

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMMSCOPE TECHNOLOGIES LLC.
Petitioner

v.

BELDEN INC.
Patent Owner

Case IPR _____
U.S. Patent No. US 6,998,537
Issued: Feb. 14, 2006
Filed: January 3, 2003

DECLARATION OF KENNETH CORNELISON

In Support of *Inter Partes* Review of U.S. Patent No. 6,998,537

I, Kenneth Cornelison, declare as follows.

I. INTRODUCTION

1. I have been retained by Petitioner, CommScope Technologies LLC, (“CommScope” or “Petitioner”) to provide expert opinions in connection with a petition for *inter partes* review before the United States Patent and Trademark Office. I understand that this declaration involves my expert opinions and expert knowledge related to U.S. Patent No. 6,998,537 (“the ’537 Patent”), titled “Multi-Pair Data Cable with Configurable Core Filling and Pair Separation,” and its field of endeavor.

2. I have been asked to provide my independent technical review, analysis, insights, and opinions regarding the ’537 Patent and the references that form the basis for the grounds of unpatentability set forth in the Petition for *Inter Partes* Review of the ’537 Patent. The statements made herein are based on my own knowledge and opinions.

II. SUMMARY OF OPINIONS

To summarize the opinions stated herein, it is my opinion that the claims of the ’537 Patent are invalid based on the following grounds:

	Claims	Basis for Unpatentability
Ground 1	Independent claim 19	Obvious in view of Beggs , further in view of Jachimowicz and the knowledge of a POSITA.

Ground 2	Dependent claims 20, 22	Ground 1, further in view of Gingue and the knowledge of a POSITA.
Ground 3	Independent claim 19	Obvious in view of Yanagida , further in view of Jachimowicz and the knowledge of a POSITA.
Ground 4	Dependent claims 20, 22	Ground 3, further in view of Gingue and the knowledge of a POSITA.
Ground 5	Claims 19-20, 22	Obvious in view of GmbH-866 , further in view of Roberts, Gingue, and/or Jachimowicz and the knowledge of a POSITA.

3. In this declaration, I provide various annotated figures to aid in explaining my opinions. However, these figures are not intended to necessarily imply literal, precise physical or bodily combination or modification in exactly or only the way shown or annotated. Instead, I provide those figures only to help illustrate various concepts, and they should not be taken as showing the only disclosure of a particular element, or the only way that a person of ordinary skill in the art would have been motivated to modify or combine references.

III. QUALIFICATIONS

4. I have 40+ years of experience in the wire and cable industry. My experience includes the design, development and testing of high-speed data cables. I obtained my BSEE in 1974 and I started working in the wire and cable industry in 1976. Through the late 1970s through the 2000s, I worked in the design, manufacturing and testing of wires and cables for companies including Anaconda, Alcatel, Belden and General Cable. My roles included being manager of product development and customer engineering, process development manager, and VP of Technology – Data Communications. Since leaving General Cable, I have consulted in the wire and cable industry, published several papers, given technical training and been actively involved in the International Wire and Cable Symposium (IWCS). The IWCS promotes, initiates, and coordinates the exchanging of technical information on wire, cable and fiber optics within industry and the government, through an annual IWCS Symposium. I have been an instructor (or co-instructor) at the annual Symposiums held in 2013, 2014, 2015, 2016, 2018, 2019, 2022, and am currently expecting to be an instructor at the Symposium planned for 2023. I am a named inventor on more than 15 US patents.

5. I am being compensated for my time at the rate of \$175 per hour for time spent on this matter. I have no interest in the outcome of this proceeding, and my compensation is not dependent upon the outcome of this proceeding.

IV. MATERIALS CONSIDERED

6. My technical review, analysis, insights, and opinions are based on my experience and other qualifications discussed above, as well as my study of relevant materials.

7. I have reviewed and am familiar with the '537 patent specification, claims, prosecution history, and *inter partes* reexamination.

8. I have also reviewed and am familiar with each exhibit cited herein. I confirm that to the best of my knowledge the accompanying exhibits are true and accurate copies of what they purport to be, and that an expert in the field would reasonably rely on them to formulate opinions such as those set forth in this declaration.

Exhibit No.	Exhibit Description
1001	U.S. Patent No. 6,570,095 (the “ 095 patent ”)
1002	Excerpt of Prosecution History of U.S. Patent No. 6,570,095: Nov. 8, 2002 Notice of Allowance
1003	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,474 of U.S. Patent No. 6,570,095: Sept. 20, 2011 Action Closing Prosecution
1004	U.S. Patent No. 6,998,537 (the “ 537 patent ”)
1005	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: Nov. 2, 2004 Notice of Allowance
1006	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,476 of U.S. Patent No. 6,998,537: Sept. 20, 2011 Action Closing Prosecution
1007	Declaration of Kenneth Cornelison
1008	<i>Curriculum Vitae</i> of Kenneth Cornelison
1009	U.S. Patent No. 3,622,683 (“ Roberts ”)

1010	English language translation of German Patent No. 297,19,866 U1 (“ GmbH-866 ”), and attached Declaration of translator Anthea Heyes
1011	German Patent No. 297,19,866 U1 (untranslated original)
1012	English language translation of Japanese Patent Publication S43015470 (“ Yanagida ”), and attached Declaration of translator Anthea Heyes
1013	U.S. Patent No. 5,670,748 (“ Gingue ”)
1014	U.S. Patent No. 3,894,172 (“ Jachimowicz ”)
1015	U.S. Patent No. 4,755,629 (“ Beggs ”)
1016	<i>Electronic Wire & Cable - A User’s Guide: Performance and Selection</i> , Section 5: Multiconductor Cables, AT&T (1987)
1017	Whitham D. Reeve, <i>Subscriber Loop Signaling and Transmission Handbook – Digital</i> , IEEE Telecommunications Handbook Series (1995)
1018	Whitham D. Reeve, <i>Subscriber Loop Signaling and Transmission Handbook – Analog</i> , IEEE Telecommunications Handbook Series (1992)
1019	U.S. Patent No. 5,380,591
1020	U.S. Patent No. 1,727,972
1021	U.S. Patent No. 1,956,730
1022	U.S. Patent No. 3,803,340 (Jachimowicz-340)
1023	Canadian Patent Application No. 2,058,046
1024	U.S. Patent No. 4,262,164
1025	U.S. Patent Pub. No. 2006/0169478
1026	U.S. Patent No. 4,253,890
1027	U.S. Patent No. 5,283,390
1028	U.S. Patent No. 5,969,295
1029	G.F. Moore, <i>Electric Cable Handbook</i> , BICC Cables (3d. ed. 1997)
1030	<i>The New IEEE Standard Dictionary of Electrical and Electronics Terms</i> (5th ed. 1993)
1031	Neil Sclater and John Markus, <i>Electronics Dictionary</i> , McGraw-Hill (6th ed. 1997)

1032	S. Yonechi et al., <i>Application of Spacer Forming Technique to Communication Cables</i> , International Wire & Cable Symposium Proceedings (1980)
1033	U.S. Patent No. 7,179,999 (the “999 patent”)
1034	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,475 of U.S. Patent No. 7,179,999: Oct. 14, 2011 Action Closing Prosecution
1035	Alcatel Cable Systems Product Catalog ¹
1036	U.S. Patent No. 5,789,711
1037	Excerpt of Prosecution History of U.S. Patent No. 6,570,095: Oct. 22, 2001 Non-Final Office Action
1038	Excerpt of Prosecution History of U.S. Patent No. 6,570,095: April 3, 2002 Final Office Action
1039	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: March 3, 2004 Non-Final Office Action
1040	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: Terminal Disclaimer
1041	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: May 18, 2004 Amendments
1042	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: June 17, 2004 Final Office Action
1043	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: September 20, 2004 Request for Continued Examination
1044	Excerpt of Prosecution History of U.S. Patent No. 6,998,537: Sept. 9, 2005 Amendment
1045	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,474 of U.S. Patent No. 6,570,095: Feb. 24, 2012 Decision Granting Petition to Terminate <i>Inter Partes</i> Reexamination Proceeding
1046	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,476 of U.S. Patent No. 6,998,537: Feb. 24, 2012 Decision Granting Petition to Terminate <i>Inter Partes</i> Reexamination Proceedings
1047	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,475 of U.S. Patent No. 7,179,999: Feb. 24, 2012 Decision Granting Petition to Terminate <i>Inter Partes</i> Reexamination Proceedings

¹ This Alcatel Cable Systems product catalog was publicly available and distributed by Alcatel during my employment with Alcatel Cable Systems, which was in the 1988-1992 time period.

1048	U.S. Patent No. 5,814,768
1049	U.S. Patent No. 6,037,546
1050	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,474 of U.S. Patent No. 6,570,095: Jan. 11, 2010 Third Party Requester's Comments to Patent Owner's Response
1051	Excerpt of <i>Inter Partes</i> Reexamination No. 95/000,476 of U.S. Patent No. 6,998,537: Jan. 22, 2010 Third Party Requester's Comments to Patent Owner's Response
1052	<i>Belden Techs. et al. v. Superior Essex Comm'cns LP et al.</i> , No. 08-63-SLR, Dkt. 215 (D. Del. Aug. 8, 2010) – Claim Construction Order
1053	<i>Belden Inc. v. CommScope, Inc. et al.</i> , No. 22-783-RGA, Dkt. 292 (D. Del. May 26, 2023) – Scheduling Order
1054	Declaration of Sylvia D. Hall-Ellis, PhD
1055	English Translation of Japanese Patent Publication No. S43-15470 used in prior reexamination of US 6,998,537
1056	Japanese Patent Publication No. S43-15470 (untranslated original)
1057	English language translation of German Patent No. 297,19,866 U1 used in prior reexamination of US 6,998,537

All citations to exhibits are to the bates number stamped at the bottom of the page except for patents and patent publications, which are cited to their column and line numbers.

V. RELEVANT LEGAL PRINCIPLES

A. Effective Filing Date

9. I understand that claims of a patent have an “effective filing date” and that obviousness is considered based on the prior art as of that date.

10. The utility application for '537 Patent (application No. 10/336,535) was filed on Jan. 3, 2003. It is a continuation of application No. 09/853,512, filed on May 11, 2001, now U.S. Patent No. 6,570,095, which is a continuation of

application No. 09/257,844, filed on February 25, 1999, now U.S. Patent No. 6,248,954. Therefore, I am told that for the purposes of this proceeding, I have been asked to use February 25, 1999 as the effective filing date for the challenged claims.

B. Person of Ordinary Skill in the Art

11. I have been informed that a person of ordinary skill in the art (“POSITA”) is a person who is presumed to have complete knowledge of the relevant prior art and who would think along the lines of conventional wisdom in that art. The person of ordinary skill in the art has ordinary creativity and does not have extraordinary skill, e.g., is not an expert. I have been informed that factors to consider in determining the level of ordinary skill in the art include the educational level of workers in the field, the types of problems addressed in the art, prior-art solutions to such problems, how quickly innovations are made, and the complexity of the technology.

12. The ’537 Patent relates to communication cables. Generally speaking, the ’537 Patent is directed to cables that include a plurality of twisted pairs and techniques to improve crosstalk. *See* ’537 Patent (EX-1004) at Title, Abstract, 2:65-3:2, 3:15-28. In view of the factors mentioned above and the discussion of the technical background herein, it is my opinion that a person of ordinary skill in the art of the ’537 Patent would have had a bachelor’s degree in electrical

engineering and a minimum of 3-4 years of industry experience in connection with designing, manufacturing, and testing of twisted-pair data cables. An individual with a master's degree in electrical engineering would require less industry experience (e.g., 1-2 years).

13. Throughout my declaration, even if I discuss my analysis in the present tense, I am always making my determinations based on what a POSITA would have known as of the effective date (here February 25, 1999).

C. Claim Construction Standard

14. I have been instructed by counsel on the law regarding claim construction and patent claims, and understand that a patent may include two types of claims—independent claims and dependent claims. An independent claim stands alone and includes only the features it recites. A dependent claim can depend from an independent claim or another dependent claim. I understand that a dependent claim includes all the features that it recites in addition to all of the features recited in the claim from which it depends.

15. In an *inter partes* review proceeding such as this, I understand the claim of a patent shall be construed using the same claim construction standard that would be used to construe the claim in a civil action. I understand this includes construing the claim in accordance with the ordinary and customary meaning of such claim in view of the specification and the prosecution history pertaining to the

patent, as understood by one of ordinary skill in the art. For completeness, I understand this standard is different from the prior “broadest reasonable interpretation” standard that was used in certain earlier *inter partes* reexamination proceedings.

16. I understand an appropriate dictionary definition may provide evidence explaining the ordinary and customary meaning as would be understood by a person of ordinary skill in the art.

17. I understand that if there are specific statements in the specification that define the invention with respect to a term, those statements are strong evidence of a definition for the term.

D. Anticipation and Obviousness Law

18. In this declaration I have been instructed by counsel on the law regarding anticipation and obviousness. I understand that a claim is invalid if it is anticipated or obvious. My opinions here relate to both anticipation and obviousness as detailed below.

1. Anticipation

19. I understand that anticipation of a claim requires that every element of a claim is expressly or inherently disclosed in a single prior art reference. I understand that an anticipating reference need not use the exact terms of the claims, but must describe the patented subject matter with sufficient clarity and

detail to establish that the claimed subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the purported invention. I also understand that an anticipating reference must enable one of ordinary skill in the art to reduce the purported invention to practice without undue experimentation. Under what is known as inherency, I understand that if the prior art necessarily functions in accordance with, or includes the claimed limitations, it anticipates. I also understand that I may examine evidence that is outside of the prior art reference in determining whether a feature, while not expressly discussed in the reference, is necessarily present in that reference.

2. Obviousness

20. I understand that a patent claim is also invalid if the claims would have been obvious to a POSITA at the time of the invention. I understand that the obviousness inquiry should not be done in hindsight but rather from the perspective of a POSITA as of the time of the invention.

21. I understand that to obtain a patent, the claims must have been, as of the time of the invention, nonobvious in view of the prior art. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious to a POSITA at the time of the invention in view of the prior art and in light of the general knowledge in the

art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered:

- (1) the scope and content of the prior art;
- (2) the level of ordinary skill in the art;
- (3) the differences between the claimed invention and the prior art;
- and
- (4) any objective indicia of nonobviousness.

22. I understand that a claim is obvious when the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a POSITA at the time of the invention.

23. I understand that certain objective indicia can be important evidence regarding whether a patent is obvious. Such indicia include: industry acceptance; commercial success of products covered by the patent claims; long-felt need for the invention; failed attempts by others to make the invention; copying of the invention by others in the field; unexpected results achieved by the invention as compared to the closest prior art; praise of the invention by the infringer or others in the field; taking of licenses under the patent by others; expressions of surprise by experts and those skilled in the art at making the invention; and the patentee proceeded contrary to the accepted wisdom of the prior art. I understand that such

evidence must have a nexus, or causal relationship to the elements of the claim. I am unaware of any such objective considerations having a nexus to the claims at issue in this proceeding.

24. I understand that obviousness can be established by combining multiple prior art references to meet each and every claim element, or by modifying a single prior art reference.

25. I understand that that a showing of obviousness requires that, as of the patent's effective filing date, (1) a POSITA would have been motivated to combine prior art references to arrive at the claimed subject matter and (2) there would have been a reasonable expectation of success in achieving the claimed invention from such combination.

26. I also understand that to support a combination of multiple prior art references or a modification of a single reference, there must be a rationale explaining why a skilled artisan would combine or modify the references in the manner claimed and how the proposed combination or modification meets each and every claim element. This rationale may come from a teaching, suggestion, or motivation to combine. However, I understand that a specific teaching, suggestion, or motivation to combine elements in the prior art to achieve the claimed combination is not required for obviousness. Instead, I understand that a combination of known elements may be obvious in light of the interrelated

teachings of the prior art, the effects of demands in the market, the background knowledge possessed by a POSITA, and inferences and creative steps that a POSITA would employ. But I also understand that a proposed combination or modification of references can be susceptible to hindsight bias. When it appears hindsight bias is being used, I understand the modification or combination is not considered obvious.

27. I understand that exemplary rationales that may support a conclusion of obviousness include: combining or modifying prior art elements according to known methods to yield predictable results; simple substitutions of one known element for another to obtain predictable results; using a known technique to improve similar devices in the same way; applying a known technique to a known device ready for improvement to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art teachings to arrive at the claimed invention.

28. I understand that teaching away, e.g., discouragement from making the proposed modification, is strong evidence that the references are not combinable. I also understand that a disclosure of more than one alternative does not necessarily constitute a teaching away.

29. I understand that the combination does not need to result in the most desirable embodiment, but if the proposed combination does not have a reasonable expectation of success at the time of the invention, a POSITA would not have had an adequate teaching, suggestion, or motivation to combine the references.

30. I understand that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated or physically combined into the structure of the primary reference, but whether the claimed invention is rendered obvious by the teachings of the references as a whole.

VI. Technology Overview

A. Twisted Pairs

31. The '537 Patent relates to data communications cables, such as those used for telephone and data. '537 Patent at Abstract. Data communications cables were typically constructed of twisted pairs of metal conductors (e.g., wires). *See* AT&T User Guide (EX-1016) at 7 (“Most of the cables within the scope of AT&T’s EC&W product line utilize the twisted pair construction.”). Twisted pairs were (and are) commonly referred to as simply “pairs” in the industry. *See, e.g.,*

Reeve (EX-1017) at 18 (“Each cable pair consists of two twisted insulated conductors.”). Each of the conductors of a twisted pair is typically wrapped in an insulating material, commonly a polymeric material. This was well known at the time the priority application was filed, February 25, 1999. *See, e.g.*, Keogh (EX-1019) at 1:10-12 (filed Dec. 30, 1992; “[a] typical telephone cable is constructed of twisted pairs of metal conductors for signal transmission. Each conductor is insulated with a polymeric material.”). A number of twisted pairs were then assembled into a cable and wrapped in a polymeric sheath or jacket. Keogh at 1:12-16; *see also* AT&T User Guide at 7 (“Production of small cables of this type involves twisting individual pairs and grouping those twisted pairs to form either a cable or a unit for a larger cable.”).

32. Twisted pairs have been a staple of the cable industry for over a century. For example, telephone cable patents from the 1920s discuss using twisted pairs in electrical cables. *See, e.g.*, Ford (EX-1020) at 2:55-57 (U.S. Patent No. 1,727,972 filed April 18, 1924; “A plurality of copper wires insulated with paper, cotton, silk, or other suitable materials, usually twisted together in pairs”); Reichelt (EX-1021) at 1:43-47 (U.S. Patent No. 1,956,730 filed Sept. 11, 1929; “assembling and twisting a plurality of twisted pairs of individual insulated electrical conductors into a single compact group or so called cable unit”).

33. When compared to untwisted pairs, twisted pairs have improved crosstalk and decreased unbalanced mutual capacitance. AT&T User Guide at 7 (“The two main reasons for twisting pairs of conductors are to minimize or eliminate crosstalk and to decrease unbalanced mutual capacitance.”). Certain electrical parameters, such as wave impedance, are dependent on the spacing of the two conductors. Twisting the two conductors maintains consistent spacing between the two conductors along the length of the pair. The twisting also causes periodic reversals in the electrical field that surrounds the pair. These reversals also result in improved isolation from electrical fields produced by adjacent pairs or outside electrical fields. Twisted pairs also have a mechanical advantage in that the individual wires stay together, and the individual wires of the pair do not become intermixed.

B. Crosstalk

34. Crosstalk was a well-known issue associated with communication cables at the time the priority application was filed. *See, e.g.*, Jachimowicz (EX-1014) at 1:8-16. Crosstalk can refer to crosstalk between adjacent pairs or groups of pairs, or crosstalk between adjacent cables. Crosstalk between pairs or groups of pairs was known to occur when a signal is transmitted over a first twisted pair—commonly referred to as a disturbing circuit—and that signal induces currents and electromotive forces in another twisted pair—referred to as the disturbed circuit.

Roberts (EX-1009) at 3:21-28; *see also* (EX-1022) at 1:7-10. This results in the disturbed circuit carrying two signals: (1) the information signal intended for transmission and (2) the unwanted signal induced by the disturbing pair.

Jachimowicz-340 at 1:10-14. The unwanted signal is superimposed over the intended signal reducing the clarity and reliability of the transmission. *Id.* at 1:10-16. Crosstalk between cables was known to occur where one cable induces disturbing currents in an adjacent cable (sometimes referred to as alien crosstalk).

35. There are multiple types of crosstalk. One is near-end crosstalk. This is crosstalk that occurs when a twisted pair (or group of twisted pairs) transmitting in one direction causes crosstalk on a nearby twisted pair (or group of twisted pairs) transmitting in the opposite direction).² This happens because the signal being transmitted out from one end (originating at the near-end) would be relatively stronger than the signal being received at that near end, because the received signal originated at the far-end and signal strength is diminished as it travels through the cable.

² (EX-1030) at 5 (“near-end crosstalk. Crosstalk that is propagated in a disturbed channel in the direction opposite to the direction of propagation of the current in the disturbing channel. *Note:* the terminal of the disturbing channel at which the near-end crosstalk is present is ordinarily near to or coincides with the energized terminal of the disturbing channel.”).

36. Far-end crosstalk occurs when there is crosstalk between twisted pairs transmitting in the same direction.³ Several design options are used to reduce far-end crosstalk. One way to prevent far-end crosstalk is adding a metal containing layer around individual twisted pairs. *See* EX-1010, EX-1011 (GmbH-866) at 2.

37. Prior to 1999, there were various known ways to reduce crosstalk between adjacent pairs or groups of pairs. For example, the twist lengths of the twisted pairs may be varied to prevent the electrical fields surrounding each pair from being in unison along their length and therefore more strongly influence the other. The twist lengths of the twisted pairs may also be varied to prevent the twisted pairs from nesting together. Jachimowicz at 1:30-34. Nesting results when the circles circumscribing each twisted pair overlap with each other resulting in closer proximity from pair to pair and stronger crosstalk between the pairs. *See, e.g.,* Beggs (EX-1015) at 6:57-7:3, Figs. 8A. Preventing the twisted pairs from nesting together reduces crosstalk.

38. Another known way to reduce crosstalk was to physically separate a twisted pair or set of twisted pairs from each other such that voltage induced by the disturbing pair on the disturbed pair is decreased. The crosstalk was known to be

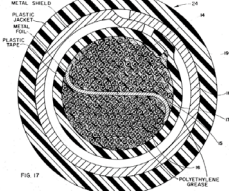
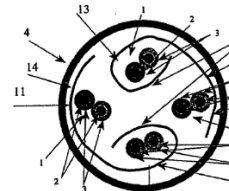
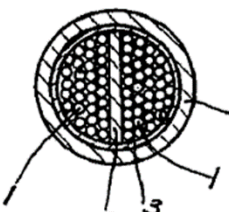
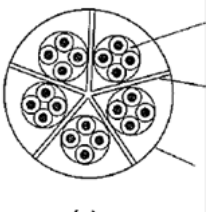
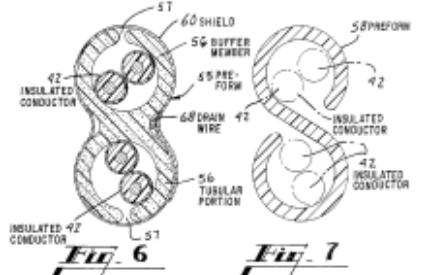
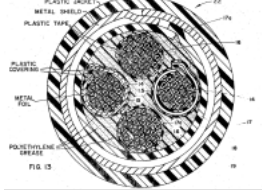
³ IEEE Standard at 4 (“far-end crosstalk. Crosstalk that is propagated in a disturbed channel in the same direction as the direction of propagation of the current in the disturbing channel. The terminal of the disturbed channel at which the far-end crosstalk is present and the energized terminals of the disturbing channel are ordinarily remote from each other.”).

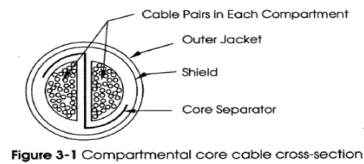
reduced to acceptably low levels by having the physical barrier, which prevented the twisted pairs from nesting with each other. *See, e.g.*, Beggs at 6:57-7:3, Figs. 8A. Crosstalk was also known to be reduced to acceptably low levels by the physical barrier creating and maintaining a certain minimum physical distance between twisted pairs. *E.g.*, Beggs at 3:48-51 (“As a result of the physical separation of the conductor pairs and the maintenance of the twist configuration of each pair, crosstalk performance is improved”), 7:58-60 (“The portions of the buffer system maintain the conductor pairs spaced apart which improves crosstalk performance”); Tessier (EX-1023) at 3:17-31. Increasing the distance between adjacent twisted pairs was understood to effectively decrease the crosstalk. *E.g.*, Tessier at 3:17-31.

C. Separators/Buffers Between Twisted Pairs or Groups of Twisted Pairs Within a Data Communications Cable

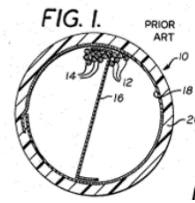
39. Various physical barriers/buffers/separators between twisted pairs or groups of twisted pairs in data communications cables were known and used in the art by 1999 and long before. For example, some barriers were made purely of plastics/polymers. *See, e.g.*, Beggs at Figs. 6, 7 and 5:64-6:14; Yanagida at Figs. 1, 2; EX-1023, Figs. 2, 3; EX-1036, Fig. 1. Others were plastic-coated metallic tapes. *See, e.g.*, Roberts, GmbH-886, Jachimowicz-340, Reeve, Reeve 1992. Common plastic coatings included an olefin polymer such as polyethylene, polypropylene, polyethylene terephthalate (Mylar), or other plastic material. *See, e.g.*, Roberts at

3:32-37. Some examples of physical separators in the prior art for separating twisted pairs in data communications cables are shown below:

 Roberts, Fig. 17 – plastic-coated metal tape separator	 GmbH-866, Fig. 1 – plastic-coated metal tape separators
 Yanagida, Fig. 1 – plastic separator	 Yonechi (IWCS), Fig. 3 – polyester tape separators
 Beggs, Figs. 6, 7 and 5:64-6:14, 6:52-56 – foamed polymer and/or dielectric tape separators	 Roberts, Fig. 13 – plastic tape-only separator (17a)



Reeve, Fig. 7-7 – core separator (See also EX-1018, Fig. 3-1)



Jachimowicz-340, Fig. 1 – Z-screen separator

40. Separating twisted pairs using a foamed polymer, specifically, was also known by 1999. E.g., Beggs at Fig. 6 and cl. 19 (a “buffer” of foamed PVC separating twisted pairs).

41. Material with one or more conductive layers often was (and is) used in data communications cables and at the time was referred to as a shield or shielding. For example, a metal tape (or plastic-coated metal tape) was wrapped around a cable assembly with the conductive layer grounded (e.g., with a ground wire) to dissipate unwanted currents and create an electromagnetic shield around the wrapped assembly. These shields could be either around or between each individual twisted pair or groups of pairs within a cable assembly, or around the cable assembly (e.g., within or next to the cable jacket), or both. Such shielding between twisted pairs or groups of twisted pairs was known to help reduce crosstalk by electrically isolating either twisted pairs or groups of twisted pairs from one another or cables from one another. E.g., Beggs, 2:54-66 (“Shielding often is added to a twisted pair of insulated conductors to confine its electric and

magnetic fields. In this way, susceptibility to electromagnetic interference is reduced.”). However, it was understood that acceptably low levels of crosstalk could be achieved, for example between adjacent twisted pairs, without using metal-containing separators or shields, and that there were known tradeoffs associated with using a shield around each twisted pair. *E.g.*, Beggs, 2:54-66 (“However, as the electric and magnetic fields are confined [by a metal-containing shield], resistance, capacitance and inductance all change, each in such a way as to **increase transmission loss**. . . . In order to compensate for the increased losses, the conductor insulation must be increased in thickness.”) (emphasis added); 9:33-37 (“crosstalk performance of the cable 20 is somewhat less than for multiple coaxial cable, or in cables having individually shielded pairs, but it is acceptable in a cable which meets stringent size requirements”).

42. It was known that separators worked to reduce crosstalk to acceptably low levels even without completely surrounding the twisted pair (or group of twisted pairs). *See, e.g.*, GmbH-866; Yonechi; Roberts; Beggs, Fig. 7.

D. Dielectrics

43. A POSITA would understand that an insulator is a dielectric material, and that plastic/polymer is a dielectric material. *See, e.g.*, Electronics Dictionary (EX-1031) at 4 (dielectric). Polymers and plastics were generally known to be dielectric materials prior to the filing of the priority application. *See, e.g.*,

Electronics Dictionary at 4 (dielectric). Specifically, olefin polymers such as polyethylene and polypropylene were known to have very low dielectric constants. Gingue at 2:10-13. It was also known that foaming a polymer resulted in a material with an even *lower* dielectric constant, as foaming adds air (which has the lowest dielectric constant) to the material. *E.g.*, Gingue at 3:20-26. Polyester layers were also known to be good dielectrics with low dielectric constants. An example of a common polyester used in cabling was Mylar.

44. By the late 1990s, foamed polymer was commonly used in data communications cables and was known to have beneficial properties, including good electrical properties and flame retardance. Such polymers were known to have “favorable” electrical properties, such as “very low dielectric constant and low dissipation factor.” Gingue, 2:10-14. Gingue teaches that foamed polymer “optimizes the electrical characteristics (i.e., the dielectric constant and dissipation factor) of the material....” Gingue at 4:5-9. Foaming reduces the dielectric constant of a material (thereby enhancing electrical performance) because it traps air, which has a very low dielectric constant, in the material.

45. A low dielectric constant results in lower capacitance between metal conductors, resulting in lower transmission loss. Capacitors form when two conductors are separated by a dielectric material. For example, capacitance may occur between twisted pairs on opposite sides of a non-metal separator or between

a twisted pair and a metal layer within the separator. When an alternating current is applied to the conductor, some current will flow through the capacitor resulting in current loss (i.e., transmission loss). It was known that using a conductive separator increased transmission losses, due to capacitance between a twisted pair and the conductive layer causing current leakage. *E.g.*, Beggs at 2:54-66. To reduce transmission losses, and also to further reduce crosstalk, it was known to improve pair isolation by (i) increasing distance/separation between the twisted pairs and (ii) making the buffer between the pairs “comprise[] a dielectric” material that reduced the pair-to-pair or pair-to-conductive layer capacitance. *E.g.*, Beggs at 2:63-67, 3:42-50; Canadian Patent Application No. 2,058,046 (EX-1023), 3:17-23.

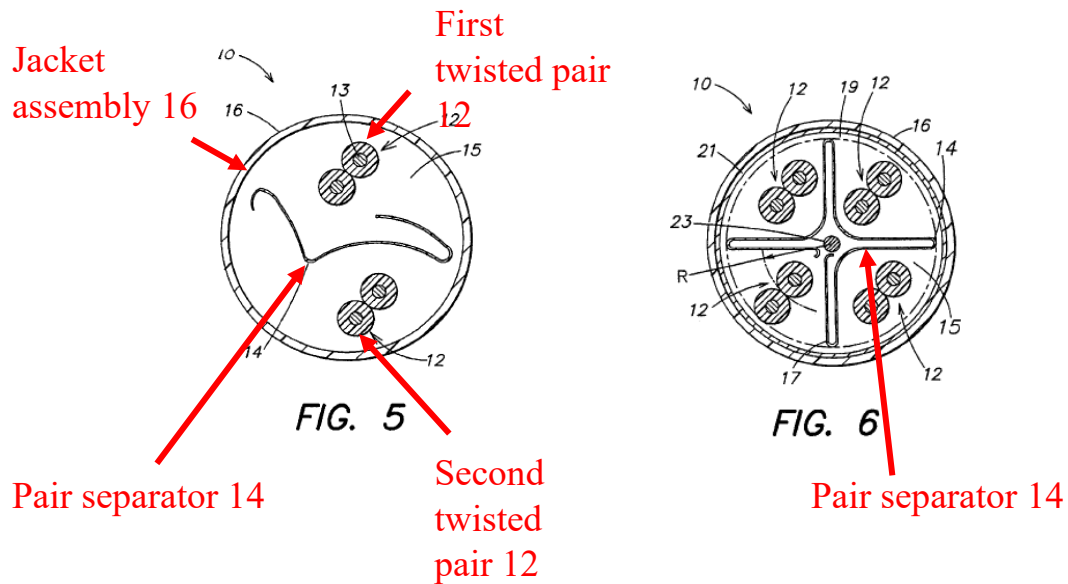
46. Gingue also teaches that foaming “decreases the amount of flammable material employed for a given volume of material.” Gingue at 3:22-24. Foamed polymers could then also be provided with a flame-retardant additive. Gingue, 4:37-48. Thus, in data communications cables “a foamed material is preferably employed to achieve a favorable balance of electrical properties and flame retardancy.” Gingue at 3:23-25 (emphasis added); *see also* Jachimowicz at 2:46-59 (teaching using a foamed polymer tape (such as foamed polyethylene backed by Mylar) to beneficially hold twisted pairs together and separate the pairs from a metal shield); GmbH-866 at 2 (teaching a “foam-skin polyethylene” insulation for

a cable conductor wire). Thus foaming achieves a “favorable balance of electrical properties and flame retardance.” Gingue at 3:24-26. Foamed polymers could then also be provided with a flame-retardant additive. Gingue at 4:37-48.

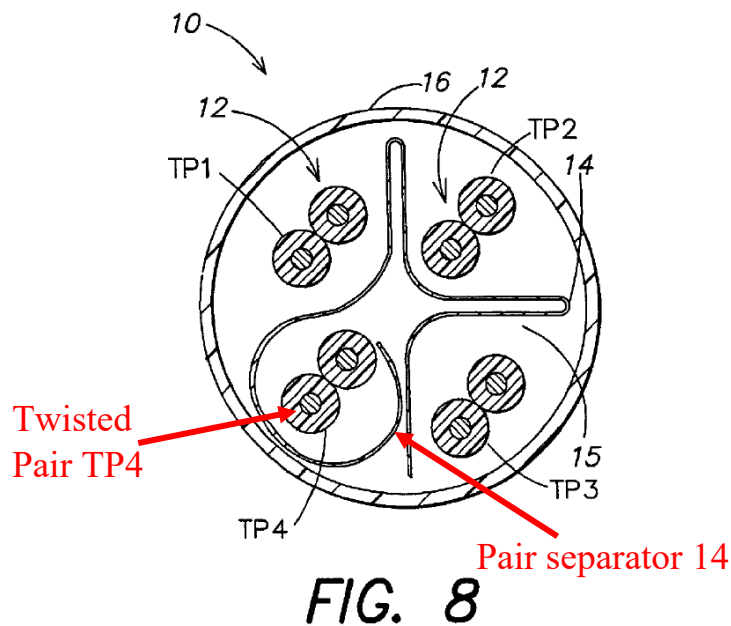
VII. THE ’537 PATENT

47. The ’537 Patent describes a communications cable with a plurality of twisted pairs and a pair separator 14 within a jacket assembly 16. ’537 Patent at Abstract, 4:28-41. The pair separator 14 separates the twisted pairs from each other to provide “a desired crosstalk isolation between each of the plurality of twisted pairs.” *Id.* at Abstract; *see also id.* at 4:28-41. The pair separator 14 is configured to form grooves along a longitudinal length for the twisted pairs to be disposed within. *Id.* The pair separator 14 is “preferably a flame-retardant, low-dielectric constant, low-dissipation factor, foamed polymer tape.” *Id.* at 4:61-63. The ’537 Patent teaches that the purported Invention “is not limited to the materials described,” and notes that other materials such as a polyolefin or glass fiber that is flame-retardant. *Id.* at 4:58-59, 5:8-12. The ’537 Patent teaches that the separator may include a conductor, such as aluminum. *Id.* at 6:30-35. It specifically gives an example of a pair separator that is made of an aluminum/mylar tape. *Id.* at 6:2-4. The ’537 Patent also claims a pair separator that includes a conductive layer. *Id.* at claim 14.

48. Various configurations of the pair separator are disclosed. For example, Figure 5 discloses a pair separator 14 with grooves that separate but do not completely enclose the channel, while Figure 6 discloses a pair separator 14 folded into a 'plus' shape:



Id. at 4:37-43, 5:48-55, Figs. 5 and 6 (annotated). Figure 8 discloses a similar shape to Figure 6, but the separator partially encloses one twisted pair TP4.



Id. at Fig. 8 (annotated).

49. The pair separator 14 and twisted pairs 12 are twisted together prior to the application of the jacket. *Id.* at 8:41-48. The specification teaches that the pair separator can also be used in other cable constructions, such as “fiber optic media.” *Id.* at 4:20-26.

A. The Challenged Claims of the '537 Patent

50. The challenged claims include claims 19-20, 22. These claims include one independent claim (19) and two dependent claims (dependent claims 20 and 22 depend from claim 19).

B. Prosecution History

51. I have reviewed the prosecution history of the '537 patent. I understand that none of the references that I discuss in this declaration were

substantively discussed by the examiner of '537 Patent. I understand that Roberts was submitted as part of an Information Disclosure Statement (IDS). I understand that Beggs, Yanagida, GmbH-866, Jachimowicz, and Gingue were not before the examiner during prosecution of the '537 Patent. The references I discuss here have features that the references the examiner was focused on did not. For example, Beggs, Yanagida, and GmbH-866 have separators that are substantially flat and separate a twisted pair from another twisted pair, and Beggs and Yanagida teach a separator that is metal-free (and comprised of dielectric material). The Boucino reference (US 5,969,295) the examiner was focused on had a solid plus-shaped separator, and the Simons patent (US 3,911,200) had a metal-containing separator member. *E.g.*, Excerpts from Prosecution History of U.S. Patent No. 6,998,537 (EX-1005, EX-1040, EX-1041, EX-1042, EX-1043, EX-1044).

C. Reexaminations before the USPTO

52. I have also reviewed the reexaminations of the '095, '537, and '999 patents. *See generally* EX-1003, EX-1006, EX-1034.

53. When the '537 patent reexamination was terminated, claims 19-22 had been rejected. The examiner found them obvious in view of the combination of

“GmbH-866”, Roberts, and Gingue. EX-1006, 17-23.⁴ For claim 19, the examiner explained that GmbH-866 taught a separator disposed between twisted pairs. (*id.* at 19-20), the separator was “substantially flat” as that term was used in the ’537 Patent—i.e., the shape of the separator is “flat when supplied, not [necessarily] in a finished [cable] product” (*id.* at 17 (incorporating discussion of ground 5 at 10-11)), that it would have been obvious to modify the GmbH-866 separator to consist of a dielectric layer only (*id.* at 19-20, citing Roberts), and that it would have been obvious to modify the separator to include foamed polymer material as taught by Gingue (*id.* at 21). The examiner also found that dependent claims 20-22 were obvious. The examiner stated that Gingue taught the claimed flame-retardant and low-dielectric constant properties of foamed polymer material and it would have been obvious to use foamed polymer material having these known, beneficial properties. *Id.* at 22-23. For the reasons I explain in this declaration, I agree with the examiner that these references make claims 19, 20 and 22 (the claims I discuss) obvious.

54. The Beggs reference was before the examiner in the ’537 reexamination. The examiner stated that Beggs did not anticipate the ’537 Patent. I

⁴ Jachimowicz was added to the IPR for this ground. It teaches a foamed polymer tape consisting of two dielectric materials.

understand that the examiner did not consider whether Beggs, in view of other references, made claim 19 obvious.

55. The examiner cited Roberts as evidence that there were only a finite number of predictable options for the composition of a communications cable separators, and that one of those known options was a metal free, dielectric separator. EX-1006 at 20. I agree with that.

56. The '537 and '999 reexaminations did involve Yanagida.⁵ I understand that the examiners reached conflicting conclusions. For example, the '999 examiner decided that Yanagida disclosed a “configurable” separator, while the '537 examiner decided that Yanagida did not disclose a “configurable” separator.

57. Each of the reexaminations did involve Gingue. Where the distinction over the prior art was a “foamed polymer” limitation, each of the three reexaminations had found that Gingue made the “foamed polymer” limitations obvious. EX-1006, 21-23 ('537 patent); EX-1003, 17-19 ('095 patent); EX-1034, 36-41 ('999 patent). The examiners did not think that such addition of foamed polymer made the claims patentable because of Gingue. As I explain in more detail in this declaration, I agree with that conclusion.

⁵ I understand that the '095 reexamination did not involve Yanagida, though it was cited in an IDS (but never discussed).

58. The examiners in the reexaminations did not find the objective evidence submitted by Belden persuasive. I agree with the examiners. For example, it does not appear that Belden showed that the objective evidence it cited was tied to what was actually claimed.

59. I understand the none of the reexaminations reached finality. I understand that following the settlement of the settlement of the district court litigation in early 2012, the reexaminations were terminated at the request of the Patent Owner.

D. District Court Litigation Involving the '537 Patent

60. I am generally aware that there was a U.S. District Court trial involving several Belden patents, including the '537 patent, the '095 patent, and the '999 patent. I understand that based on the evidence the jury saw, some claims were found valid and some claims were found invalid. I also understand that the case was settled shortly after the conclusion of the trial.

VIII. Claim Constructions

61. I understand that in prior proceedings involving the '537 Patent, there have been some disputes about the meanings of certain claim terms.

62. I understand that claim terms in a patent are to be given their plain and ordinary meaning, as would have been understood by a person having ordinary skill in the art, at the time of the alleged invention, which I am informed is

February 25, 1999, considering the language of the claims, the specification, and the prosecution history of record.

63. Below I provide my understanding of claim terms relevant to this declaration that were disputed in previous matters.

64. For all other terms, I have given the claim terms their plain and ordinary meaning, as would have been understood by a person having ordinary skill in the art as of February 25, 1999, in view of the claims themselves, the specification of the '537 Patent, and its prosecution history.

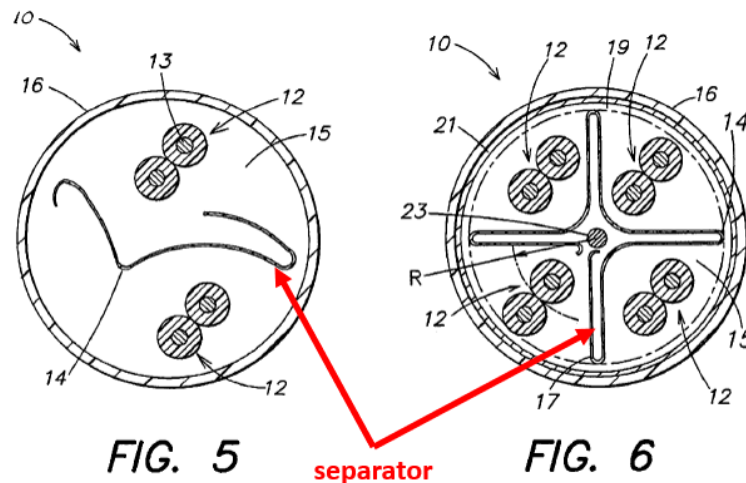
**A. “configurable dielectric pair separator being *substantially flat*”/
“configurable dielectric pair separator . . . including a *substantially flat* dielectric tape” (independent claim 19)**

65. I understand that the meaning of a “substantially flat” separator, as would be understood by one of ordinary skill in the art in view of the '537 Patent's claims, specification, and prosecution history, is a separator that is initially a substantially flat member prior to being formed into the cable. I also understand that the term does not require that the separator be substantially flat in the finished cable.

66. This construction is consistent with how a POSITA would understand the '537 Patent's description in its specification. For example, the pair separator 14

is described in the specification as “a flat configurable tape” and that in the preferred embodiment the pair separator “is supplied as a flat extruded tape.” ’537 Patent at 5:48-61. The specification then explains that the pair separator 14 (a “flat configurable tape”) is arranged in various shapes when in the final assembled cable to separate twisted pairs.

67. For example, in Figure 5 the pair separator 14 “is configured such that the twisted pairs are disposed within channels or grooves 15 of the pair separator....” ’537 Patent at 4:37-41. The patent also explains, with respect to Figure 6, that “the pair separator 14 is a flat configurable tape . . . that is shaped to have the illustrated profile....” ’537 Patent at 5:48-50. I have reproduced and annotated these figures below:



’537 Patent at Figs. 5, 6 (Annotated). This is the only context in which the specification uses the word “flat” as applied to the pair separator 14 (whether prior

to assembling or after assembling in the cable). The only other uses of the word “flat” in the specification are in reference to an alternative (non-circular) overall shape of the cable such as the cable having a “substantially flat configuration” shown in Figure 10. ’537 Patent at 7:60-62, Fig. 10. I also note that claims of both the ’537 and the related ’095 patent would also indicate that the term “substantially flat” dielectric separator does not have to be substantially flat once in the final assembled cable. For example, claims 27 and 33 of the ’095 patent each requires that the dielectric pair separator is both “substantially flat” and is “arranged within the jacket to form at least two grooves”. ’095 Patent. Claims of the ’537 Patent similarly require a “substantially flat configurable dielectric separator . . . in the finished communications cable” that is arranged into various shapes, e.g.: “arranged to have no more than one concave surface” (dependent claim 2), “arranged within the jacket to provide at least two grooves (dependent claim 3), “has a concave shape” (claim 17). I also understand that during prosecution of the related ’537 Patent, the patent applicant amended claim 1 to add a limitation (to distinguish the art) that the “substantially flat” separator must be “arranged . . . so as to be substantially flat *in a radial cross-section taken through the finished communications cable.*” EX-1044, 3 (emphasis added).

68. I understand that this construction is consistent with how previous patent examiners have construed the term in related patents that use the same term,

for example the '537 Patent. EX-1006 at 9-11. That examiner explained that Figures 4 and 5 of the specification show what the Patent Owner contends is an embodiment of the “substantially flat” separator, the only “reasonable interpretation of the term ‘substantially flat’...must be that the shape is flat when supplied, not in a finished product”). EX-1006 at 9-11

69. This construction is also consistent with how a federal court construed the term in a previous litigation. In that previous litigation, the court construed the term “substantially flat” to mean “thin and substantially uniform in thickness.” EX-1052 at 3-4.

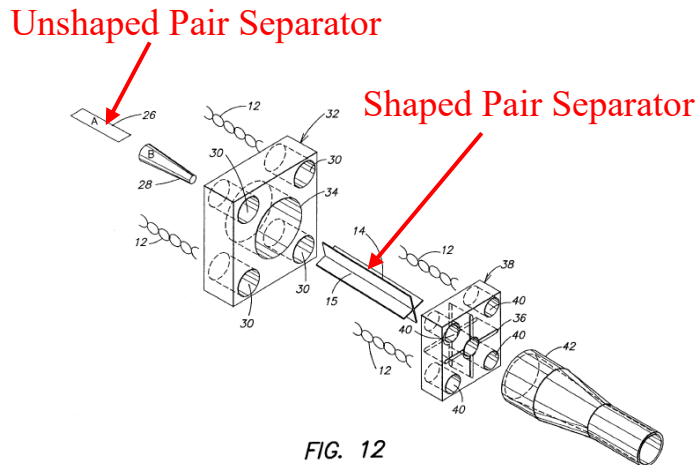
B. “Configurable” separator (independent claim 19)

70. I understand that the meaning of a “configurable” separator, as would be understood by one of ordinary skill in the art in view of the '537 Patent's claims, specification, and prosecution history, is a separator that can be formed or arranged when the cable is being formed. “Configurable,” as used in the claims of the '537 Patent, does not require that the separator be reconfigurable or continue to remain “configurable” once in the finished cable assembly.

71. This is consistent with how a POSITA would understand the specification of the '537 Patent. The specification teaches that the separator is drawn from a reel, formed into a cylinder around a cob, aligned with the twisted

pairs, and then “configured into a desired shape.” EX-1004 at 8:28-38; Fig. 12.

This can be seen in Figure 12, which I have reproduced and annotated below.



'537 Patent at Fig. 12 (Annotated). The specification also discloses that the configurable pair separator “is configured such that the twisted pairs are disposed within channels or grooves....” '537 Patent at 4:38-41. The specification further describes the tape used to form the pair separator as “a flat configurable tape...that is shaped to have the illustrated profile....” '537 Patent at 5:48-51.

72. Similarly, the claims of the related '095 patent recite that the “configurable” separator is “arranged within the jacket to form at least two grooves.” *E.g.*, '095 Patent at claims 27, 33. The plain meaning of this phrasing, in view of the specification, is that the separator is “configurable” into that shape during the cable manufacturing/assembly process, not that one is able to

“reconfigure” the separator into that shape *after* the cable has been manufactured and assembled.

73. I understand that this construction is also consistent with the construction provided by the federal court previous litigation involving the ‘537 patent, where the term was construed to mean “[f]lexible enough to be formed or shaped.” *Belden Techs. Et al. v. Superior Essex Comm’cns LP et al.*, No. 08-63, Claim Construction Order (EX-1052) at 1-2. I also understand that this construction is consistent with how a patent examiner construed the same “configurable” separator term during an *inter partes* reexamination of the related ‘999 patent. I understand the examiner found that there was no basis to limit “configurable” to require that the separator remain “configurable” once *inside* the assembled cable, or that the separator must be “configurable” at “normal manufacturing temperatures,” and that even a heat formed separator would have been “configurable” at normal manufacturing temperatures. EX-1034 at 109-112.

74. I note that I am aware that the examiner during reexamination of the related ‘537 patent found that a plastic separator described as “rigid” in the Yanagida reference was not a “configurable” separator. EX-1006 at 27-28. However, there was no discussion of what the patent specification teaches regarding “configurable,” and as I explained above, I do not think that a POSITA

would understand the '537 patent to be using "configurable" to require that the separator remain configurable even after it is placed into the final cable assembly.

IX. GROUND

A. GROUND 1: Beggs and Jachimowicz Renders Claim 19 Obvious

1. Overview of the Combination

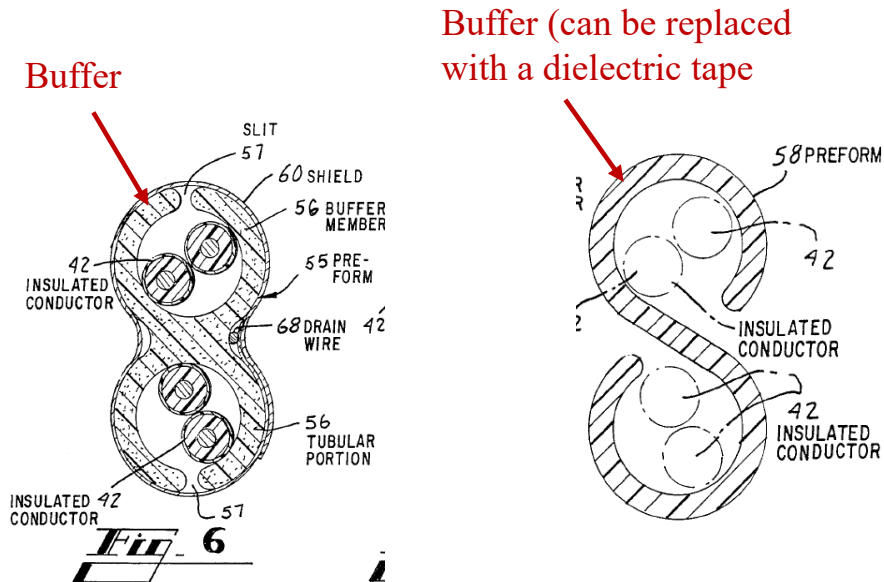
a. Beggs

75. Beggs provides an overview of some desired characteristics of data communications cables, including explaining that "flame retardance . . . is important," the cable should be "low in cost," and should have a relatively small cross-section but meet "attenuation and crosstalk requirements." Beggs at 1:36-37, 1:47-58. Beggs further explains that in cables where pairs are non-shielded and enclosed in a jacket, "[i]mproved pair isolation has long been sought ...to reduce crosstalk." Beggs at 3:16-18.

76. Beggs teaches a cable "capable of high rate transmission of data streams" and "comprises a plurality of . . . twisted pair[s] of individually insulated conductors." Beggs at 3:34-42; *see also* Beggs at 5:33-35 ("plurality of twisted pairs 43-43"), Abstract, 1:9-12.

77. Beggs teaches a "buffer" system between the twisted pairs. The "buffer" can be a "preform" that has a dual tubular shape (Fig. 6) or 'S' shape (Fig.

7), and the S-shaped buffer “may be replaced with a tape which is made of dielectric material”:



Beggs at 5:64-6:11, 6:48-56.

78. The preform buffer may be comprised of “expanded polyvinyl chloride plastic material.” Beggs at 6:1-3. Beggs at claim 19 also claims a buffer, generally, that is comprised of a “cellular polyvinyl chloride material”. Beggs, cl. 19. A POSITA would understand these to be references to foamed polymers.

79. While Beggs’ preferred embodiment has a metal shield inside the cable jacket, Beggs teaches that “it is also within the scope of this invention to enclose the buffer system with a jacket only . . . should a shield not be needed . . .” Beggs at 8:19-21.

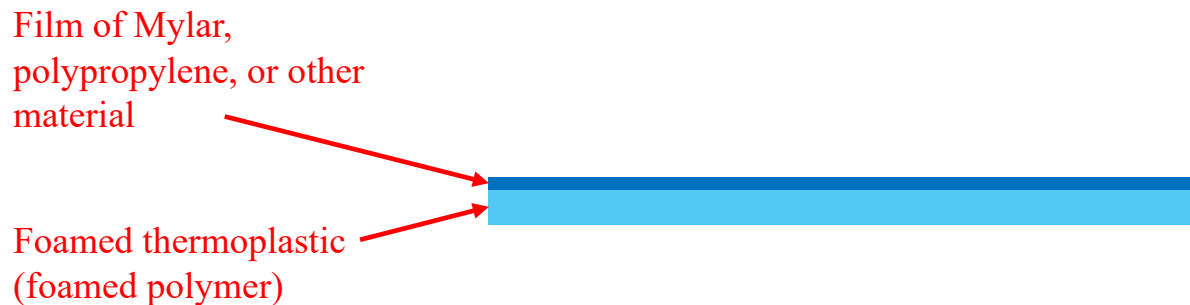
b. Jachimowicz

80. By 1999 (and well before), foamed polymer was commonly used in communications cables. Its advantages in that application were also well-known in the art.

81. Jachimowicz teaches a data communications cable (for sending “pulse code modulated signals”) that has multiple sets of twisted pairs of conductors that are then assembled in a twisted cable core and covered with a plastic jacket.

Jachimowicz at Abstract, 1:6-16. A *“tape made of foamed thermoplastic supported by a film such as Mylar or polypropylene or other material”* may be applied over the twisted pairs to hold them together and prevent lay distortion.

Jachimowicz at 2:46-59. Such a two-material foamed polymer tape is illustrated below (side profile view):



A POSITA would understand this “tape” to also be substantially flat and configurable. A “tape” of insulating material used in communications cabling construction was understood in the field to connote a component that was substantially flat and configurable. Jachimowicz indicates, for example, that the

tape is “appl[ied]” to hold pairs together in a bundle (Jachimowicz, 2:50-53), indicating that the tape was substantially flat could be configured (e.g. wrapped or folded) around the pairs. Jachimowicz teaches that the jacket or tape of foamed material may be a “foamed polyethylene 20.” Jachimowicz at 2:48-50. Solid (non-foamed) polyethylene was a material known to have a “very low dielectric constant”, and foaming a polymer (i.e. adding air) resulted in an even lower dielectric constant. *E.g.*, Gingue, 2:10-14, 3:20-23. Thus a POSITA would have understood the foamed polymer tape of Jachimowicz to be a very low dielectric constant tape, and therefore an insulating and non-conductive tape.

2. Independent Claim 19

a. [19.pre] “An unshielded communications cable comprising:”

82. I understand the preamble does not limit the claim language.

However, Beggs discloses an unshielded communications cable. Beggs teaches a cable “capable of high rate transmission of data streams”. Beggs at 3:34-42; *see also id.* at Abstract, 1:9-12. Beggs also teaches that “it is also within the scope of this invention to enclose the buffer system with a jacket only . . . should a shield not be needed....” Beggs at 8:19-21; *see also id.* Fig. 9B, Fig. 7 (showing a

separator and two sets of twisted pairs without any metal conductive layer around the pairs); *compare id.* at claim 1 (claiming a communications cable that does not require shielding) *with* claim 2 (requiring a shield).

83. Beggs thus discloses this element.

b. [19.a] “a plurality of twisted pairs of insulated conductors comprising a first twisted pair of insulated conductors and a second twisted pair of insulated conductors;”

84. Beggs teaches a plurality of twisted pairs of insulated conductors comprising a first twisted pair an insulated conductors and a second twisted pair of insulated conductors. *E.g.*, Beggs at 3:34-42 (a cable that “comprises a plurality of . . . twisted pair[s] of individually insulated conductors”), 5:33-35 (“plurality of twisted pairs 43-43”), cl. 1, Figs. 1, 9A, 9B.

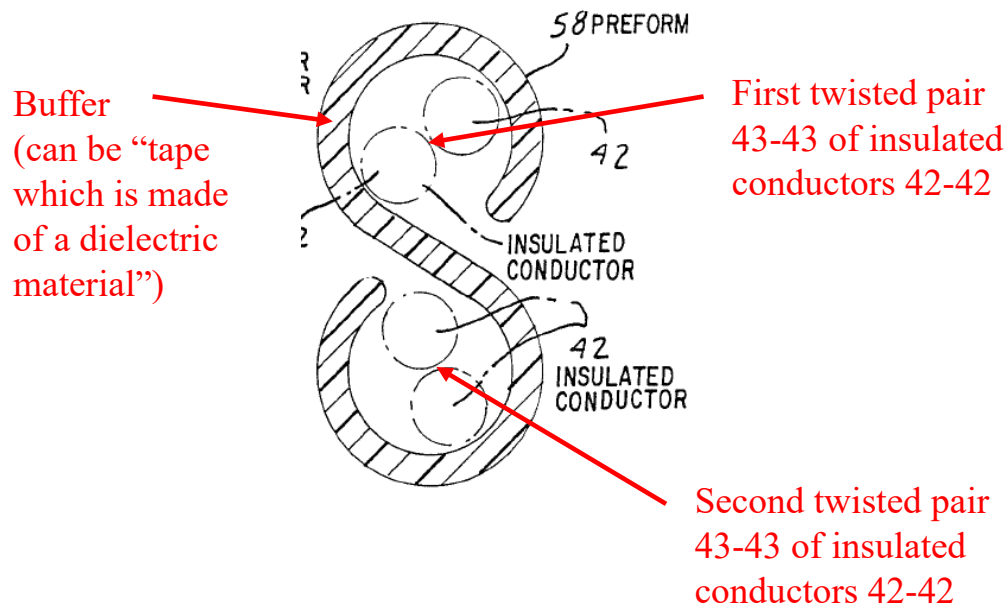
85. Beggs thus discloses this element.

c. [19.b] “a substantially flat configurable dielectric separator that consists of non-conductive, dielectric materials disposed between the plurality of twisted pairs of conductors that separates the first twisted pair of insulated conductors from the second twisted pair of insulated conductors; and”

[19.d] “wherein the substantially flat configurable dielectric separator includes a foamed polymer.”

86. The combination of Beggs and Jachimowicz teaches elements [19.b] and [19.d].

87. Beggs teaches a *substantially flat configurable dielectric separator that consists of [one] non-conductive, dielectric material disposed between the plurality of twisted pairs* that separates the first twisted pair from the second (claim element [19.b]): the embodiment where the S-shaped preform 58 in Fig. 7 is “replaced with a tape which is made of a dielectric material and which is wrapped about the conductor pairs” Beggs at 6:52-56; *see also id.* at 6:9-11 (“S-shaped preform provides an individual buffer for each conductor pair”) and Fig. 7. A POSITA would understand that a dielectric material is a non-conductive, insulating material. *See Electronics Dictionary* at 4 (dielectric). Such materials do not conduct electrical currents. By providing a “buffer” between the twisted pairs, the dielectric tape of Beggs is disposed between the first and second twisted pairs and separates the first from the second. For example, I have illustrated this below:



Beggs at Fig. 7 (Annotated).

88. The “tape” made of a dielectric material that provides a “buffer” between twisted pairs is a *substantially flat* and *configurable* dielectric separator. As discussed above, it is my understanding that the term “substantially flat” separator requires only a separator that is initially a substantially flat member prior to being formed into the cable; the term does not require that the separator be substantially flat in the finished cable. *Supra*, §VIII.A. A POSITA would understand that the “tape” disclosed by Beggs would be configurable and could be configured into, for example, the ‘S’-shaped buffer taught by Beggs. Beggs at 6:52-56 (“the S-shaped preform 58 in FIG. 7 may be replaced with a tape which is made of a dielectric material and which is wrapped about the conductor pairs to

cause each pair to be enclosed substantially in a dielectric portion of the buffer system.”).

89. Further, Beggs’ tape made of dielectric materials is *non-conductive*. A POSITA would have understood that a tape made of dielectric material was non-conductive. *See* Ex. 1031 at 4 (dielectric). Beggs teaches that the buffer member does not include any metal. *E.g.*, Beggs, Fig. 7, 6:1-3 (buffer comprised of solid or expanded PVC), 6:54-55 (buffer of tape “made of a dielectric material”), 7:40-44 and 7:63-65 (discussing an advantage of the embodiments being “the absence of individual pair shielding”). For example, the expanded polyvinyl chloride plastic (PVC) taught by Beggs is a material suitable for the buffer (Beggs at 6:1-3) was understood to be non-conductive.

90. Beggs’ tape made of dielectric materials also *separates* the twisted pairs. Beggs teaches that the purpose of the dielectric member between the twisted pairs (e.g., the S-shaped perform or the dielectric tape) is to provide a “buffer” that creates a “physical separation” between the twisted pairs and “maintain[s] the twist configuration of each pair,” thereby improving “crosstalk performance.” Beggs at 3:42-51.

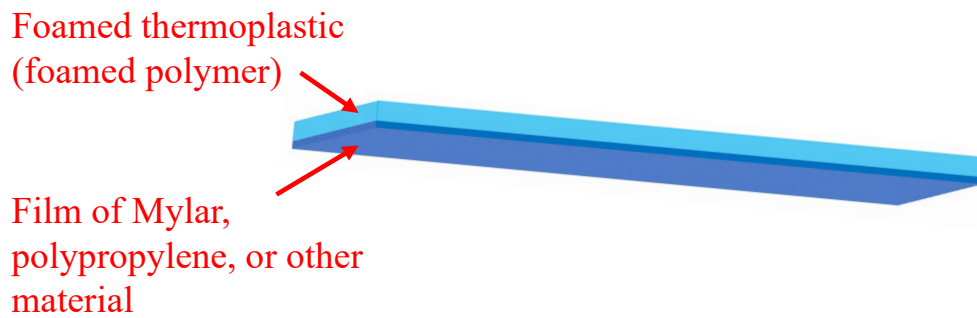
91. Beggs discloses that the separator, which is refers to as a “buffer” (*substantially flat configurable dielectric separator*) may include a foamed polymer (element [19.d]). Beggs at 6:1-3 (“The preform [buffer] may be

comprised of a solid **or expanded polyvinyl chloride plastic material.**”), 6:52-56 (“S-shaped preform 58 in Fig. 7 may be replaced with a tape which is made of a dielectric material and which is wrapped about the conductor pairs . . .”), claim 19 (“wherein said buffer system is comprised of a cellular polyvinyl chloride material.”); 5:60-63. A POSITA would have known that expanded PVC and cellular PVC are and refer to foamed polymers. Thus the specification at 5:64-6:16 indicates that the preform buffer can be either solid or expanded PVC material, discloses an alternative *shape* for the preform (an ‘S’ shape), and that the S-shaped preform can be replaced with a tape made of dielectric material. Nothing in Beggs limits the teaching that the buffer of dual-tubular embodiment (preform 55) can be comprised of foamed polymer to only that embodiment. Rather, Beggs would indicate to a POSITA that any of the disclosed buffer embodiments, including the ‘S’-shaped “preform 58” and the embodiment where “S-shaped preform 58 [is] replaced with a tape” (Beggs at 6:52-56), can be comprised of foamed polymer, just like the dual tubular preform 55 embodiment.

92. Even if Beggs did not expressly disclose a separator that includes a foamed polymer, a POSITA would have known (based on Beggs’ description) that one could make the S-shaped preform 58 as well as the tape Beggs teaches as an alternative for preform 58 of a foamed polymer, just like what is expressly taught for preform 55. The foamed S-shaped preform and tape would have the same

function and benefits as the foamed buffer preform 55. It would provide separation between the twisted pairs helping with isolating the pairs. Beggs at 6:35-45. It would also provide the mechanical advantage of preventing the twisted pairs from untwisting. Beggs at 3:45-48 (“Each buffer portion encloses substantially the associated pair of insulated conductors and is effective to inhibit distortion of the twist configuration of the associated pairs of conductors”). I also note that the obvious combination of Beggs and Jachimowicz’s plastic-backed foamed polymer tape (which I discuss below) also discloses this limitation.

93. Beggs does not expressly teach that the dielectric separator consists of *multiple* dielectric “materials,” as claimed. The combination of Beggs and Jachimowicz does. Jachimowicz teaches using a “tape made of foamed thermoplastic supported by a film such as Mylar or polypropylene, or other material.” Jachimowicz at 2:51-53. This tape is a *substantially flat configurable dielectric separator* that “consists of” two “non-conductive, dielectric materials,” as claimed: (i) the foamed thermoplastic (*foamed polymer*), backed by (ii) a plastic film of Mylar, polypropylene, or other material:



Jachimowicz at 2:46-59 and Figs. 1, 2. The foamed polymer tape disclosed by Jachimowicz was understood to be both substantially flat and configurable, as it was described as a “tape.” Consistent with this, the “tape” of insulating material, such as a Mylar-backed foamed polymer tape, was described as capable of being “appl[ied]” to hold twisted pairs together. Jachimowicz, 2:50-53.

94. Jachimowicz’s foamed polymer tape consists of non-conductive materials, because it is all polymers. There are no metal layers in the tape. The polymers that Jachimowicz discusses were generally understood to be non-conductive materials. For example, foamed polymers (including foamed polyethylene) and plastic film backing (including Mylar and polypropylene) were known polymers and were understood to be non-conductive.

95. Jachimowicz’s foamed polymer tape also consists of dielectric materials, because each of the two materials were known to be dielectrics (the plastic film and the foamed polymer). *See also*, Electronics Dictionary at 4. The first material—foamed thermoplastic—was also known to be a non-conductive,

dielectric material. Gingue at 2:10-13 (“olefin polymers, such as polyethylene and polypropylene, are melt extrudable *thermoplastic materials* having favorable electrical properties as manifested by their *very low dielectric constant* and low dissipation factor.” (emphasis added)). The second material—a plastic film such as Mylar or polypropylene—was also known to be a non-conductive, dielectric material. Gingue at 2:10-13 (“olefin polymers, such as polyethylene and *polypropylene*, are melt extrudable thermoplastic materials having favorable electrical properties as manifested by their *very low dielectric constant* and low dissipation factor.” (emphasis added)); Roberts at 3:51 (“polyethylene teraphthalate (*Mylar*) *dielectric*” (emphasis added)).

96. The obvious combination of Beggs, which teaches a dielectric buffer between twisted pairs that can be foamed polymer and can be a dielectric tape, with Jachimowicz, which teaches a plastic film-backed foamed polymer tape, would result in a separator that “consists of non-conductive, dielectric materials,” as recited by claim 19. A POSITA would have been motivated, with a reasonable expectation of success, to use a plastic film-backed foamed polymer tape such as that taught by Jachimowicz as the dielectric tape buffer in Beggs for at least five reasons.

97. **First**, Beggs itself teaches that the “buffer” member can be a foamed polymer. Beggs at 6:1-3 (“The preform may be comprised of a solid or expanded polyvinyl chloride plastic material.”).

98. **Second**, providing a plastic film backing on a foamed polymer was known to improve the mechanical characteristics of the foamed polymer tape. For example, the Mylar film backing would provide enhanced tensile strength properties to the foamed tape, decreasing the tendency for the foamed tape to stretch or break. The mechanical properties of the plastic-backed tape were known to be particularly important in cabling applications, where the cable (and thus the foamed polymer layer) was commonly subject to movement, stress, and strain, particularly during cable assembly.

99. **Third**, a POSITA would have been motivated to use a plastic-backed foamed polymer tape instead of a Mylar only, non-foamed tape in order to improve the electrical performance of the cable by reducing capacitance between twisted pairs, thereby reducing current leakage and the associated transmission losses within the cable. Current leakage arises when two conductors are separated by a dielectric material, forming a capacitor. If an alternating current is applied to the conductor, some current will flow through the capacitor resulting in some current loss. This is a common problem in any kind of transmission line. Reducing the capacitance between the conductors reduces the amount of current that is leaked.

100. There were at least three known ways to reduce capacitance: (1) lowering the dielectric constant of the material between the conductors, (2) increasing the distance between the conductors, and (3) reducing the area of the conductors.⁶

101. A POSITA would have expected the foamed tape to reduce the capacitance by lowering the dielectric constant of the material. Gingue, for example, expressly teaches that foaming a polymeric insulating material “enhance[s]” its electrical performance—i.e., provides a “*low dielectric constant and low dissipation factor*.” Gingue at 3:20-26 and 2:12-14 (emphasis added). Foaming reduces the dielectric constant (thereby enhancing electrical performance) because it traps air, which has a very low dielectric constant, in the material.

102. A POSITA also would have expected the use of a foamed polymer tape to maintain the distance between those twisted pairs similar to what Beggs teaches for foamed buffer. This is due to the increased thickness of the foamed tape compared to the S-shape non-foamed tape. *See* Beggs at 6:11-14 (“thickness of each portion of the preform is equal at least to the radius” of the conductor”), Figs. 6-7; Gingue at 3:20-23. It was well known in the art that two ways to effectively

⁶ As an example, the capacitance of a parallel plate capacitor is: $C = \epsilon_0 \frac{A}{d}$ where C is the capacitance, ϵ_0 is the dielectric constant, A is the area of the parallel plates, and d is the distance between the plates.

reduce capacitance, and thereby reduce current leakage and the resulting transmission losses, were to lower the dielectric constant of the material between the conductors and to increase the distance (or maintain an increased distance) between conductors.

103. **Fourth**, using a plastic-backed foamed polymer tape instead of a non-foamed tape would have predictably further decreased crosstalk between twisted pairs on opposite sides of the separator by maintaining at least the distance between twisted pairs that Beggs teaches for the foamed buffer. *See* Beggs at 6:11-14, Figs. 6-7. A POSITA would know that increasing (or maintaining an increased distance) and then maintaining the distance between adjacent twisted pairs effectively reduced crosstalk between them. *See, e.g.*, EX-1023 at 3:17-24 (“The spacing of the pairs minimizes cross-talk between the pairs...”); Beggs at 7:58-61 (“The portions of the buffer system maintain the conductor pairs spaced apart which improves crosstalk performance”). The greater the distance between the twisted pairs that is maintained in a cable, the lower the crosstalk. EX-1023 at 3:17-31.

104. **Fifth**, foamed polymer would have been expected to predictably have less of a negative effect on the flame resistance of the cable than non-foamed polymer. This is because foaming “decreases the amount of flammable material employed for a given volume of material.” Gingue at 3:20-26. The substitution of

Jachimowicz's plastic-backed foamed polymer tape for a non-foamed tape would result in less flammable material within the cable, thus improving the overall flame resistance of the cable. This is because the overall flame resistance of a cable is determined by the balance of flammable and inflammable materials within the cable. Reducing the amount of flammable material shift the overall balance of the cable in favor of inflammable materials. Beggs itself, in the "Background of the Invention" section of the specification, confirms that it was known in the communications cable art that "flame retardance . . . is important". Beggs at 1:36-37.

105. A POSITA would have had a reasonable expectation of success in using a plastic film-backed foamed polymer tape such as that taught by Jachimowicz as the dielectric tape buffer of Beggs because doing so would have been straightforward and would not have required any skill beyond routine engineering. There was substantial, in fact complete, overlap in the technology between Beggs and Jachimowicz, and a POSITA would have expected to have predictable results by combining the teachings. Beggs itself teaches that the separator can be a foamed polymer (Beggs at 6:1-3 and cl. 19) and can be in tape form (Beggs at 6:52-56). POSITA would have easily expected to be able to use the plastic film-backed foamed polymer tape of Jachimowicz in exactly the same way that Beggs teaches using the foamed buffer and dielectric buffer tape. A

POSITA would simply insert Jachimowicz's plastic film-backed foamed polymer tape into the die plates used to construct the cable using Beggs' dielectric buffer tape. Therefore, a POSITA would have expected to be able to do this known cable assembly techniques.

106. Further, a POSITA would have expected the foamed polymer tape of Jachimowicz, with its very low dielectric constant, to work as the "buffer" in Beggs in the same way that Beggs teaches the foamed buffer of Figure 6—working as an effective insulator and spacer. *See* Beggs at 5:64-6:14; Jachimowicz at 2:46-54. Sold (non-foamed) polyethylene was a material known to have a "very low dielectric constant", and foaming a polymer (i.e., adding air) was known to result in an even lower dielectric constant. *E.g.*, Gingue at 2:10-14, 3:20-23.

107. Thus, it is my opinion that it would have been obvious to modify Beggs, based on its teachings and the teachings of Jachimowicz, to have the substantially flat configurable dielectric separator that "consists of non-conductive, dielectric materials" and includes a foamed polymer.

d. [19.c] "a jacket enclosing the plurality of twisted pairs of insulated conductors and the configurable dielectric separator;"

108. Beggs teaches a jacket enclosing the plurality of twisted pairs of insulated conductors and the configurable dielectric separator. *E.g.*, Beggs at 8:7-12 ("In a preferred embodiment, the cable 20 is provided with an outer jacket 80

... which is comprised a polyvinyl chloride material”); *see also id.* at 8:19-21 (“It is also within the scope of this invention to enclose the buffer system with a jacket only . . . should a shield not be needed . . .”). While Beggs notes that “if the preform 55 or 58 is used, a binder may not be necessary” (Beggs at 8:23-24), it still teaches that it is preferred to enclose the cable assembly with a jacket, and doing so was the conventional and obvious thing to do for communications cables as of 1999 and long before. *See, e.g.,* Roberts at 12:33-36; GmbH-866 at 4; Yanagida at 1. Such jackets protect the conductors from damage while installing the cable, and also provide a moisture boundary to prevent liquid from entering the cable.

109. Beggs thus discloses this element.

110. Thus, Beggs in view of Jachimowicz renders this claim obvious.

B. GROUND 2: Beggs and Jachimowicz, Further in View of Gingue, Renders Dependent Claims 20 and 22 Obvious

1. Overview of the Gingue

111. Gingue discloses a composite insulation for electrical conductors in jacketed cables, including “data transmission cables,” that includes a layer of “foamed polymeric material.” Gingue at Abstract, 1:8-10, 5:18-22. Gingue teaches that the foamed material has “reduced flame spread” while also having “favorable electrical properties.” Gingue at 1:9-12.

112. Gingue explains that it was known that electrical cables for voice and data transmission should be flame-resistant while exhibiting favorable electrical

properties, which include materials with a “low dielectric constant.” Gingue at 2:1-13. Gingue further explains that foaming an insulating material was generally understood to both improve its electrical performance while also improving its flame retardancy:

In general, the *electrical performance of an insulating material is enhanced by foaming or expanding the corresponding solid material. Foaming also decreases the amount of flammable material* employed for a given volume of material. Accordingly, a foamed material is preferably employed to achieve a favorable balance of electrical properties and flame retardancy.

Gingue at 3:20-26 (emphasis added).

113. Accordingly, Gingue discloses a two-layer insulation for data communications cables that includes an inner layer of a “foamed polymeric material” and an outer “skin”. Gingue at 4:22-26 and 5:48-51. Gingue teaches that this foamed polymeric inner layer “optimizes the electrical characteristics (i.e., the dielectric constant and dissipation factor) of the material....” Gingue at 4:5-9. In the preferred embodiment, the foamed polymeric layer is “foamed polyethylene or foamed polypropylene” and also includes an additive that renders the layer flame retardant and smoke suppressant. Gingue at 4:32-39.

2. Claim 20: “The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator includes a flame-retardant, low-dielectric constant, foamed polymer tape.”

114. Claim 20 adds the requirement that the separator include a foamed polymer tape with flame-retardant and low-dielectric constant properties. These were well-known and desirable properties of foamed polymer, and it would have been obvious to and desirable to provide the foamed polymer tape of Ground 1 (the combination of Beggs and Jachimowicz) with these properties as taught by Gingue. Gingue teaches using flame-retardant and low-dielectric constant foamed polymers in communications cables like those of Beggs and Jachimowicz.

115. Gingue teaches a flame-retardant foamed polymer. Gingue teaches that foaming the polymer material “decreases the amount of flammable material employed for a given volume of material.” Gingue at 3:20-26. Gingue also teaches using a “foamed polyethylene or foamed polypropylene” or other foamed polymer, that preferably includes an additive rendering the foamed polymer “flame retardant and smoke suppressant.” Gingue at 4:32-44; *see also id.* at Table 1. Gingue’s patent, in fact, is focused on materials used for flame retardancy and smoke suppression in communications cables. Gingue at Abstract; *see also id.*, 2:1-4 (cables for voice and data transmission “should exhibit low smoke evolution, low flame spread”).

116. Both Gingue and Jachimowicz teach using foamed polymers having low dielectric constants. Gingue expressly teaches that materials such as solid (non-foamed form) polyethylene and polypropylene have “favorable electrical properties” such as “**very low dielectric constant** and low dissipation factor.” Gingue at 2:10-14 (emphasis added); *see also id.* 4:1-9, 6:36-40. A POSITA would understand that foaming polymers would provide an even lower dielectric constant. Gingue expressly teaches this: “[i]n general, the electrical performance of an insulating material is enhanced by foaming or expanding the corresponding solid material.” Gingue at 3:20-26. Jachimowicz teaches a tape having “foamed polyethylene” (Jachimowicz at 2:50-54), material that Gingue teaches that even in solid (non-foamed form) already has a “very low dielectric constant” (Gingue at 2:10-14). Foaming such a material would result in an even lower dielectric constant. Foaming reduces the dielectric constant because it traps air, which has a very low dielectric constant, in the material. Providing the flame-retardant and low-dielectric constant properties taught by Gingue in a foamed polymer tape like Jachimowicz would not have been expected to be materially affected or impeded by the plastic film backing on the tape (the Mylar, polypropylene or other film). It was known that such a thin plastic backing would not significantly affect the flame-resistant or dielectric properties of the foam, and film materials such as

Mylar or polypropylene were reasonably flame-resistant and low-dielectric.

Gingue at 2:10-14 (polypropylene has “very low dielectric constant”).

117. In view of the teachings of Gingue, a POSITA would have been motivated to use the foamed polymer tape having flame-retardant and low-dielectric constant properties in the Beggs/Jachimowicz combination, to predictably obtain the known benefits of improved electrical and flame-retardant properties in communications cables as taught by Gingue. Specifically, a POSITA would be motivated to use foam with such properties to, as Gingue teaches, achieve “a favorable balance of *electrical properties* and *flame retardancy*”.

Gingue at 3:20-26 (emphasis added). As I explained above in my discussion of claim 19, a POSITA would have wanted to use a separator with a low-dielectric constant as a buffer member between twisted pairs, because the low-dielectric constant separator would have predictably improved cable electrical performance by reducing transmission loss and increasing crosstalk isolation. I would also note that the background portion of Beggs explains that it was known in the communications cable prior art that “flame retardance . . . is important”. Beggs at 1:36-37.

118. A POSITA would have a reasonable expectation of success in doing this because of the substantial, in fact complete, overlap in the technology, and therefore a POSITA would have expected predictable results by combining the

teachings. Gingue teaches its “preferred” foamed polymer is “foamed polyethylene or foamed polypropylene” (Gingue at 4:32-34); Jachimowicz teaches that the foamed polymer portion of its tape can be the very same material—“foamed polyethylene” (Jachimowicz at 2:50-54).

119. Gingue also teaches that it was known how to create foamed polymers with flame-retardant and low-dielectric constant properties, and that such foamed polymers were already being used in communications cables. Based on the teaching of Gingue, a POSITA would have expected that the foamed polyethylene tape taught by Jachimowicz would be flame retardant and low-dielectric constant, and would have reasonably expected to be able to use that foamed polymer with an additional flame retardant additive if additional flame retardance was desired (*see* Gingue at 4:37-56). Further, Beggs, like Jachimowicz and Gingue, teaches a communications cable, and given the almost complete overlap in technology a POSITA would have reasonably expected using foamed material with the beneficial electrical and flame-retardant properties taught by Gingue and Jachimowicz to improve the Beggs cable in a similar way.

120. In view of the teachings of Gingue and the knowledge in the art at the time, providing a non-conductive foamed tape separator that had flame-retardant and low-dielectric constant properties was known and required no more than routine skill.

121. Thus, it is my opinion that it would have been obvious to modify Beggs based on Jachimowicz and Gingue such that the substantially flat configurable dielectric separator includes a flame-retardant, low-dielectric constant, foamed polymer tape.

122. Thus, Beggs in view of Jachimowicz and Gingue renders this claim obvious.

3. Claim 22: “The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator is a flame-retardant, foamed polymer tape.”

123. Claim 22 adds the requirement that the separator is a flame-retardant foamed polymer tape. It would have been obvious to have the foamed polymer tape separator of the Beggs and Jachimowicz combination (Ground 1) be a *flame-retardant* foamed polymer tape, in view of the teachings of Gingue, for the same reasons that I explained with respect to claim 20.

124. Thus, it is my opinion that it would have been obvious to modify Beggs based on Jachimowicz and Gingue such that the substantially flat configurable dielectric separator to be a flame-retardant, foamed polymer tape.

125. Thus, Beggs in view of Jachimowicz and Gingue renders this claim obvious.

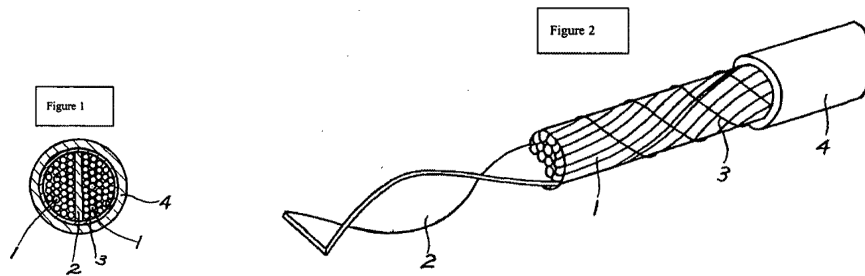
C. GROUND 3: Yanagida and Jachimowicz Render Claim 19 Obvious

1. Overview of the Combination

a. Yanagida

126. Yanagida relates to communications cables with alternatingly stranded cables. Yanagida, 1[col.1]. Alternatingly stranded cables can include a plurality of “pairs” of stranded wires. Yanagida (EX-1012) at 1[col.1]; *see also* Yanagida Translation (EX-1055) at 1 (“stranded pairs”). “Stranded” meant “twisted” in the communications cable field.

127. Yanagida teaches a cable formed with a “reciprocatingly twisted” core material 2 running through its center, and the wires 1 (e.g., the “stranded” (twisted) pairs) running along the surface of the twisted core material 2:



Yanagida, 1[col.1]; Figs. 1, 2. The core element 2 is made from “rigid plastic or other material.” *Id.* The twisted core 2 that divides the groups of wires prevents the wires from unravelling even when tensile force is applied in the longitudinal direction. *Id.* This was a common problem for alternatingly stranded cables. A cable sheath 4 covers the assembly to complete the cable. *Id.*

b. Overview of Jachimowicz

128. As I discussed above, Jachimowicz teaches an example of a data communications cable that uses a two-dielectric material foamed polymer tape. Jachimowicz explains that “a tape made of foamed thermoplastic supported by a film such as Mylar or polypropylene or other material” may be applied over the twisted pairs to hold them together and prevent lay distortion. Jachimowicz at 2:46-58. The foamed polymer material may be “foamed polyethylene 20.” Jachimowicz at 2:48-50.

2. Independent Claim 19

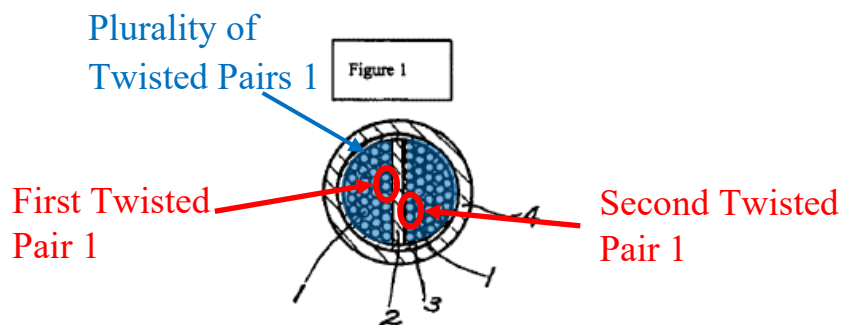
a. [19.pre] “An unshielded communications cable comprising:”

129. I understand the preamble does not limit the claim language. However, Yanagida teaches this element. Yanagida teaches an invention for “communication cables.” Yanagida, 1[col.c1]. Also, the cable disclosed in Yanagida is unshielded. Yanagida identifies a number of elements, including insulated wire elements 1, a plastic core material 2, pressing wrap 3, and a cable sheath 4, but it does not disclose any metal shielding. Yanagida at 1[col.1], Fig. 2.

130. Yanagida thus discloses this element.

- b. [19.a] “a plurality of twisted pairs of insulated conductors comprising a first twisted pair of insulated conductors and a second twisted pair of insulated conductors;”

131. Yanagida discloses a plurality of stranded pairs 1 (*twisted pairs of insulated conductors*) comprising a first stranded pair 1 (*first twisted pair of insulated conductors*) and a second stranded pair 1 (*second twisted pair of insulated conductors*). Yanagida describes a plurality of “strands of insulated wires or pairs thereof” that run along the surface of the core material. Yanagida at 1[col.1]; *see also id.* (element 1 can be where “insulated wires are twisted together”); Yanagida Translation at 1 (“stranded pairs”). The terms “stranded” and “twisted” are used synonymously in the industry. Exemplary first and second twisted pairs are identified below within the plurality of twisted pairs.



Yanagida at Fig. 1 (Annotated).

132. Yanagida thus discloses this element.

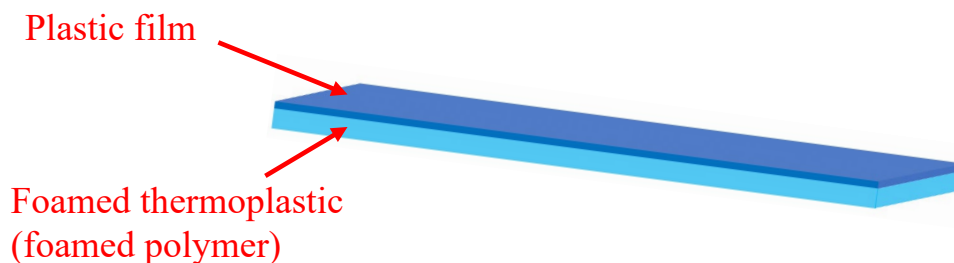
c. [19.b] “a substantially flat configurable dielectric separator that consists of non-conductive, dielectric materials disposed between the plurality of twisted pairs of conductors that separates the first twisted pair of insulated conductors from the second twisted pair of insulated conductors; and”

[19.d] “wherein the substantially flat configurable dielectric separator includes a foamed polymer.”

133. The combination of Yanagida and Jachimowicz teaches both element 19.b and element 19.d.

134. Jachimowicz teaches using a “tape made of foamed thermoplastic supported by a film such as Mylar or polypropylene, or other material.”

Jachimowicz at 2:51-53. This tape would be a *substantially flat configurable dielectric separator* that “consists of” two “non-conductive, dielectric materials” and includes a foamed polymer as required by the claim: (i) the foamed thermoplastic (e.g., foamed polyethylene), backed by (ii) a plastic film (e.g., Mylar, polypropylene, or other material):



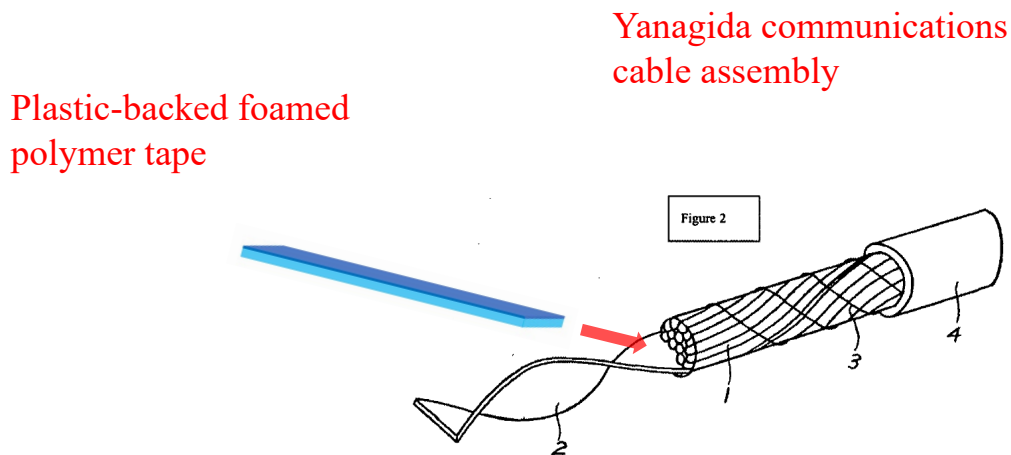
Jachimowicz at 2:46-59 and Figs. 1, 2. As I explained above, Jachimowicz's foamed polymer tape consists of non-conductive materials, because it is all polymers and there are no metal layers, and Jachimowicz's tape also consists of dielectric materials, because the polymers in the tape were understood to be dielectrics. *Supra*, §IX.A.A.2, IX.A.B.3.

135. A POSITA would have also understood the plastic-backed foamed polymer tape of Jachimowicz (such as the exemplary Mylar-backed foamed polyethylene) to be *substantially flat*. As explained above, the term "substantially flat" separator requires only a separator that is initially a substantially flat member prior to being formed into the cable; the term does not require that the separator be substantially flat in the finished cable. *Supra*, §VIII.A. However, the foamed polymer tape would be substantially flat after assembly into the cable as the tape would be adjacent to Yanagida's core material, which is taught to be "flat." Yanagida, 1[col.1], Fig. 1.

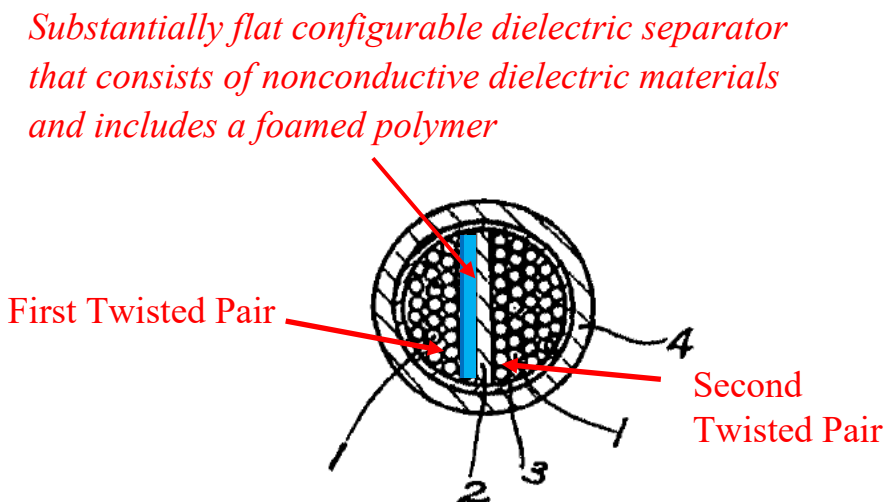
136. Additionally, a POSITA would have understood the plastic-backed foamed polymer tape of Jachimowicz (such as the exemplary Mylar backed foamed polyethylene) to be *configurable*. Such tapes can be shaped such as to hold together a bundle of conductor pairs. Jachimowicz at 2:50-53.

137. For the reasons I explain below, a POSITA would have been motivated, with a reasonable expectation of success, to add the plastic-backed

foamed polymer tape taught by Jachimowicz between the core material 2 and at least one set of twisted pairs in Yanagida's cable assembly as I have drawn below:



Yanagida at Fig. 2 (Annotated); Jachimowicz at 2:51-53. This combination would predictably improve electrical properties of the communications cable, and would have resulted in a separator as claimed:



Yanagida at Fig. 2 (Annotated); Jachimowicz at 2:51-53. A POSITA would have understood the plastic film-backed foamed polymer tape of Jachimowicz (the

substantially flat dielectric separator that consists of non-conductive, dielectric materials and is *disposed between* the plurality of twisted pairs) is also *configurable*. A POSITA would understand that a foamed polymer tape backed by a film of Mylar or other plastic was configurable due to the known nature of its materials and would easily “configure” to follow the helical shape of Yanagida’s core material 2.

138. In the communications industry, there was market pressure to improve the electrical performance of cables. A POSITA would have been motivated to make this combination. It would have predictably improved electrical performance of the cable in two ways.

139. **First**, the addition of foamed polymer tape would have been expected to improve electrical performance by reducing the capacitance between a twisted pair (or group of twisted pairs) on one side of Yanagida’s core 2 and a twisted (or group of twisted pairs) on the other side, which would reduce current leakage between the pairs and the resulting transmission loss within the cable. As I explained above, current leakage arises when two conductors are separated by a dielectric material, forming a capacitor. If an alternating current is applied to the conductor, some current will flow through the capacitor resulting in some current loss. This is a common problem in any kind of transmission line. Reducing the capacitance between the conductors reduces the amount of current that is leaked. A

POSITA would know there are three ways to reduce capacitance: (1) lowering the dielectric constant of the material between the conductors, (2) increasing the distance between the conductors, and (3) reducing the area of the conductors. A POSITA would have been motivated to add a foamed tape such as Jachimowicz's foamed polyethylene tape to Yanagida's core because it would have been expected to reduce the capacitance in two ways. One, the foam component of the tape would reduce the dielectric constant of the capacitor, thus reducing the capacitance between the groups of twisted pairs. Foaming reduces the dielectric constant because it traps air, which has a very low dielectric constant, in the material. Gingue expressly teaches that foaming an insulating material "enhance[s]" its electrical performance—i.e., provides a "low dielectric constant and low dissipation factor." Gingue at 3:20-26, 2:12-14 (emphasis added). Two, the inclusion of the foamed polymer tape would have increased physical distance between the two groups of twisted pairs, thereby predictably further reducing the capacitance between them. *See also* Jachimowicz at 2:55-60 (the "foamed material separates the [twisted] pairs from proximity to metal shield").

140. **Second**, the foamed tape would have been expected to beneficially lower crosstalk between twisted pairs on either side of the separator by increasing the distance maintained between the twisted pairs in the cable. A POSITA would know that increasing and then maintaining the distance between adjacent twisted

pairs effectively reduced crosstalk between them. *See, e.g.*, EX-1023 at 3:17-24 (“The spacing of the pairs minimizes cross-talk between the pairs...”); Beggs at 7:58-61 (“The portions of the buffer system maintain the conductor pairs spaced apart which improves crosstalk performance”). The greater the distance between the twisted pairs that is maintained in a cable, the lower the crosstalk. EX-1023 at 3:17-31.

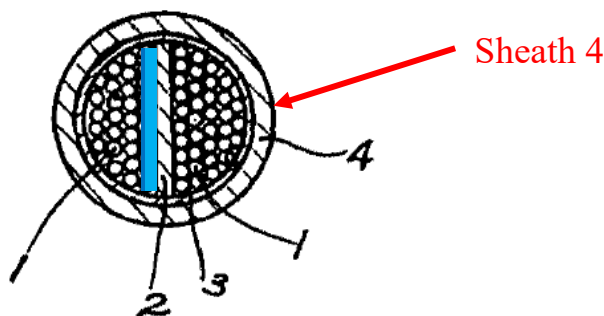
141. A POSITA would have had a reasonable expectation of success in using a plastic film-backed foamed polymer tape taught by Jachimowicz in the Yanagida communications cable because doing so would have been straightforward and would not have required any skill beyond routine engineering. There was substantial overlap in the technology—both references teach cable assemblies with copper twisted pairs and plastic insulating materials—and therefore a POSITA would have expected predictable results by combining the teachings. For example, a POSITA would have been able, using routine manufacturing techniques at the time, to simply add plastic-backed foamed polymer tape in the cabling machine that was being used, and feed the foamed polymer tape in between at least one set of twisted pairs and the helical core. A POSITA would have been able to easily feed the foamed polymer tape along a surface of the plastic core during assembly in a similar manner as Yanagida

describes running the twisted pairs. *See Yanagida at 1* (“...run along both surfaces of the core material”).

142. Thus, it is my opinion that it would have been obvious to modify Yanagida, based the teachings of Jachimowicz, to have the substantially flat configurable dielectric separator include a foamed polymer.

d. [19.c] “a jacket enclosing the plurality of twisted pairs of insulated conductors and the configurable dielectric separator;”

143. Yanagida discloses a sheath 4 (*jacket*) that encloses the stranded pairs (*plurality of twisted pairs of insulated conductors*) and the added plastic film-backed foamed dielectric tape (*configurable dielectric separator*) running between the core material 2 and at least one group of twisted pairs 1. Yanagida teaches that after the core material is formed and the stranded pairs are applied along its surfaces, “the outer periphery [is] then covered with a cable sheath 4”. Yanagida at 1[col.1]. This is show in annotated figure 1 below:



Yanagida at Figs. 1 (Annotated).

144. Thus, Yanagida in view of Jachimowicz renders this claim obvious.

D. GROUND 4: Yanagida and Jachimowicz, Further in View of Gingue, Renders Dependent Claims 20 and 22 Obvious

1. Claim 20: “The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator includes a flame-retardant, low-dielectric constant, foamed polymer tape.”

145. Claim 20 adds the requirement that the separator include a foamed polymer tape with *flame-retardant* and *low-dielectric constant* properties. These were well known and desirable properties of foamed polymer, and it would have been obvious to provide the foamed polymer separator tape of the combination of Yanagida and Jachimowicz (Ground 3) with these properties, in further view of the teachings of Gingue.

146. Gingue teaches the *flame-retardant* and *low-dielectric constant* properties of foamed polymer, including the specific exemplary foamed polymer Jachimowicz’s tape uses (“foamed polyethylene”), as explained above. *Supra*, §IX.B.

147. In view of the teachings of Gingue, a POSITA would have been motivated to use foamed polymer tape having flame-retardant and low-dielectric constant properties in the Yanagida/Jachimowicz combination, to predictably improve the electrical and flame-retardant properties of the Yanagida communication cable. Specifically, a POSITA would be motivated to use foam

with such properties to, as Gingue teaches, achieve “a favorable balance of electrical properties and flame retardancy”. Gingue at 3:20-26 (emphasis added). These improved electrical properties, due to the low-dielectric constant characteristic of the foamed polymer tape, include reduced current leakage due to capacitance and reduced crosstalk as I discussed above in Ground 3. *Supra*, §IX.C.B.3. Further, it was known in the communications cable prior art that “flame retardance . . . is important”. Beggs at 1:36-37; *see also* Gingue at 1:34-49. In addition, Gingue specifically teaches the use of foamed polymer such as foamed polyethylene (the foamed material of Jachimowicz’s tape) with flame-retardant additives. Gingue at 4:37-39. Flame retardant additives can deteriorate the electrical properties, including the dielectric constant. *See* Gingue at 2:55-58; Table 1. However, foaming balances this deterioration out by enhancing the electrical performance, e.g., reducing the dielectric constant of the material. *See* Gingue at 3:20-26.

148. A POSITA would have a reasonable expectation of success in doing this because of the substantial overlap in the technology, and therefore a POSITA would have expected predictable results by combining the teachings. Gingue and Jachimowicz use the same materials to be used as foamed polymers. Gingue teaches its “preferred” foamed polymer is “foamed polyethylene or foamed polypropylene” (Gingue at 4:32-34); Jachimowicz teaches that the foamed polymer

portion of its tape can be the very same material—“foamed polyethylene” (Jachimowicz at 2:50-54). Further, as Gingue teaches, it was known how to create foamed polymers with flame-retardant and low-dielectric constant properties, and such foamed polymers were already being used in communications cables. Based on the teaching of Gingue, a POSITA would have expected that the foamed polyethylene tape taught by Jachimowicz would be low-dielectric constant, and would have reasonably expected to be able to use that foamed polymer with an additional flame retardant additive if additional flame retardance was desired (*see* Gingue at 4:37-56). Further, Yanagida, like Jachimowicz and Gingue, teaches a communications cable, and given the almost complete overlap in technology a POSITA would have reasonably expected using foamed material with the beneficial electrical and flame-retardant properties taught by Gingue and Jachimowicz to improve the Yanagida cable in a similar way.

149. In view of the teachings of Gingue and the knowledge in the art at the time, providing a non-conductive foamed tape separator that had flame-retardant and low-dielectric constant properties was known and required no more than routine skill.

150. Thus, it is my opinion that it would have been obvious to modify Yanagida based on Jachimowicz and Gingue such that the substantially flat

configurable dielectric separator includes a flame-retardant, low-dielectric constant, foamed polymer tape.

151. Thus, Yanagida in view of Jachimowicz and Gingue renders this claim obvious.

2. Claim 22: “The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator is a flame-retardant, foamed polymer tape.”

152. Claim 22 adds the requirement that the separator is a flame-retardant foamed polymer tape. It would have been obvious to have the foamed polymer tape separator of the combination of Yanagida and Jachimowicz have the flame-retardant foam polymer tape, in view of the teachings of Gingue, for the same reasons I explained above with respect to claim 20.

153. Thus, it is my opinion that it would have been obvious to modify Yanagida based on Jachimowicz and Gingue such that the substantially flat configurable dielectric separator to be a flame-retardant, foamed polymer tape.

154. Thus, Yanagida in view of Jachimowicz and Gingue renders this claim obvious.

E. GROUND 5: GmbH-866, Modified in View of Roberts, Gingue and/or Jachimowicz Renders Claim 19-20, 22 Obvious

1. Overview of the Combination

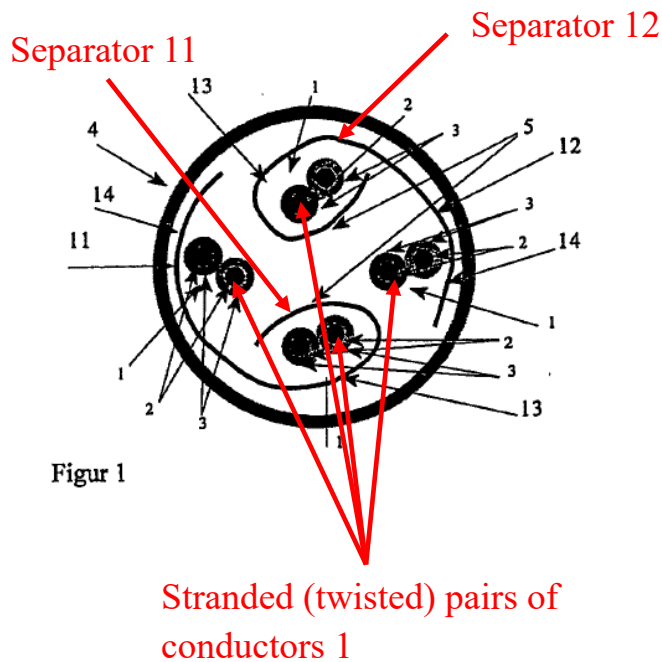
a. GmbH-866

155. GmbH-866 teaches a “data transfer cable” with twisted, insulated conductor pairs that are “divided” from each other by preferably plastic-coated metal foil partial shieldings. GmbH-866 at 3, 4. This allows the creation of cables with “optimized transfer properties,” including “low crosstalk”, at a lowered manufacturing cost. GmbH-866 at 2. GmbH-866 explains that the invention is directed to a reduced-cost cable that can transmit signals in the desired range from 1 to 100 MHz or 1 to 600 MHz. GmbH-866 at 2.

156. Each conductor pair is stranded (twisted) together, forming a stranded pair. *E.g.*, GmbH-866 at 2 (“Data transfer cables of this kind typically consist of four pairs of two stranded isolated copper conductors or wires”). Each wire of these stranded pairs is preferably insulated with “an insulation 3 consisting of a thermoplastic polymer, in particular ... foam-skin polyethylene, skin-foam-skin polyethylene” GmbH-866 at 3. The partial shieldings 11, 12 preferably consist of metal foils that are “laminated with plastics material.” GmbH-866 at 5. The plastic-coated partial shieldings 11, 12 are positioned to “divide[] the cable cross section into at least two shielding sectors,” with a (twisted) conductor pair

“extend[ing] in each shielding sector,” so that the conductor pairs are “shielded from one another.” GmbH-866 at 2, *see also* cl. 1.

157. For example, in Figure 1, two partial shieldings 5 (i.e., separators) are used to separate the four conducting twisted pairs 1:

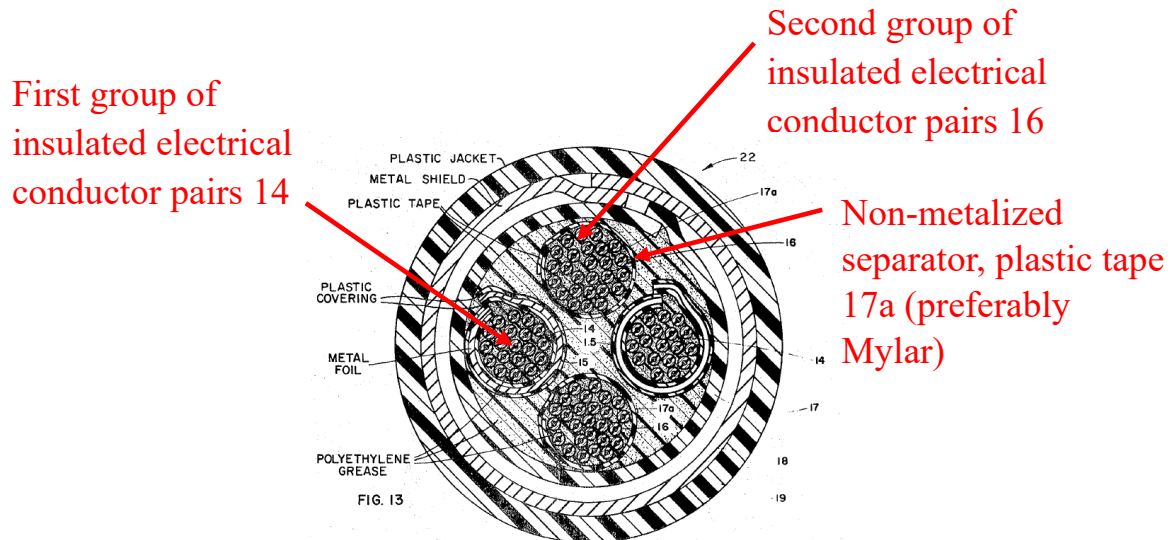


GmbH-866 at Fig. 1 (Annotated). This divides the cable cross-section into “four shielding sectors.” GmbH-866 at 4. The cable also includes an outer cable sheath directly surrounding the twisted pairs and partial shieldings 11, 12.

b. Roberts

158. Roberts teaches a telephone cable that reduces crosstalk between electrical conductor pairs using various separators. Roberts at Abstract, 13:34-36. Roberts teaches dividing conductor pairs into groups. For example, the embodiment of Figure 13 has four groups of insulated conductors 14 and 16,

separated from each other by either metalized or non-metalized separating members:

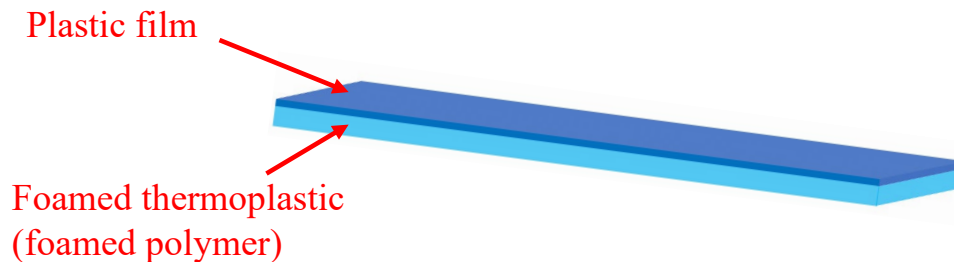


Roberts at Fig. 13, 7:26-50, Figs. 13-16.

c. Foamed Polymer References—Gingue and Jachimowicz

159. I have described Gingue and Jachimowicz in detail above. Each teaches using foamed polymer in a communications cable. In the ‘537 reexamination, the examiner found the “foamed polymer” limitation of claim 19 obvious in view of Gingue. EX-1006 at 17-23. I agree with this conclusion. Gingue teaches the known benefits of foamed polymer in communications cables, specifically that “a foamed material is preferably employed to achieve a favorable balance of electrical properties and flame retardancy.” Gingue at 3:20-26. Jachimowicz, a reference that was not before the examiner during the ‘537

reexamination, expressly teaches a two-material foamed polymer tape, consisting of, for example, plastic-backed foamed polyethylene:



Jachimowicz at 2:46-59 and Figs. 1, 2. Jachimowicz teaches that the foamed polymer tape holds a bundle of twisted pairs together. Jachimowicz at 2:50-54.

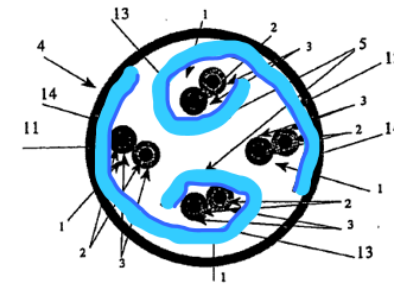
2. Motivation to Combine/Modify and Reasonable Expectation of Success

160. For several reasons, a POSITA would have been motivated, with a reasonable expectation of success, to replace the multi-layer partial shieldings 11, 12 in GmbH-866 with a substantially flat configurable dielectric separator consisting of a plastic-backed foamed polymer tape such as taught by Jachimowicz and illustrated conceptually below:

Plastic-backed foamed
polymer tape:



Modification of GmbH-866:



Figur 1

GmbH-866 at Fig. 1 (Annotated); Jachimowicz at 2:51-53.

161. **First**, Roberts teaches that separators can be either a plastic-coated metal separator (like partial shieldings 11, 12 in GmbH-866) or made solely of a dielectric (i.e., Roberts' plastic tape 17a). Figure 13 of Roberts has four groups of conductor pairs. The two groups having conductors 14 are separated from the other conductors by a screen 15 made up of plastic-coated metal foil tape, whereas the other two groups of conductors 16 are separated from other groups of conductors by a plastic tape 17a, that Roberts teaches is preferably Mylar tape. Roberts at 7:32-40, 7:44-46, 2:55-59, FIG. 13. Thus, a POSITA would understand, based on the teaching of Roberts that dielectric-only separators can be used to separate conductor pairs within a cable.

162. **Second**, there are a finite number of combinations of plastic and/or metal separators that can be used. Figures 5-8 of Roberts shows four different possible configurations (e.g., metal-only, two-layer design with one layer metal

and the other plastic, and three-layer designs with metal sandwiched by plastic layers or completely enclosed/surrounded by plastic), and FIG. 13 (discussed above) shows a fifth arrangement in which the separator is made solely of plastic (i.e., dielectric-only separator). A POSITA would be motivated to try each of these limited options as a separator.

163. **Third**, modifying the GmbH-866 laminated foil to be a foamed polymer tape, and in particular a mylar-backed foamed polymer tape, would have been expected to provide improved electrical performance by reducing current leakage resulting from capacitance within the cable. Separators with metal layers were known to introduce capacitance into the cable resulting in increased current leakage between the twisted pairs and the conductive layer in the separator. *See* Beggs at 2:54-60. As discussed above, current leakage arises when two conductors are separated by a dielectric material, forming a capacitor. If an alternating current is applied to the conductor, some current will flow through the capacitor resulting in some current loss. This is a common problem in any kind of transmission line. Reducing the capacitance between the conductors reduces the amount of current that is leaked.

164. A POSITA would know there are three ways to reduce capacitance: (1) lowering the dielectric constant of the material between the conductors, (2) increasing the distance between the conductors, and (3) reducing the area of the

conductors.⁷ Further, a POSITA would know that removing metal conductors from a cable would remove a potential source of capacitance as capacitors form between conductors. Therefore, a POSITA would also have expected the foamed tape to reduce the capacitance by lowering the effective dielectric constant of the material between the twisted pairs. Gingue, for example, expressly teaches that foaming a polymeric insulating material “enhance[s]” its electrical performance—i.e., provides a “*low dielectric constant and low dissipation factor.*” Gingue at 3:20-26 and 2:12-14 (emphasis added). Foaming reduces the dielectric constant (thereby enhancing electrical performance) because it traps air, which has a very low dielectric constant, in the material. A POSITA also would have expected the use of a foamed polymer tape to predictably increased the thickness of the separator layer, thereby providing increased physical distance between the two groups of twisted pairs and further reducing the capacitance between them. Additionally, a POSITA would expect the elimination of the metal layer in the separator to reduce capacitance and current leakage between the separator and the conductive elements. By replacing GmbH’s laminated foil with a foamed polymer

⁷ As an example, the capacitance of a parallel plate capacitor is: $C = \epsilon_0 \frac{A}{d}$ where C is the capacitance, ϵ_0 is the dielectric constant, A is the area of the parallel plates, and d is the distance between the plates.

tape, a source of capacitance is removed: i.e., the capacitance between the laminated foil and the twisted pairs.

165. **Fourth**, a POSITA would be under market pressure to reduce the costs of manufacturing cable. GmbH-866 itself teaches that there was market pressure to reduce manufacturing costs. GmbH-866 at 2. A POSITA would have known that using foamed polymer tape, rather than a metalized separator, would be beneficial to the overall cost of the cable. For example, the foamed polymer tape would reduce the capacitance between the components of the cable (as I discuss above) allowing for a more cost-effective cable construction, such as smaller conductors and thinner conductor insulation. *See* Beggs at 2:54-66. I also note that, based on my experience, in the early 1999 timeframe customers in the United States preferred cables that were cheaper and/or had no metal shielding (which was somewhat different than preferences in Europe, for example).

166. **Fifth**, using a foamed polymer tape would have been expected to predictably improve the flame resistance of the GmbH-866 cable. *E.g.*, Gingue at 3:20-26 (“Foaming also decreases the amount of flammable material employed for a given volume of material”), 4:37-39 (the foamed polymer can include an additive that further improves flame resistance). It was known that data communications cables should be flame resistant. Gingue at 2:1-4 (“in plenum applications for voice and data transmission, electrical conductor and cables should exhibit low

smoke evolution . . .”); Beggs at 1:37-38 (“flame retardance...is important”). As Gingue explained, “foamed material is preferably employed to achieve a favorable balance of electrical properties and *flame retardancy*.” Gingue at 3:20-26 (emphasis added).

167. A POSITA would have had a reasonable expectation of success in modifying the foil partial shieldings 11, 12 of Gmbh-866 to be a plastic-backed foamed polymer tape (as disclosed in Jachimowicz), because doing so would have been straightforward and would not have required any skill beyond routine engineering. A POSITA would have expected to simply feed that flat foamed polymer tape (such as that taught by Jachimowicz) through the die of a standard cabling machine, to form the foamed polymer tape separator into the final cable assembly in the same way the plastic-laminated foil shield disclosed by GmbH-866 would be. Further, there was substantial overlap in the technology—GmbH-866, Roberts, Jachimowicz and Gingue all concern communications cables using insulated copper wires. And each of GmbH-866 and Jachimowicz disclose the use of foamed polymers within a data cable, and more specifically an arrangement in which the foamed polymer has a non-foamed backing (or skin). GmbH-866 at 3; Jachimowicz at 2:51-53. For this additional reason, a POSITA would have expected predictable results when combining the teachings.

168. A POSITA also would have had a reasonable expectation that after replacing the metalized partial shieldings 11, 12 with a foamed polymer tape, the GmbH cable would still work for its intended purpose.

169. **First**, GmbH-866 itself shows a cable that does not have any separator—much less a metalized separator—between two of the twisted pairs, and teaches that it works:

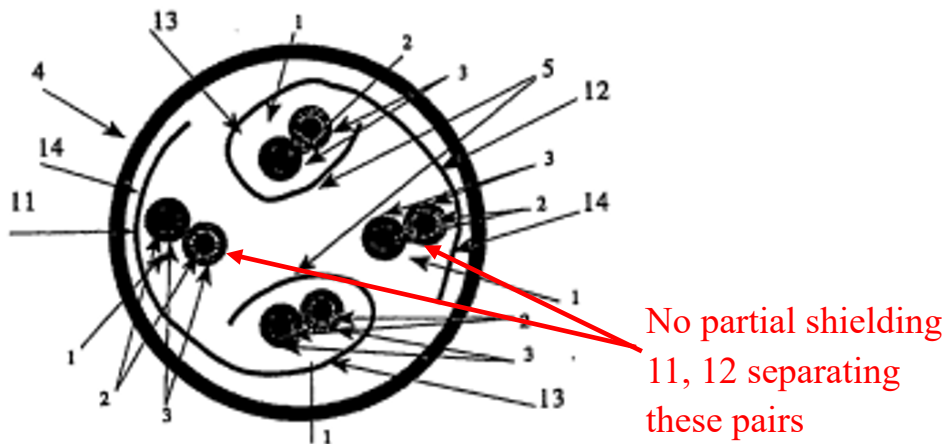


Figure 1

GmbH-866 at Figure 1 (Annotated).

170. **Second**, the prior art shows cables with dielectric-only separators or no separators at all already worked for the intended purposes of the GmbH-866 cable. For example, Beggs (discussed in Ground 1) teaches that conductor pairs are separated by a dielectric-only buffer (e.g., Figs. 6-7), and explains that “[c]rosstalk performance of the cable 20 is somewhat less than for multiple coaxial cables, or in cables having individually shielded pairs, **but it is acceptable** in a

cable which meets stringent size requirements.” Beggs at 9:32-36 (emphasis added). Beggs further explains that the cable, with dielectric-only buffer, can achieve “transmission needs up to about fifty megabits per second over each conductor pair over distances up to several thousands of feet.” Beggs at 9:41-44; *see also* U.S. Patent No. 5,814,768 (EX-1048), Figs. 1-2, 5-6 (showing cables that use of twisted pairs “in high speed data communications applications” have *no* separator between the pairs); U.S. Patent No. 5,789,711 (EX-1036) at 4:5-16 (disclosing an unshielded “star separator”); Canadian Patent Application No. 2,058,046 (EX-1023) at 3:12-14 (disclosing a “spacer member...formed from a dielectric material.”); U.S. Patent No. 6,037,546 (EX-1049) (showing “high-frequency communications cable” having four twisted pairs and no separator between the pairs and touting electrical performance up to 100 MHz). U.S. Patent No. 6,037,546, filed around the time of the ’537 Patent, includes figures showing the disclosed cable (without a separator) meeting the electrical performance requirements such as crosstalk for up the 100 MHz (U.S. Patent No. 6,037,546 at Figs. 1-3, 3:52-56, 2:31-34), which is the stated range of operation of the cable in GmbH-866 (*see* GmbH-866 at 2). Thus, while the modification (replacing the metalized partial shieldings 11, 12 with a foamed polymer tape) may result in some loss of crosstalk protection, the cable of GmbH-866 would have been expected to perform as intended.

171. **Third**, a POSITA would have expected that the plastic-backed foamed separator tape arranged such as shown in GmbH-866 would help maintain certain minimum spacing between the pairs, further ensuring that any pair-to-pair crosstalk was within acceptable levels. *See* EX-1023 at 3:17-31; Beggs at 3:48-51, 7:52-62.

172. Thus, it is my opinion that it would have been obvious to modify GmbH-866 based on Roberts, Gingue and/or Jachimowicz to include a substantially flat configurable dielectric separator that is a flame-retardant, low-dielectric constant, foamed polymer tape.

3. Independent Claim 19

a. [19.pre] “An unshielded communications cable comprising:”

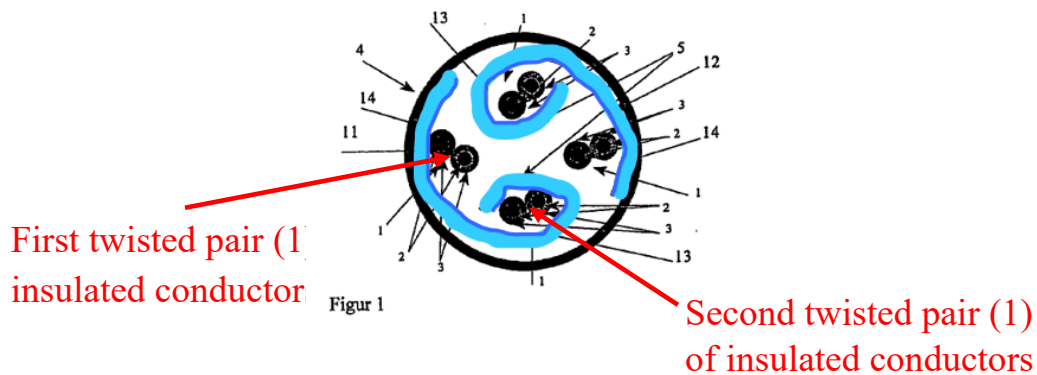
173. I understand the preamble of claim 19 is not limiting. Even if it were, the obvious modification of GmbH-866 discussed above teaches this. GmbH-866 teaches a “data transfer cable.” GmbH-866 at 2; *see also id.* (describing cables with transfer ranges “from 1 to 100 MHz or 1 to 600 MHz”). A POSITA would understand this to be a communications cable. As to unshielded, as I explain below, a POSITA would have been motivated to use a separator consisting of only dielectric materials in place of the GmbH-866’s partial shieldings 11, 12. GmbH-866 teaches an outer cable sheath 4, which “consists of conventional thermoplastic sheath materials,” immediately outward from the twisted pairs and separators.

GmbH-866 at 4. For that embodiment of GmbH-866, the combination would result in a cable without metal containing layers surrounding the twisted pairs. Thus, this would be an unshielded cable under any definition. Further, Roberts teaches that at least one bundle of pairs may be covered with a plastic tape 17a (a metal-free separator around the pairs). Roberts at Fig. 13.

174. Thus, this element is taught by the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz.

b. [19.a] “a plurality of twisted pairs of insulated conductors comprising a first twisted pair of insulated conductors and a second twisted pair of insulated conductors;”

175. GmbH-866 discloses plural twisted pairs of insulated conductors. GmbH-866’s cables each consist of an even number of isolated twisted conductor pairs: “A data transfer cable . . . shown in Fig. 1, comprises four pairs 1, each consisting of *two* isolated, *stranded copper conductors 2 or wires*.” GmbH-866 at 3 (emphasis added). “Stranded” in this context means “twisted.” These terms are used synonymously within the industry. The embodiment disclosed by GmbH-866 in Figure 1 consists of four twisted pairs of isolated conductor pair:



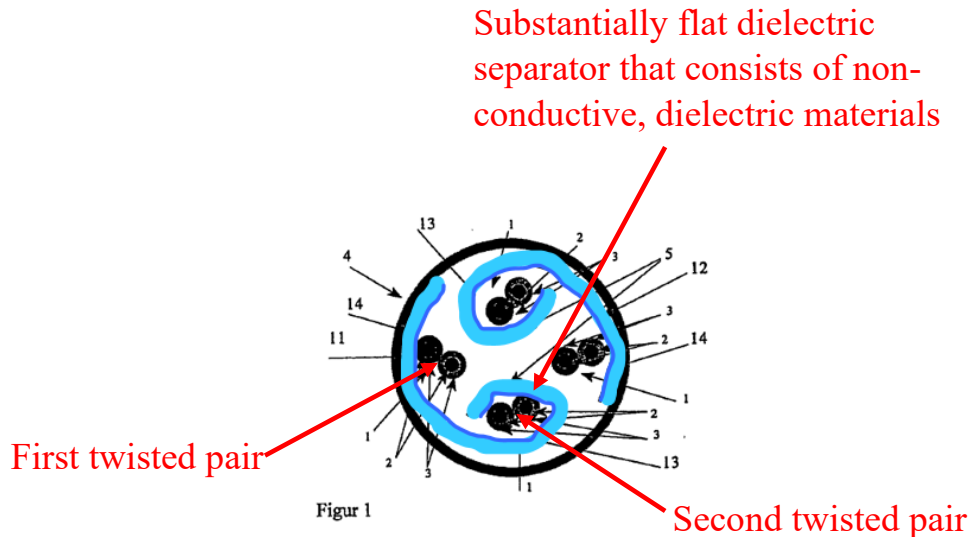
GmbH-866 at Fig. 1 (Annotated). GmbH-866 discloses that the pairs are insulated. Each pair consists of “two *isolated*, stranded copper conductors or wires . . . [the] wires preferably have an *insulation* 3 . . .” GmbH-866 at 3 (emphasis added).

176. GmbH-866 thus teaches this element.

c. [19.b] “a substantially flat configurable dielectric separator that consists of non-conductive, dielectric materials disposed between the plurality of twisted pairs of conductors that separates the first twisted pair of insulated conductors from the second twisted pair of insulated conductors; and”

177. The obvious modification of GmbH-866, in view of Roberts, Gingue and/or Jachimowicz, as explained above (*Supra*, §IX.E.B), results in this element. A plastic film-backed foamed polymer tape as taught by Jachimowicz (*substantially flat configurable dielectric separator*), put into the GmbH-866 cable in place of partial shieldings 11, 12 would be disposed between the plurality of stranded (i.e., twisted) pairs 1 (*plurality of twisted pairs of conductors*) and be

separating the first and second stranded pairs 1 (*first and second twisted pairs of insulated conductors*):

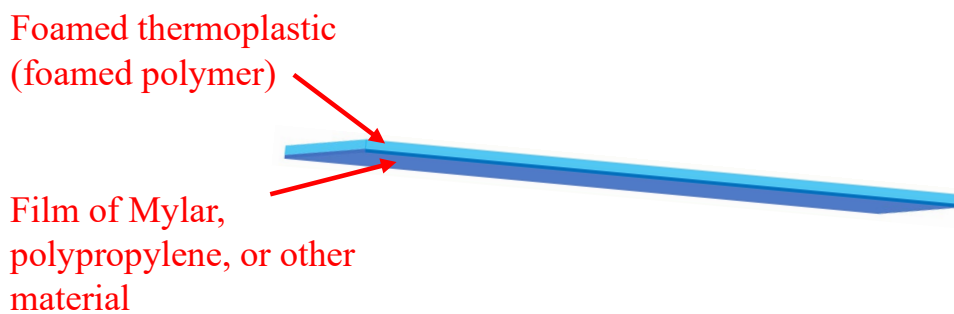


GmbH-866 at Fig. 1 (Annotated).

178. Such tapes are substantially flat. As explained above, the term “substantially flat” separator requires only a separator that is initially a substantially flat member prior to being formed into the cable; the term does not require that the separator be substantially flat in the finished cable. *Supra*, §VIII.A. The partial shieldings 11, 12 taught by GmbH-866 are made out of aluminum foil laminated with plastic material with the thickness of the aluminum being between 20 and 60 μm . GmbH-866 at 5. A POSITA would recognize that such a material is substantially flat. A POSITA would similarly conclude that plastic-backed foamed polymer tape would be flat.

179. Foamed polymer tapes are also configurable. Such tapes are flexible enough to be configured as shown in GmbH-866. For example, such tapes can be shaped such as to hold together a bundle of conductor pairs. Jachimowicz at 2:50-54.

180. The plastic film-backed foamed polymer tape disclosed by Jachimowicz would also *consist of non-conductive, dielectric materials*:



Jachimowicz as 2:50-54. The first non-conductive, dielectric material is the foamed thermoplastic, that may be “*foamed polyethylene*.” *Id.* Foamed polyethylene is a non-conductive, dielectric material. Gingue at 2:10-13 (“olefin polymers, such as *polyethylene* and polypropylene, are melt extrudable thermoplastic materials having favorable electrical properties as manifested by their *very low dielectric constant* and low dissipation factor.” (emphasis added)); *id.* at 3:20-25; *see also* GmbH-866 at 3 (“wires preferably have an insulation 3

consisting of a thermoplastic polymer, in particular polyethylene, cell polyethylene, foam-skin polyethylene, *skin-foam-skin polyethylene*”). The second non-conductive, dielectric material is the supporting plastic film, that may be made of “Mylar or polypropylene.” Jachimowicz at 2:50-54. The second non-conductive, dielectric material film may be made of known dielectric material such as Mylar or **polypropylene**. *Id.* Such plastic film backings are non-conductive, dielectric materials. Gingue at 2:10-13 (“olefin polymers, such as polyethylene and *polypropylene*, are melt extrudable thermoplastic materials having favorable electrical properties as manifested by their *very low dielectric constant* and low dissipation factor.” (emphasis added)); Roberts at (“polyethylene teraphthalate (*Mylar*) *dielectric*”) (emphasis added).

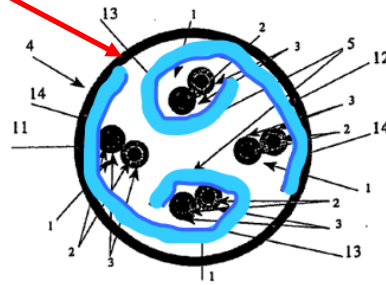
181. Thus, this element is taught by the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz.

d. [19.c] “a jacket enclosing the plurality of twisted pairs of insulated conductors and the configurable dielectric separator;”

182. GmbH-866 has a cable sheath 4 (*jacket*) that encloses the conductor pairs and the partial shieldings 11, 12. GmbH-866 discloses a cable sheath made from thermoplastics that mechanically protects the cable. GmbH-866 at 4 (“transfer cable according to the invention comprises, as outer mechanical

protection, a cable sheath 4 which consists of conventional thermoplastic sheath materials.”). Figure 1 shows cable sheath 4:

Cable sheath 4



Figur 1

GmbH-866 at Fig. 1 (Annotated).

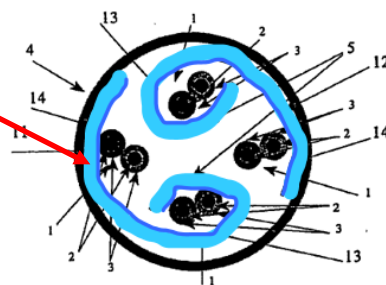
183. Thus, this element is taught by the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz.

e. [19.d] “wherein the substantially flat configurable dielectric separator includes a foamed polymer.”

184. The obvious modification of GmbH-866, in view of Roberts, Gingue and/or Jachimowicz, as explained above (*Supra*, §IX.E.B), results in this element:

Substantially flat configurable dielectric separator that includes a foamed polymer

(e.g., the Mylar-backed “tape made of foamed thermoplastic” taught by Jachimowicz)



Figur 1

GmbH-866 at Fig. 1 (Annotated). Further, GmbH-866 itself discloses the use of a plastic-backed foamed polymer as an insulator, further confirming that it would have been obvious to use a plastic-backed foamed polymer as the separator member. *See* GmbH-866 at 3 (“[W]ires preferable have an insulation 3 consisting of a thermoplastic polymer, in particular polyethylene, cell polyethylene, foam-skin polyethylene, skin-foam-skin polyethylene”). Cell polyethylene, foam-skin polyethylene, and skin-foam-skin polyethylene were understood to be examples of foamed polymers.

185. Thus, this element is taught by the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz.

186. Thus, it is my opinion that the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz renders this claim obvious.

4. Claim 20: “The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator includes a flame-retardant, low-dielectric constant, foamed polymer tape.”

187. Claim 20 adds the requirement that the separator has a *flame-retardant, low-dielectric constant* foamed polymer tape. It would have been obvious to have the foamed polymer tape separator used in the modified GmbH-866 cable as explained in claim 19, to further be a *flame-retardant, low-dielectric constant* foamed polymer tape, in view of Gingue’s teachings. As explained above, Gingue teaches flame-retardant, low-dielectric constant foamed polymers

for use in communication cables, as well as the known benefits of foamed polymer with these properties when used in communications cables. *Supra*, §IX.B. Further, it was known in the communications cable prior art that “flame retardance . . . is important”. Beggs at 1:36-37.

188. For the same reasons explained above with respect to claim 20 in Grounds 2 and 4, a POSITA would have been motivated, with a reasonable expectation of success, to use *a flame-retardant, low-dielectric constant* foamed polymer tape in place of the GmbH-866 partial shieldings 11, 12. *Supra*, §IX.B, §IX.C. In addition, GmbH-866, like Jachimowicz and Gingue, teaches a communications cable that can use foamed polymers for surrounding conductors, and given the almost complete overlap in technology a POSITA would have reasonably expected using foamed material with the beneficial electrical and flame-retardant properties taught by Gingue and Jachimowicz to predictably improve the GmbH-866 communications cable in a similar way.

189. Thus, this element is taught by the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz.

190. Thus, it is my opinion that the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz renders this claim obvious.

5. Claim 22: “The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator is a flame-retardant, foamed polymer tape.”

191. Claim 22 adds the requirement that the separator is a *flame-retardant* foamed polymer tape. It would have been obvious to have the foamed polymer tape separator used in the modified GmbH-866 cable as explained in claim 19, to further be a *flame-retardant* foamed polymer tape, in view of the teachings of Gingue, for the same reasons explained with respect to claim 20.

192. Thus, this element is taught by the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz.

193. Thus, it is my opinion that the obvious combination of GmbH-866, Roberts, Gingue and/or Jachimowicz renders this claim obvious.

X. Conclusion

194. In signing this declaration, I understand that the declaration will be filed as evidence in the contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

195. I declare that all statements made herein of my knowledge are true,
and that all statements made on information and belief are believed to be true, and
that these statements were made with the knowledge that willful false statements
and the like so made are punishable by fine or imprisonment, or both, under
Section 1001 of Title 18 of the United States Code.

Executed on: 6/13/23

By: Kenneth Cornelison
Kenneth Cornelison

Claims Listing Appendix
U.S. Patent No. 6,998,537
Challenged Claims

Designation	Claim 19
Element 19.pre	19. An unshielded communications cable comprising:
Element 19.a	a plurality of twisted pairs of insulated conductors comprising a first twisted pair of insulated conductors and a second twisted pair of insulated conductors;
Element 19.b	a substantially flat configurable dielectric separator that consists of non-conductive, dielectric materials disposed between the plurality of twisted pairs of conductors that separates the first twisted pair of insulated conductors from the second twisted pair of insulated conductors; and
Element 19.c	a jacket enclosing the plurality of twisted pairs of insulated conductors and the configurable dielectric separator;
Element 19.d	wherein the substantially flat configurable dielectric separator includes a foamed polymer.

Designation	Claim 20
	20. The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator includes a flame-retardant, low-dielectric constant, foamed polymer tape.

Designation	Claim 22
	22. The communications cable as claimed in claim 19, wherein the substantially flat configurable dielectric separator is a flame-retardant, foamed polymer tape.