1009: 19:25-27.



EX1009: Fig. 53 (annotated).

389. In addition, Takano'369's connector (10300, 10400, 10500) includes a guide on the top surface of the outer housing (10301). EX1009: Fig. 54.



EX1009: Fig. 53 (annotated).

390. As shown below, in Takano'369's modified connector, the locking tab (10411) (cyan) and guide (annotated dark purple below) each form a "first projection on the top surface" that projects upward from the top surface of the modified outer housing (10301, 10401, 10501). Alternatively, the "first projection on the top surface" is the entire push/pull latch mechanism above the top wall of the main body (green), i.e., the combination of the locking tab (10411), guide (dark purple), and front portion of the push-pull tab (10310, 10410, 10510). Further, to the extent the push-pull latch mechanism of the '994 patent may be considered any

part of a projection on the top surface of a main body, the push-pull latch mechanism of the Takano'369/Watanabe connector is likewise a "first projection on the top surface."

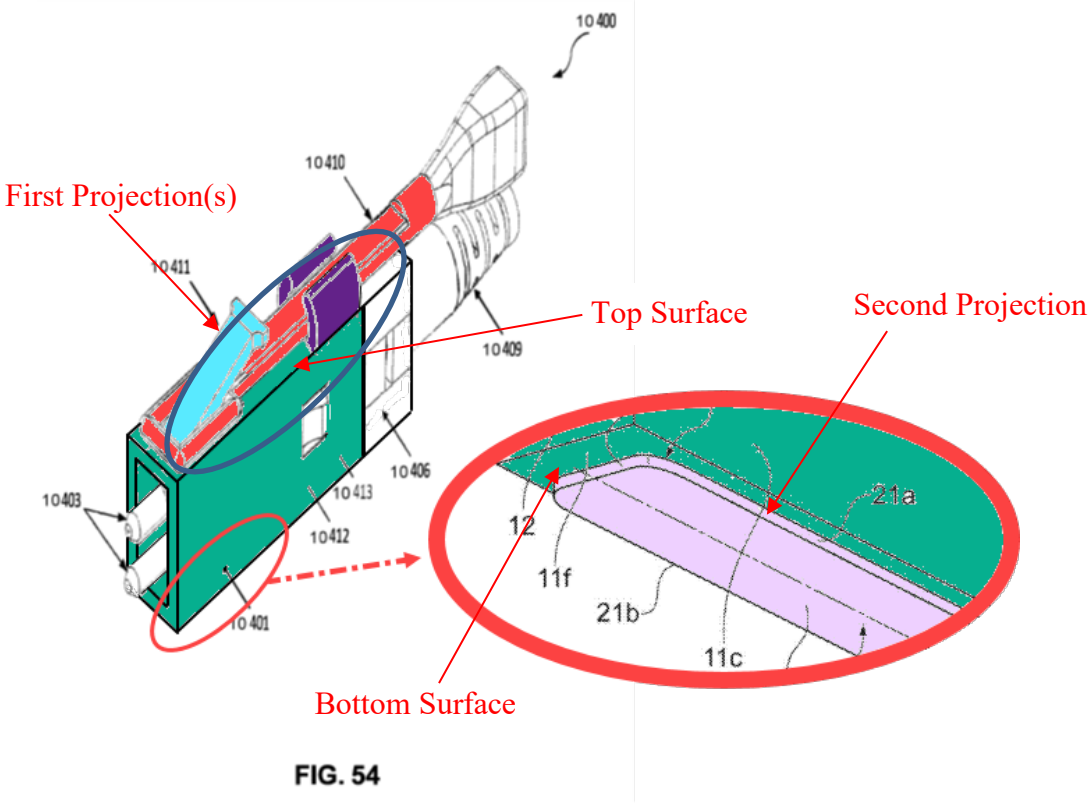


FIG. 54

EX1009: Fig. 54 (annotated, modified).

391. As shown above, the added guide rail to the bottom wall of the modified outer housing (10301, 10401, 10501) of Takano'369 is a second projection on the bottom surface of the outer housing.

392. Therefore, in my opinion, the Takano'369/Watanabe combination renders this limitation obvious.

1.f "wherein the first projection is of a different size than the second projection; and"

393. As shown below, the first projection (i.e., the locking tab (10411), guide (dark purple), the front portion of the push-pull tab (10310, 10410, 10510), and/or a combination thereof) of Takano'369's modified connector is a different size than the second projection (i.e., added guide rail).

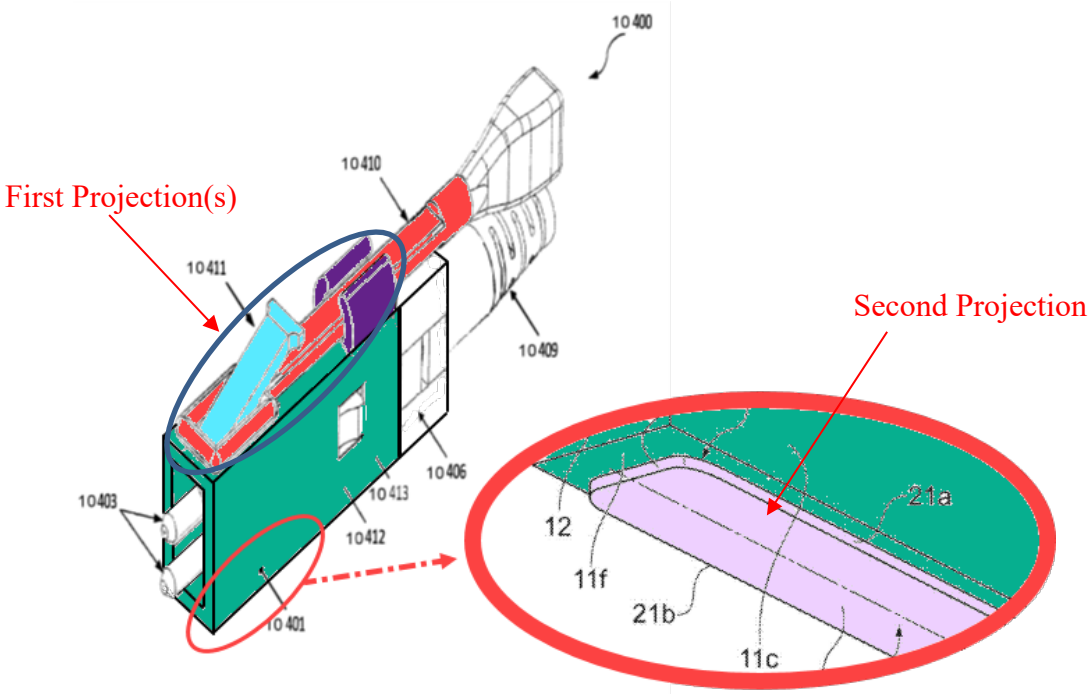


FIG. 54

EX1009: Fig. 54 (annotated, modified).

394. Therefore, in my opinion, the Takano'369/Watanabe combination renders this limitation obvious.

1.g "a strain relief boot having a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass."

395. Takano'369's connector (10300, 10400, 10500) includes a strain relief boot (10309, 10409, 10509) coupled to the rear end of the two-piece crimp body (10306, 10306). EX1009: 19:4, 19:13-19, Fig. 55. The front end of a longitudinal opening through the boot (10309, 10409, 10509) is visible in Fig. 53. By comparing Figs. 53 and 54, it can be seen that in the assembled connector, the boot (10309, 10409, 10509) is fitted over the back post (10307) such that the longitudinal opening is in continuum with the singular opening of the crimp body. The simplex Takano'369 connectors in Figs. 64 and 65 are shown terminating two-fiber cables, indicating that two fibers pass from the cables through the longitudinal opening in the boot and the singular opening of the crimp body to the ferrules. EX1009: 21:50-54, 22:3-6.

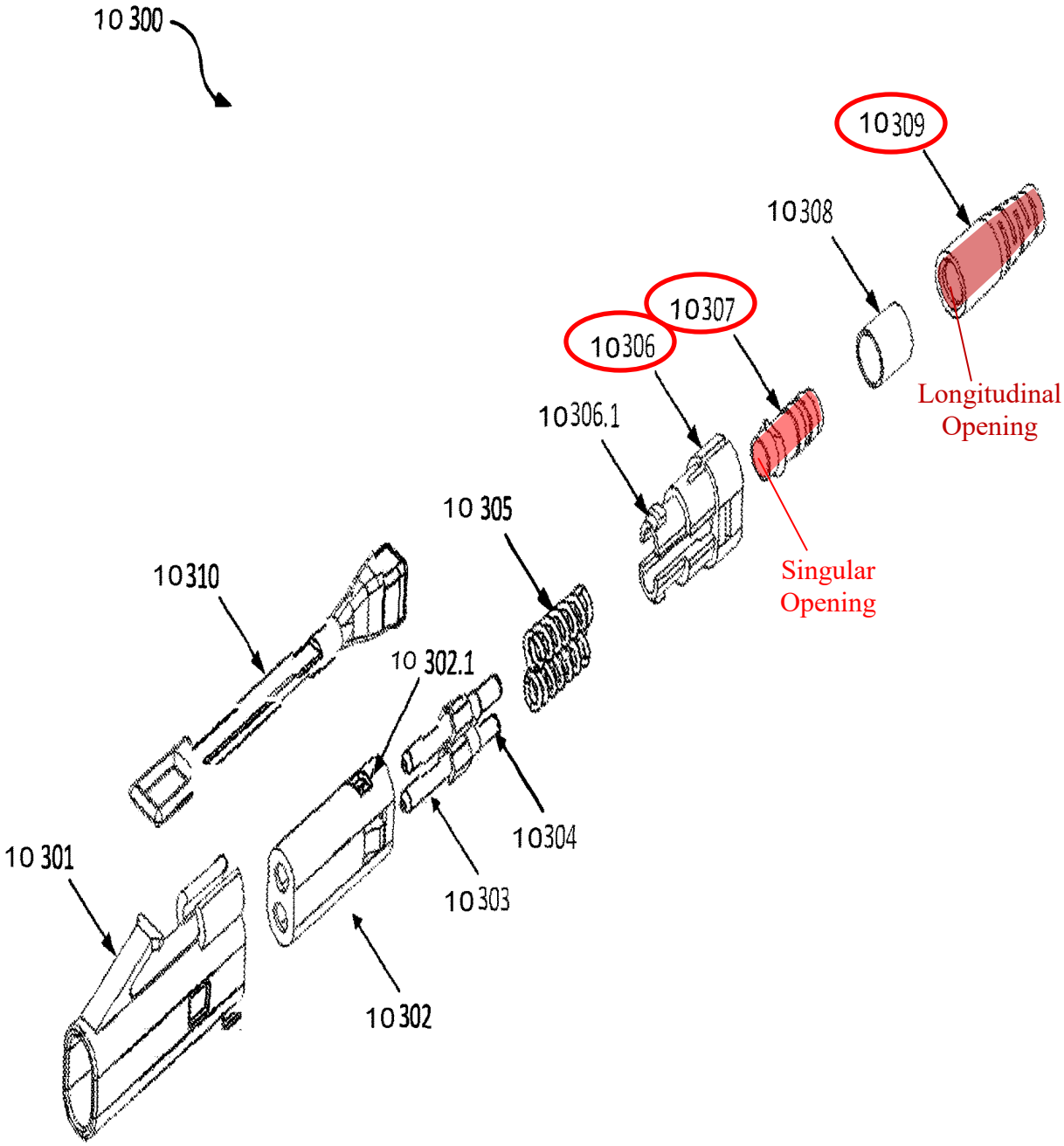


FIG. 53

EX1009: Fig. 53 (annotated).

396. One of ordinary skill in the art understands that the strain relief boot (10309, 10409, 10509) and the two-piece crimp body (10306, 10306) meet this

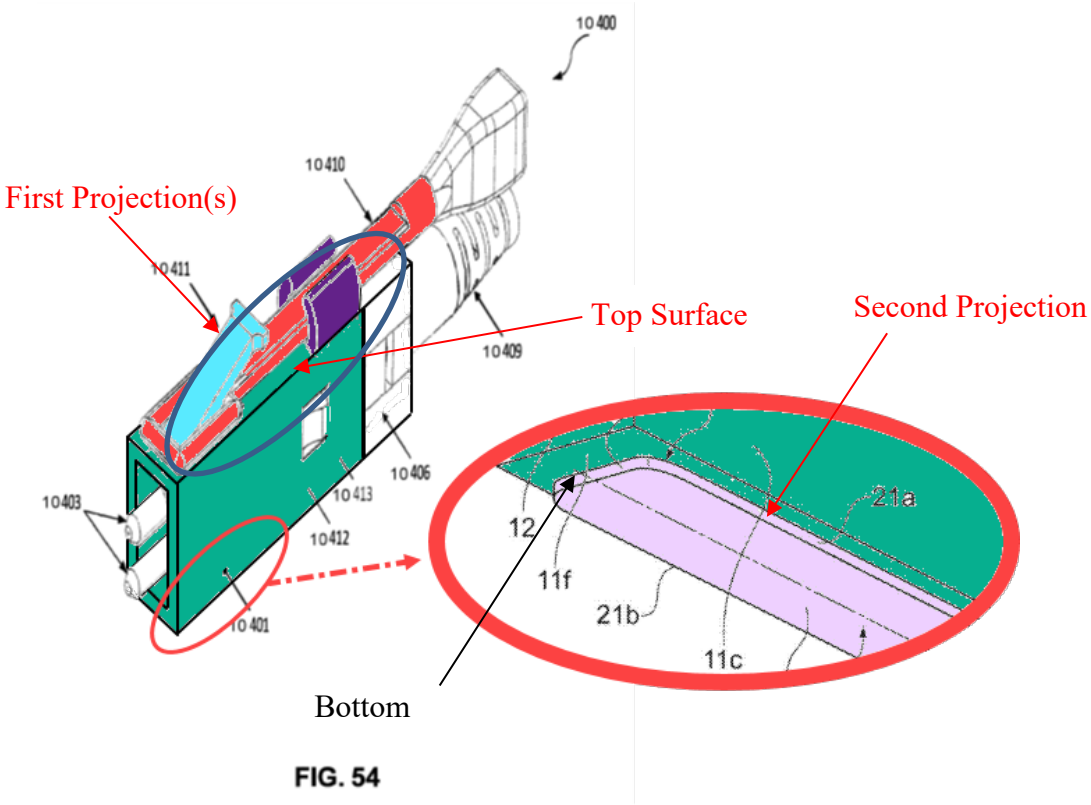
limitation. For example, Fig. 23A shows this limitation (e.g., aligned openings) is nothing more than the conventional configuration of boots and crimp bodies in these types of connectors. Fig. 23A of Takano'369 depicts how the longitudinal opening of a similar boot (2145) aligns with the singular opening in a similar cylindrical back post (2135) for passing two fibers to the ferrules (2122). In the same way, the longitudinal opening in the boot (10309) would be aligned with the singular opening at the rear end of back post (10307) for the passage of fibers to the ferrules from the fiber optic cable to the ferrules using the components already part of the Takano'369 connector. This is nothing more than the conventional configuration for a boot mounted over a cylindrical back post in a duplex connector that terminates a two-fiber, single-jacket cable like the Takano'369 connector. EX1009: 21:50-54.

397. Therefore, in my opinion, Takano'369 meets this limitation.

C. Claim 2 "The fiber optic connector according to claim 1, wherein the first projection extends longitudinally along the top surface of the housing."

398. The first projection extends longitudinally along the top surface of the outer housing (10301, 10401, 10501). For example, the locking tab (10411) extends longitudinally as an individual projection; the guide (dark purple) extends longitudinally as an individual projection; and/or the three-part push-pull latch

mechanism extends longitudinally as a collective projection in vein of the push-pull latch mechanism in the '994 patent. EX1009: Fig. 54; EX1001: Fig. 1.



EX1009: Fig. 54 (annotated, modified).

399. Therefore, in my opinion, Takano'369 meets this claim.

D. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs."

400. As I explained above in Section VII(C), the claimed "spring push" recited in claim 3 may be part of the crimp body.

401. The POSA would recognize that the front portion of the back body (10306, 10406) is a spring push for engaging a rear portion of each of the two springs (10305). Section XIV(B)(1.c).

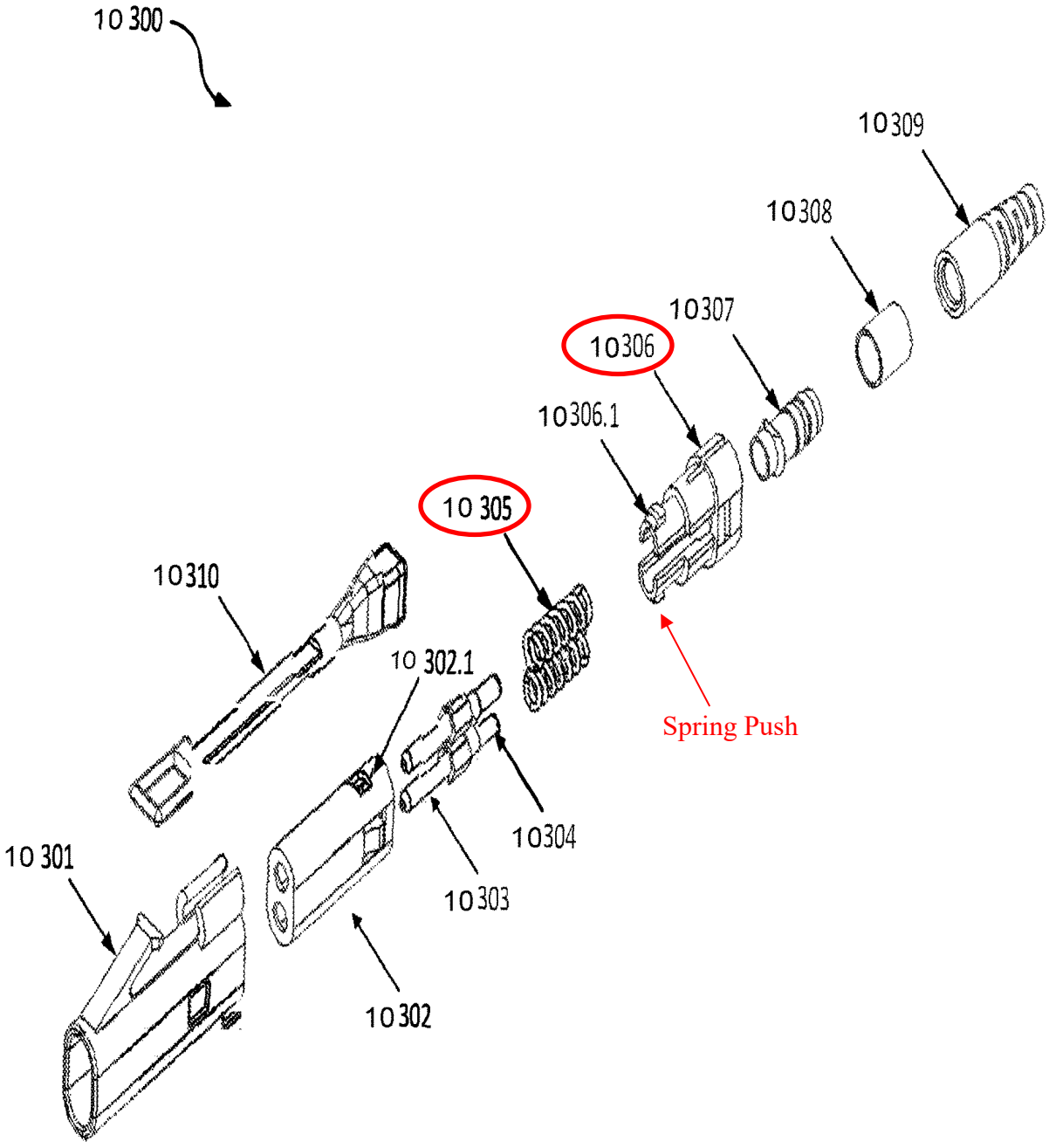


FIG. 53

EX1009: Fig. 53 (annotated).

402. One or ordinary skill in the art understands the front portion of the back body (10306, 10406) of Takano'369's connector (10300, 10400, 10500) meets this limitation. For example, Fig. 23A shows this limitation is nothing more than the conventional way ferrule springs are engaged by a spring push in these types of connectors. Fig. 23A of Takano'369 depicts how the back body (2130) engages the rear portion of each of the two ferrule springs (2125) in the connector (2100). EX1009: 14:19-29. The back body (10306) of Takano'369's connector (10300, 10400, 10500) would likewise engage the springs in the same way as the back body (2130) in order to preload the ferrule springs (10305) against the ferrule flanges using the components already part of the Takano'369 connector. This is nothing more than the conventional way of employing such ferrule springs in fiber optic connectors.

403. Therefore, in my opinion, Takano'369 meets this claim.

E. Claim 4 "The fiber optic connector according to claim 1, wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter."

404. In Takano'369's modified connector, the first projection (i.e., the locking tab (10411), guide (dark purple), the front portion of the push-pull tab (10310, 10410, 10510), and/or a combination thereof) and the second projection (i.e., added guide rail) determine a correct orientation and/or polarity of the outer

housing (10301, 10401, 10501) during an insertion into Takano'369's modified adapter (101114). The push-pull latch mechanism (and components thereof) must align with the top wall of Takano'369's modified adapter (101114) that has latch receiving structure (e.g., the latch engagement sections (31) from Watanabe), and the added bottom guide rail must align with the added rail fitting section (22) from Watanabe on the bottom wall of Takano'369's modified adapter.

405. Takano'369's modified connector will not mate with Takano'369's modified adapter if inserted upside down. When inserted upside down, Takano'369's first projection (i.e., the locking tab (10411), guide (dark purple), the front portion of the push-pull tab (10310, 10410, 10510), and/or a combination thereof) would be aligned with the added rail fitting section (22) from Watanabe on the bottom wall of Takano'369's modified adapter (101114). Similarly, when inserted upside down, Takano'369's second projection (i.e., added guide rail) would be aligned with the top wall of Takano'369's modified adapter (101114) that has latch receiving structure (e.g., the latch engagement sections (31) from Watanabe). Takano'369's first projection cannot fit in the added rail fitting section (22) from Watanabe on the bottom wall of Takano'369's modified adapter (101114). Likewise, Takano'369's second projection cannot fit in the latch receiving structure in the top wall of Takano'369's modified adapter (101114).

These resulting interferences prevent Takano'369's modified connector from mating with Takano'369's modified adapter when inserted upside down.

406. Therefore, in my opinion, the Takano'369/Watanabe combination renders this claim obvious.

F. Claim 5

5.a "The fiber optic connector according to claim 1, further comprising: a crimp band secured around an outer surface of the rear end of the crimp body, and"

407. Takano'369's connector (10300, 10400, 10500) includes a crimp ring (10308). EX1009: 19:4. By its name and by what is shown in Figs. 53 and 54, the POSA would understand that the crimp ring (10307) is "a crimp band secured around an outer surface of the rear end of the crimp body," namely, the outer surface of the back post (10307).

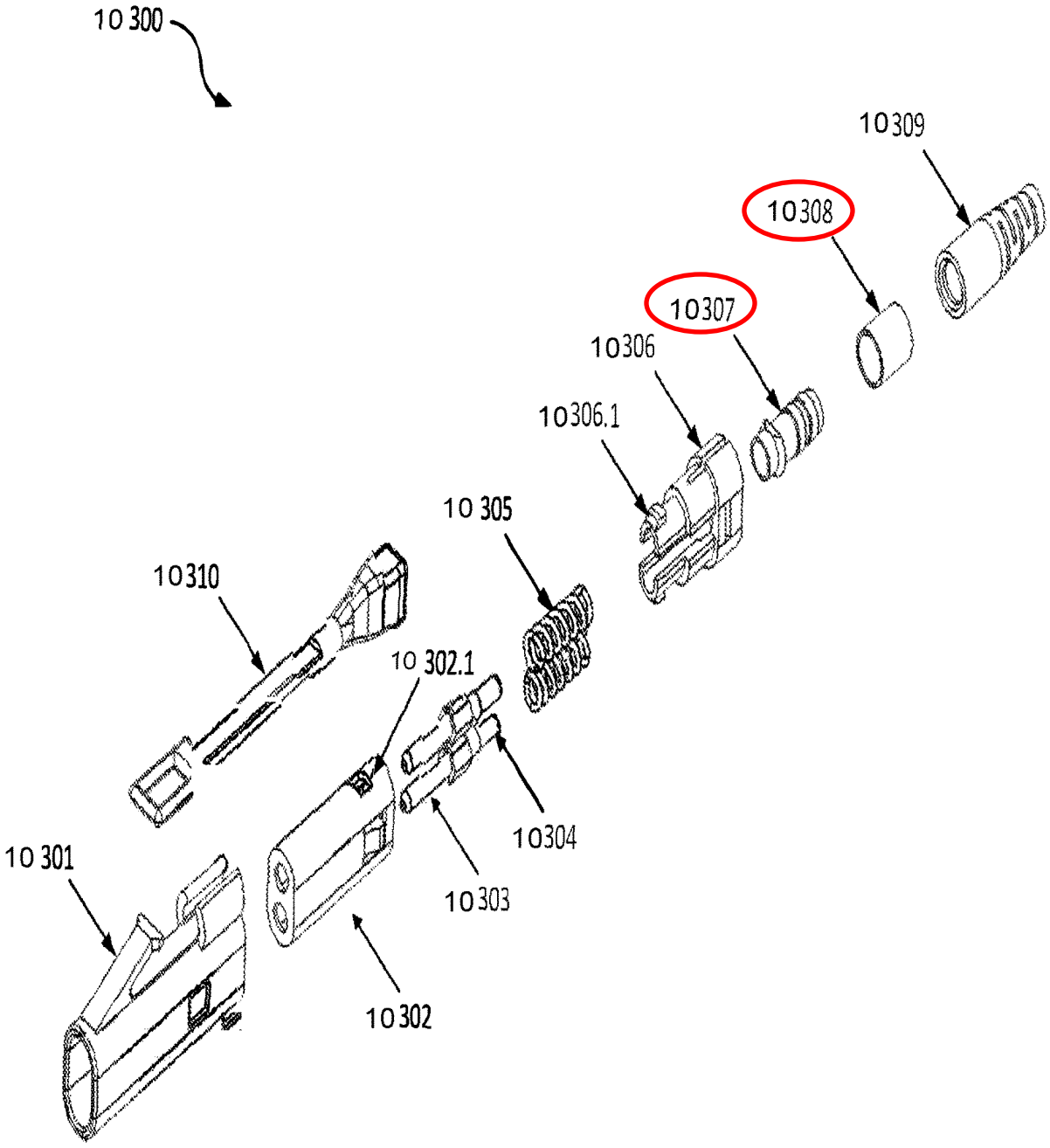


FIG. 53

EX1009: Fig. 53 (annotated).

408. Therefore, in my opinion, Takano'369 meets this limitation.

5.b "wherein the strain relief boot extends rearwardly away from the housing."

409. The boot (10309, 10409) is a strain relief boot that "extends rearwardly away from the housing" (10301, 10401, 10501). EX1009: Figs. 53 and 54.

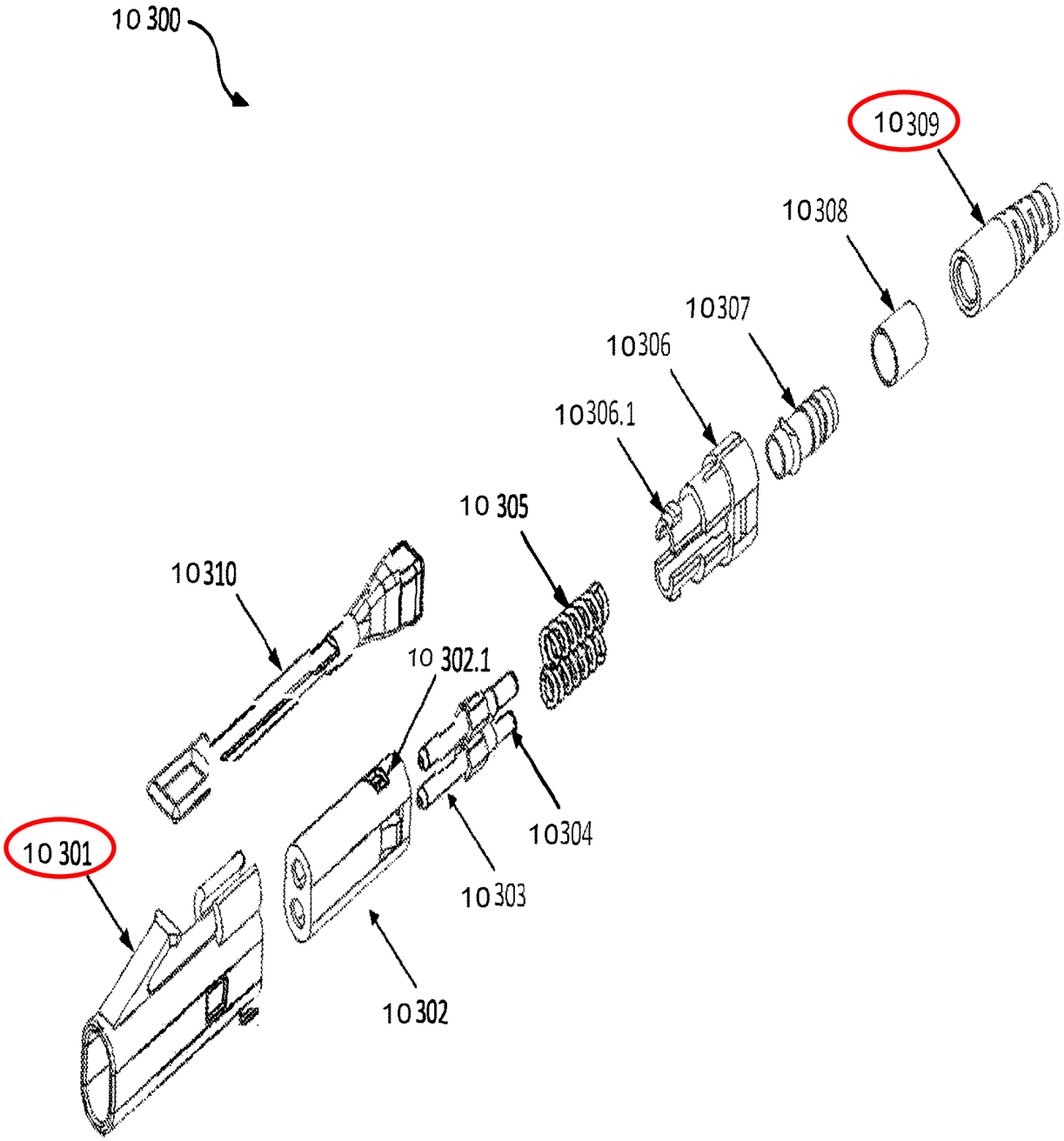

10 300
10309
10308
10307
10306
10306.1
10 305
10310
10 302.1
10304
10 301
10303
10302

FIG. 53

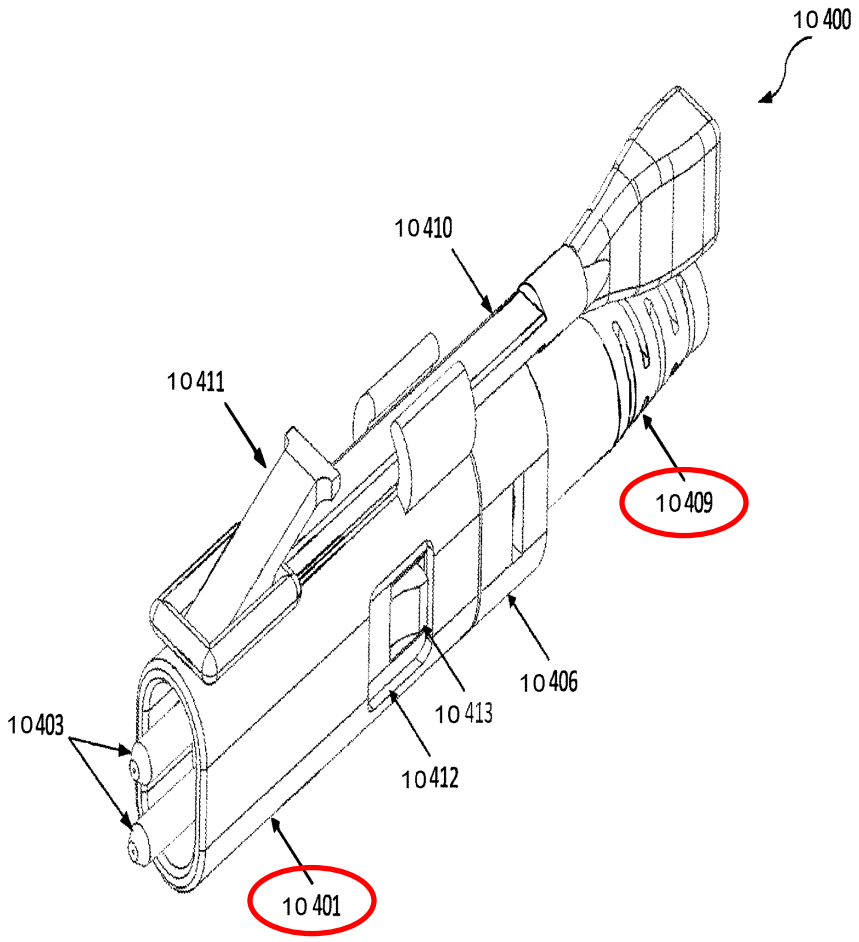


FIG. 54

EX1009: Figs. 53 and 54 (annotated).

410. Therefore, in my opinion, Takano'369 meets this limitation.

G. Claim 8 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a QSFP footprint."

411. Takano'369 explains its connectors are "narrow-pitch LC duplex connectors ... for use, for example, with future narrow pitch LC SFPs." EX1009: 6:22-25; EX1010: ¶[0037]. As a result, Takano'369's connector (10300, 10400,

10500) fits in an SFP footprint, which is 14x12.25 mm. EX1009: 16:44-45. Hence, the same connector also would fit in the larger QSFP footprint, which is 13.5x19 mm, such as if oriented so that the long sides of Takano'369's connector are parallel to the long sides (19mm) of the QSFP footprint. EX1009: 16:47-49. Therefore, the front end of the outer housing (10301, 10401, 10501) of the connector (10300, 10400, 10500) fits in a QSFP footprint.

412. Further, the modifications to Takano'369 in view of Watanabe do not require increasing the footprint of the connector. For example, the flat bottom wall and guide rail could be designed to fit within the same footprint as the arcuate bottom wall in the unmodified Takano'369 connector.

413. Therefore, in my opinion, Takano'369 meets this claim.

H. Claim 9 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a SFP footprint."

414. Takano'369's connectors are "narrow-pitch LC duplex connectors ... for use, for example, with future narrow pitch LC SFPs." EX1009: 6:22-25; *see also* EX1010: ¶[0037]. Thus, Takano'369's discloses a connector that fits in an SFP footprint, which is 14x12.25 mm. EX1009: 16:44-45. Therefore, the front end of the outer housing (10301, 10401, 10501) of Takano'369's connector fits in a SFP footprint.

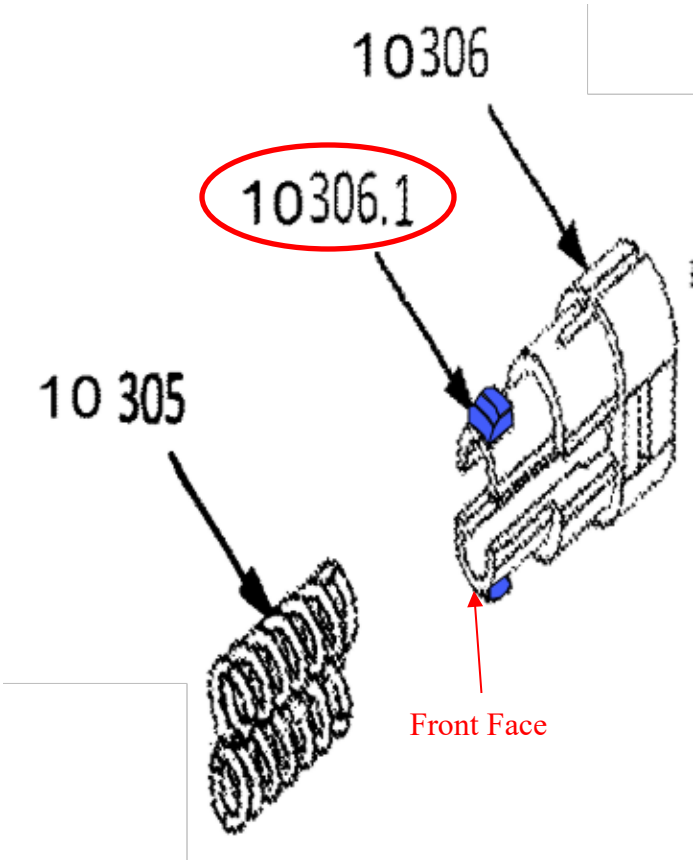
415. Further, the modifications to Takano'369 in view of Watanabe do not require increasing the footprint of the connector. For example, the flat bottom wall

and guide rail could be designed to fit within the same footprint as the arcuate bottom wall in the unmodified Takano'369 connector.

416. Therefore, in my opinion, Takano'369 meets this claim.

I. Claim 10 "The fiber optic connector according to claim 1, wherein the crimp body is located such that the two springs are positioned between a top portion and a bottom portion thereof."

417. The back body (10306, 10406) of the crimp body comprises upper and lower protrusions (10306.1). EX1009: 19:5-8. The upper protrusion (10306.1) is a top portion of the crimp body and the lower protrusion (10306.1) is a bottom portion. In the assembled connector, the rear ends of the springs (10305) engage a front face the back body (10306, 10406) at locations that are spaced apart heightwise between the upper and lower protrusions (10306.1). Hence, the crimp body is located such that the two springs (10305) are positioned between top and bottom portions (10306.1) thereof.



EX1009: Fig. 53 (annotated).

418. I note that this is no different than how the springs (122, 1122) are shown in the '994 patent as being between top and bottom portions of the crimp body (106, 1106).

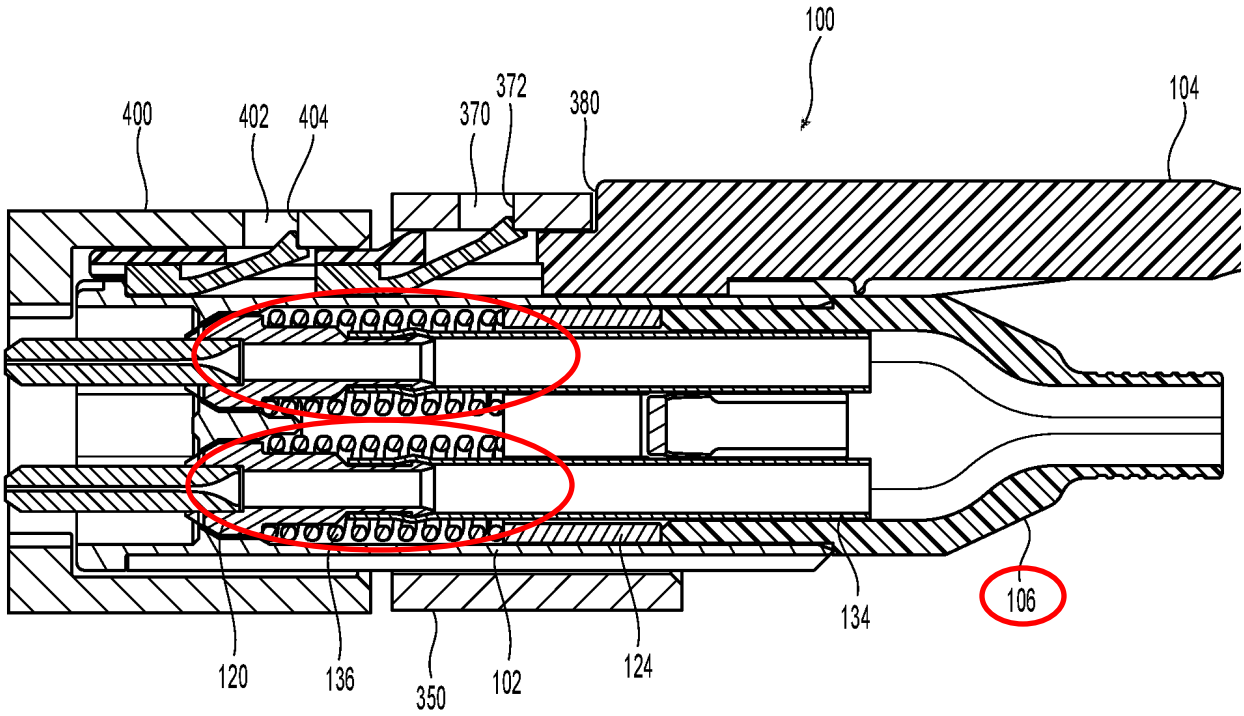


Fig. 21

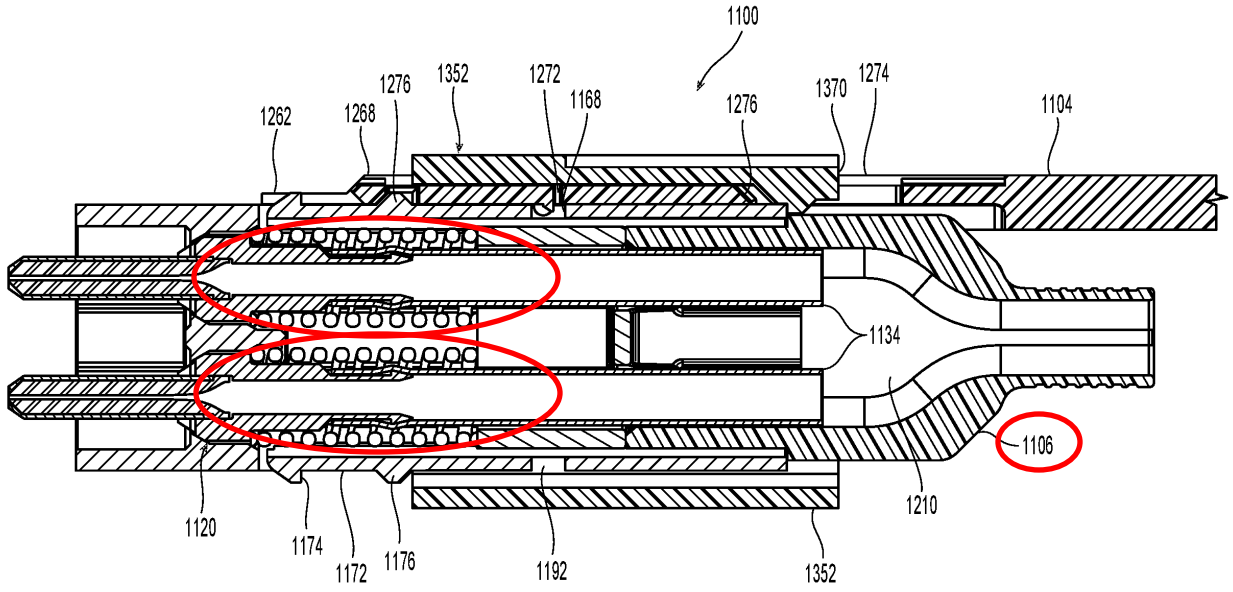


Fig. 33

EX1001: Figs. 21 and 33 (annotated).

419. Therefore, in my opinion, Takano'369 meets this claim.

J. Claim 11 "The fiber optic connector according to claim 1, wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter."

420. I have been informed that there are two types of claims: apparatus claims and method claims. I have also been informed that apparatus claims cover what a device is. I have been informed that when an apparatus claim recites an intended use of the device, a prior art reference meets the intended use if it is capable of performing the intended use.

421. All of the claims of the '994 Patent are apparatus claims. In addition, claim 11's recitation of "wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter," recites an intended use of the claimed invention. The adapter recited in claim 11 is not being positively claimed but being used in reference to the first and second projections. Therefore, based on the legal concepts as explained to me by Petitioner's counsel, claim 11 is met by any prior art reference that is capable of meeting the intended use.

422. In my opinion, Takano'369's connector modified in view of Watanabe is capable of meeting the intended use recited by claim 11.

423. As I explained above in Section XIV(A), the result of the modified Takano'369 connector (10300, 10400, 10500) and modified adapter (101114) is that the bottom wall of Takano'369's modified adapter includes recessed guide rail

fitting sections (22) (i.e., grooves) for receiving the bottom guide rails (21) (i.e., second projection) of the modified Takano'369 connector.

424. In addition, the latch mechanism (specifically, the locking tab (10411)) (i.e., first projection) of Takano'369's modified connector is capable of fitting in grooves of an adapter. Again, this limitation is entirely dependent on the construction of the adapter. As shown in Fig. 61 of Takano'369, the latch mechanism of Takano'369's connector is already insertable into an adapter. EX1009: Fig. 61. And Takano'369 does not show or describe what kind of latch receiving structure the adapter has. EX1009: Fig. 61. Accordingly, it would have been obvious to modify the top wall of Takano'369's adapter (101114) to have latch engagement sections (31) as taught by Watanabe for push-pull latch mechanism (e.g., latch (10411)) of Takano'369's modified connector. As in Watanabe, the latch engagement sections (31) would be defined by inverted T-shaped beams that define grooves comprising a wide upper portion (for the wide tip of the Takano'369 locking tab (10411)) and a narrow lower portion (for the narrower arm of the Takano'369 locking tab). EX1011: Fig. 1.

425. Therefore, in my opinion, the Takano'369/Watanabe combination renders this claim obvious.

K. Claim 12 "The fiber optic connector according to claim 1, wherein each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ferrule seats of the fiber optic ferrules of each of the ferrule assemblies, the wall

located between the top surface and the bottom surface of the main body of the housing."

426. Takano'369 discloses another embodiment of an optical connector (4100) in Fig. 41 which includes a front body (4015) with an elongated middle wall (4260). EX1009: 17:44-49.

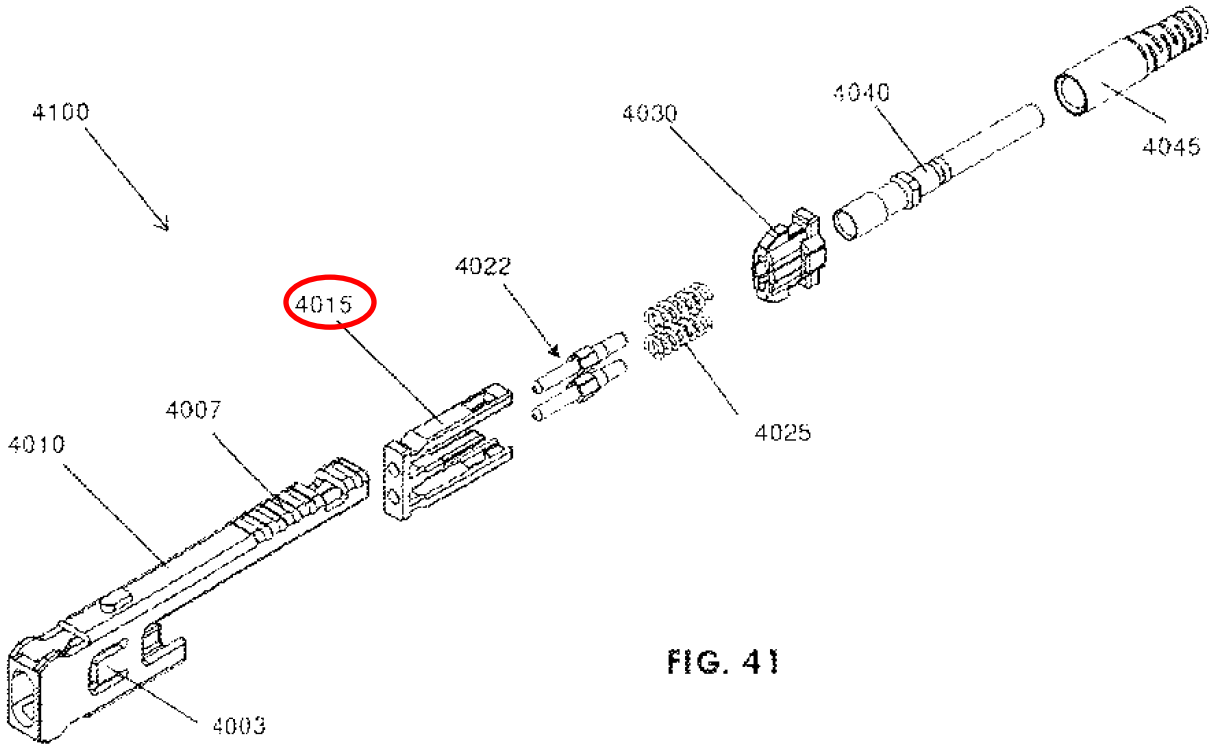


FIG. 41

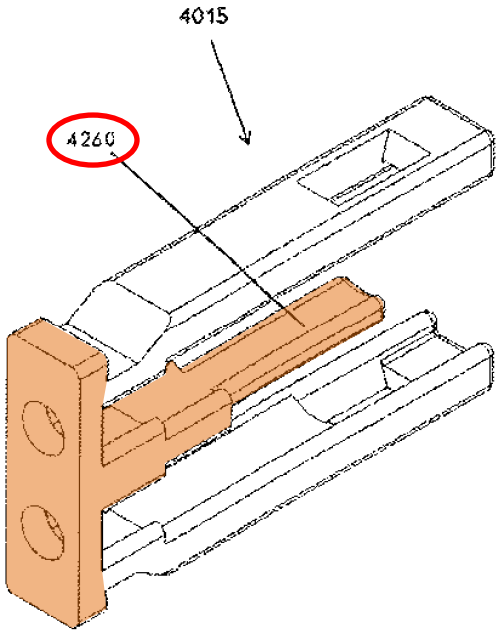


FIG. 42A

EX1009: Figs. 41 and 42A (annotated).

427. In my opinion, it would have been obvious to modify the front body (10302, 10503) of the optical connector (10300, 10400, 10500) of Figs. 53-55 in view of the optical connector (4100) of Fig. 41 to provide the front body (10302, 10503) with the elongated middle wall (4260) to separate the two ferrule springs (10305). EX1009: Figs. 42A-42B. The elongated wall (4260) would prevent entanglement of the ferrule springs, binding of the connector and breaking of optical fibers. EX1009: 17:46-49 ("middle wall reduces the possibility of the springs becoming entangled with each other, binding the connector and breaking the optical fibers").

428. This modification would have been nothing more than combining known prior art elements (optical connector (10300, 10400, 10500) and elongated middle wall (4260)) according to known methods (arrangement taught by Takano'369) to yield predictable results (a wall separating the springs to prevent entanglement).

429. This modification would have also been nothing more than the application of a known technique (elongated middle wall (4260)) to improve a similar device (optical connector (10300, 10400, 10500) with two spring-loaded ferrules) in the same way to yield predictable results (a wall separating the springs to prevent entanglement).

430. A POSA would have had a reasonable expectation of success in making this modification because the elongated middle wall (4260) would perform the same function and be generally arranged in the optical connector (10300, 10400, 10500) of Figs. 53-55 as it was in the optical connector (4100) of Fig. 41.

431. This modification results in the optical connector (10300, 10400, 10500) of Figs. 53-55 having the middle wall (4260), which meets the requirement of the wall in claim 15, as best I can understand, because it forms a wall between the locations where two ferrule assemblies are seated in the outer housing and is between the top surface and bottom surface of the main body. EX1009: Figs. 42A-B.

432. Therefore, in my opinion, Takano'369 renders this claim obvious.

L. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two springs between the crimp body and the first and second ferrule flanges engaged with the wall."

433. As I explained above in Section XIV(D), the crimp body (particularly, the front portion of the back body (10306, 10406)) forms a spring push. The spring push simultaneously compresses each of the two ferrule springs (10305) between the crimp body and the ferrule flanges (10304) engaged with the wall (4260). Section XIV(B)(1.c).

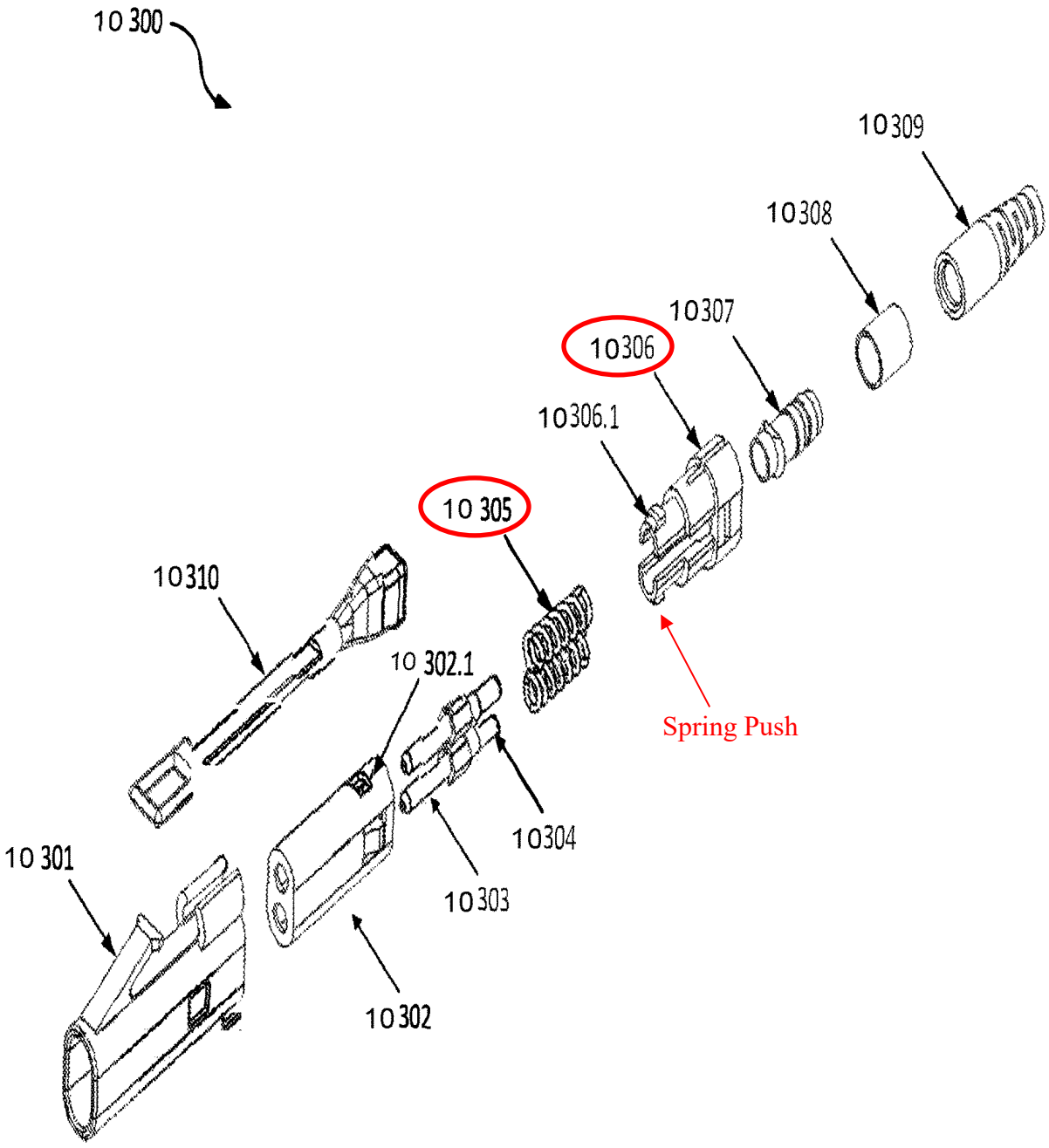


FIG. 53

EX1009: Fig. 53 (annotated).

434. As shown below, the ferrule flanges (10304) would engage a rear face of the wall, as the ferrules flanges would be pushed against the rear face of the wall

by the springs (10305). Further, the elongated middle wall (4260) includes flats that match and engage the hexagonal collar of the ferrule holders (10304) to inhibit the ferrule assemblies from rotating within the connector (10300, 10400, 10500). Such prevention of rotation/twisting is especially important when polishing the ferrules, such as when applying an angle-physical contact (APC) polish.

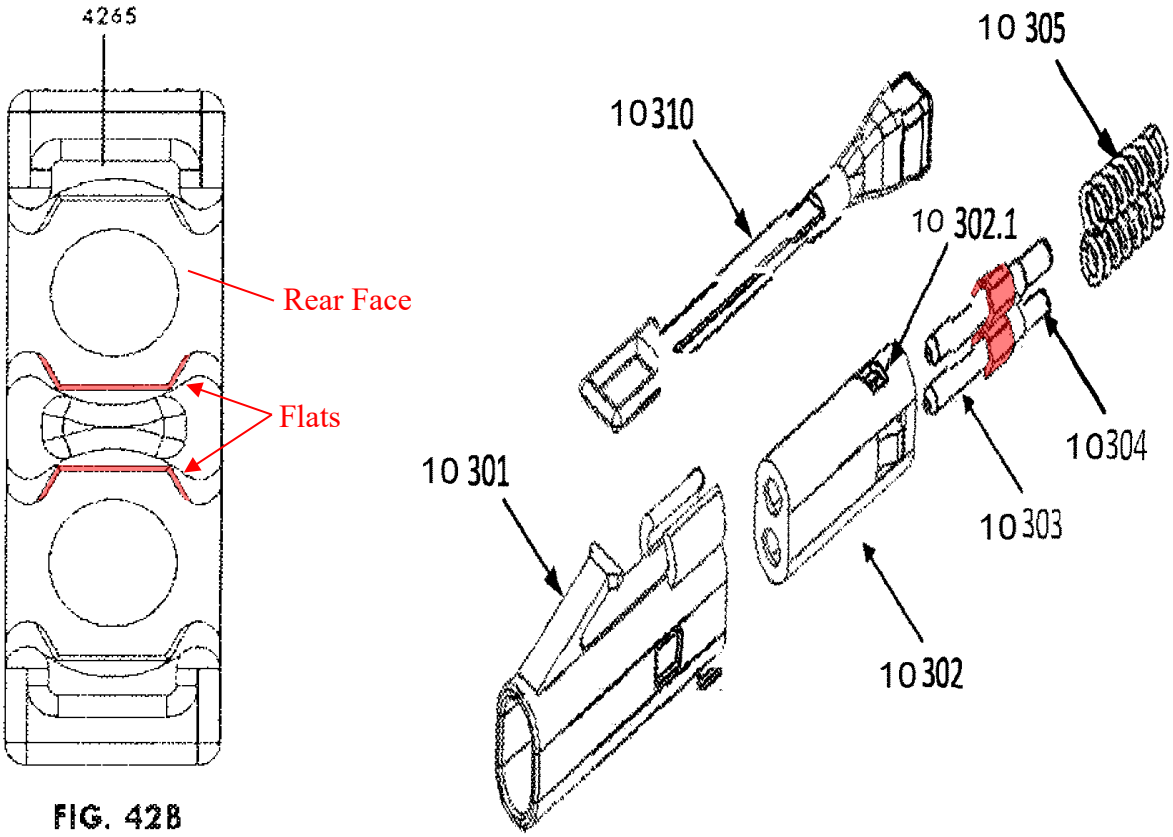


FIG. 42B

EX1009: Fig. 42B and 53 (annotated).

435. One of ordinary skill in the art understands that the spring push of Takano'369's connector (10300, 10400, 10500) meets this limitation. For example, Fig. 23A shows this limitation is nothing more than the conventional way ferrule springs are engaged by a spring push in these types of connectors. Fig. 23A

of Takano'369 depicts how the back body (2130) simultaneously engages the rear portion of each of the two ferrule springs (2125) in the connector (2100). EX1009: 14:19-29. The back body (10306) of Takano'369's connector (10300, 10400, 10500) is used in the same way as the back body (2130) in order to preload the ferrule springs (10305) against the ferrule flanges using the components already part of the Takano'369 connector. This is nothing more than the conventional way of employing such ferrule springs in fiber optic connectors.

436. Therefore, in my opinion, Takano'369 renders this claim obvious.

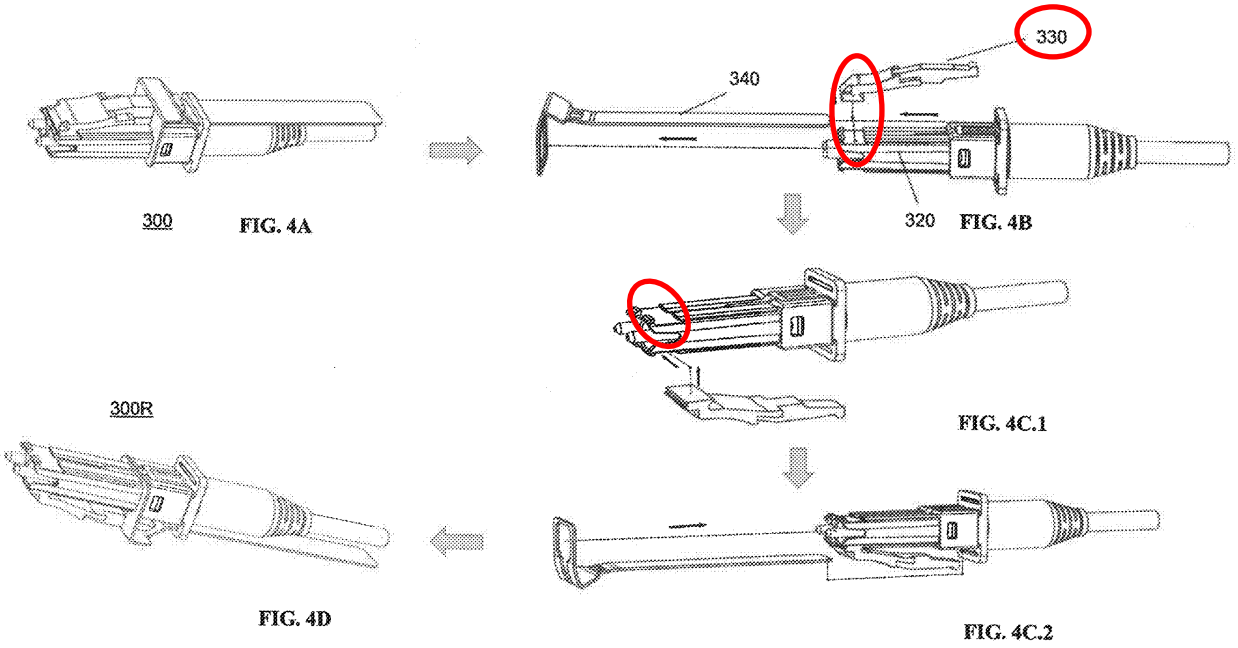
XV. OBVIOUS: TAKANO'369, WATANABE & WONG (GROUND 11)

437. In my opinion, claims 6 and 7 would have been obvious over Takano'369 in view of Watanabe and Wong.

A. Claim 6 "The fiber optic connector according to claim 1, wherein each of the top surface and the bottom surface has a receiving area for a latch component to secure the fiber optic connector to an adapter."

438. Wong discloses a reversible polarity fiber optic connector (300) that addresses demand "for smaller fiber optic connectors that will meet the needs of future developments in smaller SFPs and are reconfigurable for flexible deployment." EX1012: ¶[0007]. The connector (300) comprises a connector housing (320) with latch couplings (e.g., dovetail slots) on top and bottom exterior walls. EX1012: ¶¶[0067], [0072], Figs. 1B, 4B, 4C.1. The latch couplings selectively receive a dovetail shaped fitting on the bottom of a latch (330) for

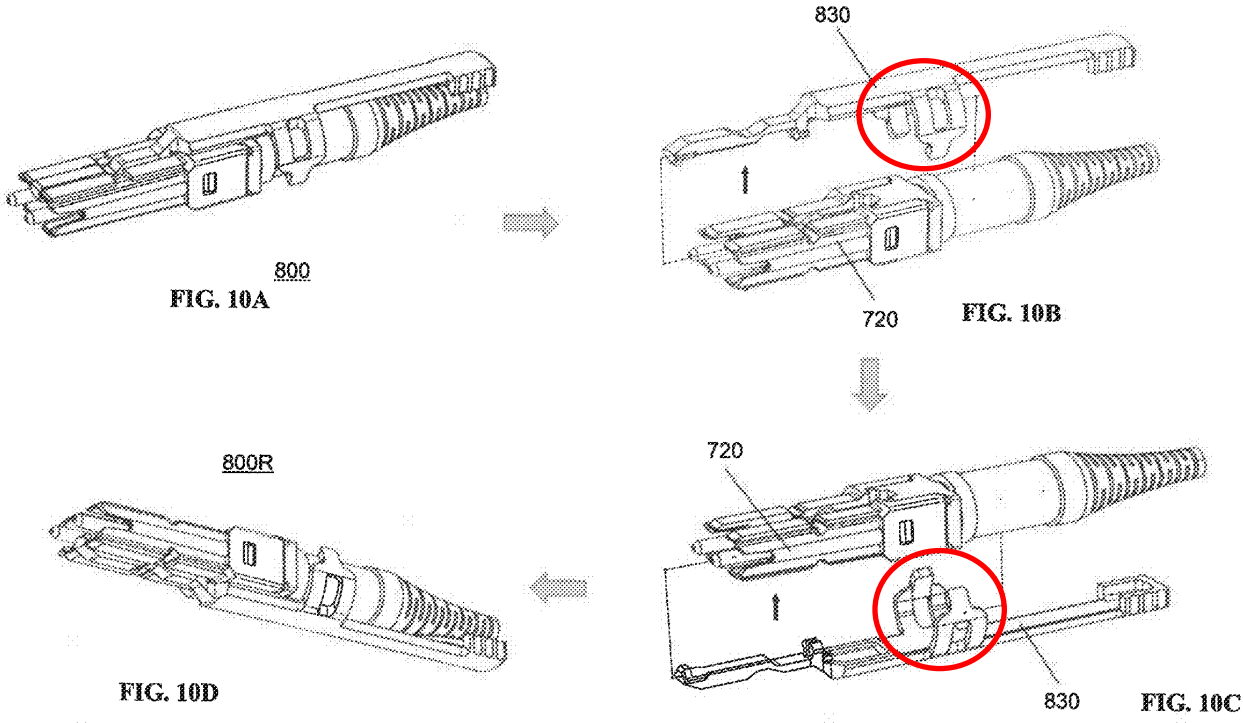
mounting the latch on the connector housing (320). EX1012: ¶¶[0067], [0072], Figs. 1B, 4B, 4C.1. The latch couplings and dovetail fitting allow the latch (330) to be selectively coupled to either the top exterior wall or the bottom exterior wall for changing the polarity of the connector. EX1012: ¶¶[0067], [0072]. As evident by Figs. 4C.1 and 4D, the connector housing (320) is inherently symmetrical on opposite sides of a middle latitudinal plane in order to enable the polarity change by moving the latch (330) between the top and bottom of the connector housing. EX1012: Figs. 4C.1, 4D, and 10A-D.



EX1012: Figs. 4A-D (annotated).

439. Wong also teaches that a pull tab (830) can include a clip that clips onto the boot of the connector and allows the pull tab to move along the boot. EX1012: Figs. 8B.1-2, 10A-D, ¶¶[0085], [0088]. The clip also allows the pull tab

(830) to be selectively positioned along the top or bottom of the connector housing when changing the polarity of the connector. EX1012: Figs. 10A-D.



EX1012: Figs. 10A-D (annotated).

440. In my opinion, it would have been obvious to modify the Takano'369's connector (10300, 10400, 10500)—already modified in view of Watanabe—to (1) to provide latch couplings as taught by Wong on the top exterior wall and bottom exterior wall, (2) separate Takano'369's locking tab (10411) from the rest of the outer housing (10301, 10401, 10501) and add Wong's dovetail fitting to the bottom of the separated locking tab, and (3) add Wong's clip to Takano'369's push-pull tab (10310, 10410, 10510) to couple the push-pull tab to the top or bottom of Takano'369's strain relief boot (10309, 10409, 10509)

(depending on latch placement) to facilitate polarity change, in view of Wong. EX1012: ¶¶[0067], [0072], Figs. 10A-D. The added clip replaces the guide (*see* Section XIV(B)(1.e)) on the top surface of the outer housing (10301, 10401, 10501) and enables Takano'369's push-pull tab (10310, 10410, 10510) to be arranged on the top or bottom of Takano'369's outer housing depending on the polarity configuration. Takano'369 already discloses that the push-pull tab is detachable. EX1009: 19:41-43, FIG. 55. Replacing the guide on the outer housing (10301, 10401, 10501) with Wong's clip is simply an alternative way of detachably connecting Takano'369's push-pull tab (10310, 10410, 10510).

441. In making the modification, the POSA would recognize Takano'369's outer housing (10301, 10401, 10501) would need to be further modified to be symmetrical on both sides of the middle latitudinal plane, as taught by Wong, in order to change polarity. EX1012: Figs. 4C.1, 4D, and 10A-D. For the reasons explained in Section XIV(A), the POSA would wish to preserve the rail along the narrow side of the connector opposite the push-pull latch mechanism for purposes of aligning the connector into a partition-free adapter. Thus, in making this modification in view of Wong, the POSA would also further modify Takano'369's outer housing (10301, 10401, 10501) to include another guide rail on the top side of the outer housing in order to maintain symmetry about the middle latitudinal plain. EX1012: Figs. 4C.1, 4D, and 10A-D. As a result, Takano'369's outer

housing (10301, 10401, 10501) includes Watanabe's guide rails on both the outer housing's top and bottom sides. This way, regardless of which side (e.g., top or bottom) the push-pull latch mechanism is secured to, the opposing side has a Watanabe guide rail to facilitate guiding the modified Takano'369 connector into a partition-free adapter.

442. A POSA would be motivated to substitute the Wong polarity change features for the Takano'369 polarity change features because, unlike the Takano'369 polarity change, Wong's polarity change does not require taking the ferrules out of the outer housing (10301, 10401, 10501). EX1009: Fig. 55, 19:44-50. The POSA would recognize that the outer housing (10301, 10401, 10501) in Takano'369 provides a measure of protection for the ferrules and sensitive fibers. The ferrules and fibers are more protected when contained in the outer housing (10301, 10401, 10501) than when they are only held by the inner front body (10302, 10502) and back body (10306) apart from the outer housing. Removing the assembly containing the ferrules from the outer housing (10301, 10401, 10501) subjects the ferrules to handling and greater risk of damage without the protection of the outer housing. The POSA would recognize that, by contrast, the Wong polarity change features allow for the ferrules to remain protected by the outer housing throughout the entire polarity change operation. Accordingly, the POSA

would be motivated to make the above modification to facilitate polarity change in a way that better protects the ferrules and fibers.

443. Further, this modification allows the overall size of the Takano'369's connector (10300, 10400, 10500) to be reduced, thereby increasing the mounting density of the connector. EX1011: ¶[0050]; EX1006: 4:9-11; EX1003: 4:5-11. Because the front body (10302, 10502) is no longer needed to form a self-contained unit with the back body (10306) for the ferrules to change polarity, the front body can be eliminated. The outer housing (10301, 10401, 10501) then can be reduced in size, as it no longer needs to accommodate the front body (10302, 10502). In this case, the back body (10306) can be attached directly to the outer housing (10301, 10401, 10501), such as by protrusions (10306.1, 10513) as suggested by Takano'369. For example, the outer housing (10301, 10401, 10501) can be modified to include windows or cutouts (10302.1) which would interlock with protrusions (10306.1) of the back body (10306) to secure the back body to the outer housing. EX1009: Fig. 53, 19:5-8. In another example, the back body (10306) can be modified to include protrusions (10413) which would interlock with the windows (10412) on the outer housing (10301, 10401, 10501) to secure the back body to the outer housing. EX1009: Fig. 54, 19:19-23. As needed, the outer housing (10301, 10401, 10501) would also be modified to include the

internal features of the front body (10302, 10502) needed to mount the ferrules (10303, 10403), ferrule holders (10304), and ferrules springs (10305) therein.

444. This modification would have been nothing more than combining known prior art elements (Takano'369's optical connector (10300, 10400, 10500), Watanabe's guide rail (21), and Wong's latch couplings and push-pull tab clip) according to known methods (arrangement taught by Wantanabe and Wong) to yield predictable results (an optical connector with a selectively mountable push-pull latch mechanism on the top and bottom of the connector to change polarity).

445. This modification would have also been nothing more than the application of a known technique (Watanabe's guide rail (21) and Wong's latch couplings and push-pull tab clip for optical connectors) to improve a similar device (Takano'369's optical connector (10300, 10400, 10500)) in the same way to yield predictable results (an optical connector with a selectively mountable push-pull latch mechanism on the top and bottom of the connector to change polarity).

446. This modification would have also been nothing more than the use of a known technique (Watanabe's guide rail (21) and Wong's latch couplings and push-pull tab clip) to a known device (Takano'369's optical connector (10300, 10400, 10500)) ready for improvement to yield predictable results (an optical connector with a selectively mountable push-pull latch mechanism on the top and bottom of the connector to change polarity).

447. There would have been a reasonable expectation of success in making the modifications because they are all straightforward changes in mechanical design, applying features from prior art optical connectors for their same purposes in the modified connector. The removable latch and latch couplings added to the top and bottom of Takano'369's connector (10300, 10400, 10500) have the same functions as in Wong, and the additional Watanabe guide rail (21) added to the top side of Takano'369's outer housing (10301, 10401, 10501) is simply a duplication of the same feature added previously in the first modification based on Watanabe. Further, based on Wong, the POSA would have had reasonable expectation that the added clip for Takano'369's push-pull tab (10310, 10410, 10510) would successfully couple the push-pull tab to Takano'369's strain relief boot (10309, 10409, 10509). At most, the proposed modifications would have required minor changes in the dimensions of parts to accommodate the altered or additional elements. But such changes are well-within the capabilities of the POSA and their results would have been entirely predictable.

448. Further, it is understood that Takano'369's modified locking tab (10411) and modified push-pull tab (10310, 10410, 10510) would each be separately connected to and removed from the rest of the Takano'369's connector. Takano'369's modified locking tab (10411) would be moved laterally to slide the locking tab along the desired latch coupling on the top or bottom of the housing.

Takano’369’s modified push-pull tab (10310, 10410, 10510) would be pulled up or down as needed to connect and disconnect the added clip of the push-pull tab from the boot. A schematic illustration of this modification is shown below:

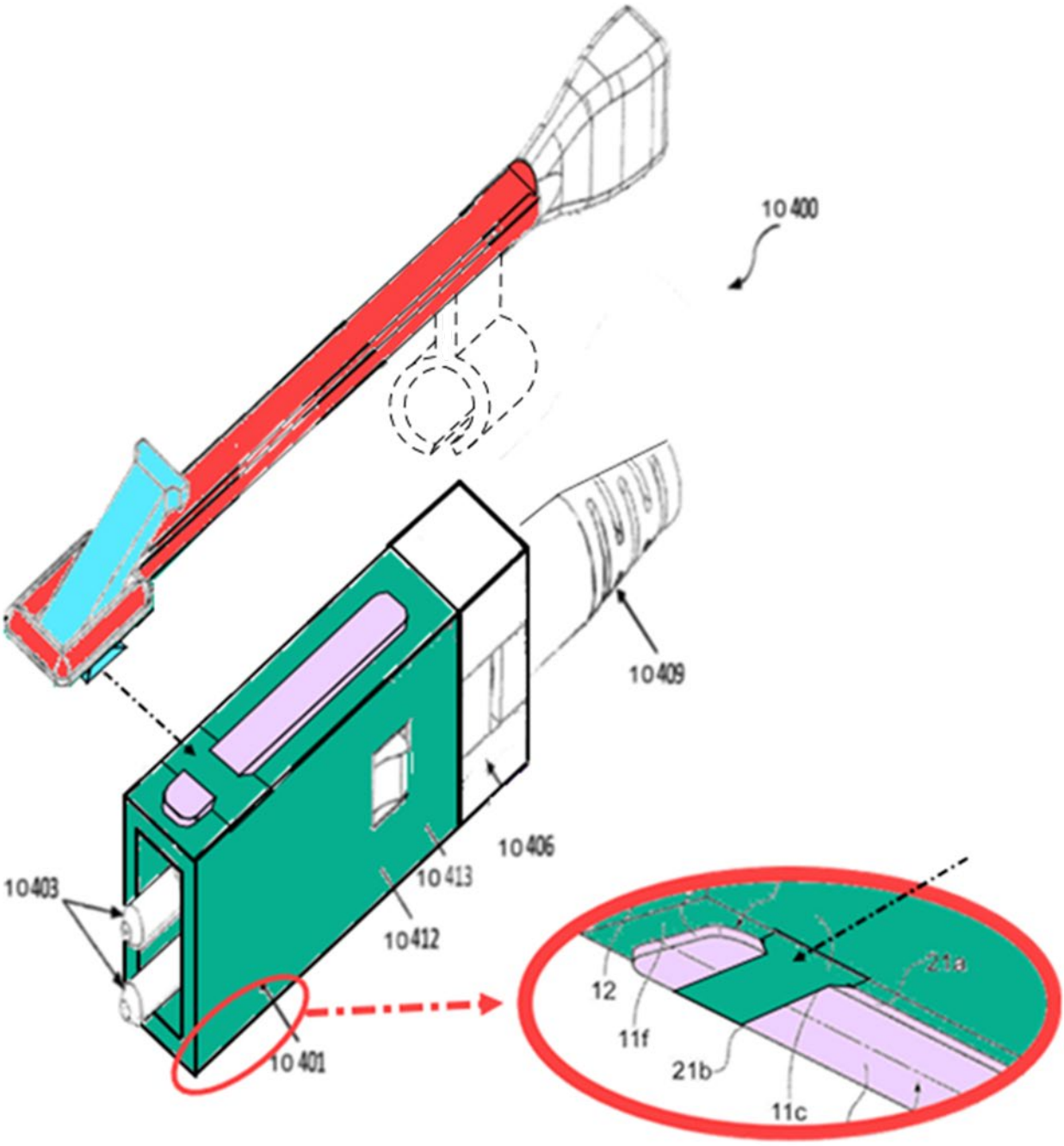


FIG. 54

EX1009: Fig. 54 (annotated, modified).

449. As a result of this modification, the top and bottom surface of Takano'369's modified outer housing (10301, 10401, 10501) each has a Wong latch coupling (i.e., a receiving area) for selectively receiving the Wong dovetail fitting added to the bottom of Takano'369's locking tab (10411).

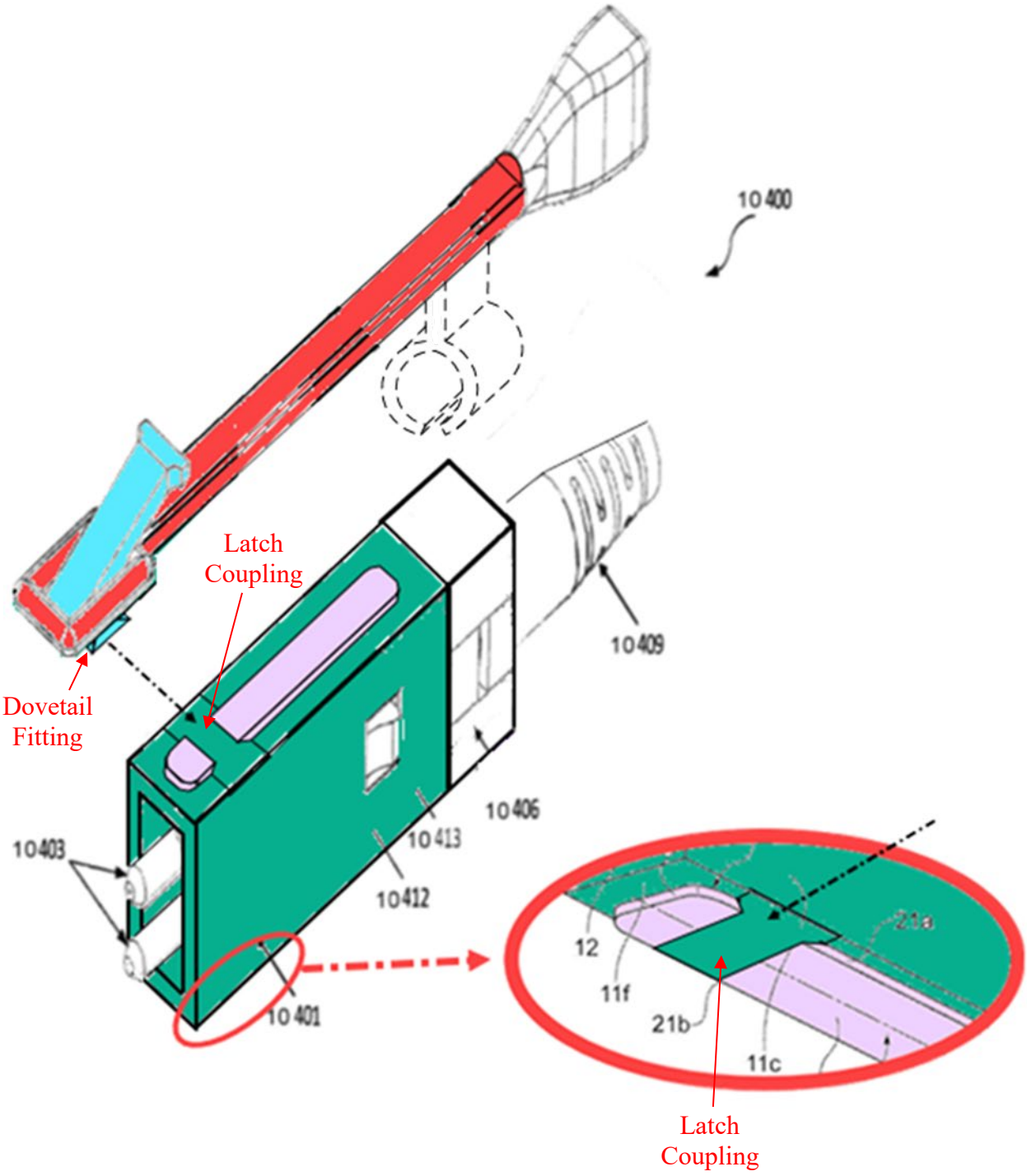


FIG. 54

EX1009: Fig. 54 (annotated, modified).

450. Therefore, in my opinion the Takano'369/Watanabe/Wong combination renders this claim obvious.

B. Claim 7 "The fiber optic connector of claim 6, wherein the fiber optic connector is configured to receive a push force to insert the fiber optic connector into an adapter or a pull force to release the latch component from the adapter."

451. Takano'369's modified connector (10300, 10400, 10500) receives a push force to insert the connector into Takano'369's modified adapter (101114). EX1009: 10:27-29, 19:25-30. Takano'369's push-pull tab (10310, 10410, 10510) also receives a pull force to release the locking tab (10411) and allow Takano'369's modified connector to be removed from the modified adapter (101114). EX1009: 19:25-30. Takano'369 explains the "locking tab 10411 of the outer housing 10401 is used to interlock with an adapter [and] the push-pull tab 10410 enables easy manipulation of the locking tab 10411 to allow for removal of the connector from the adapter." EX1009: 19:25-30.

452. Therefore, the Takano'369/Watanabe/Wong combination renders this claim obvious.

XVI. OBVIOUS: TAKANO'209, WATANABE & HILL (GROUND 12)

453. In my opinion, claims 14 and 15 would have been obvious over Takano'209 in view of Watanabe and Hill.

A. Claim 14 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an angled physical contact (APC) ferrule."

454. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Angled physical contact" or APC as recited by claim 14 is a common polish type for the end of fiber optic ferrules. EX1028: 3-4. As known in the art, APC type polish offers the lowest return loss (amount of light reflected back by the end face of the optical fiber). EX1029: 3.

455. In my opinion, it would have been obvious to modify Takano'369's optical connector (10300, 10400, 10500), as modified in view of Watanabe, in further view of Hill.

456. Takano'369's optical connector (10300, 10400, 10500) has "LC-type optical ferrules." EX1009: 2:42, 6:22-25 ("narrow-pitch LC duplex connectors … for use, for example, with future narrow pitch LC SFPs"). However, Takano'369 is silent about the type of polishing used for the LC-type ferrules.

457. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C,

¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

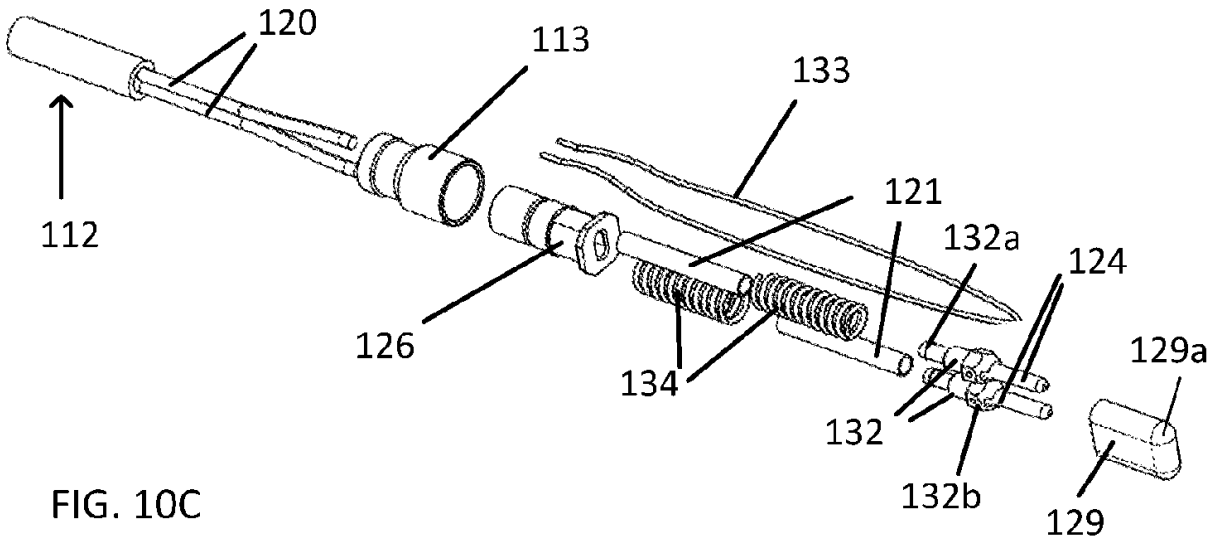


FIG. 10C

EX1007: Fig. 10C.

458. In my opinion, it would have been obvious to make the ferrules (10303, 10403) of Takano'369's optical connector (10300, 10400, 10500) an "angled physical contact" type of ferrule in view of Hill. Takano'369 already

discloses that its ferrules (10303, 10403) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well known to be particularly useful for single mode (SM) fiber applications requiring lowest return loss. EX1029: 3; EX1030: 2. Making Takano'369's ferrules (10303, 10403) an "angled physical contact" type of ferrule makes Takano'369's optical connector (10300, 10400, 10500) suitable for single mode, "high bandwidth applications and long haul links" sensitive to return loss, such as "FTTx (fiber to the x), passive optical network (PON) and wavelength-division multiplexing (WDM)" applications. EX1029: 3.

459. This modification is nothing more than a simple substitution of one known element (Hill's LC/APC type ferrule) for another (Takano'369's ferrule) to yield predictable results (an APC optical connector for lowest return loss applications).

460. This modification would have also been nothing more than the application of a known technique (Hill's APC ferrule polish type) to improve a similar device (Takano'369's ferrules) in the same way to yield predictable results (an APC optical connector for lowest return loss applications).

461. This modification would have also been obvious to try as APC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled

physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Takano'369's optical connector (10300, 10400, 10500) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used. Further, the specific polish type is generally specified by each customer application.

462. There would have been a reasonable expectation of success in making this modification given that both Takano'209's and Hill's ferrules are of LC-type. EX1009: 2:42; EX1007: ¶[0058].

463. As a result of this modification, the ferrules (10303, 10403) in Takano'369's optical connector (10300, 10400, 10500) are APC ferrules.

464. Therefore, in my opinion, the Takano'209/Watanabe/Hill combination renders this claim obvious.

B. Claim 15 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an ultra-physical contact (UPC) ferrule."

465. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Ultra-physical contact" or UPC as recited by claim 15 is another common polish type for the end of fiber optic

ferrules. EX1028: 3. As known in the art, UPC type polish offers single mode (SM) fiber applications low return loss at a low cost. EX1029: 3.

466. In my opinion, would have been obvious to modify Takano'369's optical connector (10300, 10400, 10500), as modified in view of Watanabe, in further view of Hill.

467. Takano'369's optical connector (10300, 10400, 10500) has "LC-type optical ferrules." EX1009: 2:42, 6:22-25 ("narrow-pitch LC duplex connectors … for use, for example, with future narrow pitch LC SFPs"). However, Takano'369 is silent about the type of polishing used for the LC-type ferrules.

468. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

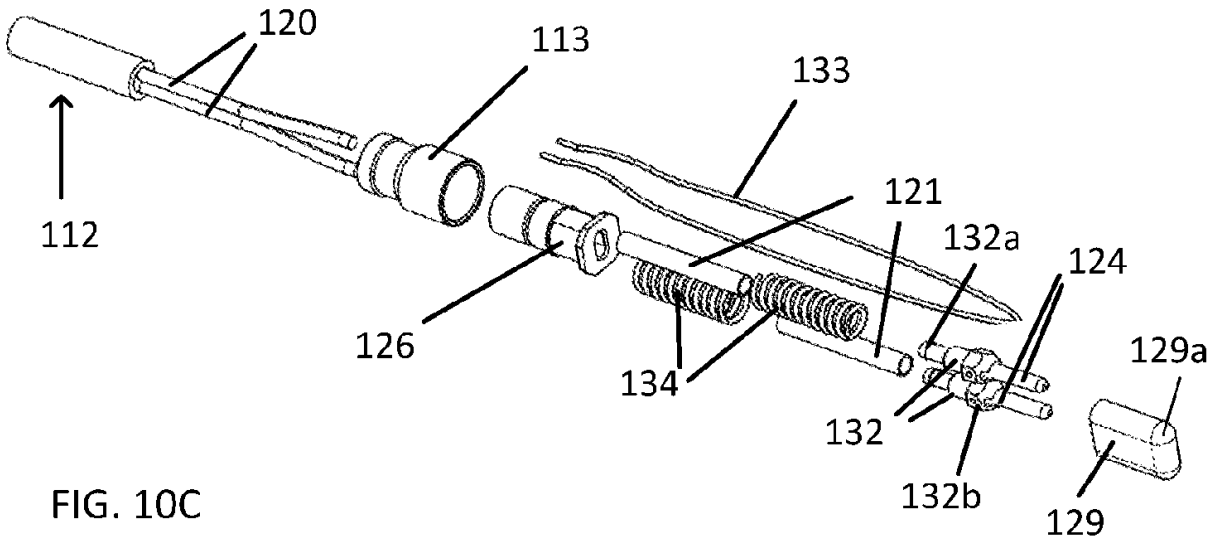


FIG. 10C

EX1007: Fig. 10C.

469. In my opinion, it would have been obvious to make the ferrules (10303, 10403) of Takano'369's optical connector (10300, 10400, 10500) an "ultra-physical contact" type of ferrule in view of Hill. Takano'369 already discloses that its ferrules (10303, 10403) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well known to be particularly useful for single mode (SM) fiber applications requiring low return loss while being cheaper than other polish types, such as APC. EX1029: 3. Making Takano'369's ferrules (10303, 10403) an "ultra-physical contact" type of ferrule makes Takano'369's optical connector (10300, 10400, 10500) suitable for more budget

conscious applications while still providing low return loss. EX1029: 3; EX1030: 2.

470. This modification is nothing more than a simple substitution of one known element (Hill's LC/UPC type ferrule) for another (Takano'369's ferrule) to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

471. This modification would have also been nothing more than the application of a known technique (Hill's UPC ferrule polish type) to improve a similar device (Takano'369's ferrules) in the same way to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

472. This modification would have also been obvious to try as UPC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Takano'369's optical connector (10300, 10400, 10500) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used. Further, the specific polish type is generally specified by each customer application.

473. There would have been a reasonable expectation of success in making this modification given that both Takano'369's and Hill's ferrules are of LC-type. EX1009: 2:42; EX1007: ¶[0058].

474. As a result of this modification, the ferrules (10303, 10403) in Takano'369's optical connector (10300, 10400, 10500) are UPC ferrules.

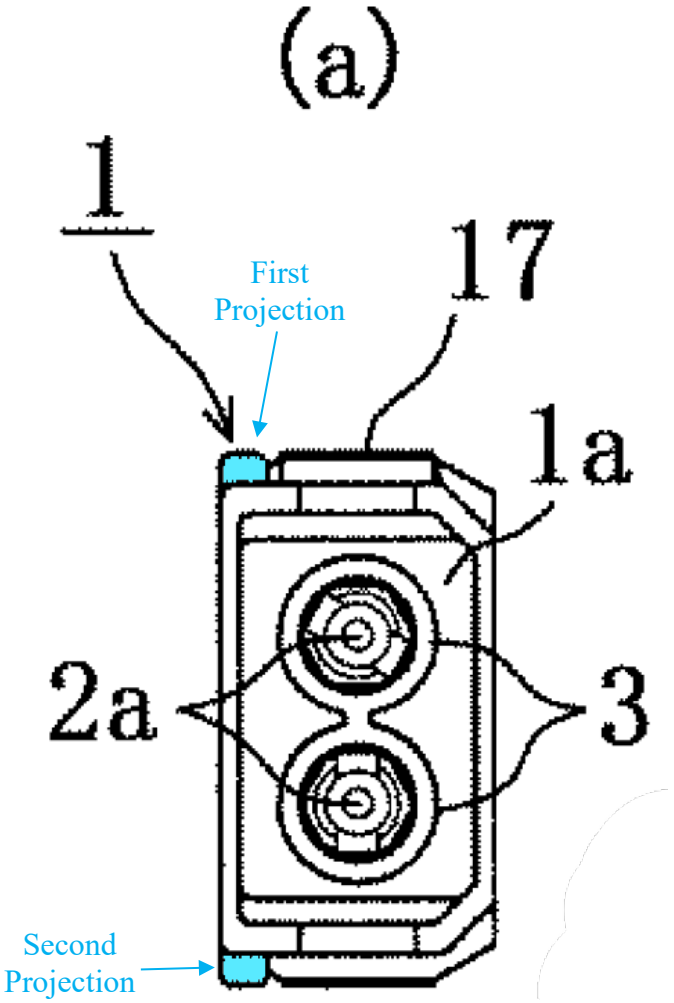
475. Therefore, in my opinion, the Takano'209/Watanabe/Hill combination renders this claim obvious.

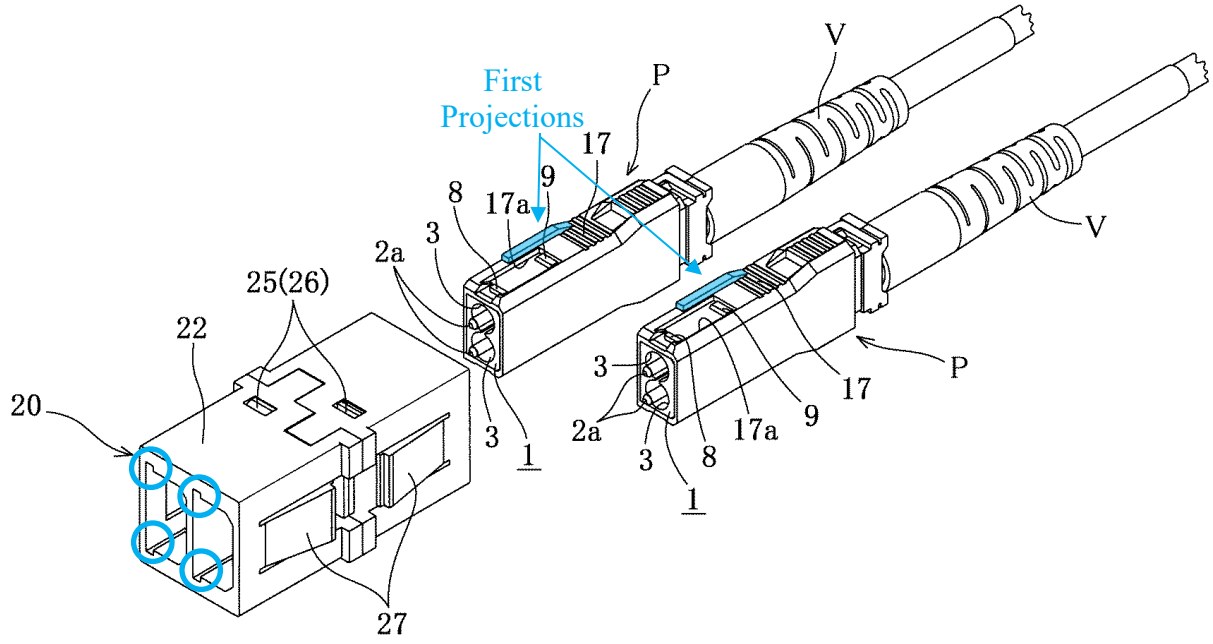
XVII. OBVIOUS: TOYAMA & SHIMOZU (GROUND 13)

476. In my opinion, claims 1-7 and 10-13 would have been obvious over Toyama in view of Shimozu.

A. Modification of Toyama Based on Shimozu

477. Toyama discloses a first key on the top surface of the knob (17) and a second key the bottom surface of the knob. EX1014: Fig. 7(a). The keys fit within keyways of the adapter (20) to indicate the correct orientation for inserting the connector into the adapter.

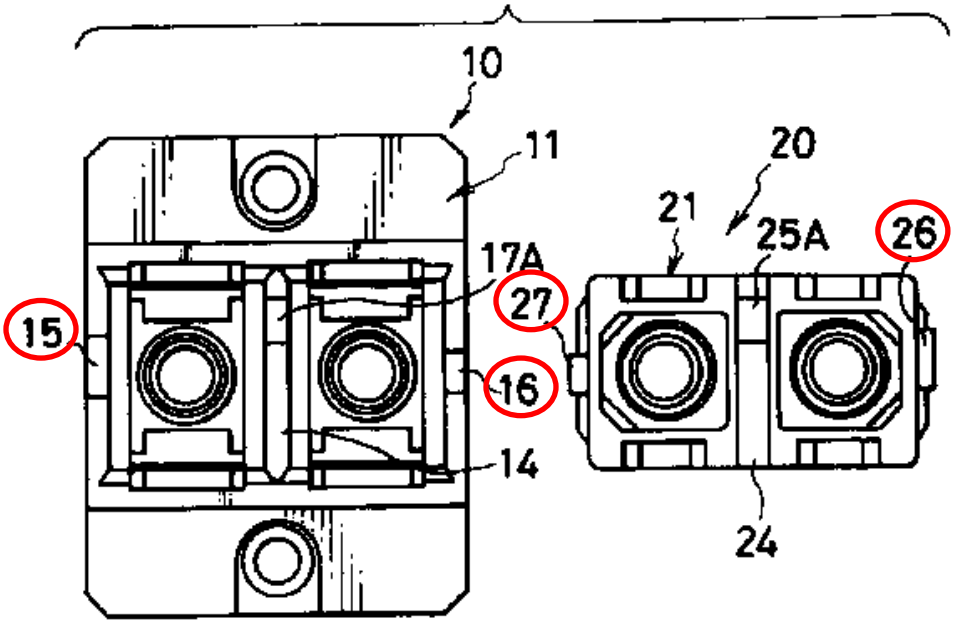

(a)
1
First
Projection
17
1a
2a
3
Second
Projection



EX1014: Figs. 7(a) and 11 (annotated).

478. Shimozu discloses a double-core optical connector plug (20) with first and second keys (26, 27), the first key being wider than and off-center from the second key. EX1008: ¶¶[0011]-[0012]. The keys (26, 27) fit into corresponding keyways (15, 16) of the mating adapter (10) to ensure proper alignment. EX1008: ¶[0014]. Shimozu teaches the keys (26, 27) and corresponding keyways (15, 16) can be implemented in other types of optical connectors. EX1008: ¶[0015].

【図２】



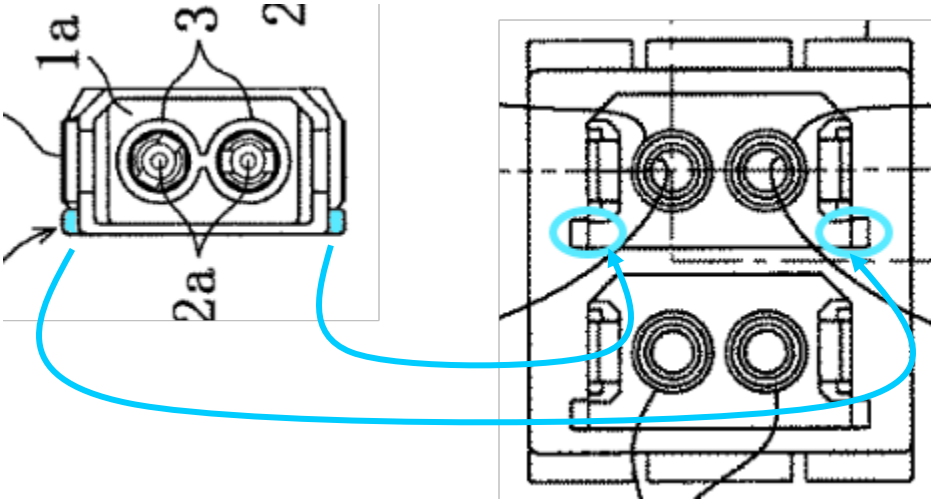
EX1008: Fig. 2 (annotated).

479. In my opinion, it would have been obvious to replace the Toyama's keys with Shimozu's keys (26, 27).

480. Given that Shimozu's keys are asymmetric in both size and location, they would be preferred over Toyama by a user in that they give a more obvious visual cue how to insert the connector into the adapter. Furthermore, other differing size keys and keyways may be deployed for specific fiber types and applications, such as single mode (SM) vs multimode (MM) fiber.

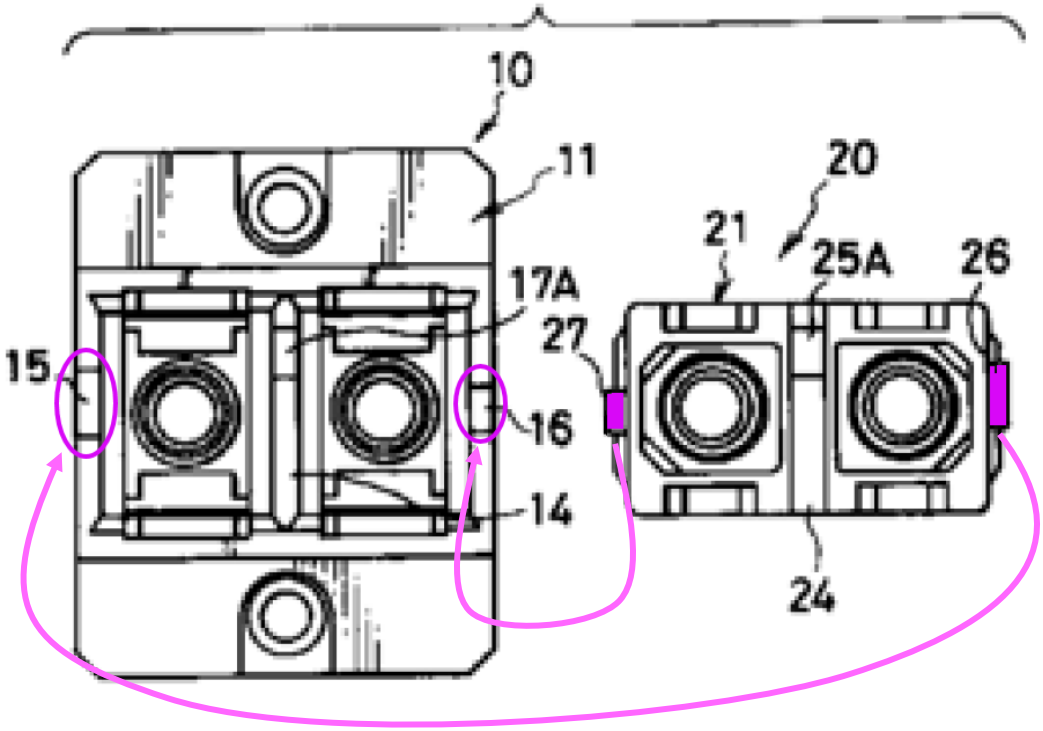
481. The same-size keys of Toyama and the different-size keys of Shimozu are prior art structures that can easily and predictably be substituted for one

another. Both keying structures indicate the correct orientation for inserting the connector into the mating adapter (i.e., the orientation in which each key will fit into the corresponding keyway of a mating adapter).



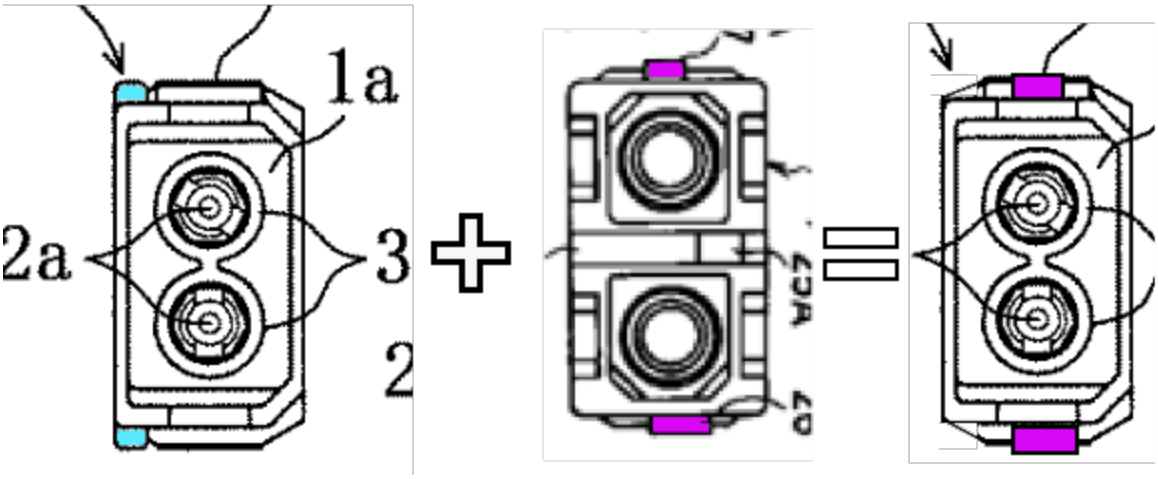
EX1014: Figs. 7(a) and 10(a) (annotated).

[FIG. 2]



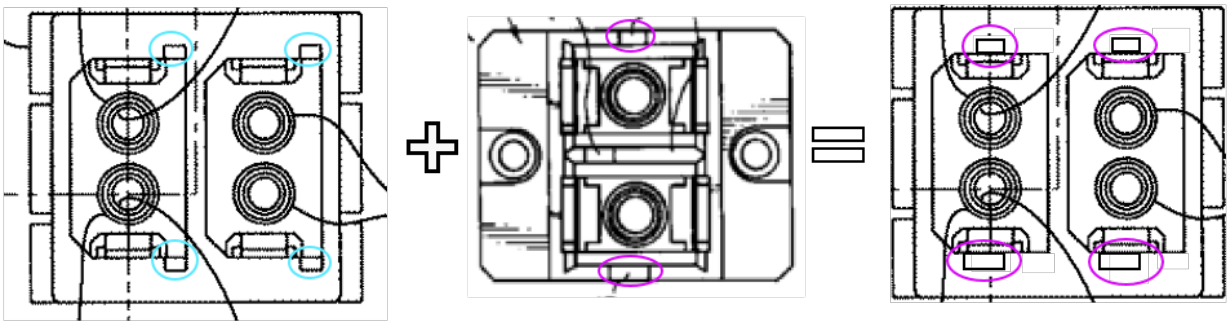
EX1008: Fig. 2 (annotated).

482. A schematic illustration of Toyama's modified plug body (P) is shown below:



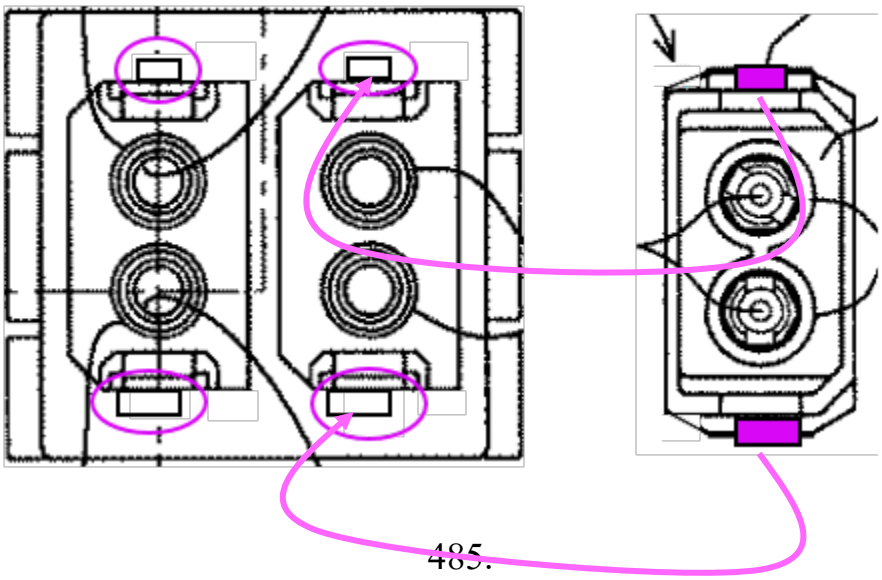
EX1014: Fig. 7(a) (annotated, modified); EX1008: Fig. 2 (annotated).

483. In modifying Toyama's plug body (P), a corresponding modification to Toyama's adapter (20) would have been made by replacing the existing keyways with Shimozu's different sized keyways, sized and positioned for accepting the added keys to Toyama's plug body, as indicated below:



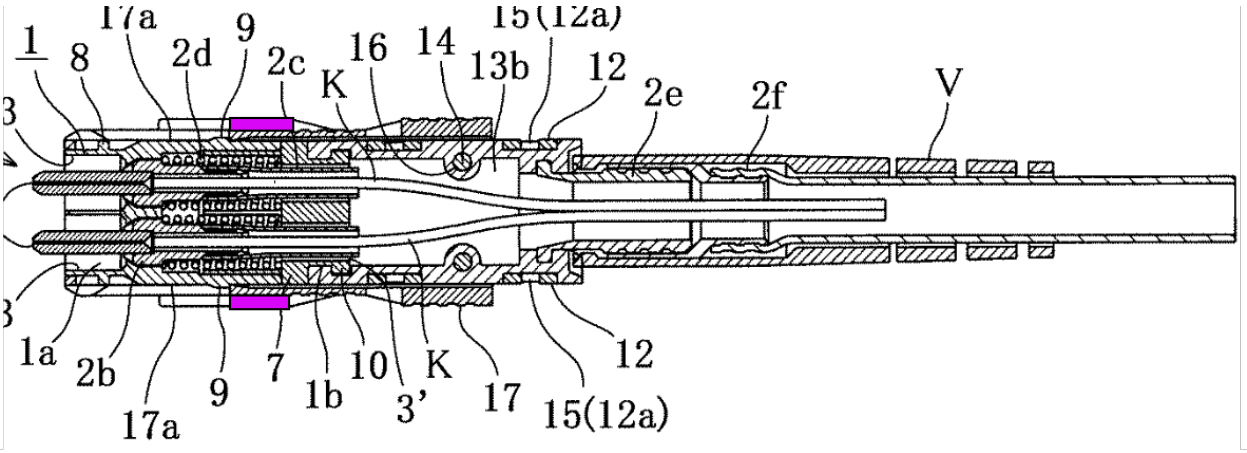
EX1014: Fig. 10(a) (annotated, modified); EX1008: Fig. 1 (annotated).

484. Substituting the different-size keys from Shimozu for the same-size keys of Toyama (and making a corresponding modification to the Toyama adapter) would yield the predictable result of providing a different keying structure to indicate the proper orientation in which to insert the connector into a mating adapter, as shown below:



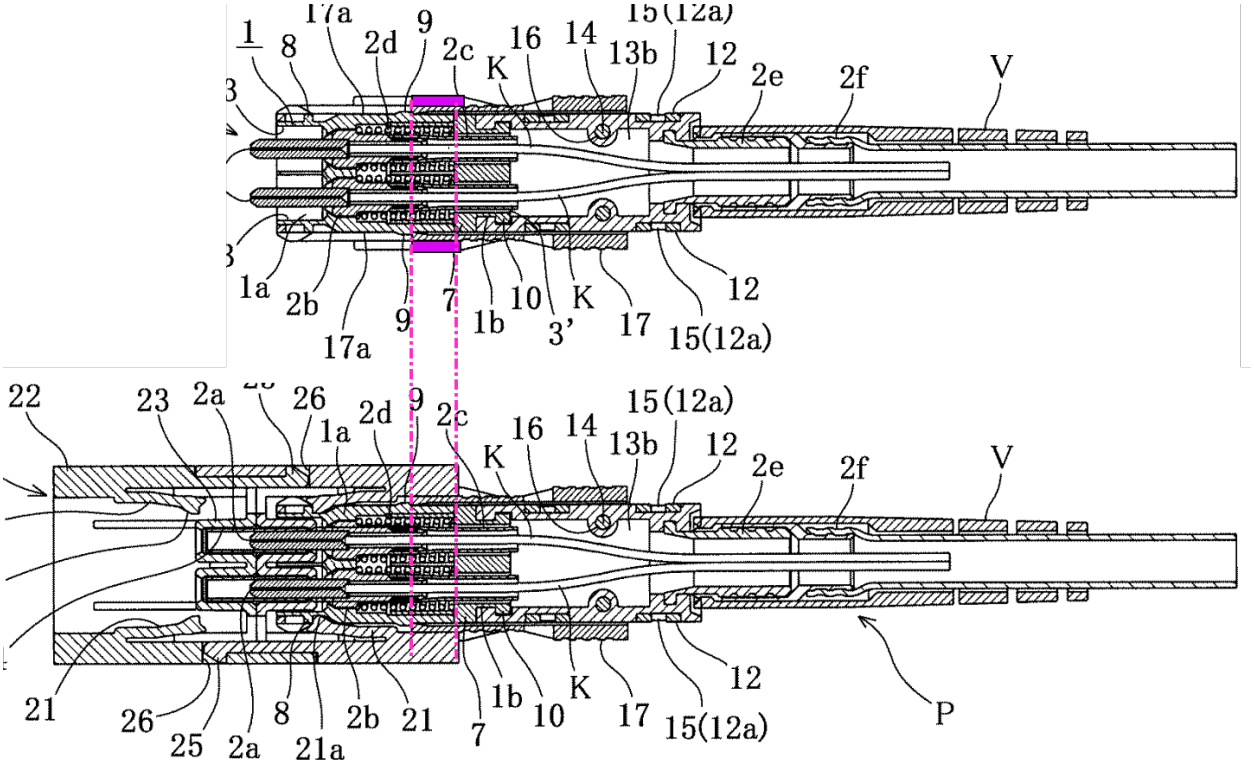
EX1014: Figs. 7(a) and 10(a) (annotated, modified).

486. Toyama and Shimozu both teach locating the keys on the narrow walls of a duplex connector housing that is also used as an extraction knob for unlatching the connector from a mating adapter. In implementing the modification, the different-size keys would remain located on narrow walls of the outer housing (17), positioned behind the openings (17a), as shown below:



EX1014: Fig. 8(a) (annotated, modified).

487. This modified key position is slightly rearward of the existing same-size keys in Toyama. In this more rearward key position, the different-size keys would still ably perform the function of indicating the proper insertion orientation of the connector by fitting into corresponding keyways in the adapter. As shown below, even at the more rearward key positions, the different-size keys still fit into the corresponding keyways in the adapter in order for the connector to fully mate with the adapter.



EX1014: Figs. 8(a) and 9(a) (annotated, modified).

488. Accordingly, the POSA would have had a reasonable expectation that Toyama could be successfully modified in view of Shimozu by simply removing

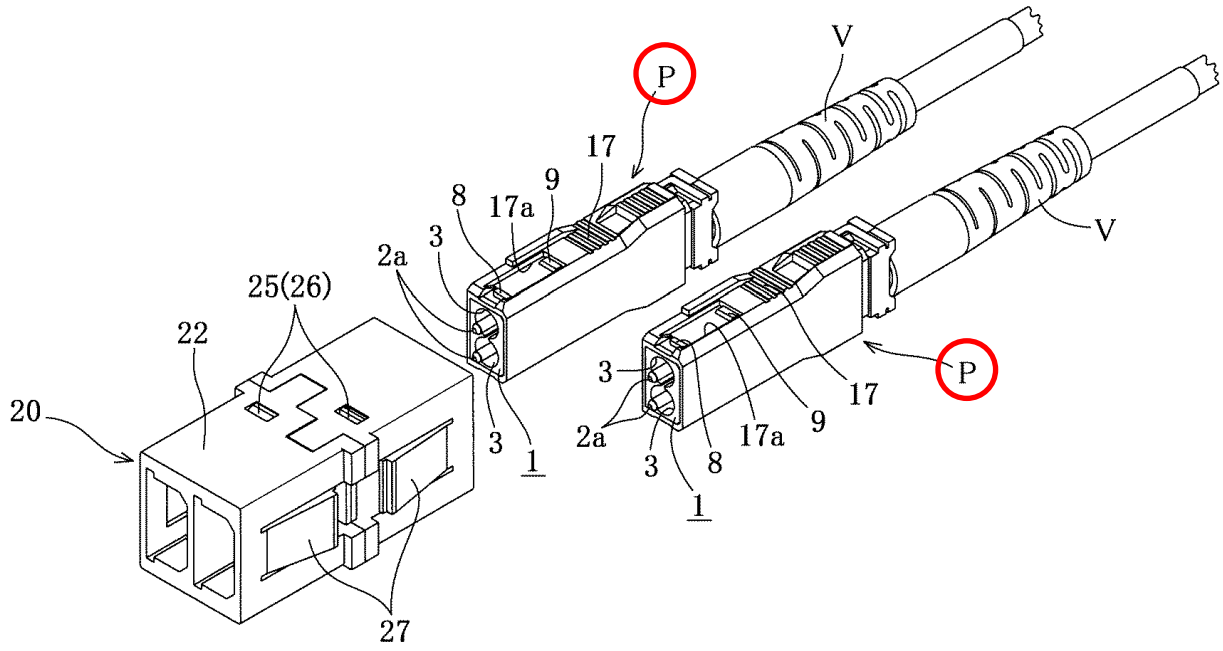
the existing same-size keys and replacing them with different-size keys located at the existing flat surfaces behind the openings (17a) of the Toyama's knob (17).

489. As explained above, Toyama and Shimozu are analogous fiber optic connectors that both use keys on the narrow sides of the outer connector housing to indicate the proper connector insertion orientation. The proposed modification of Toyama in view of Shimozu would have been nothing more than a simple substitution of one known equivalent (Shimozu's different-size keys) for another (Toyama's same-size keys) to yield predictable results (Toyama's connector with a different arrangement of keys for aligning the connector into a mating adapter). I have been informed that a claim is obvious when it claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, and the substitution does no more than yield a predictable result. This is the case here, a mere substitution of Shimozu's different size keys for Toyama's same size keys, which yield's a predictable result.

B. Independent Claim 1

1.P "A fiber optic connector comprising:"

490. Toyama discloses a plug body (P), which is "a fiber optic connector." EX1014: ¶[0022].



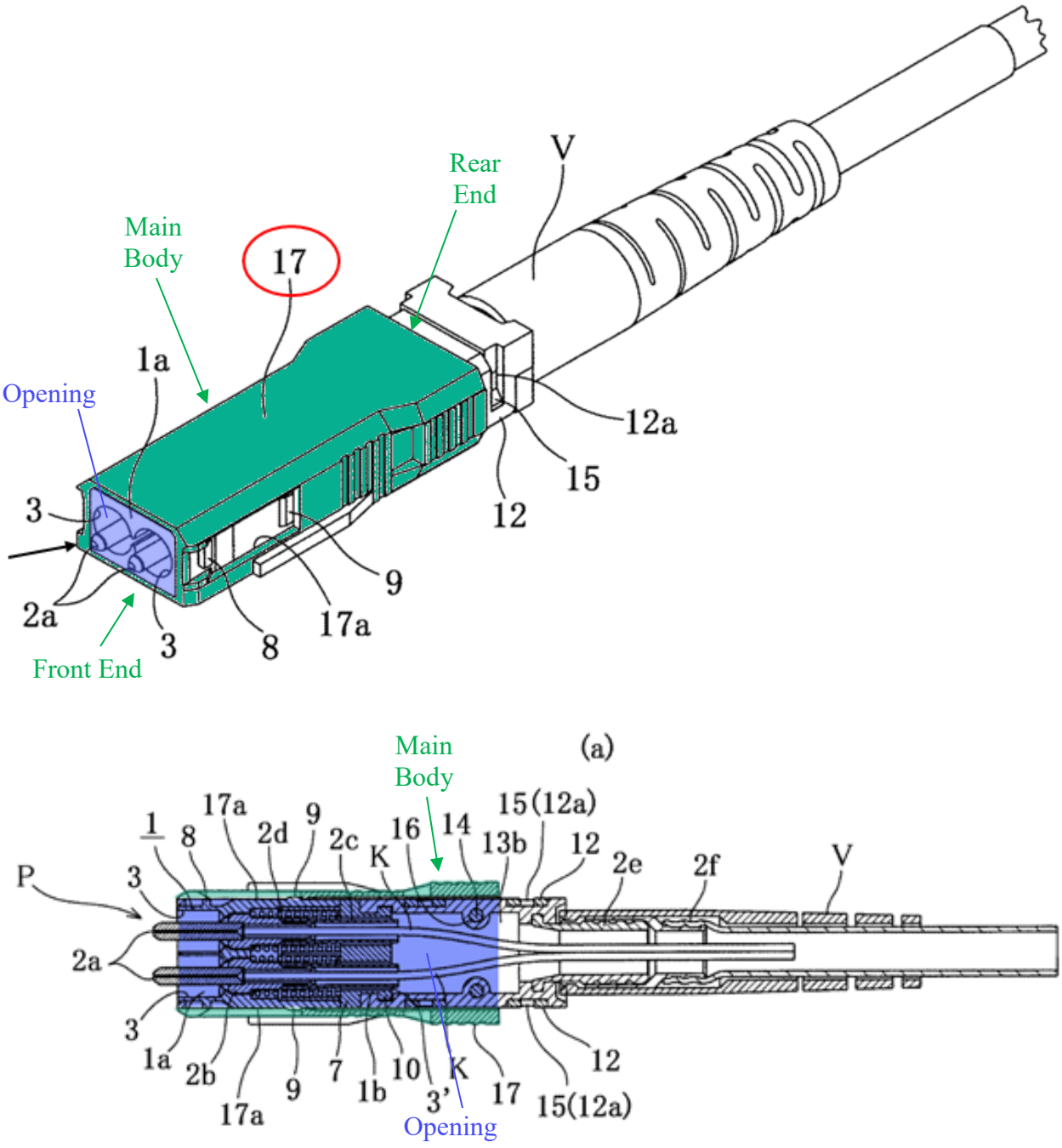
EX1014: Fig. 11 (annotated).

491. Therefore, in my opinion, Toyama meets this limitation.

1.a.1 "a housing having a main body extending between a front end and a rear end and having an opening extending therebetween,"

492. Toyama's knob (17) is a housing having a main body (green) extending between a front end and a rear end and having an opening (blue) extending therebetween. EX1014: ¶¶[0022], [0032] (describing knob (17) as "forming an angular cylindrical shape that can cover the entire plug frame").

【図６】

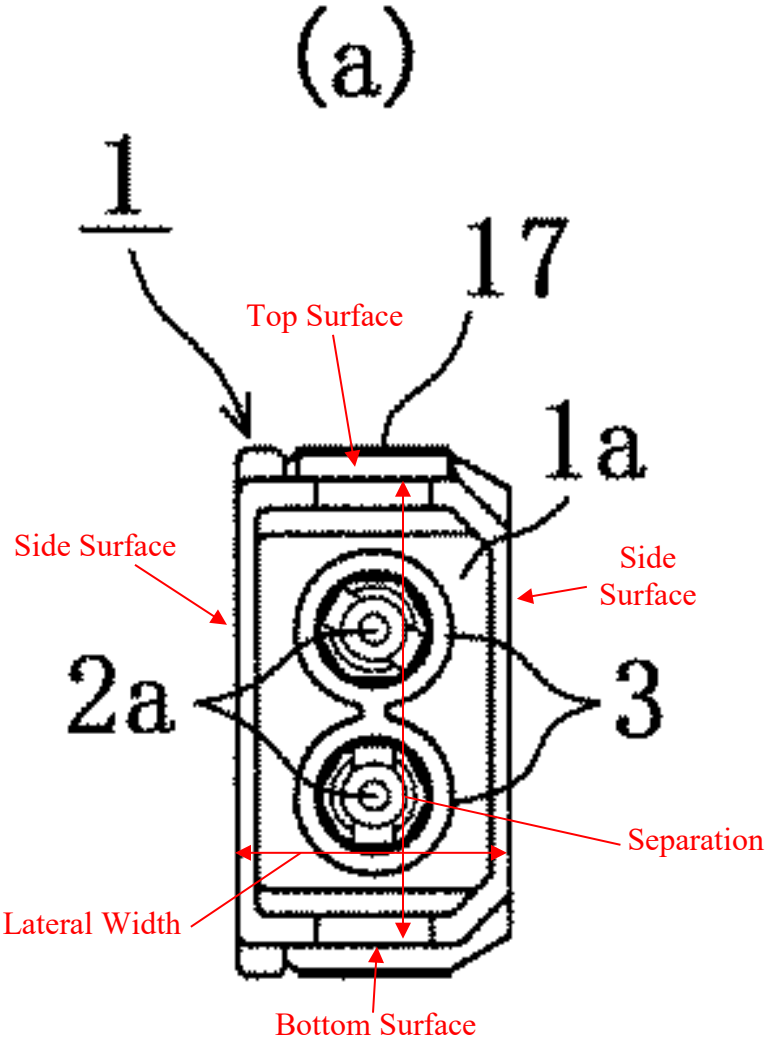


EX1014: Figs. 6 and 8(a) (annotated).

493. Therefore, in my opinion, Toyama meets this limitation.

1.a.2 "the housing having a top surface and a bottom surface joined by two opposing side surfaces such that a lateral width between the two opposing side surfaces is less than a separation between the top surface and the bottom surface along a height of the main body;"

494. Toyama's knob (17) has top and bottom surfaces bound by two opposing side surfaces with a lateral width between the two side surfaces being less than a separation between the top and bottom surfaces along a height of the main body.

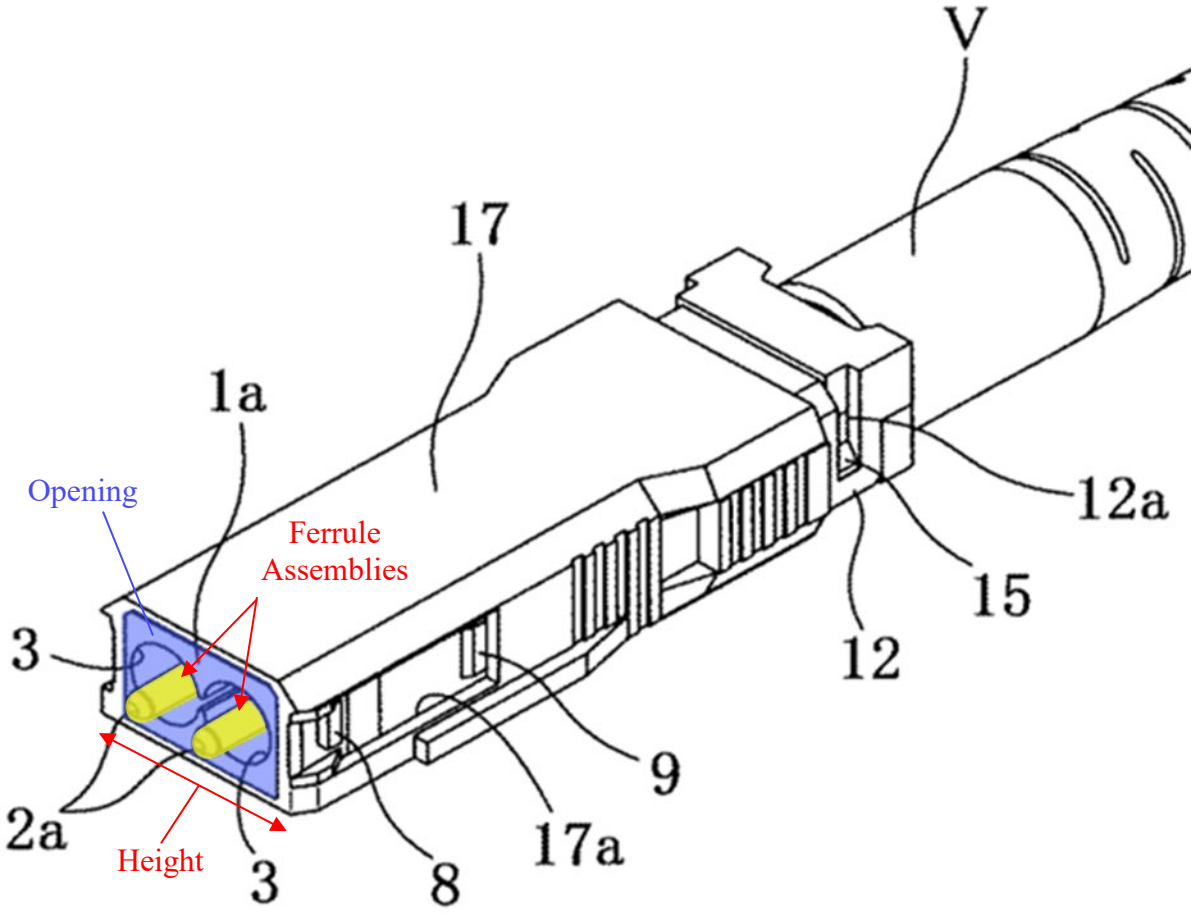


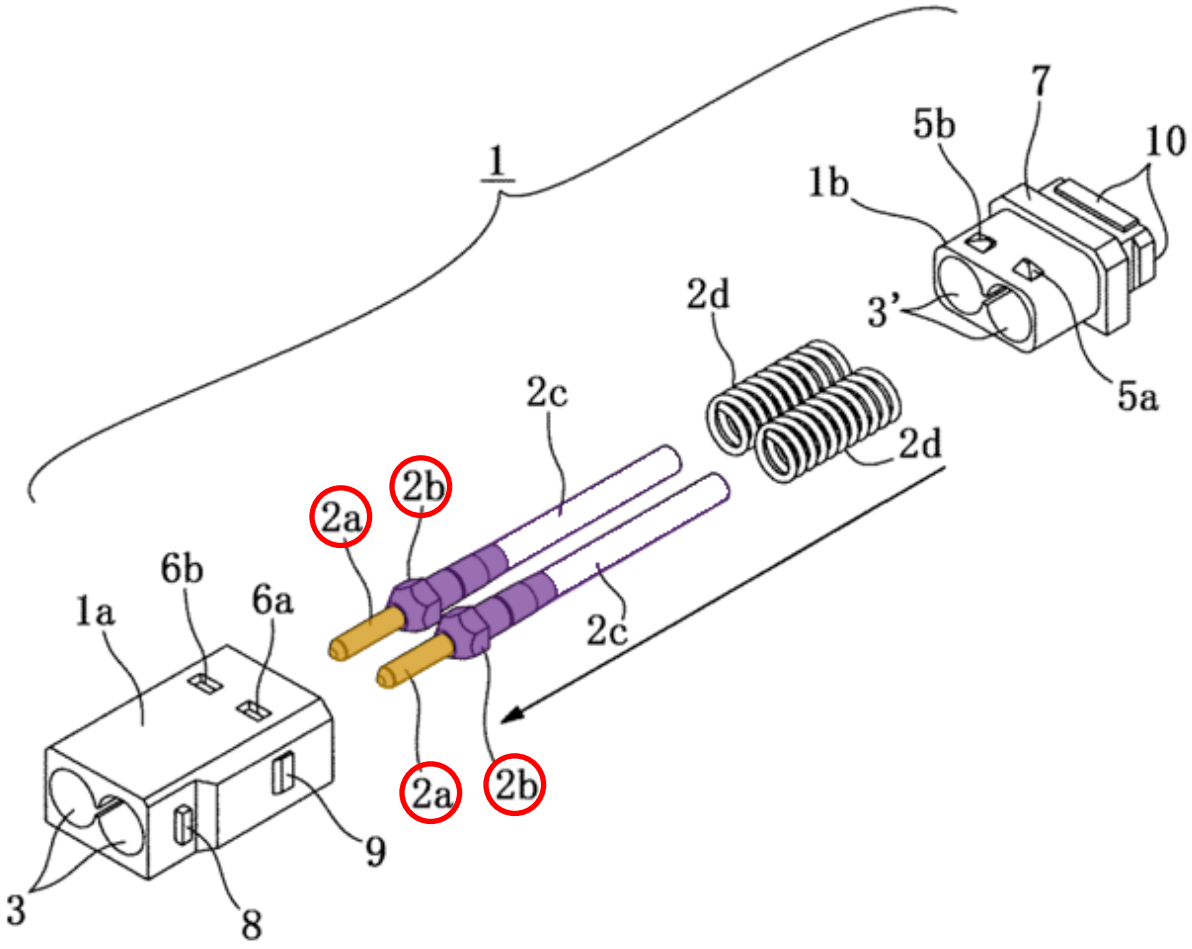
EX1014: Fig. 7(a) (annotated).

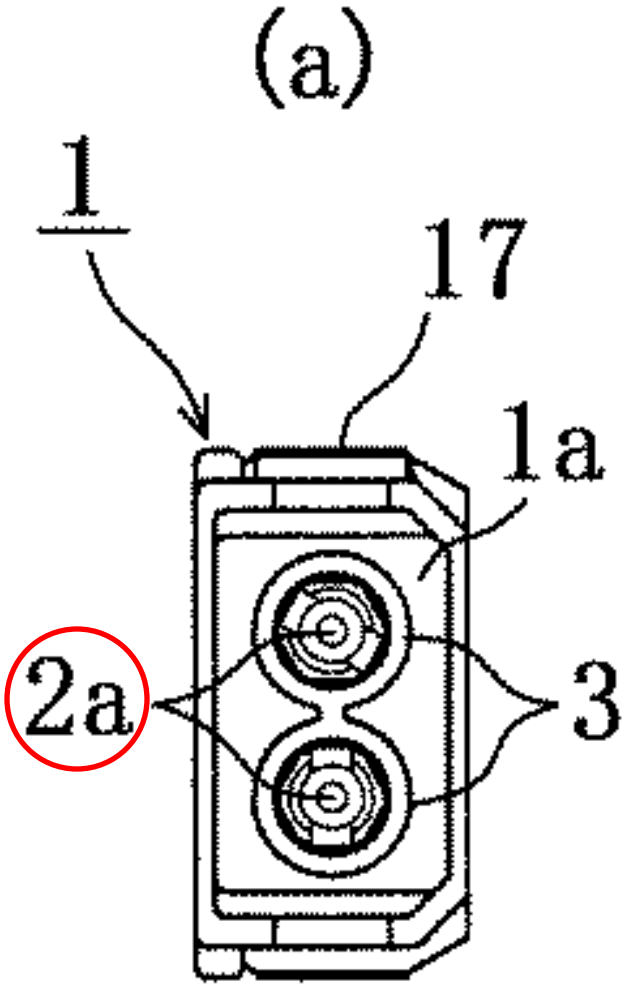
495. Therefore, in my opinion, Toyama meets this limitation.

1.b.1 "two ferrule assemblies disposed within the opening of the housing, each of the ferrule assemblies comprising a fiber optic ferrule spaced apart from each other along the height and a ferrule holder to hold the fiber optic ferrule,"

496. Toyama discloses two ferrule assemblies disposed within the opening of the knob (17). Each ferrule assembly includes a ferrule (2a) held by a ferrule holder (2b). EX1014: ¶[0022]. The ferrules (2a) are spaced apart along the height of the main body. EX1014: Fig. 7(a).




1
7
5b
10
1b
2d
3'
2c
5a
2d
2b
2a
6b
6a
1a
2c
2a
2b
9
3
8

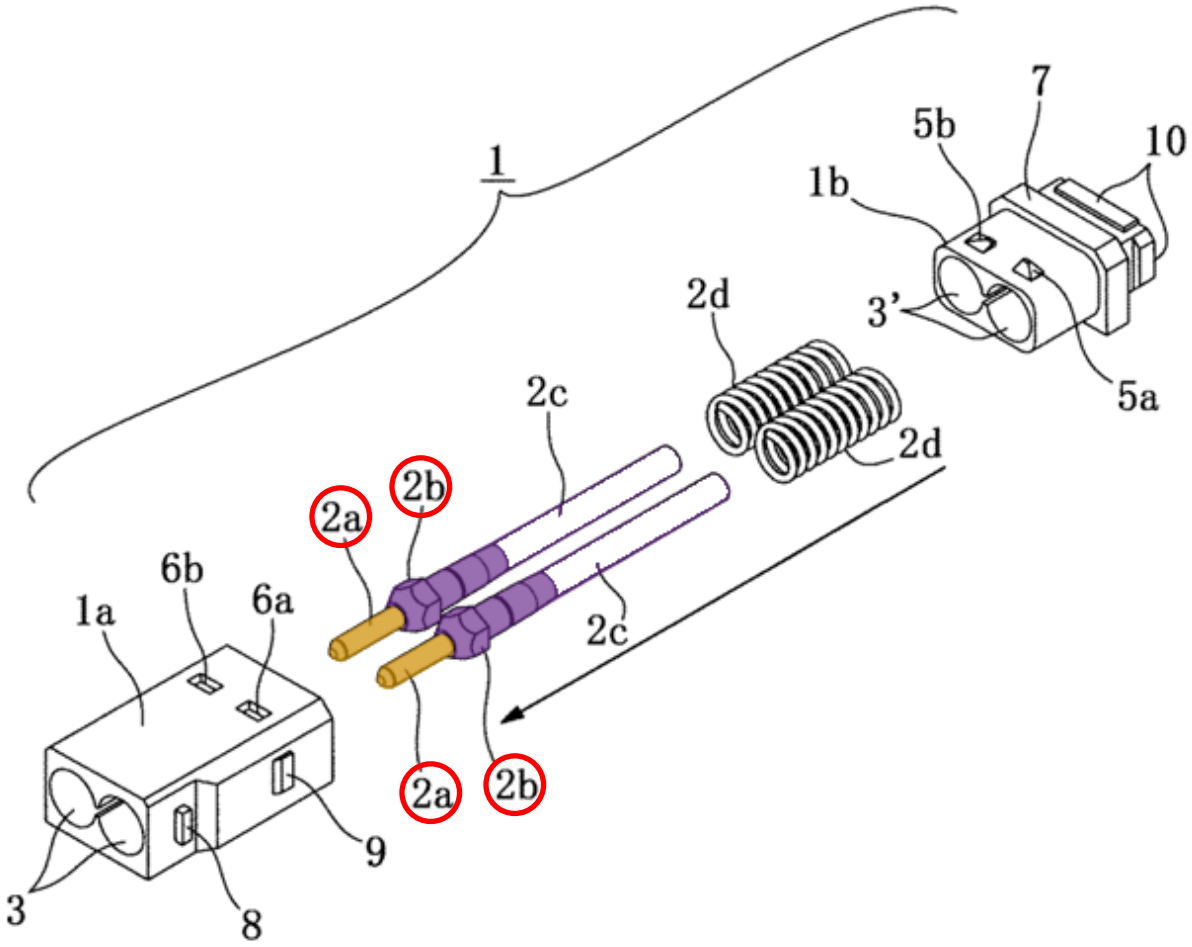


EX1014: Figs. 1, 6, and 7(a) (annotated).

497. Therefore, in my opinion, Toyama meets this limitation.

1.b.2 "the fiber optic ferrule in each of the two ferrule assemblies extending forwardly of and away from the front end of the ferrule holder;"

498. Each ferrule (2a) extends forwardly away from the front end of the ferrule holder (2b).



EX1014: Fig. 1 (annotated)

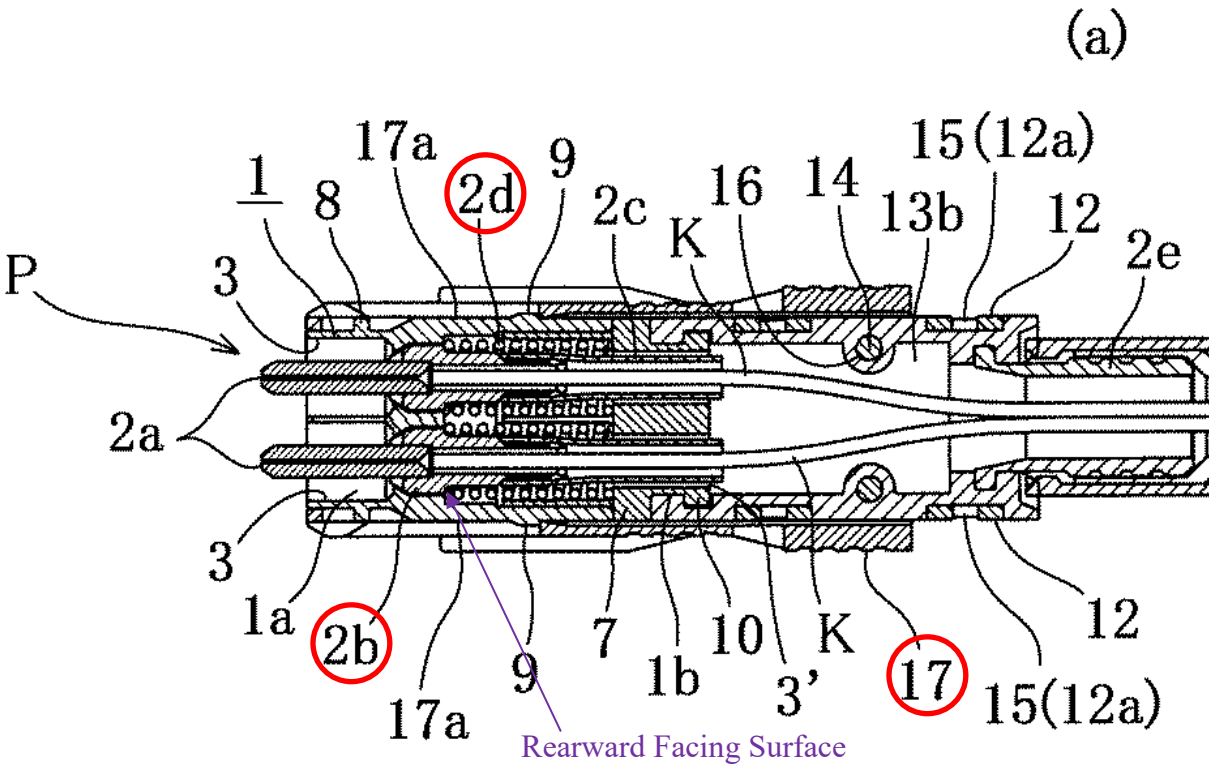
499. Therefore, in my opinion, Toyama meets this limitation.

1.c "two springs, each of the two springs engaging a rearward facing surface of a respective ferrule holder and extending towards the rear end of the housing to bias the ferrule assemblies toward the front end of the housing and retained within the housing;"

500. Toyama discloses two springs (2d) retained within the knob (17).

EX1014: ¶[0024]. Each spring (2d) engages a rearward facing surface of a ferrule

holder (2b) and extends towards the rear end of the knob (17) to bias the ferrule assemblies toward the front end of the knob (17). EX1014: ¶[0024].



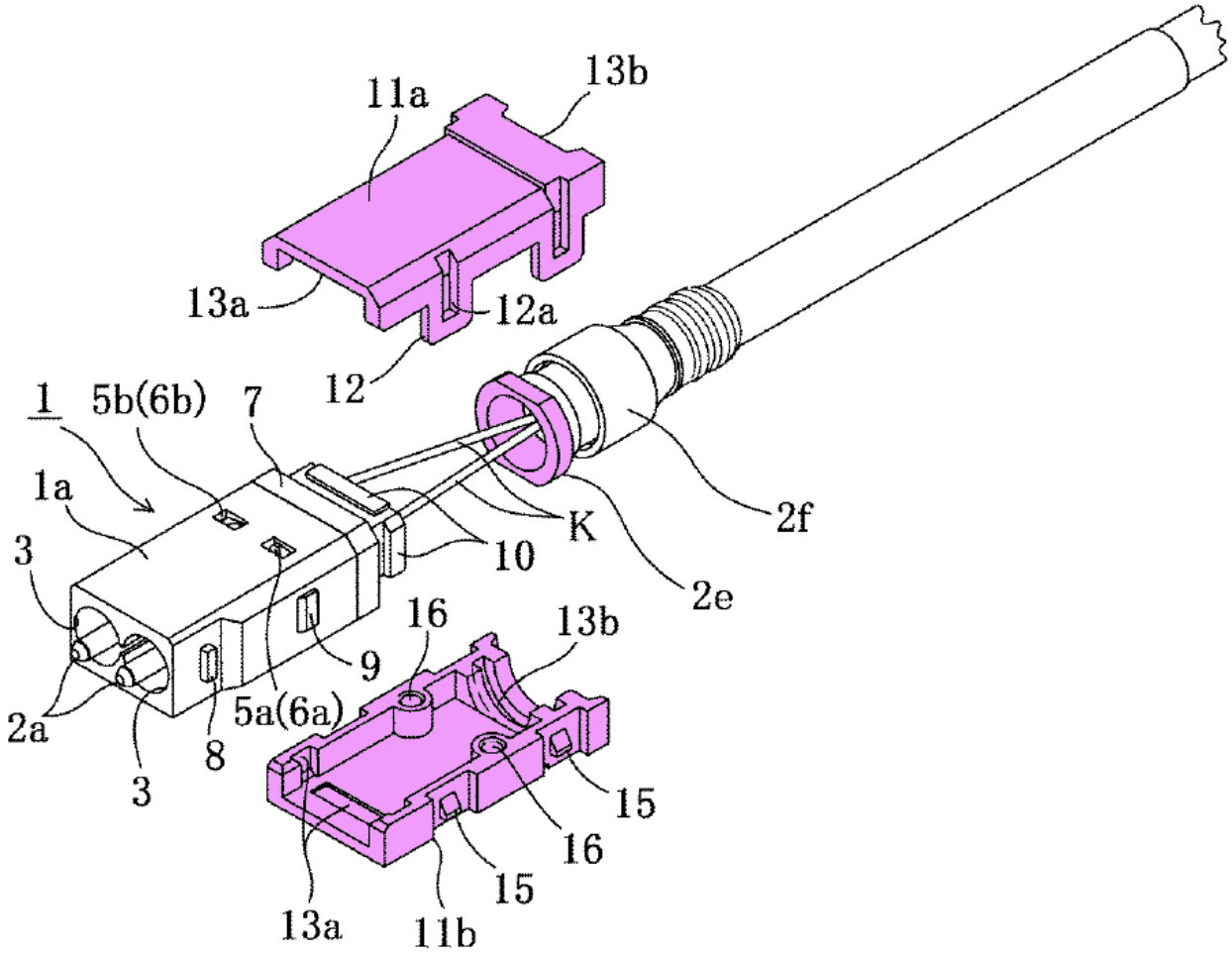
EX1014: Fig. 8(a) (annotated).

501. Therefore, in my opinion, Toyama meets this limitation.

1.d "a crimp body secured to the fiber optic connector and having a rear end forming a singular opening for optical fibers;"

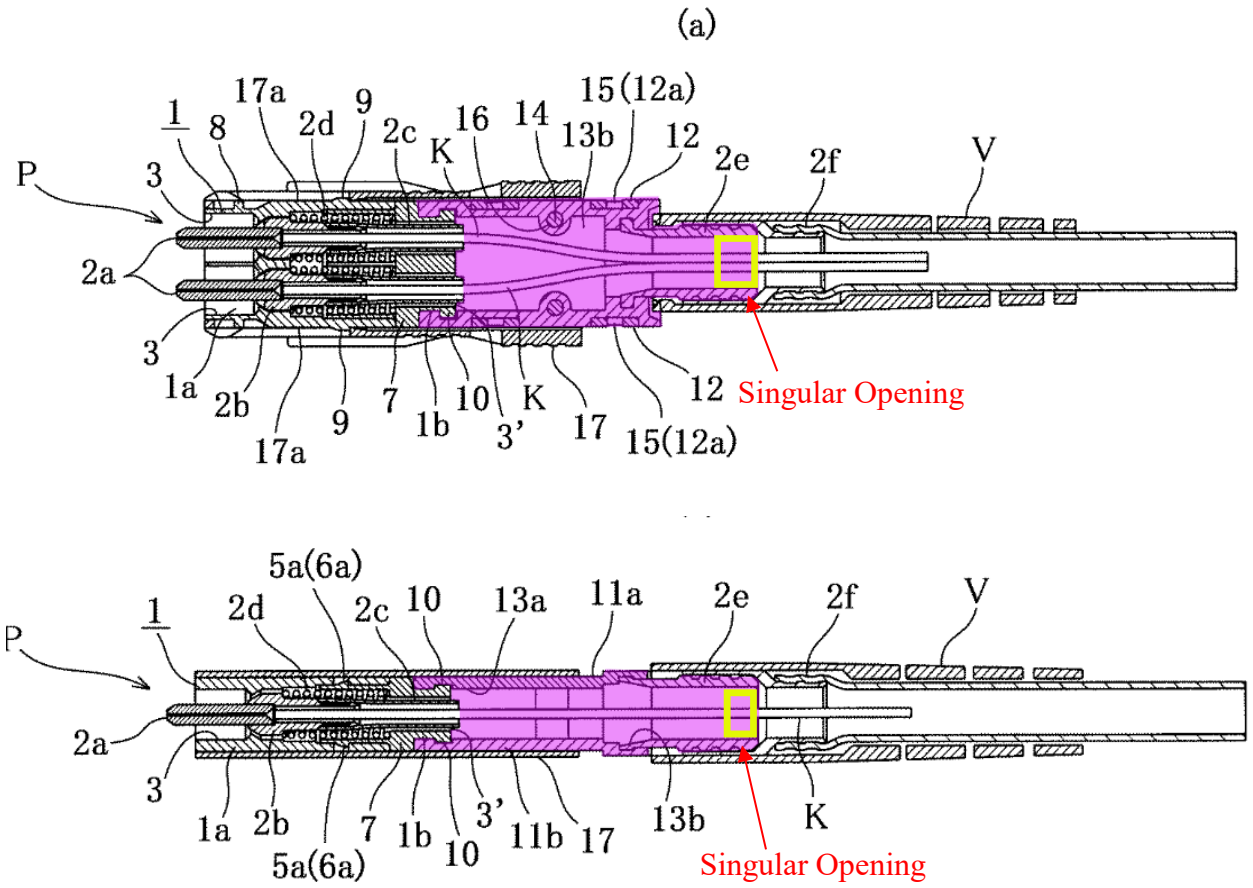
502. Toyama discloses a three-piece crimp body made up of stop ring (2e) (which is a back post for crimped engagement with a crimping ring (2f)) and the holder portions (11a, 11b) clamped onto the case (1) and the stop ring (2e) from

the outside. EX1014: ¶[0022]. The three parts (2e, 11a, 11b) form "a crimp body" and are secured to the plug body (P), specifically the case (1).



EX1014: Fig. 3 (annotated).

503. The stop ring (2e) forms a singular opening at the rear end of Toyama's three-piece crimp body.

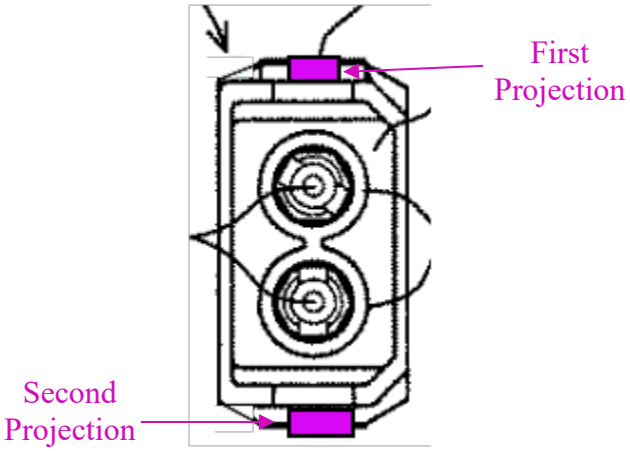


EX1014: Figs. 8(a)&(b) (annotated).

504. Therefore, in my opinion, Toyama meets this limitation.

1.e "a first projection on the top surface and a second projection on the bottom surface of the housing,"

505. As a result of the modification of Toyama in view of Shimozu (Section XVII(A)), Toyama's modified plug body (P) includes a first key (i.e., first projection) on the top surface and a second key (i.e., second projection) on the bottom surface.



EX1014: Fig. 7(a) (annotated, modified).

506. Therefore, in my opinion, the Toyama/Shimozu combination renders this limitation obvious.

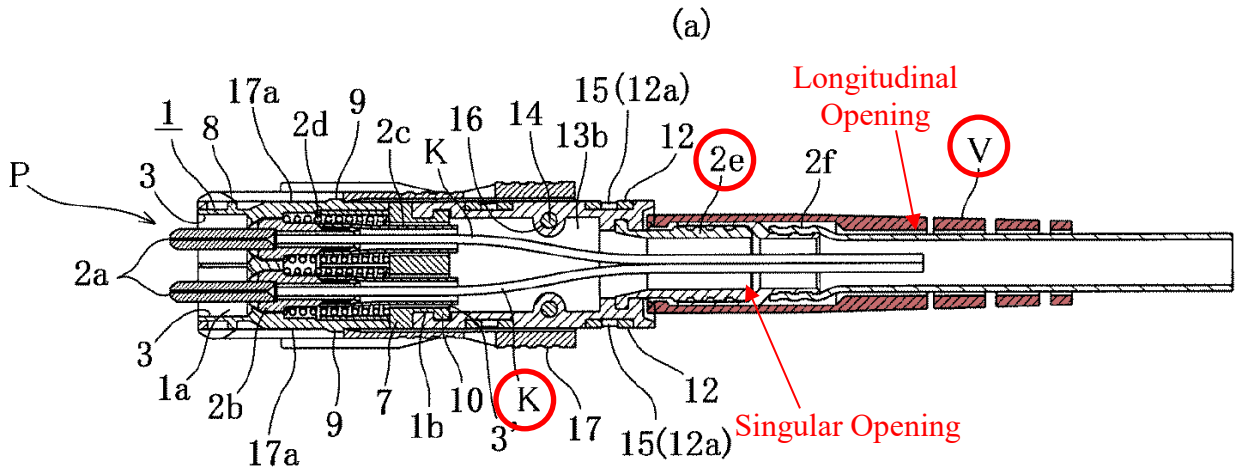
1.f "wherein the first projection is of a different size than the second projection; and"

507. As I explained in Section XVII(A), the added bottom key (i.e., second projection) to Toyama's plug body (P) has a different size (i.e., width) than the added first key (i.e., first projection).

508. Therefore, in my opinion, the Toyama/Shimozu combination renders this limitation obvious.

1.g "a strain relief boot having a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers pass."

509. Toyama discloses a strain relief boot (V) connected to the stop ring (2e). EX1014: ¶[0022]. The boot (V) has a longitudinal opening in continuum with the singular opening of the crimp body through which optical fibers (K) pass.

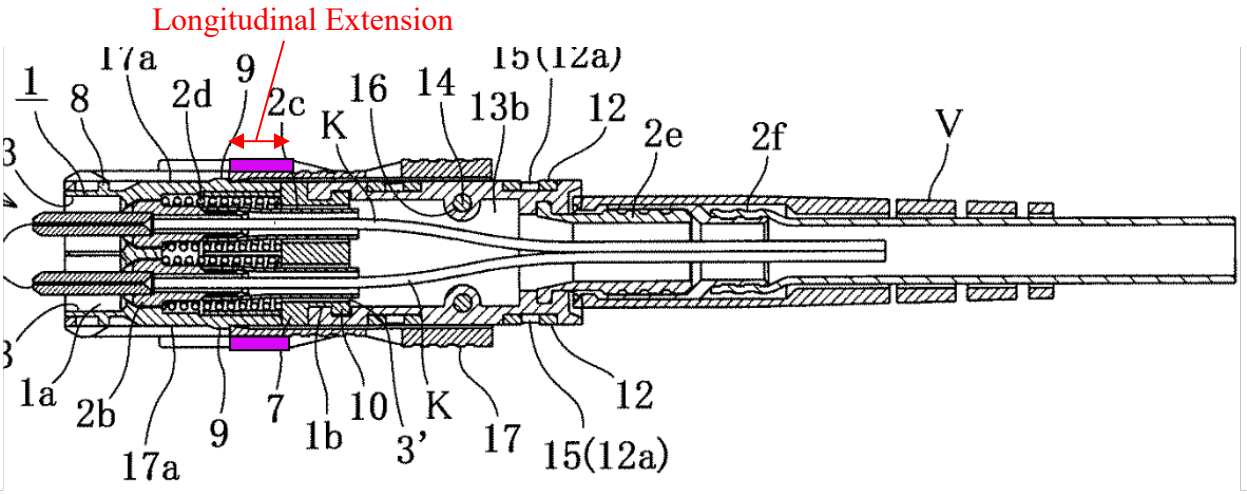


EX1014: Fig. 8(a) (annotated).

510. Therefore, in my opinion, Toyama meets this limitation.

C. Claim 2 "The fiber optic connector according to claim 1, wherein the first projection extends longitudinally along the top surface of the housing."

511. As shown below, the added first key extends longitudinally along the top surface of the knob (17).

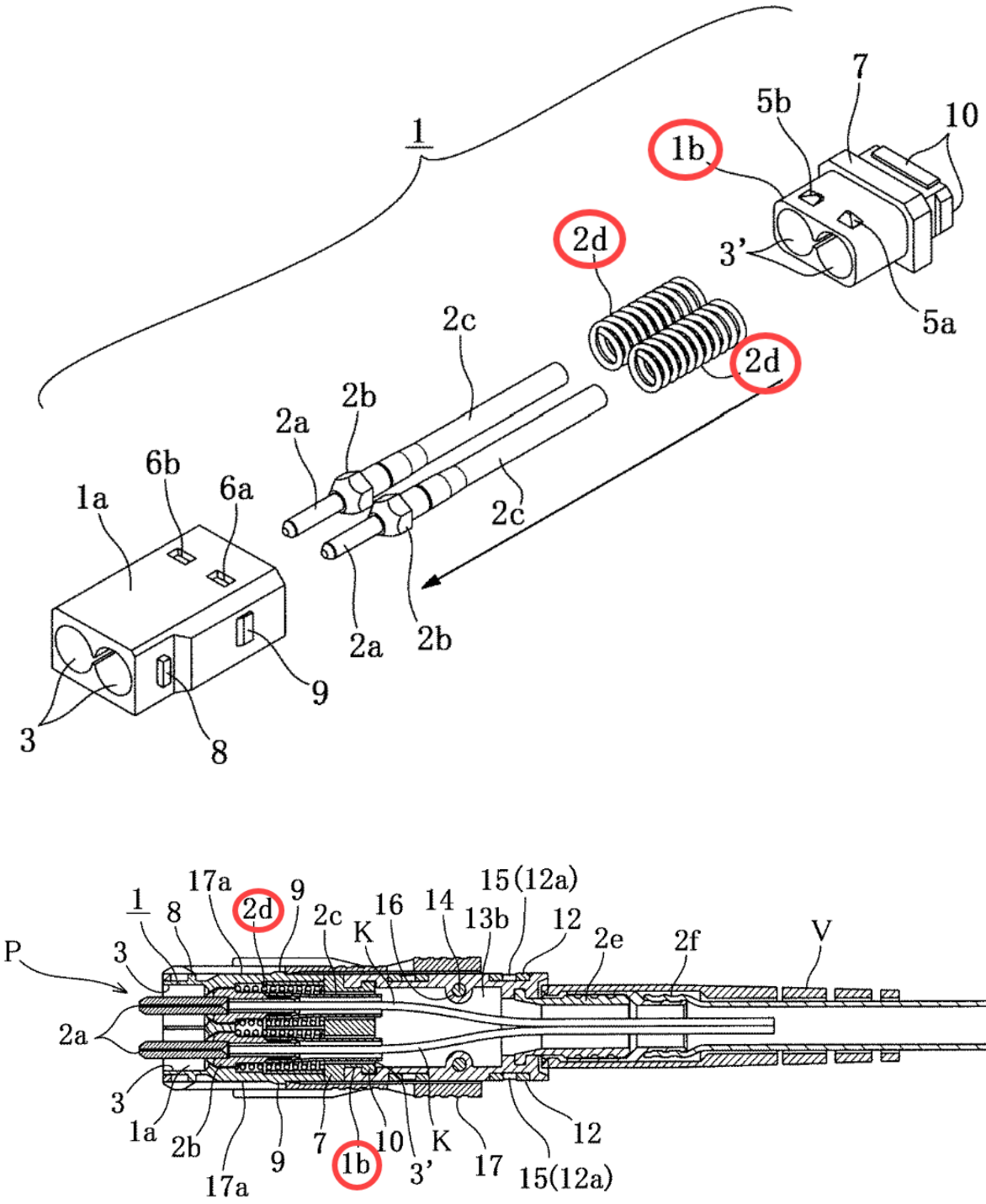


EX1014: Fig. 8(a) (annotated, modified).

512. Therefore, in my opinion, the Toyama/Shimozu combination renders this claim obvious.

D. Claim 3 "The fiber optic connector according to claim 1, further comprising a spring push engaging a rear portion of each of the two springs."

513. Toyama discloses a rear case portion (1b), which is a spring push, that engages rear portions of the springs (2d). EX1014: ¶[0022].

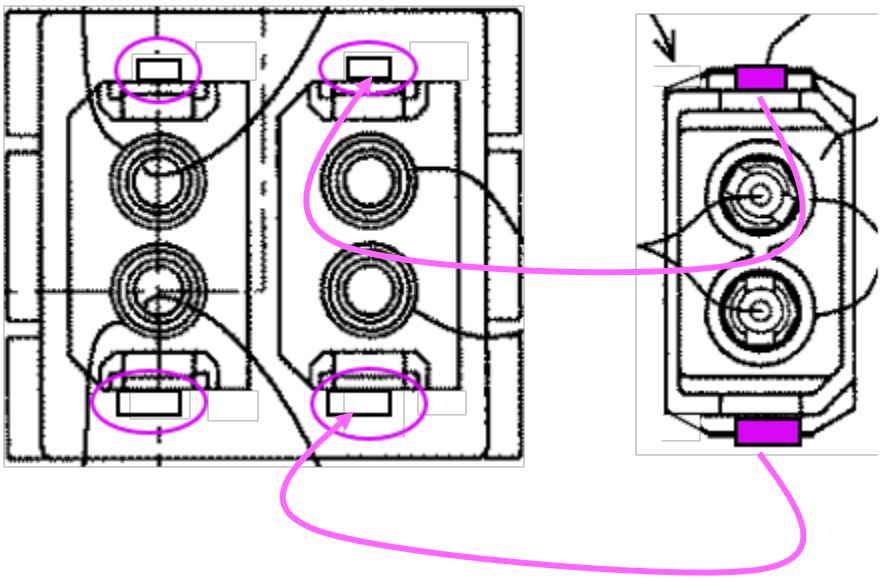


EX1014: Figs. 1 and 8(a) (annotated).

514. Therefore, in my opinion, Toyama meets this claim.

E. Claim 4 "The fiber optic connector according to claim 1, wherein the first projection and the second projection determine a correct orientation or polarity of the housing during an insertion into an adapter."

515. In Toyama's modified plug body (P), the first key (i.e., first projection) and the second key (i.e., second projection) determine a correct orientation and/or polarity of the knob (17) during an insertion into Toyama's modified adapter (20). The narrow first key must align with the narrow keyway in Toyama's modified adapter (20), and the wider second key must align with the wider keyway in Toyama's modified adapter. Toyama's modified plug body (P) will not mate with Toyama's modified adapter (20) if inserted upside down.



EX1014: Figs. 7(a) and 10(a) (annotated, modified).

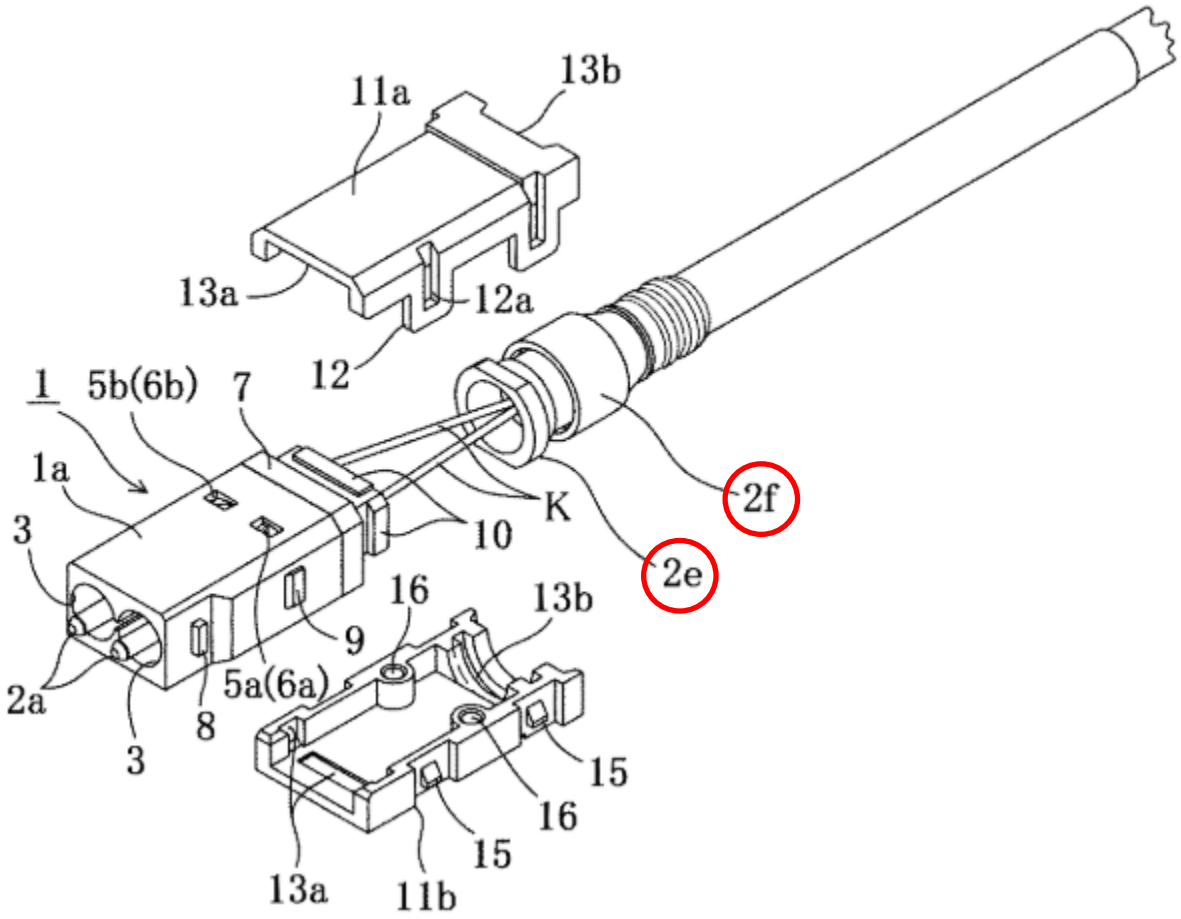
516. Therefore, in my opinion, the Toyama/Shimozu combination renders this claim obvious.

F. Claim 5

5.a "The fiber optic connector according to claim 1, further comprising: a crimp band secured around an outer surface of the rear end of the crimp body, and"

517. Toyama discloses a crimping ring (2f), which is "a crimp band." EX1014: ¶[0022]. The crimping ring (2f) is secured around an outer surface of the stop ring (2e). EX1014: ¶[0022].

【図３】

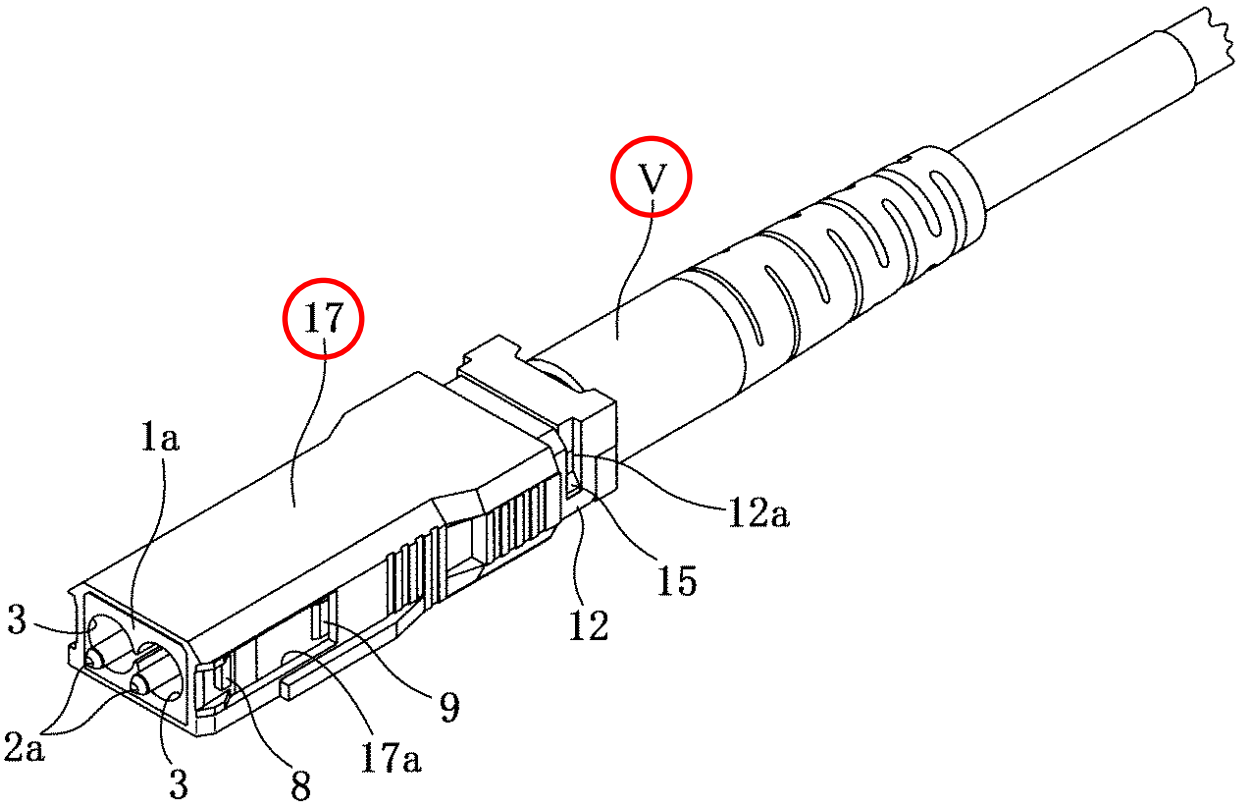


EX1014: Fig. 3 (annotated).

518. Therefore, in my opinion, Toyama meets this limitation.

5.b "wherein the strain relief boot extends rearwardly away from the housing."

519. The boot (V) extends rearwardly away from the rear end of the knob (17).



EX1014: Fig. 6 (annotated).

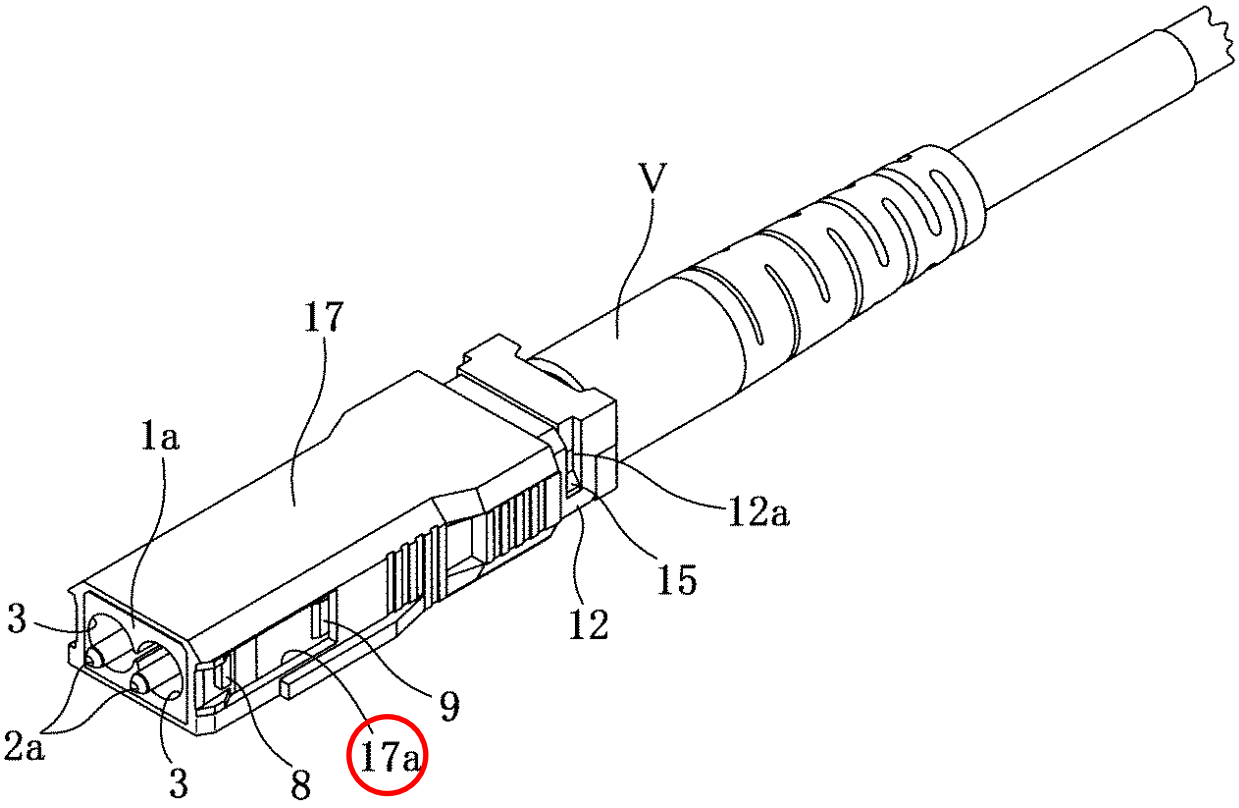
520. Therefore, in my opinion, Toyama meets the limitation.

G. Claim 6 "The fiber optic connector according to claim 1, wherein each of the top surface and the bottom surface has a receiving area for a latch component to secure the fiber optic connector to an adapter."

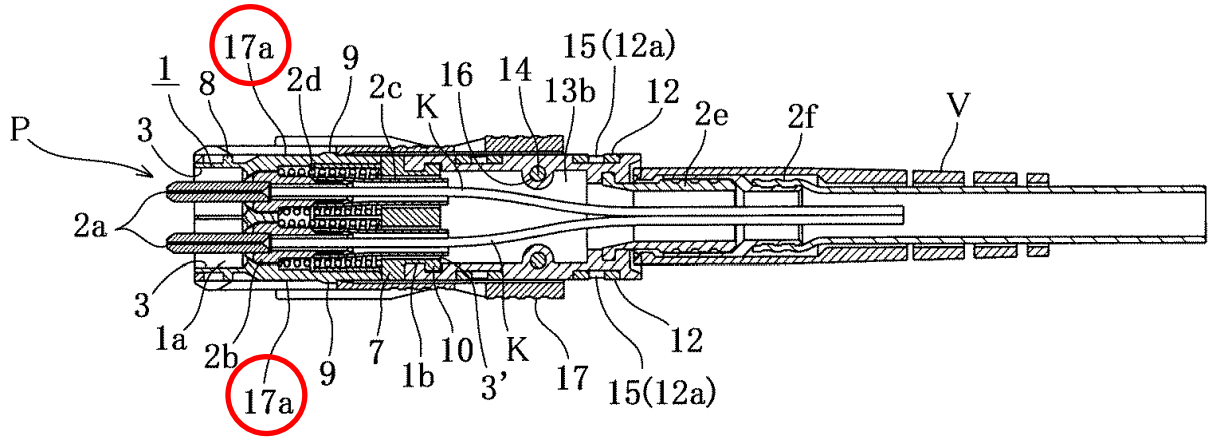
521. Each of the top and bottom surfaces of Toyama's knob (17) includes openings (17(a)) (i.e., a receiving area), for elastic pieces (21) (i.e., a latch

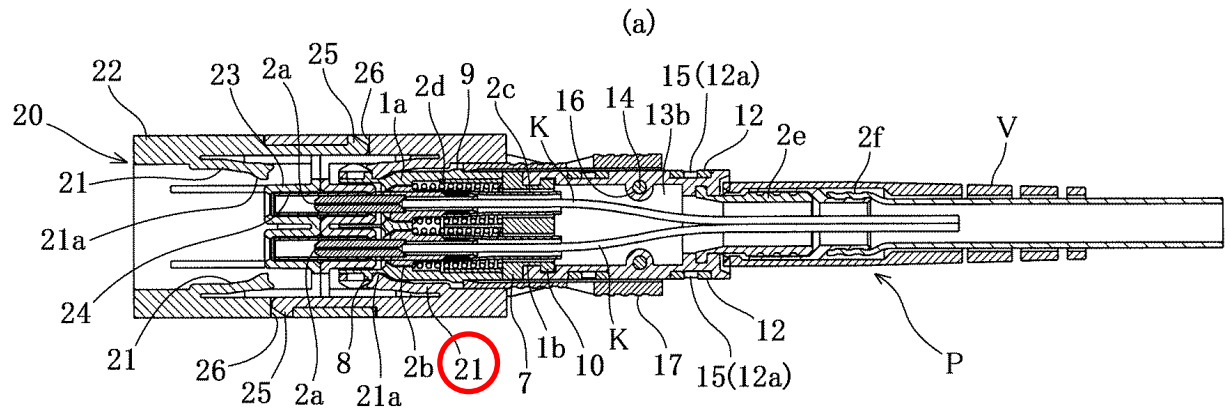
component) of the adapter (20) to secure the plug body (P) to the adapter.

EX1014: ¶¶[0035], [0045]-[0047].



(a)



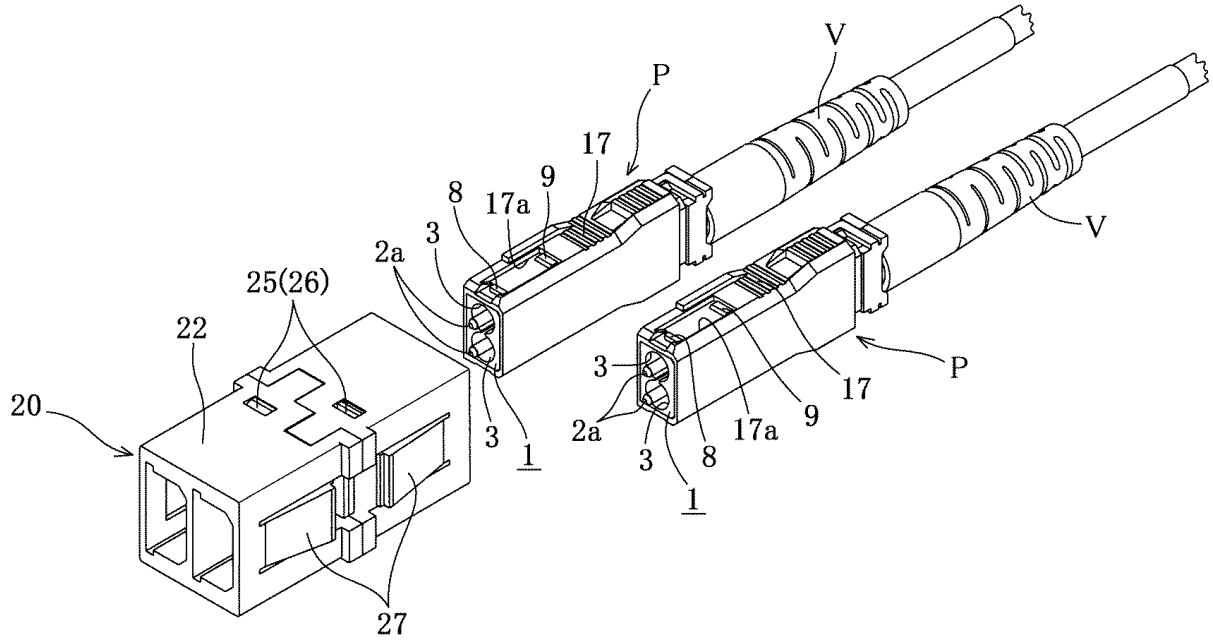


EX1014: Figs. 6, 8(a), and 21 (annotated).

522. Therefore, in my opinion, Toyama meets this claim.

H. Claim 7 "The fiber optic connector of claim 6, wherein the fiber optic connector is configured to receive a push force to insert the fiber optic connector into an adapter or a pull force to release the latch component from the adapter."

523. Toyama's plug body (P) receives a push force for insertion into the adapter (20). EX1014: Fig. 11, ¶[0045] ("Pushing in the plug body P further causes the engaging elastic piece 21 to return to its original position elastically, and the engaging protrusion 21a at the tip engages the engaging portion 8 to fix it in place."). Toyama's plug body (P) receives a pull force for releasing the plug body from the adapter (20). EX1014: Fig. 11, ¶¶[0046]-[0047] ("pulling the plug body P out of the connection opening end of the adapter 20, the knob 17 is held at both ends with the thumb and forefinger to forcefully pull out the plug body P").

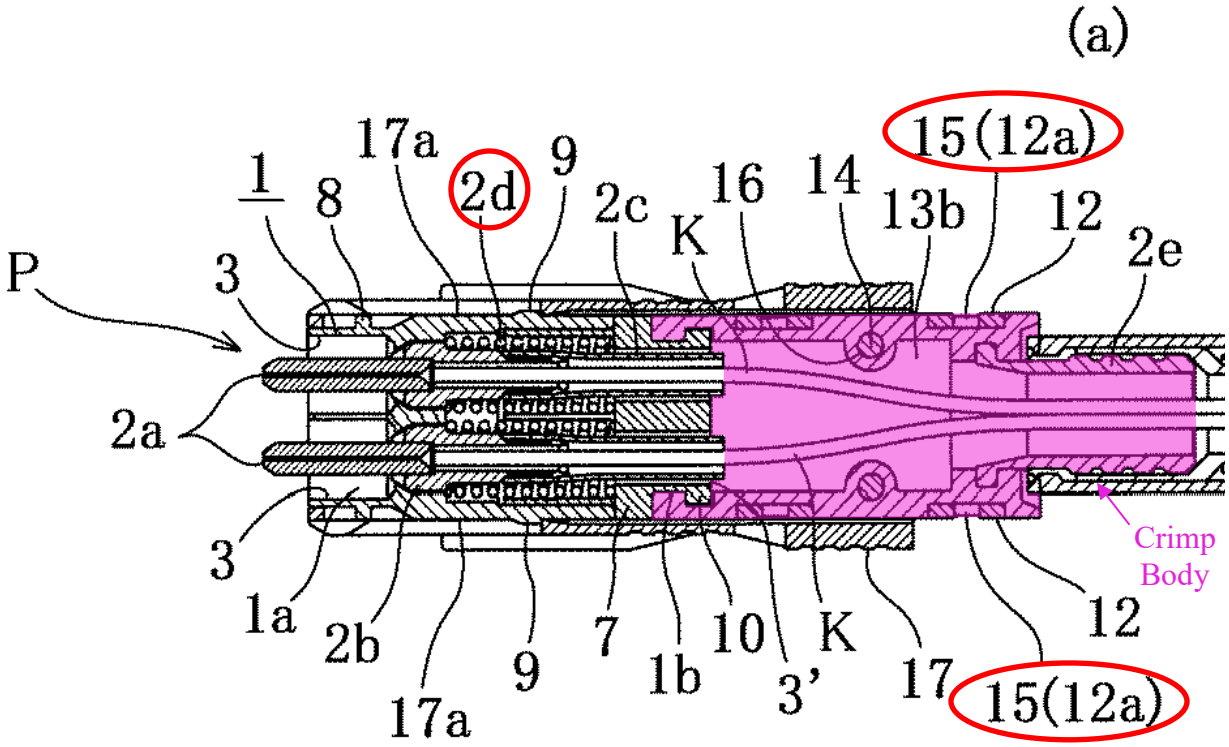


EX1014: Fig. 11.

524. Therefore, in my opinion Toyama meets this claim.

I. Claim 10 "The fiber optic connector according to claim 1, wherein the crimp body is located such that the two springs are positioned between a top portion and a bottom portion thereof."

525. Toyama's springs (2d) are positioned between top and bottom portions of Toyama's three-piece crimp body (2e, 11a, 11b), such as the mating pieces (12) and locking protrusions (15) thereof. EX1014: ¶¶[0029]-[0030].



EX1014: Fig. 8(a) (annotated)

526. I note that this is no different than how the springs (122, 1122) are shown in the '994 patent as being between top and bottom portions of the crimp body (106, 1106).

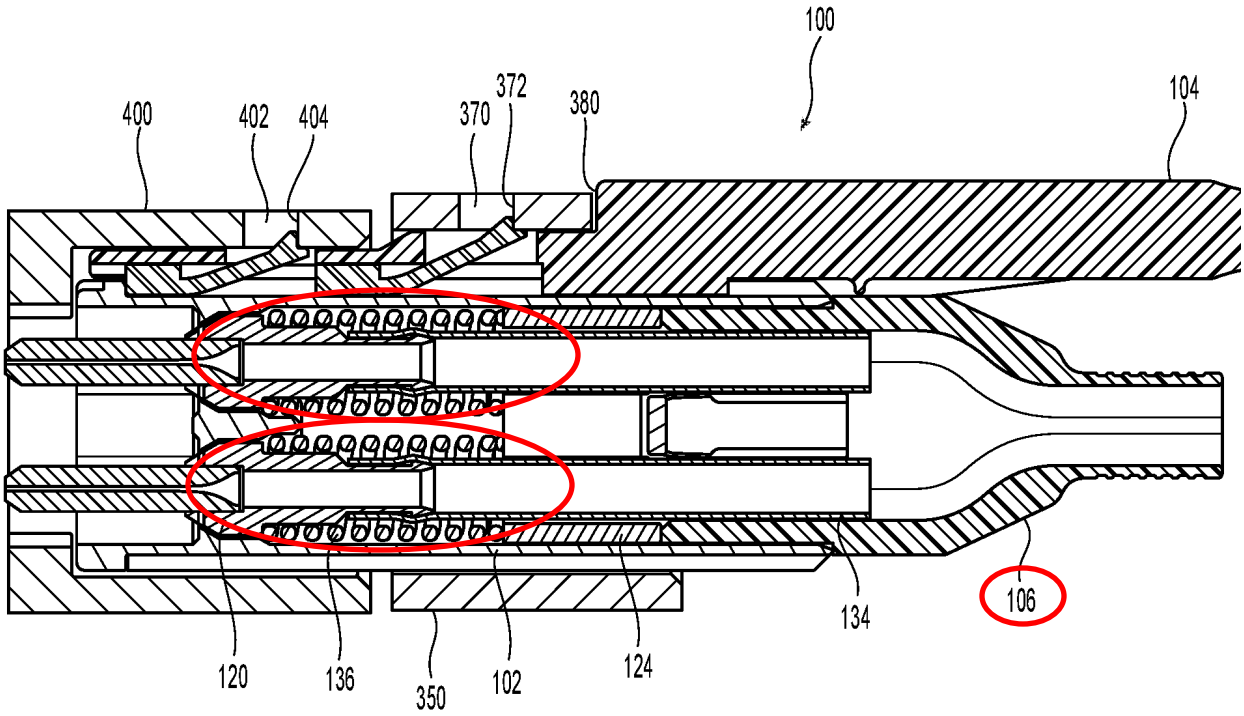


Fig. 21

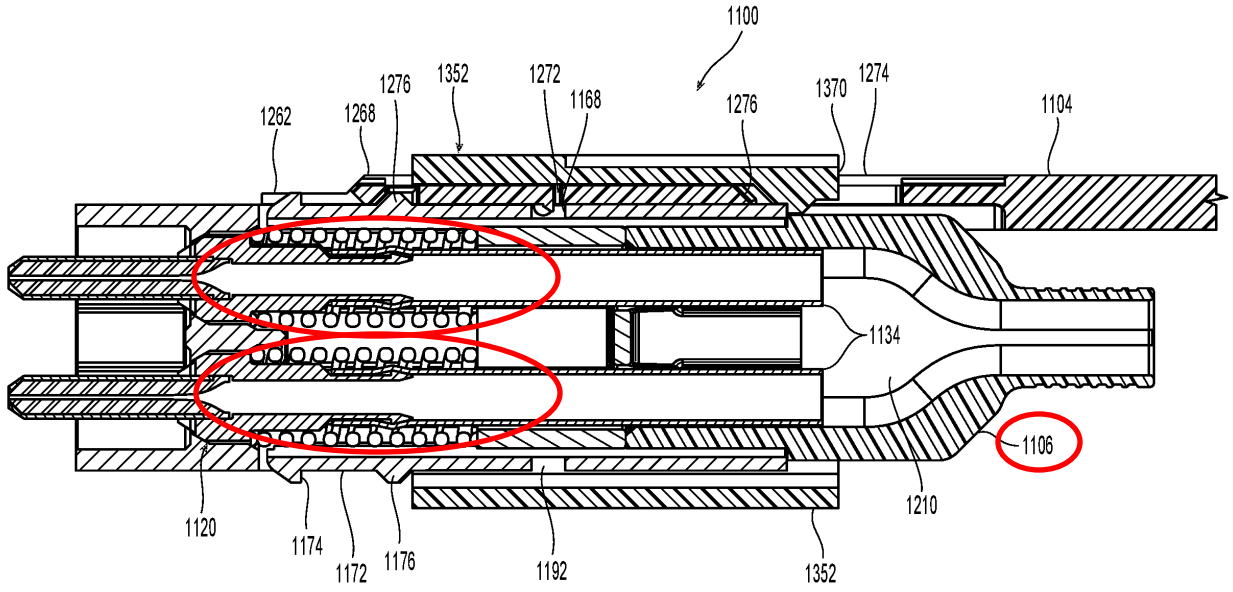


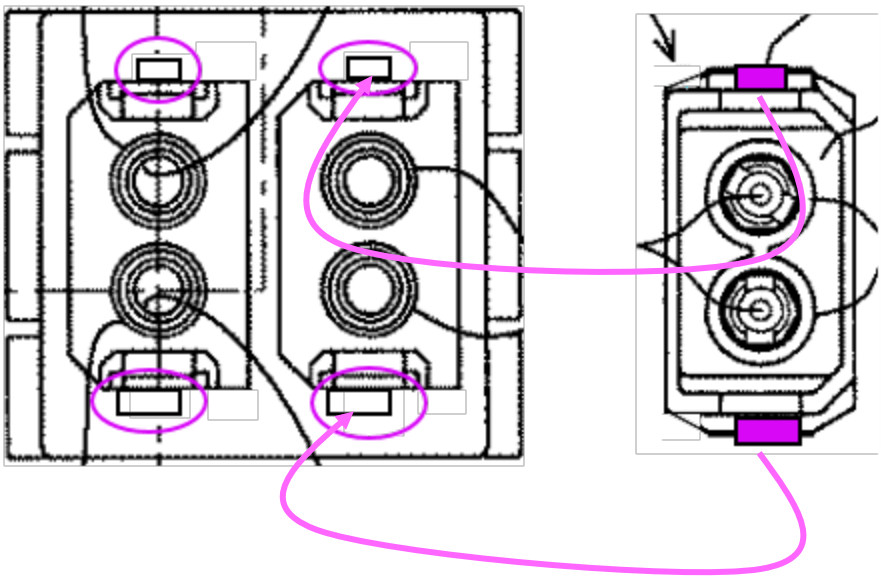
Fig. 33

EX1001: Figs. 21 and 33 (annotated).

527. Therefore, in my opinion, Toyama meets this claim.

J. Claim 11 "The fiber optic connector according to claim 1, wherein the first projection and the second projection are sized to fit inside respective grooves of an adapter."

528. As I explained in Section XVII(A), in Toyama's modified plug body (P), the first and second keys (i.e., first and second projections) are sized to fit within respective keyways (i.e., grooves) of Toyama's modified adapter (20).



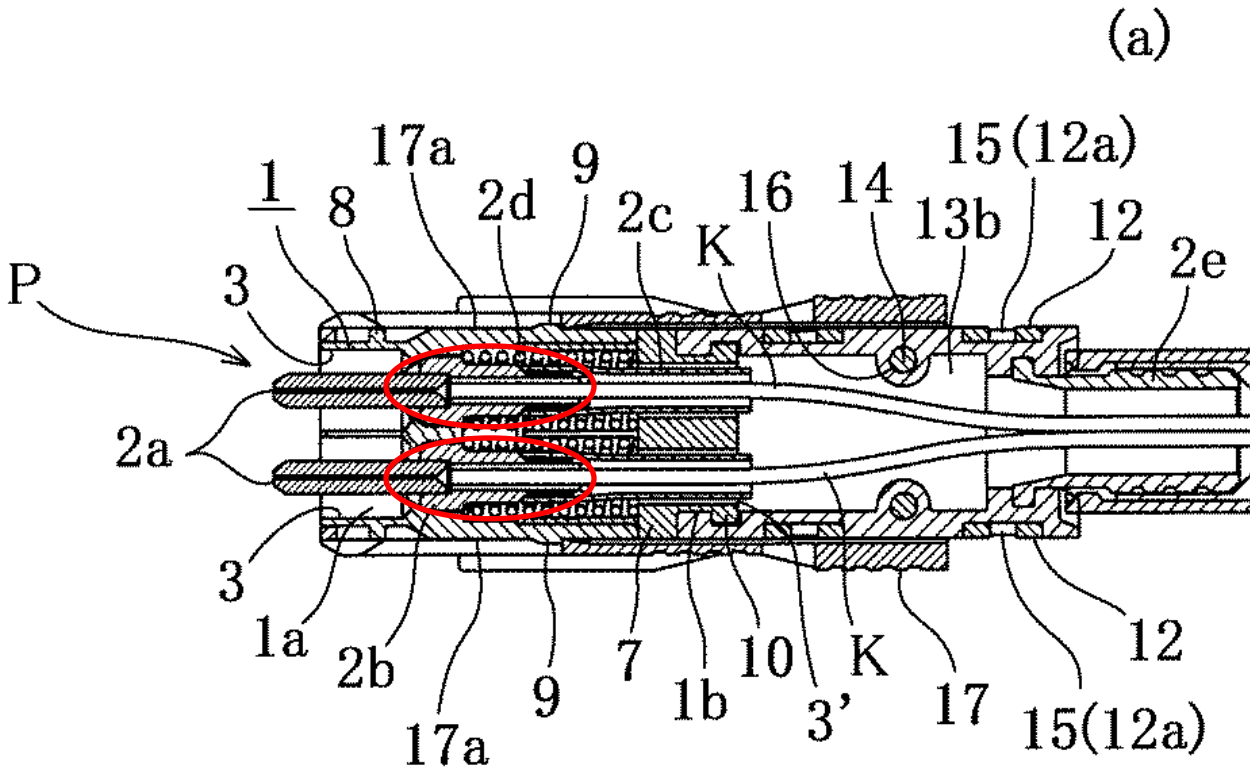
EX1014: Figs. 7(a) and 10(a) (annotated, modified).

529. Therefore, in my opinion, the Toyama/Shimozu combination renders this claim obvious.

K. Claim 12 "The fiber optic connector according to claim 1, wherein each of the ferrule assemblies is separated from the other ferrule assembly by a wall between respective ferrule seats of the fiber optic ferrules of each of the ferrule assemblies, the wall

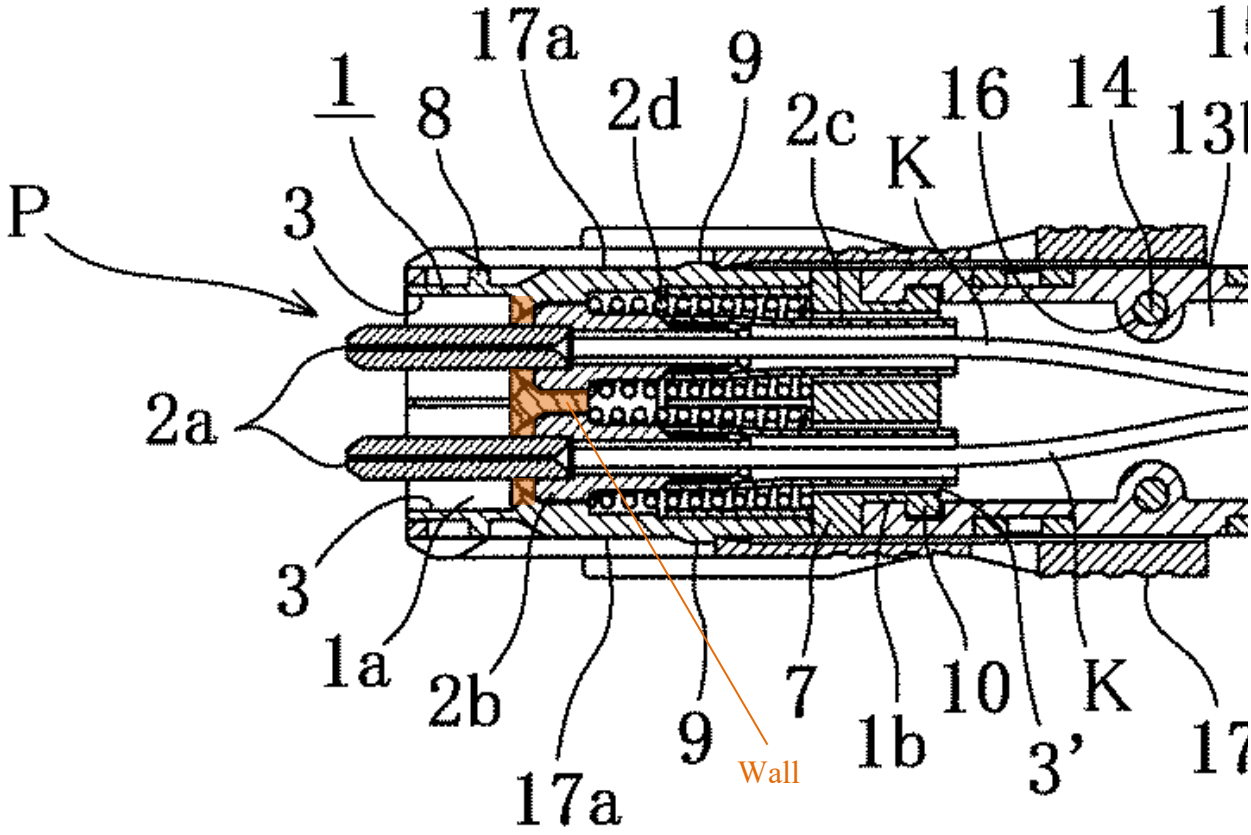
located between the top surface and the bottom surface of the main body of the housing."

530. Toyama discloses ferrules (2a) seated in respective ferrule holders (2b), which are seated in respective openings (3) in the front case portion (1a). EX1014: ¶¶[0022]-[0023]. Under any possible construction of "respective ferrule seats of the fiber optic ferrules of each of the ferrule assemblies," two ferrule seats are located in the circled areas below.



EX1014: Fig. 8a (annotated).

531. The case (1) includes a wall separating the ferrule assemblies between the locations where the ferrule assemblies are seated in the case and the wall is between the top and bottom surfaces of the knob (17).



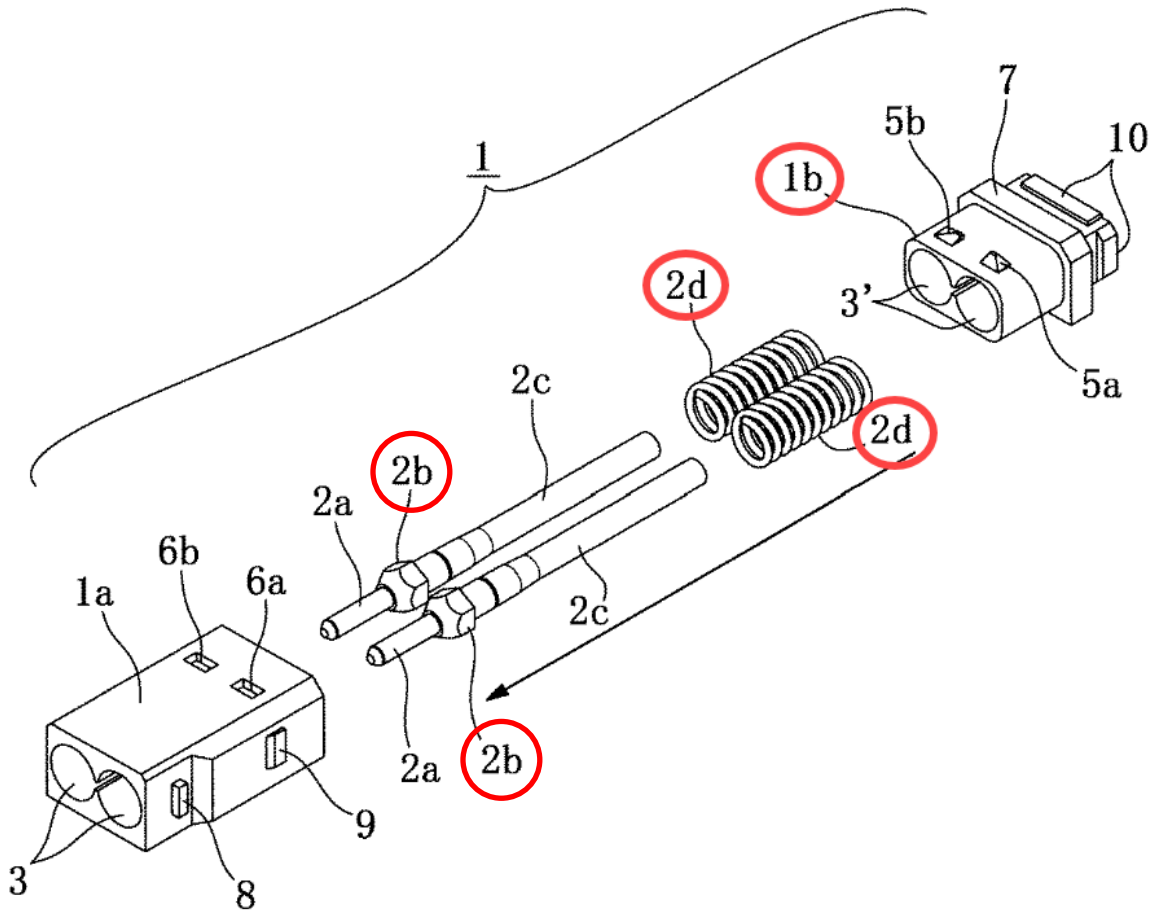
EX1014: Fig. 8a (annotated).

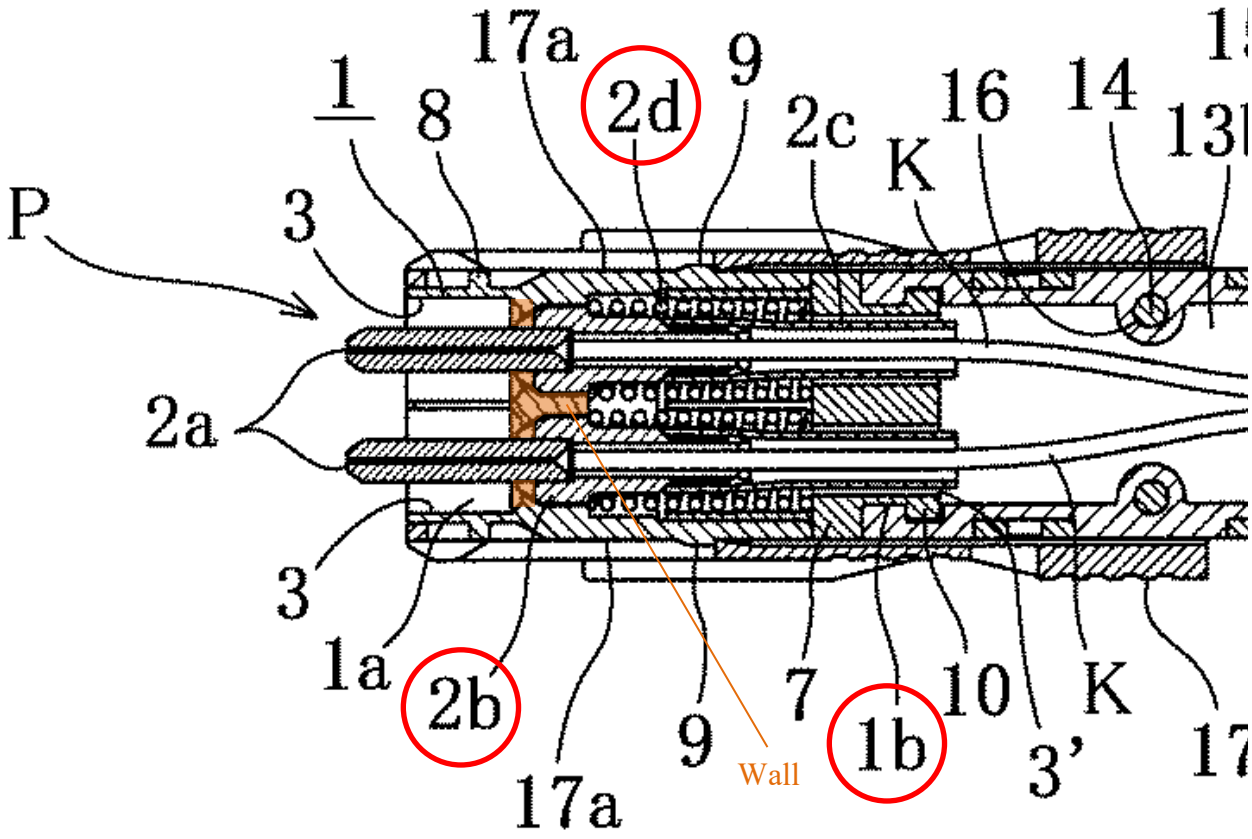
532. Therefore, in my opinion, Toyama meets this claim.

L. Claim 13 "The fiber optic connector according to claim 12, wherein spring push simultaneously compresses each of the two

springs between the crimp body and the first and second ferrule flanges engaged with the wall."

533. The rear case portion (1b) is a spring push that simultaneously compresses the springs (2d) between the three-piece crimp body (2e, 11a, 11b) and the ferrule flanges (2b) engaged with the wall. EX1014: ¶[0022].





EX1014: Figs. 1 and 8(a) (annotated).

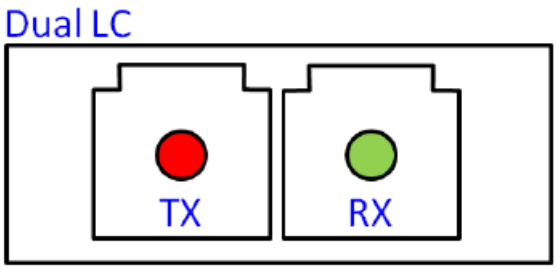
534. Therefore, in my opinion, Toyama meets this claim.

XVIII. OBVIOUS: TOYAMA, SHIMOZU, & QSFP-DD (GROUND 14)

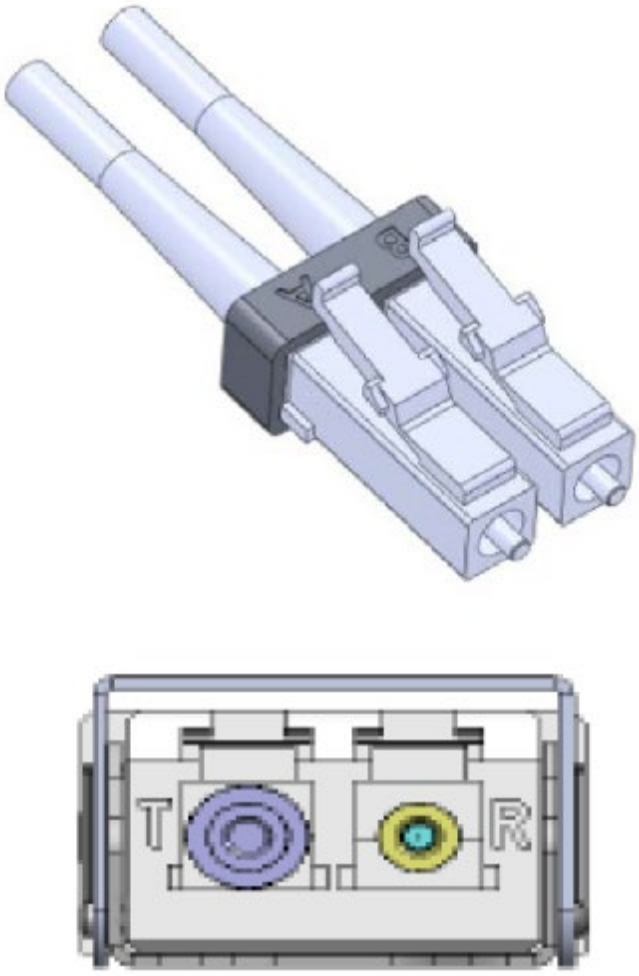
535. In my opinion, claim 8 would have been obvious over Toyama and Shimozu or obvious over Toyama, Shimozu, and QSFP-DD.

A. Claim 8 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a QSFP footprint."

536. Toyama discloses that, in comparison with standard LC components, its connection system "doubles the number of core wires that can be installed in communication equipment over the same area." EX1014: ¶[0015]. As shown below, QSFP-DD discloses that a QSFP footprint can accommodate two LC connectors containing a total of two LC core wires. EX1015: Fig. 33. Therefore, since Toyama teaches that its connection system accommodates double the number of core wires in the same area, Toyama is understood to teach that its connector would fit two double-core plug bodies (P) in the same QSFP footprint that accommodates two single-core LC plug bodies.

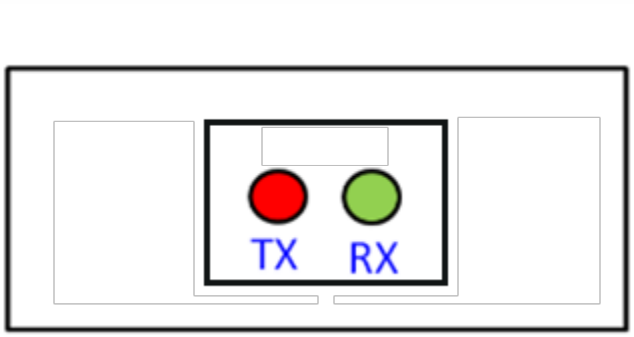


EX1015: Fig. 33.



EX1015: Fig. 37 (showing a conventional LC duplex connector and receptacle (called an "LC two-core slim-pack adapter" in Toyama) (EX1014: ¶[0015])).

537. If it is contested whether two Toyama plug bodies (P) could fit in a QSFP footprint, as shown below, it is beyond dispute that one Toyama plug body (P) would fit in a QSFP footprint if oriented so that the long sides of the plug body (P) are parallel to the long sides of the QSFP footprint, which meets the requirements of claim 8.



EX1014: Fig. 33 (modified to show how a single Toyama connector would easily fit within the QSFP footprint).

538. Thus, the front end of Toyama's knob (17) fits in a QSFP footprint.

539. Therefore, in my opinion, the Toyama/Shimozu or the Toyama/Shimozu/QSFP-DD combination renders this claim obvious.

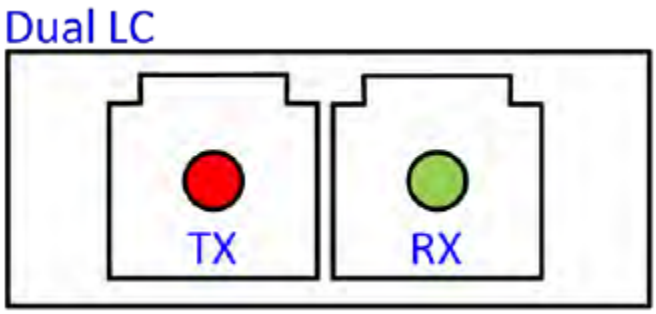
XIX. OBVIOUS: TOYAMA, SHIMOZU, & QSFP-DD (GROUND 14)

540. In my opinion, claim 8 would have been obvious over Toyama and Shimozu or obvious over Toyama, Shimozu, and SFP-DD.

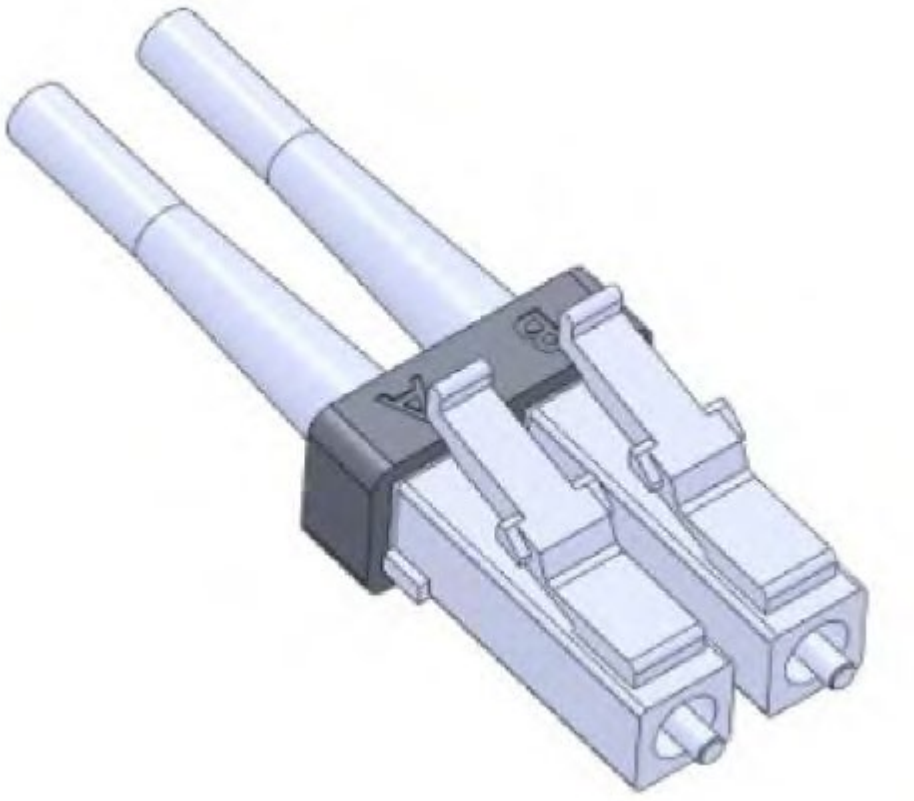
A. Claim 9 "The fiber optic connector according to claim 1, wherein the front end of the housing fits in a SFP footprint."

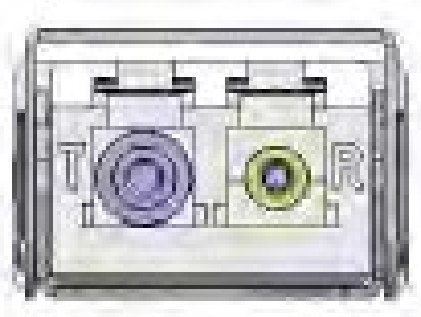
541. Toyama discloses that, in comparison with standard LC components, its connection system "doubles the number of core wires that can be installed in communication equipment over the same area." EX1014: ¶[0015]. As shown below, SFP-DD discloses that a SFP footprint can accommodate two LC connectors containing a total of two LC core wires. EX1016: Fig. 16. Therefore, since Toyama teaches that its connection system accommodates double the number

of core wires in the same area, Toyama is understood to teach that its connector would fit two double-core plug bodies (P) in the same SFP footprint that accommodates two single-core LC plug bodies.



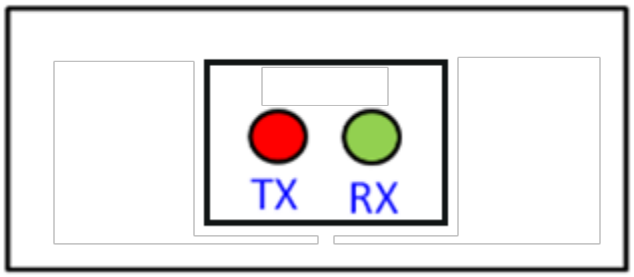
EX1016: Fig. 22.





EX1016: Fig. 24 (showing a conventional LC duplex connector and receptacle (called an "LC two-core slim-pack adapter" in Toyama) (EX1014: ¶[0015])).

542. If it is contested whether two Toyama plug bodies (P) could fit in a SFP footprint, as shown below, it is beyond dispute that one Toyama plug body (P) would fit in a SFP footprint if oriented so that the long sides of the plug body (P) are parallel to the long sides of the SFP footprint, which meets the requirements of claim 9.



EX1016: Fig. 22 (modified to show how a single Toyama connector would easily fit within the SFP footprint).

543. Thus, the front end of Toyama's knob (17) fits in a SFP footprint.

544. Therefore, in my opinion, the Toyama/Shimozu or the Toyama/Shimozu/SFP-DD combination renders this claim obvious.

XX. OBVIOUS: TOYAMA, SHIMOZU & HILL (GROUND 16)

545. In my opinion, claims 14 and 15 would have been obvious over Toyama in view of Shimozu and Hill.

A. Claim 14 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an angled physical contact (APC) ferrule."

546. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Angled physical contact" or APC as recited by claim 14 is a common polish type for the end of fiber optic ferrules. EX1028: 3-4. As known in the art, APC type polish offers the lowest return loss (amount of light reflected back by the end face of the optical fiber). EX1029: 3.

547. In my opinion, it would have been obvious to modify Toyama's plug body (P), as modified in view of Shimozu, in further view of Hill.

548. Toyama's plug body (P) has LC-type ferrules (2a). EX1014: ¶[0015], Fig. 1. However, Toyama is silent about the type of polishing used for the LC-type ferrules (2a).

549. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

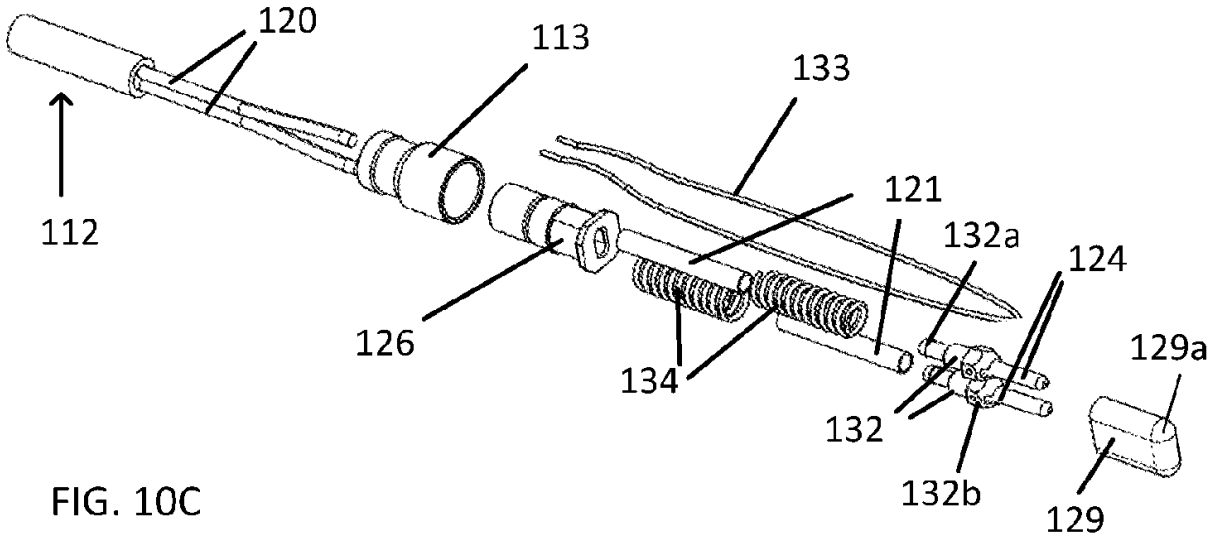


FIG. 10C

EX1007: Fig. 10C.

550. In my opinion, it would have been obvious to make the ferrules (2a) of Toyama's plug body (P) an "angled physical contact" type of ferrule in view of Hill. Toyama already discloses that its ferrules (2a) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes for LC ferrules, which is well known to be particularly useful for single mode (SM) fiber applications requiring lowest return loss. EX1029: 3; EX1030: 2. Making Toyama's ferrules (2a) an "angled physical contact" type of ferrule makes Toyama's plug body (P) suitable for single mode, "high bandwidth applications and long haul links" sensitive to return loss, such as "FTTx (fiber to the x), passive optical network (PON) and wavelength-division multiplexing (WDM)" applications. EX1029: 3.

551. This modification is nothing more than a simple substitution of one known element (Hill's LC/APC type ferrule) for another (Toyama's ferrule) to yield predictable results (an APC optical connector for lowest return loss applications).

552. This modification would have also been nothing more than the application of a known technique (Hill's APC ferrule polish type) to improve a similar device (Toyama's ferrules) in the same way to yield predictable results (an APC optical connector for lowest return loss applications).

553. This modification would have also been obvious to try as APC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Toyama's plug body (P) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used. Further, the specific polish type is generally specified by each customer application.

554. There would have been a reasonable expectation of success in making this modification given that both Toyama's and Hill's ferrules are of LC-type. EX1014: ¶[0014], Fig. 1; EX1007: ¶[0058].

555. As a result of this modification, the ferrules (2a) in Toyama's plug body (P) are APC ferrules.

556. Therefore, in my opinion, the Toyama/Shimozu/Hill combination renders this claim obvious.

B. Claim 15 "The fiber optic connector according to claim 1, wherein the fiber optic ferrule is an ultra-physical contact (UPC) ferrule."

557. The end of an optical ferrule is polished (after the optical fiber has been inserted, epoxied, and cured within the ferrule), to finish the end of the optical fiber to allow optical signals (e.g., light) to pass into and/or out of the end of the optical fiber with minimal loss of the light signal. "Ultra-physical contact" or UPC

as recited by claim 15 is another common polish type for the end of fiber optic ferrules. EX1028: 3. As known in the art, UPC type polish offers single mode (SM) fiber applications low return loss at a low cost. EX1029: 3.

558. In my opinion, would have been obvious to modify Toyama's plug body (P), as modified in view of Shimozu, in further view of Hill.

559. Toyama's plug body (P) has LC-type ferrules (2a). EX1014: ¶[0015], Fig. 1. However, Toyama is silent about the type of polishing used for the LC-type ferrules (2a).

560. Hill discloses another two-ferrule optical fiber connector and teaches that the ferrules "may be of the type LC APC (angle-polished connectors) as shown, or of the type LC UPC (ultra-polished ferrules)." EX1007: Fig. 10C, ¶[0058]. As known in the art, the acronym "APC" stands for "angle-physical contact" and the acronym "UPC" stands for "ultra-physical contact." EX1028: 3-4, EX1029: 1-2; EX1030: 1. These acronyms "APC" and "UPC" have also come to be known more broadly in the art as standing for "Angle Polished Connector" and "Ultra Polished Connector," respectively. Conventionally, UPC is deployed as the default polish for SM Fiber applications that require 45dB or lower return loss. APC polishing is deployed for SM Fiber applications when 55dB or lower return loss is required.

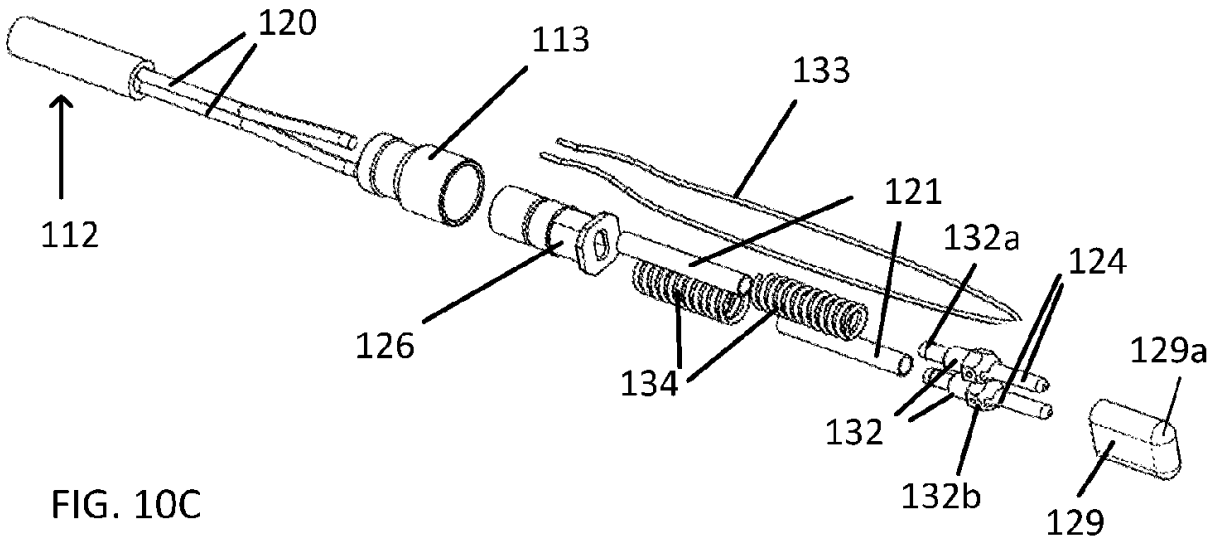


FIG. 10C

EX1007: Fig. 10C.

561. In my opinion, it would have been obvious to make the ferrules (2a) of Toyama's plug body (P) an "ultra-physical contact" type of ferrule in view of Hill. Toyama already discloses that its ferrules (2a) are LC-type (same as Hill), and the modification is nothing more than selecting one of the two most common types of polishing processes LC ferrules, which is well known to be particularly useful for single mode (SM) fiber applications requiring low return loss while being cheaper than other polish types, such as APC. EX1029: 3. Making Toyama's ferrules (2a) an "ultra-physical contact" type of ferrule makes Toyama's plug body (P) suitable for more budget conscious applications while still providing low return loss. EX1029: 3; EX1030: 2.

562. This modification is nothing more than a simple substitution of one known element (Hill's LC/UPC type ferrule) for another (Toyama's ferrule) to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

563. This modification would have also been nothing more than the application of a known technique (Hill's UPC ferrule polish type) to improve a similar device (Toyama's ferrules) in the same way to yield predictable results (an UPC optical connector for low return loss and budget applications (such as specified SM fiber applications)).

564. This modification would have also been obvious to try as UPC is one of a finite number of polish types for LC ferrules. There are four polish types for LC ferrules—flat polish, physical contact, ultra-physical contact, and angled physical contact. EX1028: 3-4. The POSA knows the LC ferrules of Toyama's plug body (P) needs one of these polish types in order to adequately transfer optical signals, and either UPC or APC are commonly used. Further, the specific polish type is generally specified by each customer application.

565. There would have been a reasonable expectation of success in making this modification given that both Toyama's and Hill's ferrules are of LC-type. EX1009: ¶[0015], Fig. 1; EX1007: ¶[0058].

566. As a result of this modification, the ferrules (2a) in Toyama's plug body (P) are UPC ferrules.

567. Therefore, in my opinion, the Toyama/Shimozu/Hill combination renders this claim obvious.

XXI. SECONDARY CONSIDERATIONS

568. I understand that to date Patent Owner has not identified any secondary considerations of non-obviousness. In the event that the Patent Owner identifies any secondary considerations in the future, I may supplement my opinion to address them.

XXII. TAKANO'209, TAKANO'369, AND WONG ARE SUPPORTED BY THEIR RESPECTIVE PROVISIONAL APPLICATIONS

569. I understand that the non-provisional applications that published as Takano'209 and issued as Takano'369 and Wong were filed after the earliest priority date of the '994 Patent. I also understand that Takano'209 claims priority to U.S. Provisional App. No. 62/588,276 ("the '276 Provisional"; EX1004), filed November 17, 2017, before the earliest priority date of the '994 Patent. I also understand that Takano'369 claims priority to U.S. Provisional App. No. 62/532,710 ("the '710 Provisional"; EX1010), filed July 14, 2017, before the earliest priority date of the '994 Patent. I also understand that Takano'369 claims priority to the '276 Provisional as well. I also understand that Wong claims priority to U.S. Provisional App. No. 62/463,901 ("the '901 Provisional";

EX1013), filed February 27, 2017, before the earliest priority date of the '994 Patent.

570. I have been informed that in order for Takano'209, Takano'369, and Wong to qualify as prior art against the '994 Patent, Takano'209, Takano'369, and Wong must be considered as effectively filed as of the date of their respective provisional applications. I have been informed that in order for a non-provisional application (like the non-provisional applications that published as Takano'209 and issued as Takano'369 and Wong) to be considered effectively filed as of the filing date of a provisional application, the non-provisional application must (1) claim priority to the provisional application, (2) be filed 1 year or less from the filing date of the provisional application or during the pendency of another application that claims priority to the provisional application, and (3) share a common inventor with the provisional application.

571. I have further been informed that for a non-provisional application to be considered effectively filed as of the filing date of the provisional application, the provisional application must also describe the subject matter relied upon in the non-provisional application.

A. Takano'209 is Prior Art to the '994 Patent

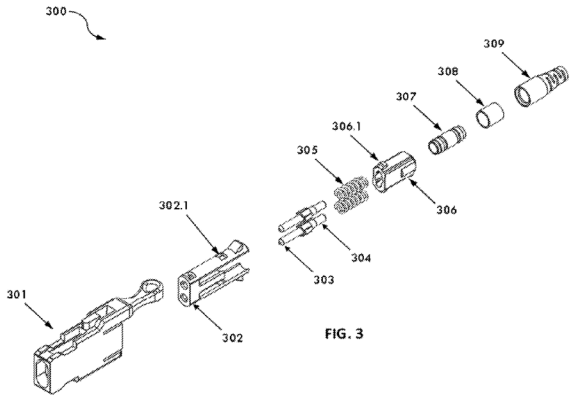
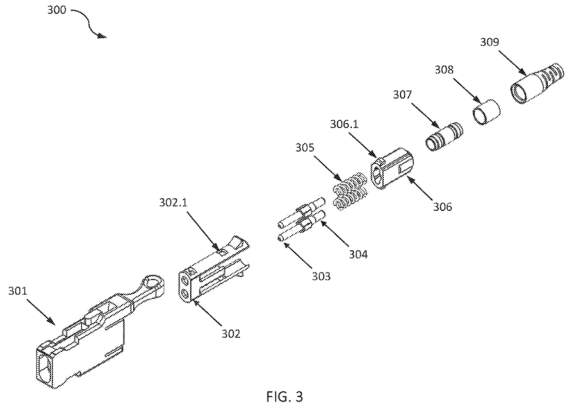
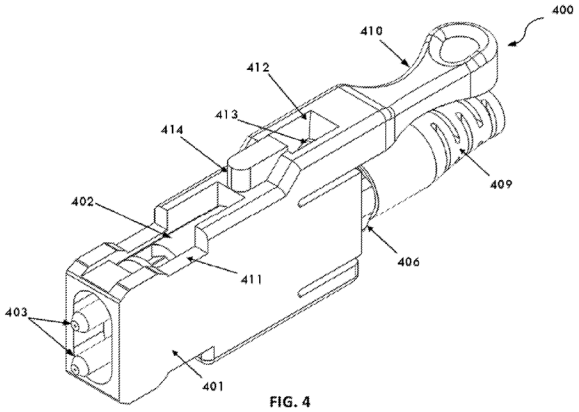
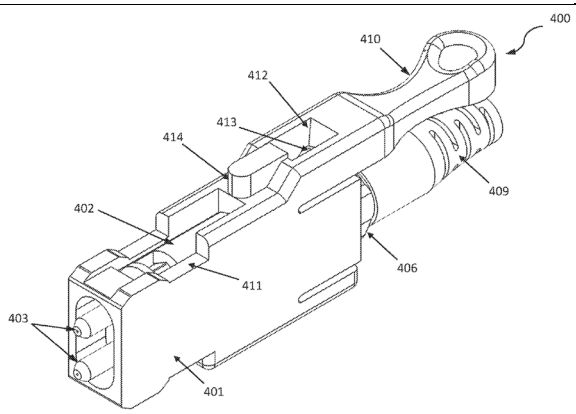
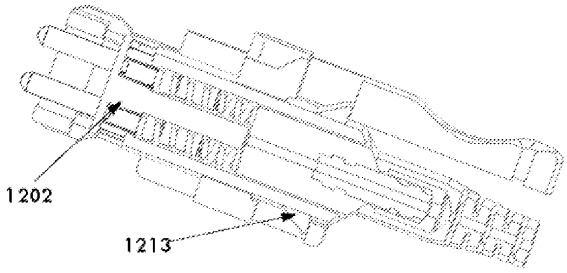
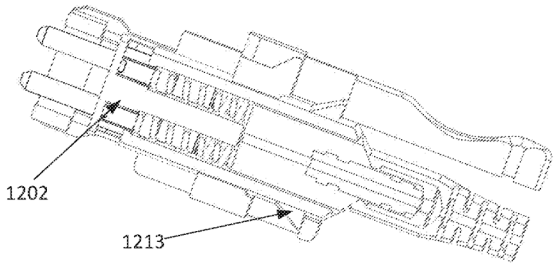
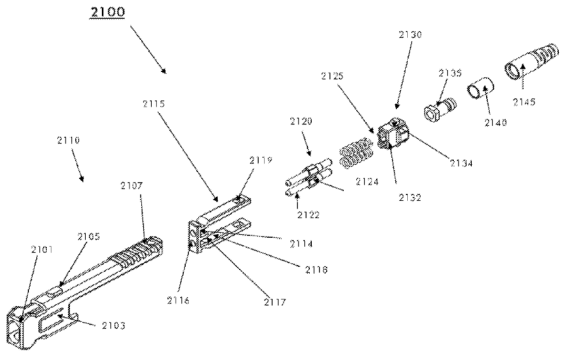
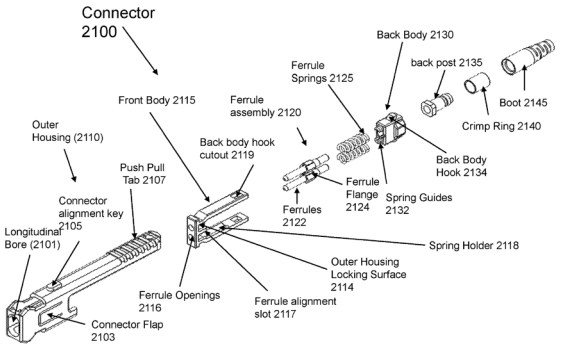
572. In my opinion, Takano'209 qualifies as prior art against the '994 Patent.

573. In my opinion, Takano'209 meets the first part of the test because Takano'209 claims the benefit of the '276 Provisional (EX1003: ¶[1001]); Takano'209 was filed co-pending with the '276 Provisional (EX1003: (22)), and Takano'209 shares common inventors with the '276 Provisional (EX1003: (72); EX1004: 17).

574. In my opinion, Takano'209 meets the second part of the test because the '276 Provisional describes the subject matter in Takano'209 forming the prior art invalidity positions described herein. The correspondence between the specification of Takano'209 and the '276 Provisional is summarized in the following chart:

Takano'209's Disclosure	**'276 Provisional's Corresponding Disclosure**
¶¶[0091]-[0094], [0105]-[0108]	¶¶[89]-[92], [102]-[105]
Figs. 3-5, 11A-13	Figs. 3-5, 11A-13
¶¶[0117]-[0132]	¶¶[111]-[125]
Figs. 21A-36B	Figs. 21A-36B
¶¶[0137]-[0138]	¶¶[130]-[131]
Figs. 41-42B	Figs. 41-42B

575. In particular, the figures identified in the chart above are generally identical between Takano'209 and the '276 Provisional. A select sampling of these corresponding figures is provided below, which shows the figures being identical or nearly identical:

Takano'209 Figures	'276 Provisional Figures
 FIG. 3	 FIG. 3
 FIG. 4	 FIG. 4
 FIG. 12B	 FIG. 12B
 FIG. 21A	 **FIG. 21A:** Connector Assembly Exploded View

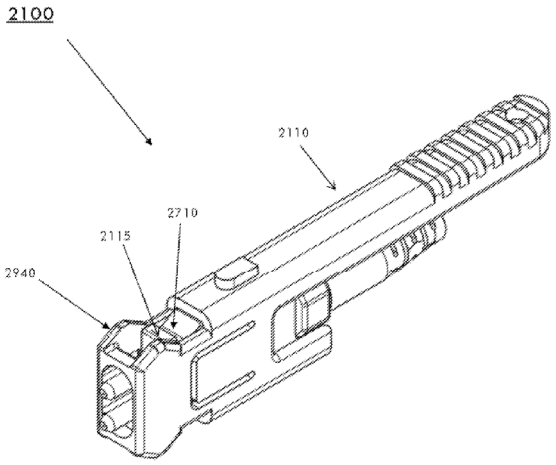


FIG. 21B

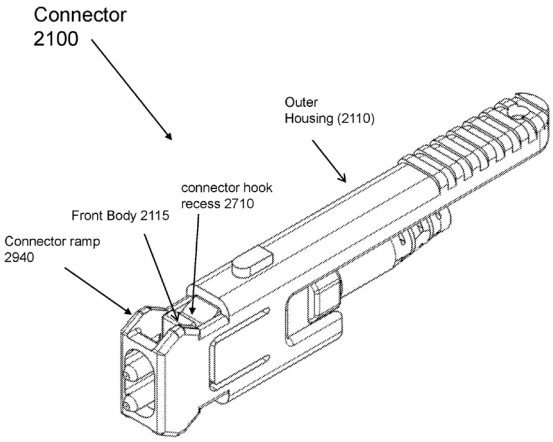


FIG. 21B: Connector Assembled

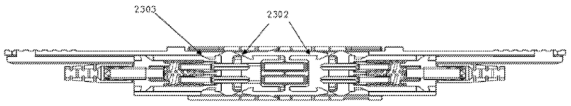


FIG. 23B

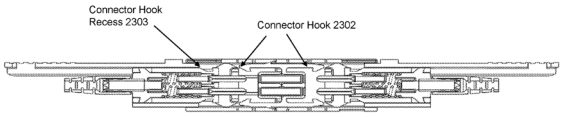


FIG. 23B Cross Section View of Connectors Unlatched from Adapter of FIG. 24 Assembled.

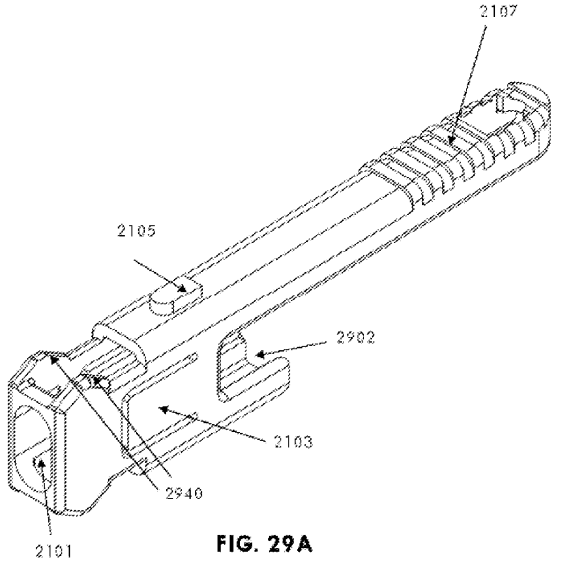


FIG. 29A

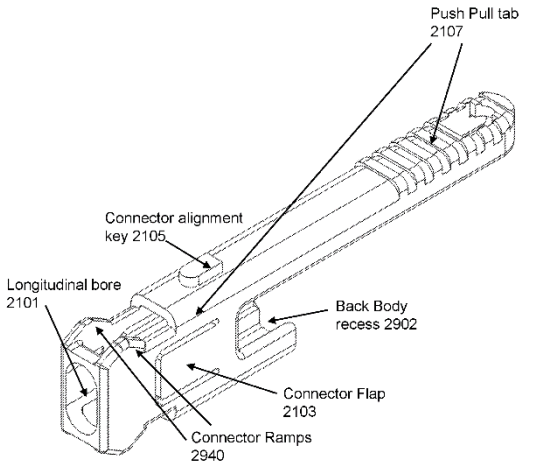


FIG. 29A Isometric View Outer Housing of FIG. 21.

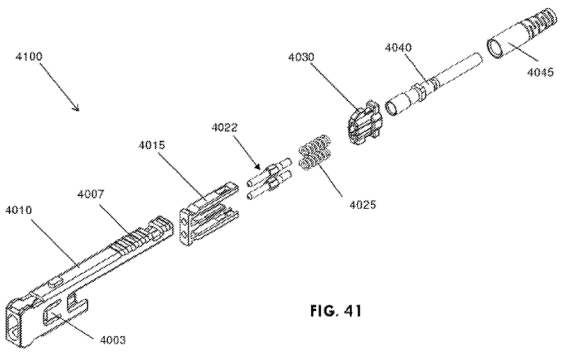


FIG. 41

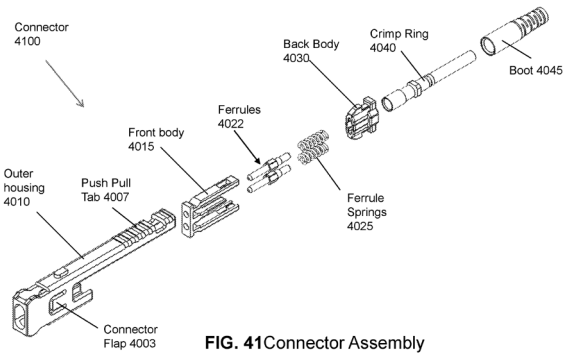


FIG. 41 Connector Assembly

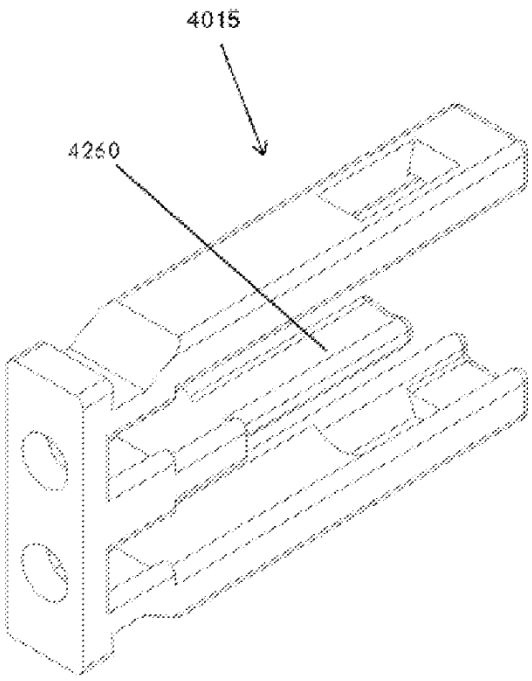


FIG. 42A

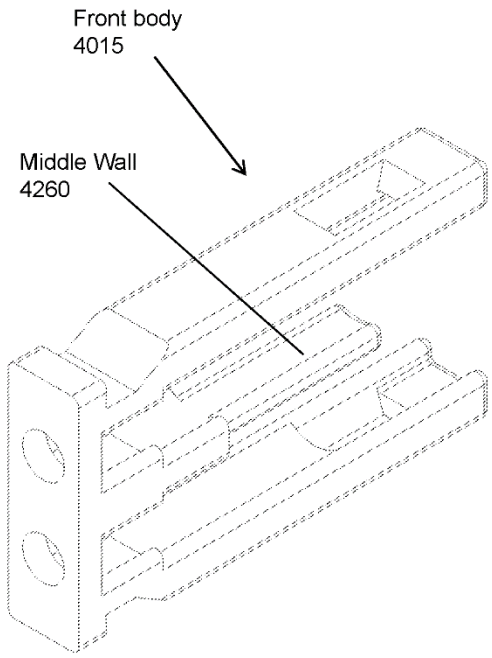


FIG. 42A Front Body Isometric View

576. Therefore, in my opinion, the '276 Provisional describes the subject matter relied upon in Takano'209 establishing the invalidity positions described herein.

B. Takano'369 is Prior Art to the '994 Patent

577. In my opinion, Takano'369 qualifies as prior art against the '994 Patent.

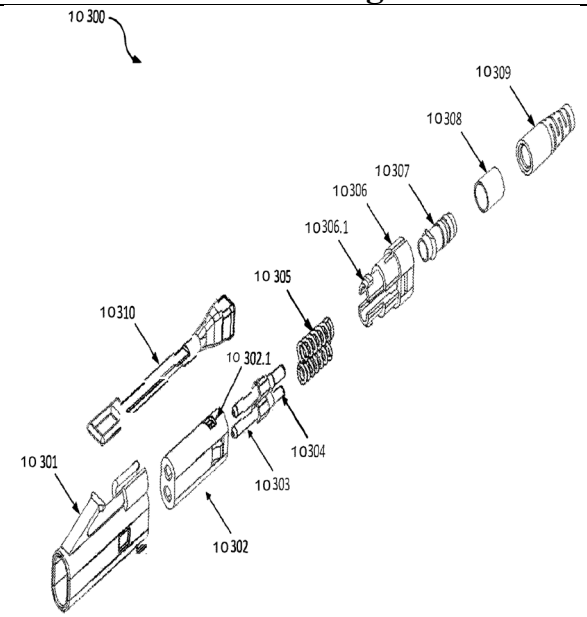
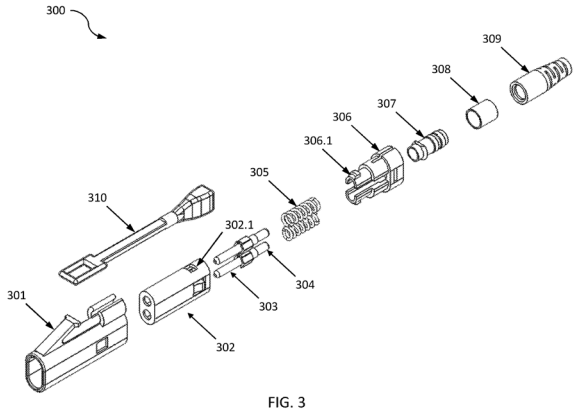
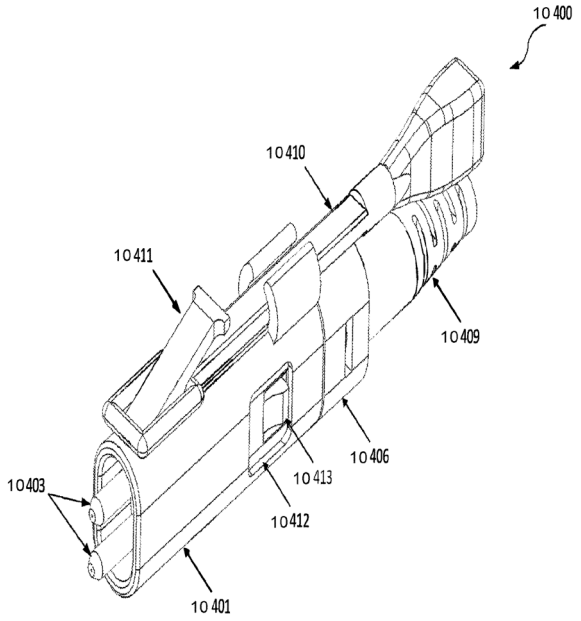
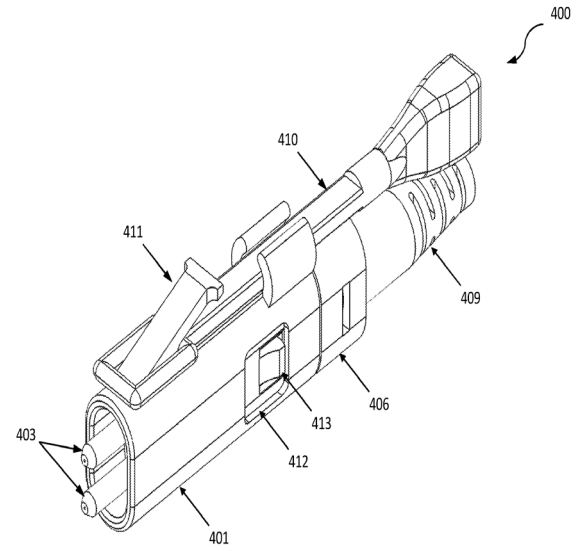
578. In my opinion, Takano'369 meets the first part of the test because Takano'369 claims the benefit of the '710 Provisional (EX1009: 1:26-28); Takano'369 was filed co-pending with U.S. App. No. 17/327,197 which also claims priority to the '710 Provisional (EX1009: (22); EX1031: 358), and

Takano'369 shares common inventors with the '710 Provisional (EX1009: (72); EX1010: 30).

579. In my opinion, Takano'369 meets the second part of the test because the '710 Provisional describes the subject matter in Takano'369 forming the prior art invalidity positions described herein. The correspondence between the specification of Takano'369 and the '710 Provisional is summarized in the following chart:

Takano'369's Disclosure	**'710 Provisional's Corresponding Disclosure**
18:63-19:50	¶¶[0041]-[0044]
Figs. 53-55, 61, 64, 65	Figs. 3-5, 11, 14, 15

580. In particular, the figures identified in the chart above are generally identical between Takano'369 and the '710 Provisional. A select sampling of these corresponding figures is provided below, which shows the figures being identical or nearly identical:

Takano'369 Figures	'710 Provisional Figures
 FIG. 53	 FIG. 3
 FIG. 54	 FIG. 4

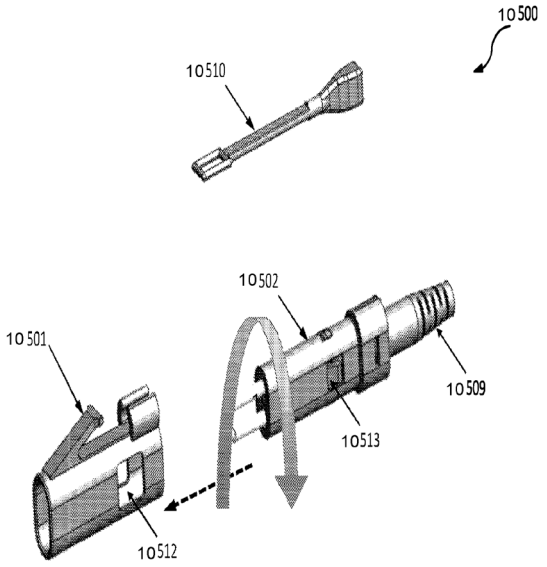


FIG. 55

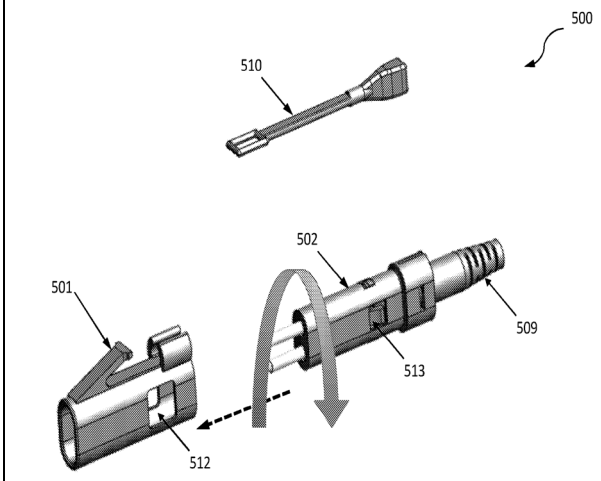


FIG. 5

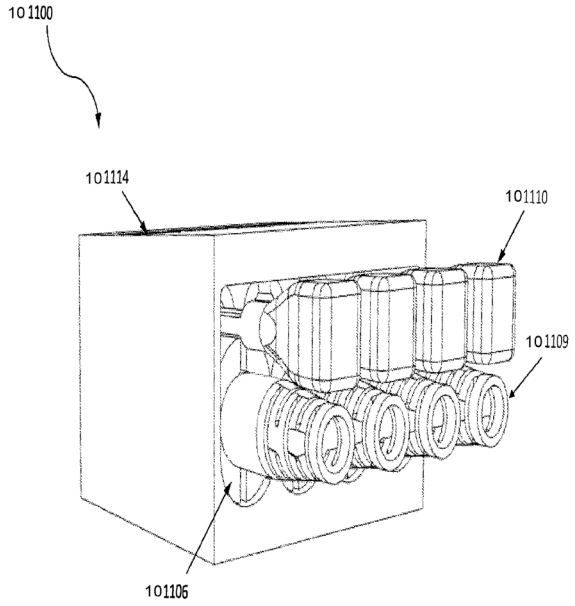


FIG. 61

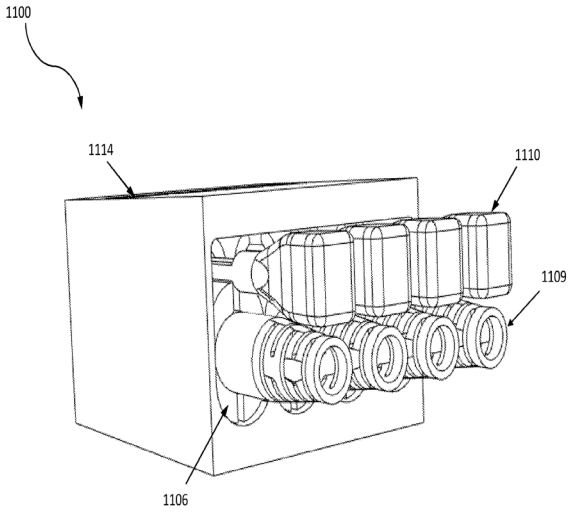


FIG. 11

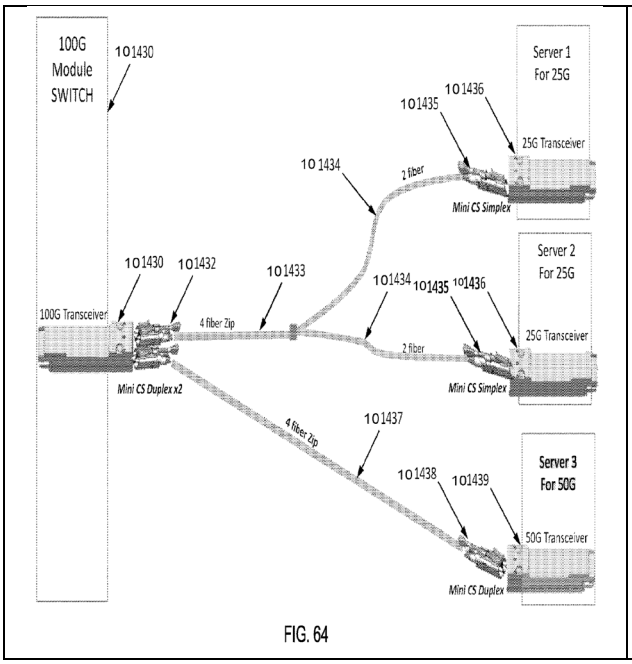


FIG. 64

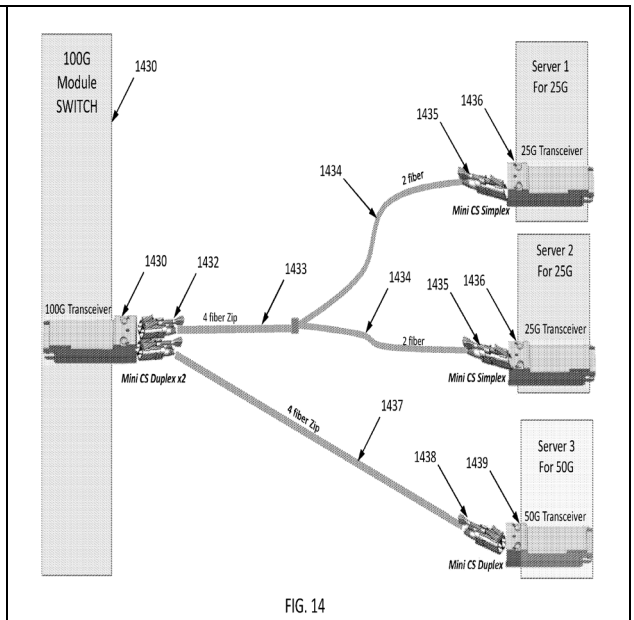


FIG. 14

581. Therefore, in my opinion, the '710 Provisional describes the subject matter relied upon in Takano'369 establishing the invalidity positions described herein.

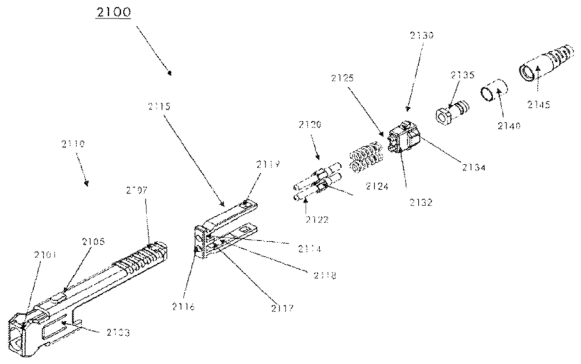
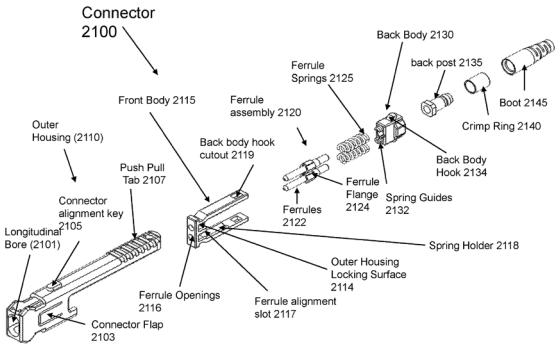
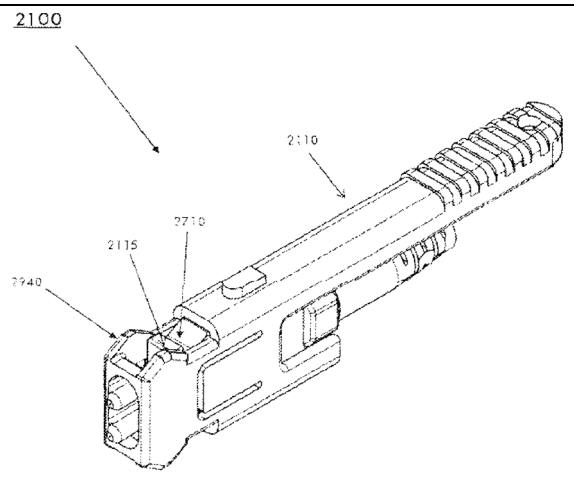
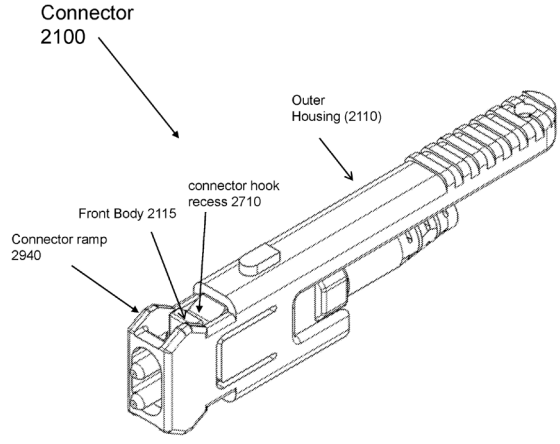
582. Regarding the '276 Provisional, in my opinion, Takano'369 meets the first part of the test because Takano'369 claims the benefit of the '276 Provisional (EX1009: 1:26-28); Takano'369 was filed co-pending with U.S. App. No. 17/327,197 which also claims priority to the '276 Provisional (EX1009: (22); EX1023: 358), and Takano'369 shares common inventors with the '276 Provisional (EX1009: (72); EX1004: 17).

583. Still with regard to the '276 Provisional, in my opinion, Takano'369 meets the second part of the test because the '276 Provisional describes the subject matter in Takano'369 forming the prior art invalidity positions described herein.

The correspondence between the specification of Takano'369 and the '276 Provisional is summarized in the following chart:

Takano'369's Disclosure	'276 Provisional's Corresponding Disclosure
12:61-22:10	¶¶[111]-[138]
Figs. 21A-52	Figs. 21A-52

584. In particular, the figures identified in the chart above are generally identical between Takano'369 and the '276 Provisional. A select sampling of these corresponding figures is provided below, which shows the figures being identical or nearly identical:

Takano'369 Figures	'276 Provisional Figures
 FIG. 21A	 **FIG. 21A:** Connector Assembly Exploded View
 FIG. 21B	 **FIG. 21B:** Connector Assembled

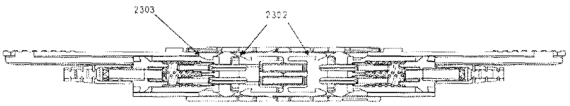


FIG. 23B

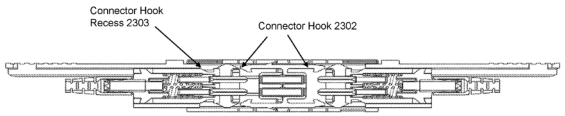


FIG. 23B Cross Section View of Connectors Unlatched from Adapter of FIG. 24 Assembled.

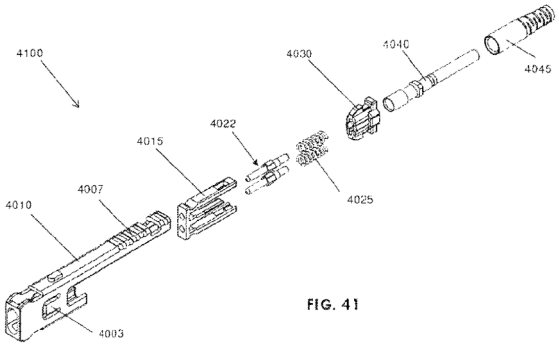


FIG. 41

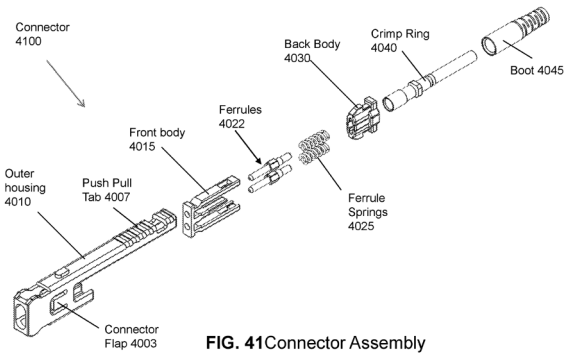


FIG. 41 Connector Assembly

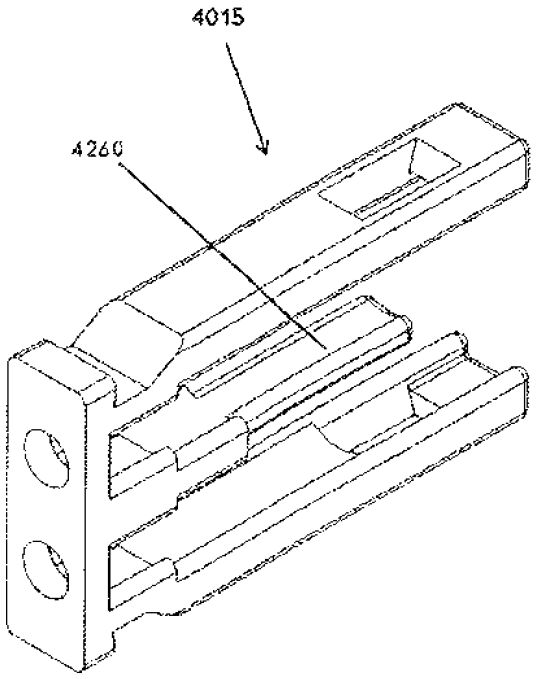


FIG. 42A

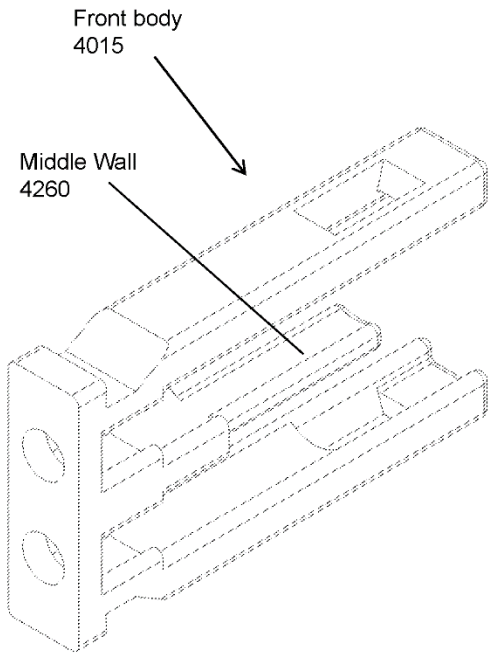


FIG. 42A Front Body Isometric View

585. Therefore, in my opinion, the '276 Provisional describes the subject matter relied upon in Takano'369 establishing the invalidity positions described herein.

C. Wong is Prior Art to the '994 Patent

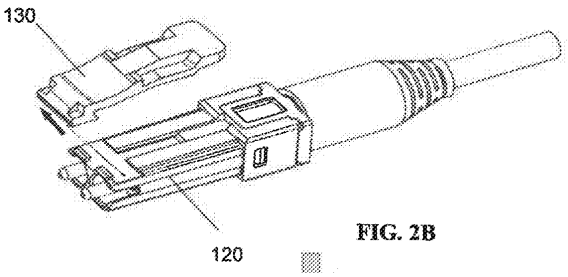
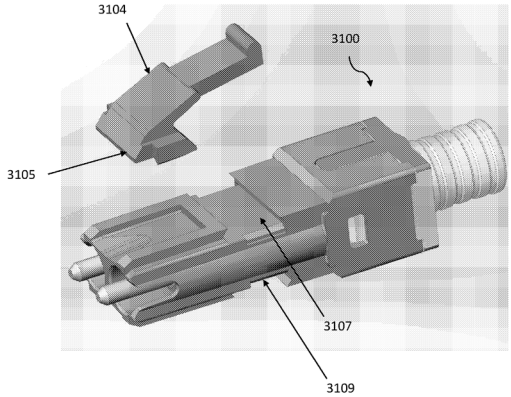
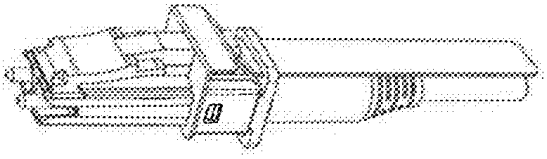
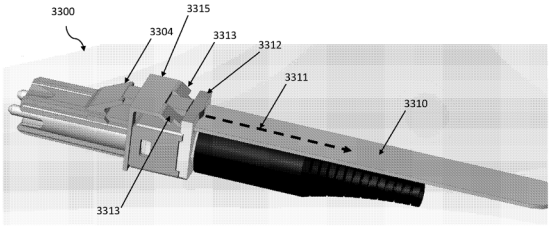
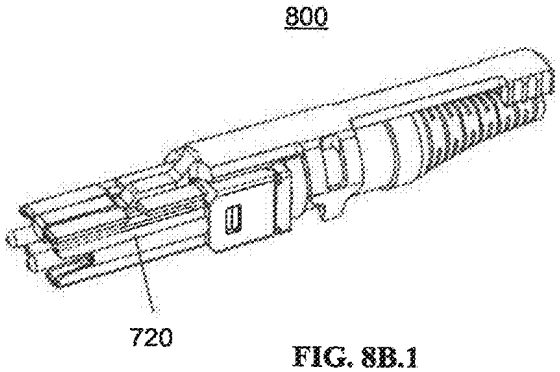
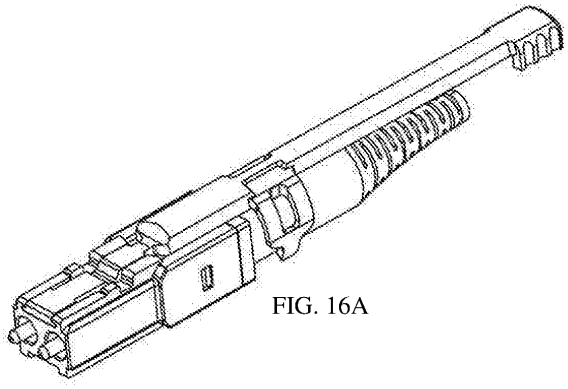
586. In my opinion, Wong qualifies as prior art against the '994 Patent.

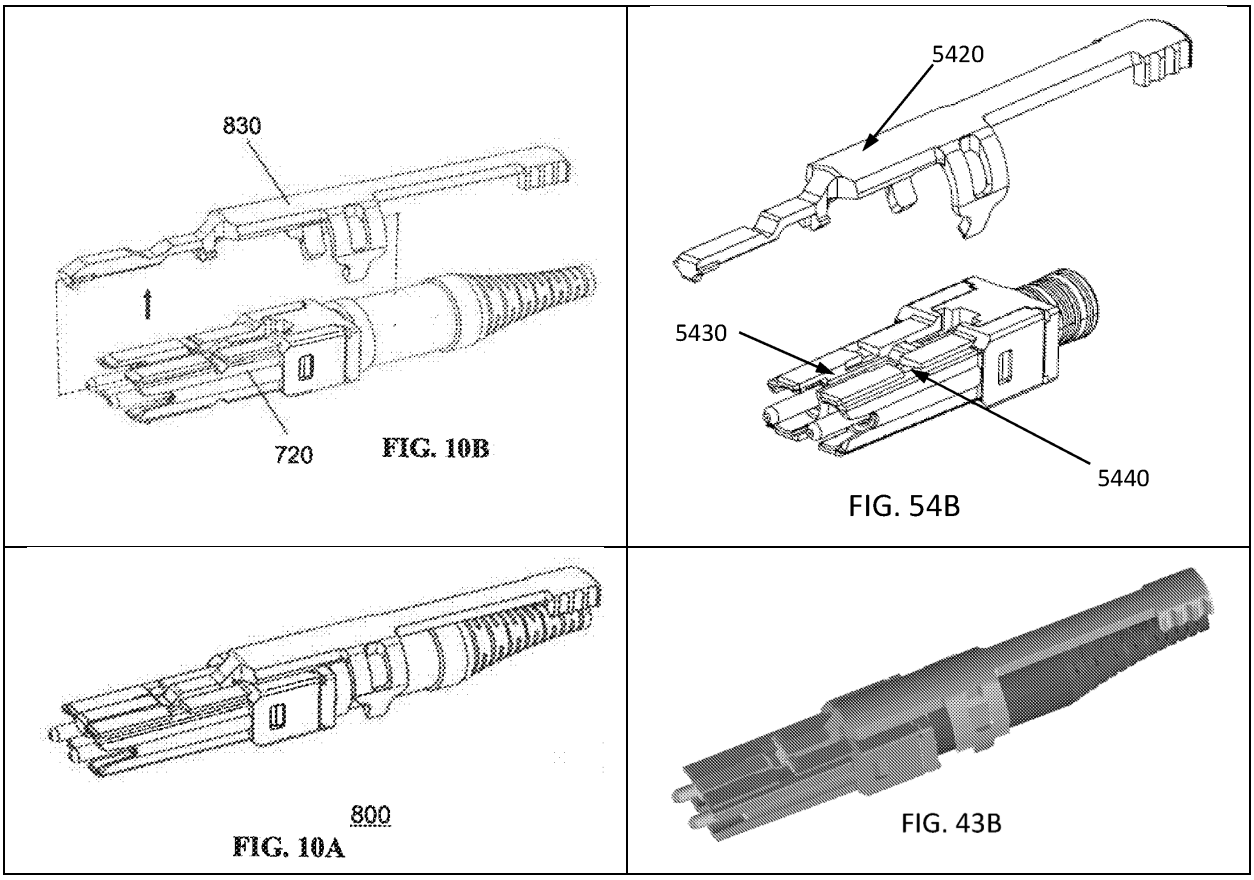
587. In my opinion, Wong meets the first part of the test because Wong claims the benefit of the '901 Provisional (EX1012: ¶[0001]); Wong was filed co-pending with the '901 Provisional (EX1012: (22)), and Wong shares a common inventor with the '901 Provisional (EX1012: (72); EX1013: 19).

588. In my opinion, Wong meets the second part of the test because the '901 Provisional describes the subject matter in Wong forming the prior art invalidity positions described herein. The correspondence between the specification of Wong and the '901 Provisional is summarized in the following chart:

Wong's Disclosure	**'901 Provisional's Corresponding Disclosure**
¶¶[0007], [0067]-[0072], [0085], [0088]	¶¶[0003]-[0007], [0118]-[0126]
Figs. 1A-4D, 8B.1-2, 10A-D	Figs. 16A-17E, 19-22B, 24-27B, 29-33, 43A-D, 45A-D, 52A-B, 54B-C

589. In particular, the figures of Wong and the '901 Provisional identified in the chart above show generally identical latch couplings, dovetail fittings, and push-pull tab clips, the features of Wong relied upon in the prior art invalidity positions described herein. A select sampling of these corresponding figures is provided below, which shows the generally identical latch couplings, dovetail fittings, and push-pull tab clips:

Wong Figures	‘901 Provisional Figures
 FIG. 2B	 FIG. 31
 FIG. 4A	 FIG. 33
 FIG. 8B.1	 FIG. 16A



590. Therefore, in my opinion, the '901 Provisional describes the subject matter relied upon in Wong establishing the invalidity positions described herein.

591. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in this post grant review and that cross examination will take place within the United States. If cross examination is required of me, I will be available for any such cross examination.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 10th day of July, 2024.

By Edward Lurie**:** /Edward Lurie/

Appendix A

Edward Lurie | Sr. Fiber Optic Interconnect Developer

- **Remote from Haiku, HI**
- **512-689-3664**
- **eblurie@sbcglobal.net**

Professional Profile

Proven Track record designing & developing Fiber Optic Interconnect Products: Connectors, CableAssemblies, Fanouts, Multifiber Connectors, and related Field Installation Kits & Tools. I successfully launched dozens of FO new products, leading development teams. My background in Precision Optical Mfg. has given me a unique perspective re: FO Product & Process Devel. Process development, Sub-micron machining, Injection Molding, Optical inspection, Precision Metrology, Tool Design and Fixturing are also areas of expertise. I have over 18 US Patents in FO Interconnect, listed below.

Core Skills

• FO Interconnect Design & Development
• Project Management
• Concurrent Engineering - DFM
• High yield manufacturing - 6 Sigma
• Invention submission & IP
• Problem solving
• Creativity • Process development
• Ideation • Prototype development

Career Summary

Sep 1983 - Aug 2019 3M Co and Corning, Inc, Austin, TX
Sr Product Development Specialist

Outline:

Developed Industry Standard and novel FO Interconnect Products for Telecom, Datacom, Enterprise (LANs) & Wireless markets. I was a Sr. Product Development Specialist (Chief Engineer - Technical SME) and concurrently served as Project Manager.

Key Responsibilities:

• FO Interconnect product Design & development from concept to Launch,
• Design for high yield manufacturing,
• Support to Customers & Application Engineering
• Concurrent process engineering.
• Manufacturing interface & support.

Key Achievements:

• Developed a large portfolio of FO Simplex, Duplex, and Multifiber Interconnect products over a 36yr Career (Biconic, ST Epoxy, ST, SC & LC Hotmelt, SC/UPC and SC/APC Epoxy, 8F -24F MTP/MPO,OGI, SC/No-Polish Mechanical Splice, Crimplok+, Crimplok+ Extreme, and SC/APC Shuttered Connectors).
• Developed dozens of proprietary manufacturing processes for polishing and Cable Assembly, thatare held as Trade Secret.
• Developed novel field installable FO Interconnects and Field Termination Kits for both Key Account Customers and the general Market.
• I am known widely as an industry expert in FO Connector Design and Process Development.
• Contributed to Telcordia, IEC, and TIA/EIA Industry Standards FO Interconnect over 85% of my career.
• Managed the Manufacturing Engineering group for several years in the early 1990's.

Apr 1980 - Apr 1983 Republic Lens Co, Englewood, NJ
Production Manager

Outline:

Production and Plant Manager for Precision OEM Optical Manufacturer. Oversaw precision optical manufacturing of custom lenses, mirrors, prisms, and optical assemblies, including in-house Thin-film coatings. Had P&L responsibility for the company.

Education

• **BS in Business Administration** | Franklin & Marshall College | Jul 1976 - Apr 1980 | Post Graduate Study at the Institute of Optics, University of Rochester, NY

Additional

Hobbies & Interests
Swimming, Tennis, Downhill Skiing, Hiking, Golf, Fitness, Tropical fruit & vegetable farming

Software
Microsoft Office, Excel, Word, PowerPoint, Skype, Microsoft Teams, Adobe Illustrator, Microsoft Windows, Microsoft Project

Languages
Proficient in German, mid-level Japanese

Publications
I have published several articles for OFC (Optical Fiber Conference), and other industry Magazines eg: Fiber Optic Product News, etc.

Patent Awards

I have been awarded the following US Patents, most are also filed Internationally:

US-20210405304-A1 - Fiber optic connectors with funnel-shaped boots and methods of installing the same
US-10663679-B2 - Assembly tool and optical fiber connector assembly method
US-10502919-B2 - Cable assembly with a removable installation device
US-20180299633-A1 - Cable assembly with a removable installation device

Patent Awards (continued)

US-10001619-B2 - Cable assembly with a removable installation device
US-20180081130-A1 - Assembly tool and optical fiber connector assembly method
US-20170261716-A1 - Cable assembly with a removable installation device
US-20140299645-A1 - Low cost, disposable optical fiber cleaver
US-8292699-B2 - Optical fiber polishing apparatus and method
US-20100029180-A1 - Optical fiber polishing apparatus and method
US-7255486-B2 - Field termination apparatus and method for small form factor optical connectors with thermoplastic adhesive
US-7147384-B2 - Small form factor optical connector with thermoplastic adhesive
US-7149402-B2 - Device for holding field termination load adapter for optical connectors
US-7108431-B2 - Ferrule for use in fiber optic connectors
US-20060105684-A1 - Fiber polishing apparatus and method for field terminable optical connectors
US-20060103039-A1 - Heat shrink device and method
US-20060104574-A1 - Field termination apparatus and method for small form factor optical connectors with thermoplastic adhesive
US-20060104588-A1 - Device for holding field termination load adapter for optical connectors
US-7001081-B2 - Strain relief boot with flexible extension for guiding fiber optic cable
US-6973242-B2 - Apparatus useful for guiding fiber optic ribbons into ferrules
US-20050213891-A1 - Small form factor optical connector with thermoplastic adhesive
US-6850684-B2 - Three dimensional optical circuits
US-6832032-B2 - In-line shuffle modules utilizing three dimensional optical circuits
US-20040234209-A1 - Strain relief boot with flexible extension for guiding fiber optic cable
US-20040208455-A1 - Apparatus useful for guiding fiber optic ribbons into ferrules
US-20040208456-A1 - Ferrule for use in fiber optic connectors
US-6556754-B2 - Three dimensional optical circuit
US-6549710-B2 - Method of making a three dimensional optical circuit
US-20030031436-A1 - Three dimensional optical circuit
US-20030031437-A1 - In-line shuffle modules utilizing three dimensional optical circuits
US-20030031452-A1 - Method of making a three dimensional optical circuit
US-20030031448-A1 - Optical manifold
US-5458528-A - Method for polishing fiber optic ferrules
US-5351327-A - Polished fiber optic ferrules
US-5109983-A - Package for an optical fiber jumper