IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

3M COMPANY and 3M INNOVATIVE PROPERTIES COMPANY, Plaintiffs, v. AMPHENOL CORP., Defendant.	)	C.A. No. 17-360 (VAC) (MPT) **DEMAND FOR JURY TRIAL**

SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT

3M Company and 3M Innovative Properties Company (collectively, "3M" or "Plaintiffs"), by their attorneys and for their Complaint against Defendant Amphenol Corp. ("Amphenol" or "Defendant"), allege as follows:

NATURE OF THE ACTION

1. 3M is a leading innovator and provider of high performance, shielded ribbon cables for data transmission. 3M has received multiple patents in areas of innovation covering key aspects of this technology. For example, one aspect of 3M's technology facilitates the use of high performance cables in space-constrained systems with minimal signal loss or performance impact. Additional aspects of 3M's technology address physical dimensions concerning the layout of the shielded ribbon cable structure and high frequency isolation between adjacent conductor sets that results in less crosstalk. These important features, and others, were disclosed by 3M to the public in connection with patent applications. The United States Patent and Trademark Office assessed 3M's technical contributions, examined the content of those patent applications, and awarded 3M with United States Patent Nos. 8,933,333 ("the '333 Patent"), 9,601,236 ("the '236 Patent"), and 9,627,106 ("the '106 Patent").

2. Upon information and belief, Amphenol is now manufacturing, using, offering for sale and/or importing shielded ribbon cables ("Shielded Ribbon Cables") into the United States that use 3M's technology in direct competition with 3M.

3. Upon information and belief, Amphenol's Shielded Ribbon Cables are also incorporated into servers sold within the United States and/or imported into the United States. Upon information and belief, Amphenol has targeted and/or concentrated on the United States by offering its Shielded Ribbon Cables for sale directly and or indirectly through third parties who Amphenol reasonably knows will incorporate the Amphenol Shielded Ribbon Cables into products imported into or otherwise sold in the United States.

4. This is an action for patent infringement of 3M's '333 Patent, '236 Patent, and '106 Patent under the patent laws of the United States, 35 U.S.C. §§ 271, 281-285. 3M brings this action to stop Amphenol's infringing activities and to recover damages suffered by 3M due to Amphenol's infringement. Moreover, Amphenol's infringement will irreparably harm 3M, which has devoted significant resources to its patent-protected technology, commercial products, and brand. 3M also seeks preliminary and permanent injunctive relief against Amphenol.

THE PARTIES

5. Plaintiff 3M Company ("3M Co.") is a corporation organized and existing under the laws of the state of Delaware, and having its principal place of business at 3M Center, St. Paul, Minnesota 55133.

6. Plaintiff 3M Innovative Properties Company ("3M IPC") is a wholly-owned subsidiary of 3M Company with its principal place of business at 3M Center, St. Paul, Minnesota 55133.

7. Defendant Amphenol Corp. ("Amphenol"), upon information and belief, is a corporation organized and existing under the laws of the state of Delaware, and having its principal place of business at 358 Hall Avenue, Wallingford, Connecticut 06492.

JURISDICTION AND VENUE

8. This action arises under the patent laws of the United States, including 35 U.S.C. § 271.

9. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

10. This Court has personal jurisdiction over Amphenol because it is incorporated under the laws of the State of Delaware.

11. Venue is proper in this District pursuant to 28 U.S.C. § 1400(b).

3M'S PATENTS-IN-SUIT

U.S. Patent No. 8,933,333

12. On January 13, 2015, the '333 Patent entitled "Shielded Electrical Cable," was duly and legally issued by the United States Patent and Trademark Office to inventor Douglas B. Gundel. A true and correct copy of the '333 Patent is attached as Exhibit A to this Complaint.

13. The '333 Patent relates generally to the field of electrical cables for transmitting data. The claims of the '333 Patent are directed to shielded electrical cables that may be bent at various angles without losing the integrity of the electrical signal.

14. The '333 Patent is currently in full force and effect.

15. All right, title and interest in and to the '333 Patent have been assigned to 3M IPC, which is the sole owner of the '333 Patent.

16. 3M Co. is the exclusive licensee of the ’333 Patent.

U.S. Patent No. 9,601,236

17. On March 21, 2017, the ’236 Patent, entitled “Shielded Electrical Cable,” was duly and legally issued by the United States Patent and Trademark Office to inventor Douglas B. Gundel. A true and correct copy of the ’236 Patent is attached as Exhibit B to this Complaint.

18. The ’236 Patent issued from a continuation of the application that issued as the ’333 Patent and also relates generally to the field of electrical cables for transmitting data. The claims of the ’236 Patent are directed to shielded electrical cables with specific physical dimensions.

19. The ’236 Patent is currently in full force and effect.

20. All right, title and interest in and to the ’236 Patent have been assigned to 3M IPC, which is the sole owner of the ’236 Patent.

21. 3M Co. is the exclusive licensee of the ’236 Patent.

U.S. Patent No. 9,627,106

22. On April 18, 2017, the ’106 Patent, entitled “High Density Shielded Electrical Cable and Other Shielded Cables, Systems, and Methods,” was duly and legally issued by the United States Patent and Trademark Office to co-inventors Douglas B. Gundel, Rocky D. Edwards, Mark M. Lettang, and Charles F. Staley. A true and correct copy of the ’106 Patent is attached as Exhibit C to this Complaint.

23. The ’106 Patent also relates generally to the field of electrical cables for transmitting data. The claims of the ’106 Patent are directed to shielded electrical cables with specific physical dimensions and electrical properties.

24. The ’106 Patent is currently in full force and effect.

25. All right, title and interest in and to the ’106 Patent have been assigned to 3M IPC, which is the sole owner of the ’106 Patent.

26. 3M Co. is the exclusive licensee of the ’106 Patent.

FIRST CLAIM FOR RELIEF
(Amphenol’s Infringement of the ’333 Patent)

27. Upon information and belief, Amphenol has infringed and continues to infringe, has actively and knowingly induced and continues to actively and knowingly induce infringement, and contributes and will continue to contribute to infringement, of one or more claims of the ’333 Patent, including at least claim 5 of the ’333 Patent in this District and elsewhere under 35 U.S.C. §§ 271(a), (b), and (c).

28. Claim 5 of the ’333 Patent states as follows:

> 5. A shielded electrical cable, comprising:
>
> a plurality of differential pairs extending along a length of the cable and being arranged generally in a plane along a width of the cable, each differential pair including two insulated conductors having wire diameters not greater than 24 American Wire Gauge (AWG), each differential pair being substantially surrounded by a shield;
>
> first and second non-conductive polymeric layers disposed on opposite sides of the cable, the first and second layers including cover portions and pinched portions arranged such that, in transverse cross section, the cover portions of the first and second layers in combination substantially surround the plurality of differential pairs, and the pinched portions of the first and second layers in combination form pinched portions of the cable on each side of the plurality of differential pairs; and
>
> an adhesive layer bonding the first non-conductive polymeric layer to the second non-conductive polymeric layer in the pinched portions of the cable;
>
> wherein a transverse bending of the cable at a cable location of 90 degrees over an inner radius of at most 5 mm causes an insertion

> loss of the insulated conductors of the differential pairs proximate the cable location to vary by no more than 0.5 dB from an initial insertion loss measured at the cable location in an unbent configuration.

29. Amphenol's Shielded Ribbon Cables meet all the limitations of at least claim 5 of the '333 Patent.

30. Figures 1 and 2 depict an exemplary cable of the accused Amphenol Shielded Ribbon Cables. The cable bears the name "Amphenol," as shown on the right side of Figure 1:

Figure 1. Top Side of an exemplary Shielded Ribbon Cable

Figure 2. Bottom Side of an exemplary Shielded Ribbon Cable

31. Upon information and belief, the particular Amphenol Shielded Ribbon Cable is sold under the designation "HP 747577-001 Mini-SAS Cable." Other designations for the accused Amphenol Shielded Ribbon Cable may include "HP Dual Mini SAS Ribbon Cable" with part number 747576 or "ProLiant DL380 G9 Mini-SAS Cable" with part number HP 747577.

32. The Shielded Ribbon Cable is a shielded electrical cable as depicted in Figures 1 and 2.

33. The Shielded Ribbon Cable comprises a plurality of differential pairs extending along the length of the cable and arranged generally in a plane along a width of the cable, each differential pair including two insulated conductors having wire diameters not greater than 24 American Wire Gauge (AWG), each differential pair being substantially surrounded by a shield. Figure 3 shows a cross-section view of the full width of the Shielded Ribbon cable, which includes twelve differential pairs extending along a length of the cable, generally arranged in a plane along a width of the cable. Figure 4 shows a magnified view of six of the twelve differential pairs of the Shielded Ribbon Cable:

Figure 3. Full Width Cross-Section View

Figure 4. Cross-Section Depicting a Plurality of Differential Pairs

Figure 5 shows two of the differential pairs (110 and 120), each of which includes two insulated conductors (130) and two ground conductors (140):

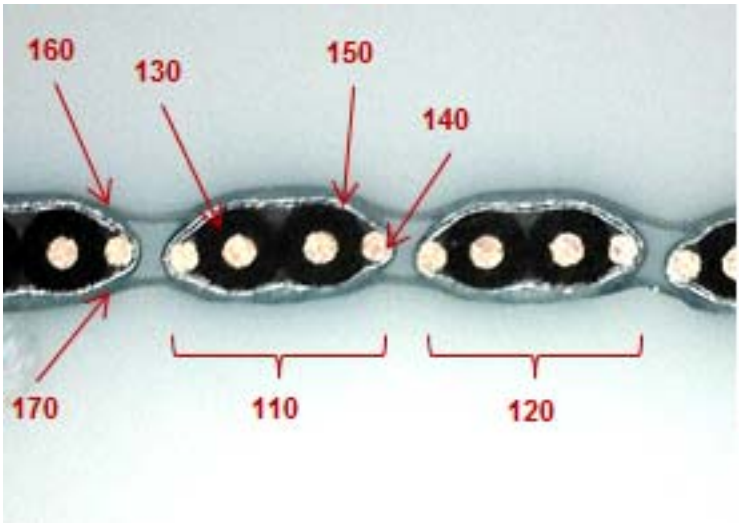

Figure 5. Cross-Section Depicting Two Differential Pairs

The diameters of the insulating conductors (130), across multiple samples, range from 223 to 224 microns. The diameter of the insulating conductor (130) is not greater than 511 microns, which is the equivalent diameter for 24 AWG. These diameters are shown in Table 1:

TABLE 1 Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires at 20°C

Size	Diameter		Cross-Sectional Area		Size	Diameter		Cross-Sectional Area	
AWG	mils	mm	cmils	mm²	AWG	mils	mm	cmils	mm²
4/0	460.0	11.684	211 600	107.2	29	11.3	0.287	128	0.0647
3/0	409.6	10.404	167 800	85.0	30	10.0	0.254	100	0.0507
2/0	364.8	9.26	133 100	67.4	31	8.9	0.226	79.2	0.0401
1/0	324.9	8.25	105 600	53.5	32	8.0	0.203	64.0	0.0324
1	289.3	7.35	83 690	42.4	33	7.1	0.180	50.4	0.0255
2	257.6	6.54	66 360	33.6	34	6.3	0.160	39.7	0.0201
3	229.4	5.82	52 620	26.7	35	5.6	0.142	31.4	0.0159
4	204.3	5.19	41 740	21.1	36	5.0	0.127	25.0	0.0127
5	181.9	4.62	33 090	16.8	37	4.5	0.114	20.2	0.0103
6	162.0	4.11	26 240	13.3	38	4.0	0.102	16.0	0.00811
7	144.3	3.67	20 820	10.6	39	3.5	0.0890	12.2	0.00621
8	128.5	3.26	16 510	8.37	40	3.1	0.0787	9.61	0.00487
9	114.4	2.91	13 090	6.63	41	2.8	0.0711	7.84	0.00397
10	101.9	2.59	10 380	5.26	42	2.5	0.0635	6.25	0.00317
11	90.7	2.30	8 230	4.17	43	2.2	0.0559	4.84	0.00245
12	80.8	2.05	6 530	3.31	44	2.0	0.0508	4.00	0.00203
13	72.0	1.83	5 180	2.63	45	1.76	0.0447	3.10	0.00157
14	64.1	1.63	4 110	2.08	46	1.57	0.0399	2.46	0.00125
15	57.1	1.45	3 260	1.65	47	1.40	0.0356	1.96	0.000993
16	50.8	1.29	2 580	1.31	48	1.24	0.0315	1.54	0.000779
17	45.3	1.15	2 050	1.04	49	1.11	0.0282	1.23	0.000624
18	40.3	1.02	1 620	0.823	50	0.99	0.0252	0.980	0.000497
19	35.9	0.904	1 290	0.653	51	0.88	0.0224	0.774	0.000392
20	32.0	0.813	1 020	0.519	52	0.78	0.0198	0.608	0.000308
21	28.5	0.724	812	0.412	53	0.70	0.0178	0.490	0.000248
22	25.3	0.643	640	0.324	54	0.62	0.0158	0.384	0.000195
23	22.6	0.574	511	0.259	55	0.55	0.0140	0.302	0.000153
24	20.1	0.511	404	0.205	56	0.49	0.0125	0.240	0.000122
25	17.9	0.455	320	0.162					
26	15.9	0.404	253	0.128					
27	14.2	0.361	202	0.102					
28	12.6	0.320	159	0.0804					

Table 1. ASTM B258-02: showing wire diameters under AWD convention

Each differential pair is also substantially surrounded by a conductive metallic foil. As illustrated in Figures 6 and 7, the metallic layer (150) forms a shield that substantially surrounds each differential pair:

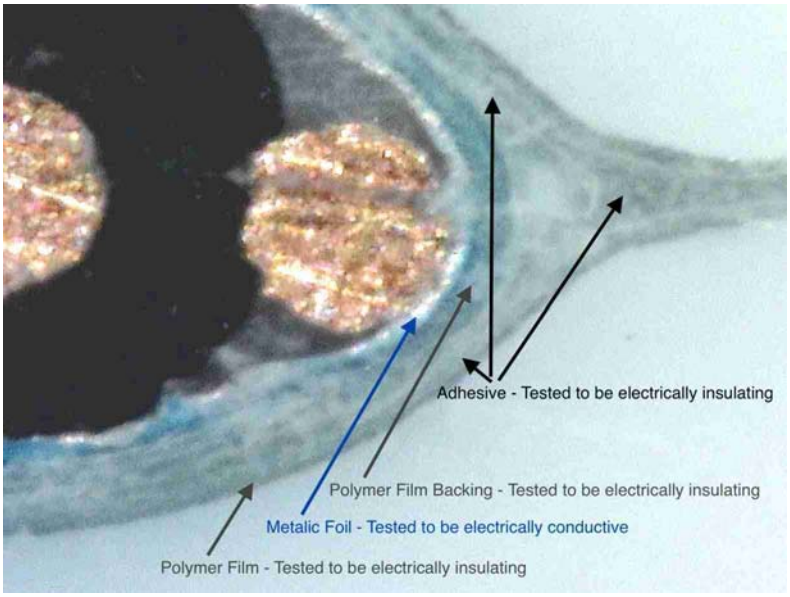

Figure 6. Layers of the Shielded Ribbon Cable

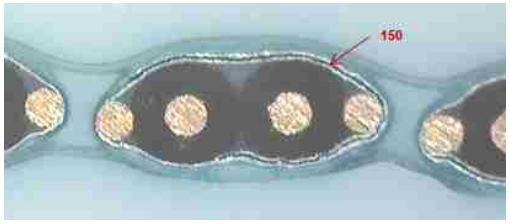

Figure 7. Cross-Section View Depicting Shield

34. The Shielded Ribbon Cable includes first and second non-conductive polymeric layers disposed on opposite sides of the cable, the first and second layers including cover portions and pinched portions arranged such that, in transverse cross section, the cover portions of the first and second layers in combination substantially surround the plurality of differential pairs, and the pinched portions of the first and second layers in combination form pinched portions of the cable on each side of the cable, *i.e.* on each side of the plurality of differential pairs. As shown in Figures 8 and 9, the Shielded Ribbon Cable includes two polymer films (*i.e.*, non-conductive polymeric layers) that are electrically insulating. The first non-conductive polymeric layer (160) is on the top side of the cable and the second non-conductive polymeric layer (170) is on the bottom side of the cable, opposite of the first layer:

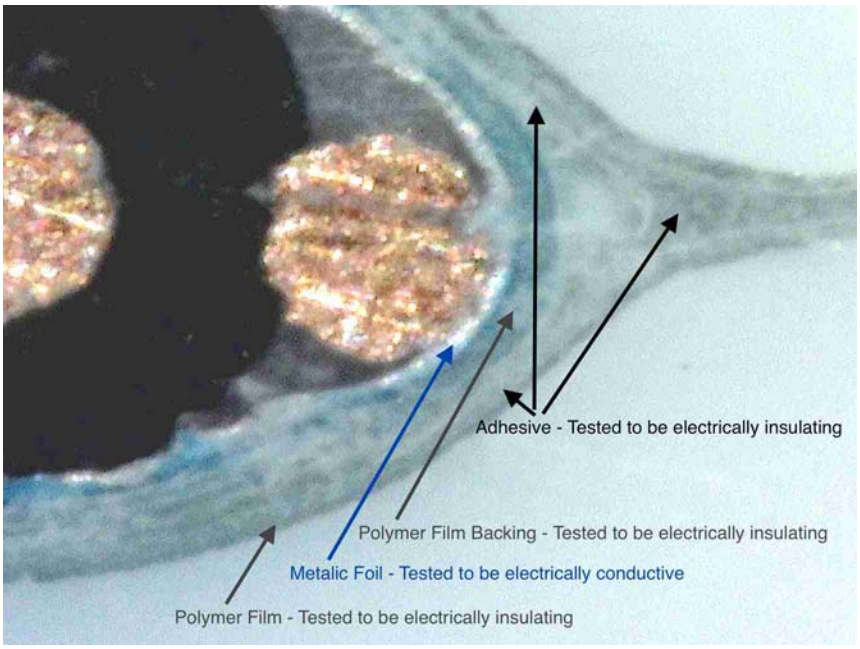

Figure 8. Layers of the Shielded Ribbon Cable

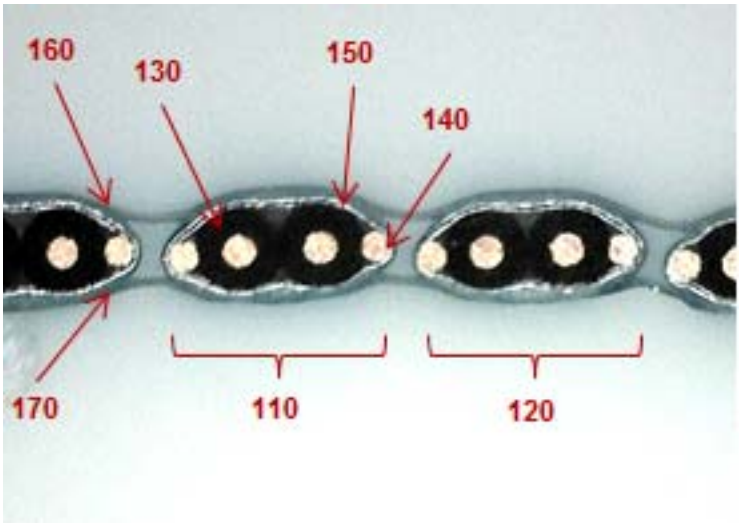

Figure 9. Cross-Section Depicting Two Differential Pairs

Figure 10 depicts cover portions (162 and 172) of the non-conductive polymeric layers. In transverse cross-section, the cover portions – in combination – substantially surround the plurality of differential pairs:

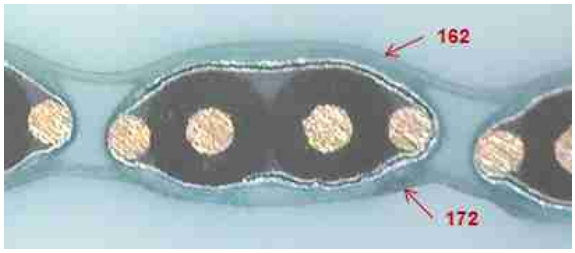

Figure 10. Cross-Section Depicting Cover Portions

Figures 11 and 12 depict pinched portions (180) of the non-conductive polymeric layers, which are located on each side of the plurality of differential pairs:

Figure 11. Cross-Section Depicting Pinched Portions

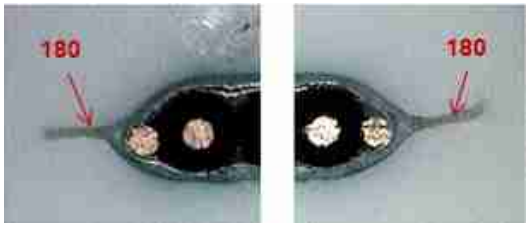

Figure 12. Close-up View of Pinched Portions

35. The Shielded Ribbon Cable includes an adhesive layer that bonds the first and second non-conductive polymeric layers in the pinched portions of the cable. Figure 13 depicts an adhesive layer (190) that bonds the two non-conductive polymeric layers (164 and 174) in the pinched portions of the cable:

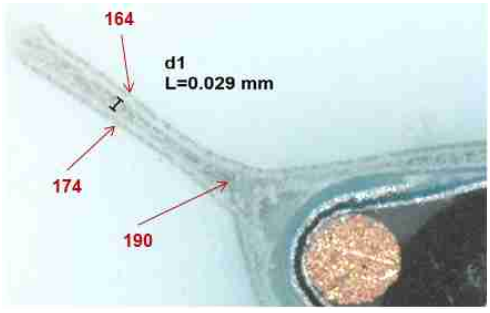

Figure 13. Cross-Section Depicting Adhesive Between Pinched Portions

36. The Shielded Ribbon Cable, with a transverse bending of the cable at a cable location of 90 degrees over an inner radius of at most 5 mm, causes an insertion loss of the

insulated conductors of the differential pairs proximate the cable location to vary by no more than 0.5 dB from an initial insertion loss measured at the cable location in an unbent configuration. The insertion loss of the Shielded Ribbon Cable was measured using a Teledyne LeCroy SPARQ Signal Integrity Network Analyzer. The insertion loss was measured between two points of the cable in an unbent configuration (Figure 14). The cable was then bent at an angle of 90 degrees over an inner radius of 5 mm in the following manner and again measured (Figure 15):

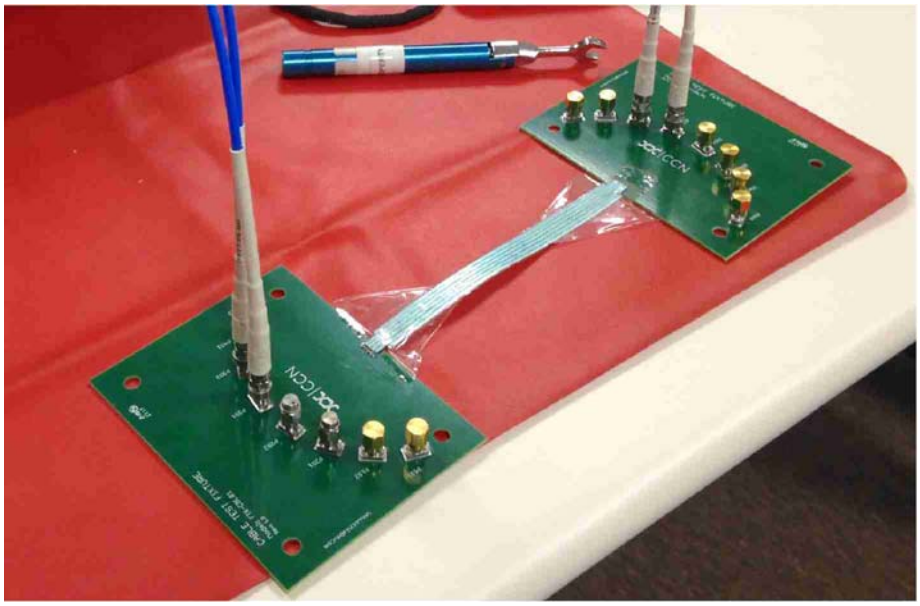

Figure 14. Unbent Configuration

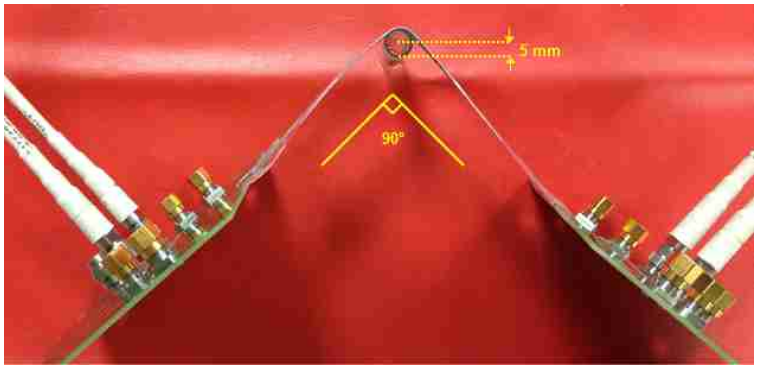

Figure 15. Bent Configuration

In the bent configuration, the insertion loss was measured between the same two points of the cable for a frequency of up to 18 GHz. Figure 16 depicts the difference in insertion loss between the unbent and bent configurations for a frequency of up to 18 GHz:

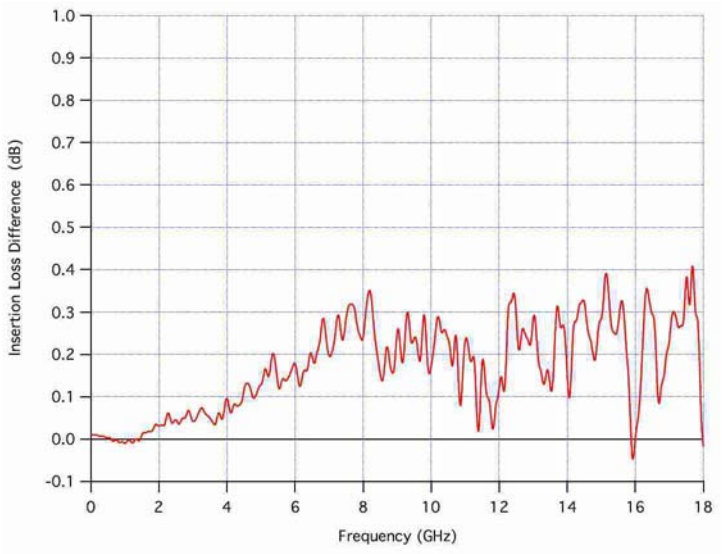

Figure 16. Charted Analysis of Insertion Loss for the Amphenol Cable

Figure 16 shows that the difference in insertion loss of a bent configuration in the Shielded Ribbon Cable does not vary by more than 0.5 dB from an initial insertion loss measured at the cable location in an unbent configuration.

37. Accordingly, the Amphenol Shielded Ribbon Cable meets every limitation of at least claim 5 of the ’333 Patent either literally or under the doctrine of equivalents and thus infringes at least claim 5. Upon information and belief, other exemplary cables of Amphenol’s Shielded Ribbon Cables infringe at least claim 5 either literally or under the doctrine of equivalents because they operate in the same or similar ways to the Shielded Ribbon Cable, and any differences are minor and not material to the infringement analysis. Certain products (*e.g.*, electronic devices) containing Amphenol’s Shielded Ribbon Cables likewise infringe at least claim 5 of the ’333 Patent either literally or under the doctrine of equivalents.

38. Amphenol's acts of infringement have been without permission, consent, authorization or license of 3M.

39. Upon information and belief, at least as of the time it received notice of the original complaint in this case, Amphenol's inducement of infringement has been with full knowledge of the '333 Patent and with the intention of actively inducing direct infringement by others in the United States.

40. Despite Amphenol's awareness of the '333 Patent and 3M's allegations, Amphenol has continued to knowingly and actively induce the direct infringement of at least claim 5 of the '333 Patent by Amphenol's customers and/or end users. Upon information and belief, at least one Amphenol customer and/or end user has directly infringed one or more claims of the '333 Patent in view of Amphenol's knowing and active inducement.

41. Amphenol has provided and continues to provide promotional materials directed to the functionalities described and claimed in the '333 Patent. For example, Amphenol has promoted and continues to promote its Shielded Ribbon Cables. *See, e.g.*, Exhibit D at p. 2 (describing "features and benefits" of cable). As shown in Paragraphs 28-38 above, the Amphenol Cable infringes at least claim 5 of the '333 Patent. At least by promoting the infringing functionalities of the Shielded Ribbon Cables, Amphenol has induced and is actively inducing the use of such products, which infringe at least claim 5 of the '333 Patent.

42. In addition, Amphenol has indirectly infringed at least claim 5 of the '333 Patent by contributing to infringement.

43. Amphenol's Shielded Ribbon Cables are made solely for the purpose of permitting functionality in a manner that infringes the asserted claim of the '333 Patent. Further, Amphenol's Shielded Ribbon Cables are especially made and/or especially adapted for use in the

infringement of the ’333 Patent, are not a staple commodity of commerce, and are not suitable for substantial non-infringing use. By selling the Shielded Ribbon Cables, Amphenol has contributed to the infringement of the ’333 Patent by customers and/or end users.

44. Upon information and belief, Amphenol will continue to infringe the ’333 Patent unless and until it is enjoined by this Court.

45. Amphenol has caused and will continue to cause 3M injury and damage by infringing the ’333 Patent. 3M will suffer further irreparable injury unless and until Amphenol is enjoined from infringing the ’333 Patent.

SECOND CLAIM FOR RELIEF
(Amphenol’s Infringement of the ’236 Patent)

46. 3M incorporates as if fully stated herein the allegations of the preceding paragraphs set forth above.

47. Upon information and belief, Amphenol has infringed and continues to infringe, has actively and knowingly induced and continues to actively and knowingly induce infringement, and contributes to and will continue to contribute to infringement, of one or more claims of the ’236 Patent, including at least claim 1 of the ’236 Patent in this District and elsewhere under 35 U.S.C. §§ 271(a), (b), and (c).

48. Claim 1 of the ’236 Patent states as follows:

> 1. A shielded electrical cable, comprising:
>
> a plurality of conductor sets extending along a length of the cable and arranged generally in a plane along a width of the cable, each conductor set substantially surrounded by a shield and including two insulated conductors;
>
> first and second non-conductive polymeric layers disposed on opposite sides of the cable, the first and second layers including cover portions and pinched portions arranged such that, in transverse cross section, the cover portions of the first and second

layers in combination substantially surround the plurality of conductor sets, and the pinched portions of the first and second layers in combination form pinched portions of the cable on each side of the cable; and

an adhesive layer bonding the first non-conductive polymeric layer to the second non-conductive polymeric layer in the pinched portions of the cable;

wherein:

the first and second layers are spaced apart within 0.05 mm of each other in each pinched portion along the length of the cable;

a maximum separation between the cover portions of the first and second layers is D;

a minimum separation between the pinched portions of the first and second layers on each side of the cable is d_1, d_1/D being less than 0.25; and

a minimum separation between the cover portions of the first and second layers in a region between the conductors of each conductor set is d_2, d_2/D being greater than 0.33.

49. Amphenol's Shielded Ribbon Cables meet all the limitations of at least claim 1 of the '236 Patent.

50. Figures 17 and 18 depict an exemplary cable of the accused Amphenol Shielded Ribbon Cables. The cable bears the name "Amphenol," as shown on the right side of Figure 17:

Figure 17. Top Side of an exemplary Shielded Ribbon Cable

Figure 18. Bottom Side of an exemplary Shielded Ribbon Cable

51. Upon information and belief, the particular Amphenol Shielded Ribbon Cable is sold under the designation "HP 747577-001 Mini-SAS Cable." Other designations for the accused Amphenol Shielded Ribbon Cable may include "HP Dual Mini SAS Ribbon Cable" with part number 747576 or "ProLiant DL380 G9 Mini-SAS Cable" with part number HP 747577.

52. The Shielded Ribbon Cable is a shielded electrical cable as depicted in Figures 17 and 18.

53. The Shielded Ribbon Cable comprises a plurality of conductor sets extending along a length of the cable and arranged generally in a plane along a width of the cable, each conductor set substantially surrounded by a shield and including two insulated conductors. Figure 19 shows a cross-section view of the full width of the Shielded Ribbon Cable, which includes twelve conductor sets extending along a length of the cable, generally arranged in a plane along a width of the cable. Figure 20 shows a magnified view of six of the twelve conductor sets of the Shielded Ribbon Cable:

Figure 19. Full Width Cross-Section View

Figure 20. Cross-Section Depicting a Plurality of Conductor Sets

Figure 21 shows two conductor sets (110 and 120), each of which includes two insulated conductors (130) and two ground conductors (140):

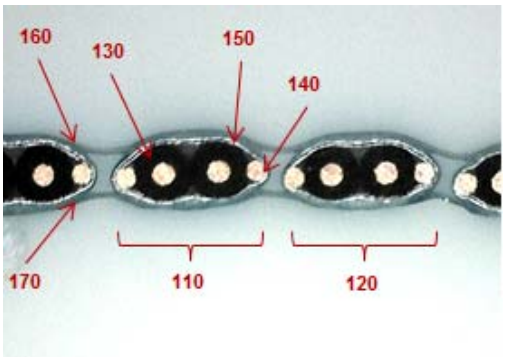

Figure 21. Cross-Section Depicting Two Conductor Sets

Each conductor set is also substantially surrounded by a conductive metallic foil. As illustrated in Figures 22 and 23, the metallic layer (150) forms a shield that substantially surrounds each conductor set:

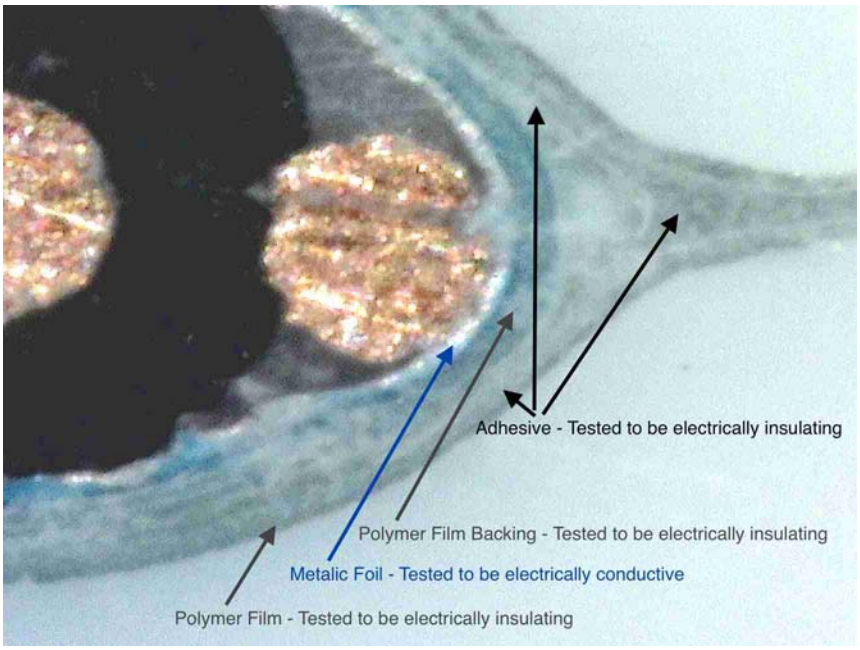

Figure 22. Layers of the Shielded Ribbon Cable

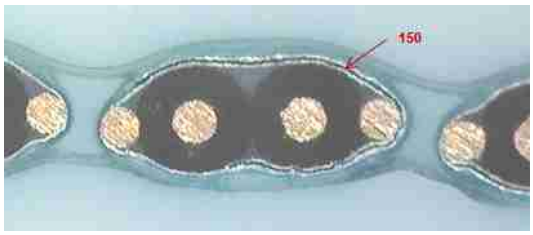

Figure 23. Cross-Section View Depicting Shield

54. The Shielded Ribbon Cable includes first and second non-conductive polymeric layers disposed on opposite sides of the cable, the first and second layers including cover portions and pinched portions arranged such that, in transverse cross section, the cover portions of the first and second layers in combination substantially surround the plurality of conductor sets, and the pinched portions of the first and second layers in combination form pinched portions of the cable on each side of the cable. As shown in Figures 24 and 25, the Shielded Ribbon Cable includes two polymer films (*i.e.*, non-conductive polymeric layers) that are electrically insulating. The first non-conductive polymeric layer (160) is on the top side of the cable and the second non-conductive polymeric layer (170) is on the bottom side of the cable, opposite of the first layer:

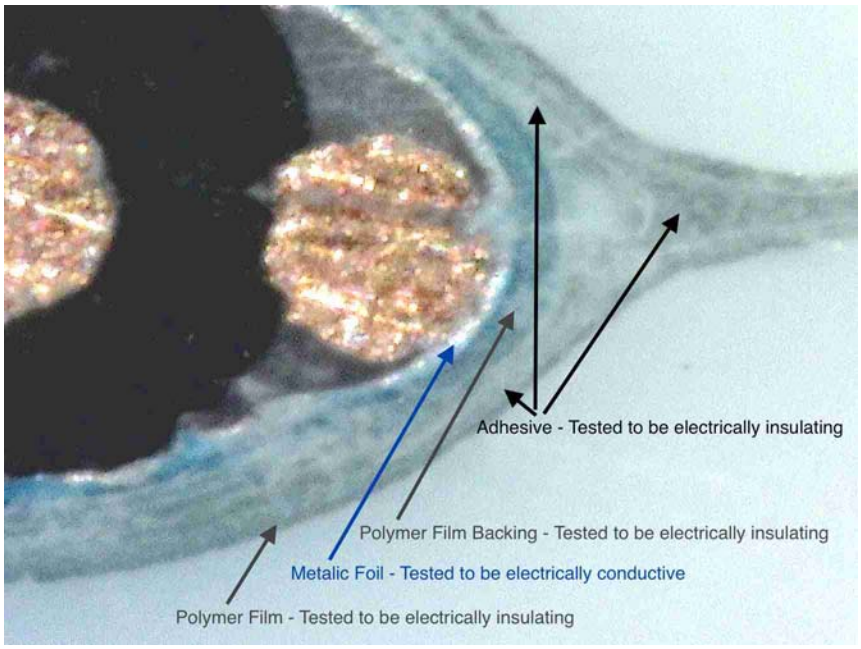

Figure 24. Layers of the Shielded Ribbon Cable

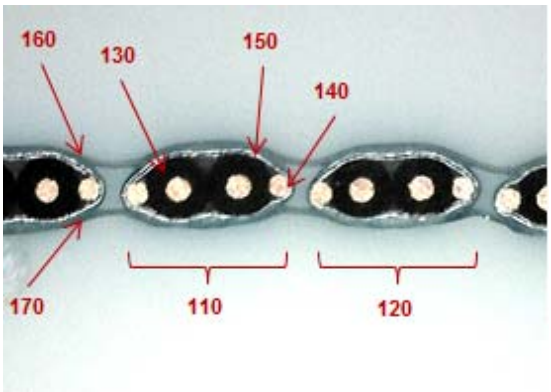

Figure 25. Cross-Section Depicting Two Conductor Sets

Figure 26 depicts cover portions (162 and 172) of the non-conductive polymeric layers. In transverse cross-section, the cover portions – in combination – substantially surround the plurality of conductor sets:

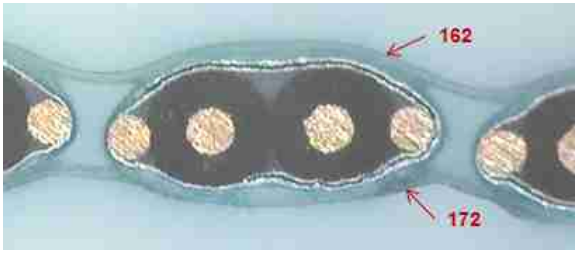

Figure 26. Cross-Section Depicting Cover Portions

Figures 27 and 28 depict two pinched portions (180) of the non-conductive polymeric layers, which are located on each side of the Shielded Ribbon cable:

Figure 27. Cross-Section Depicting Two Pinched Portions

Figure 28. Close-up View of Two Pinched Portions

55. The Shielded Ribbon Cable includes an adhesive layer bonding the first non-conductive polymeric layer to the second non-conductive polymeric layer in the pinched

portions of the cable. Figure 29 depicts an adhesive layer (190) that bonds the two non-conductive polymeric layers (164 and 174) in the pinched portions of the cable:

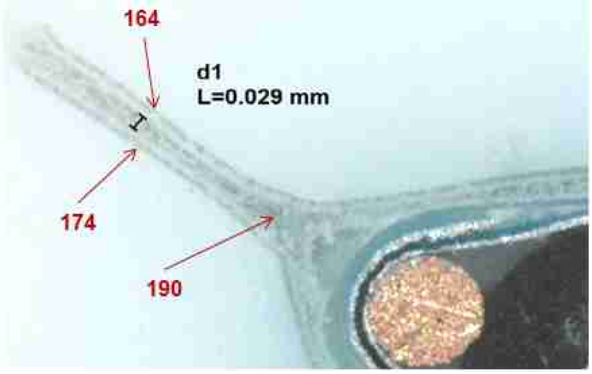

Figure 29. Cross-Section Depicting Adhesive Between Pinched Portions

56. The Shielded Ribbon Cable has first and second layers that are spaced apart within 0.05 mm of each other in each pinched portion along the length of the cable. Figure 30 depicts a Shielded Ribbon Cable wherein each pinched portion has first and second layers that are spaced apart within 0.05 mm of each other. In particular, the d1 values for the Amphenol cable were 0.029 mm and 0.046 mm:

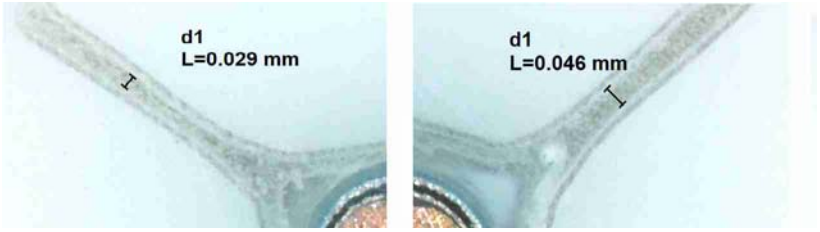

Figure 30. Cross-Section Depicting Space Between First and Second Layers at Pinched Portion

57. In the Shielded Ribbon Cable, a maximum separation between the cover portions of the first and second layers is D. Figure 31 shows a Shielded Ribbon Cable displaying a maximum separation, D, between the cover portions of the first and second layers with a value of 0.799 mm:

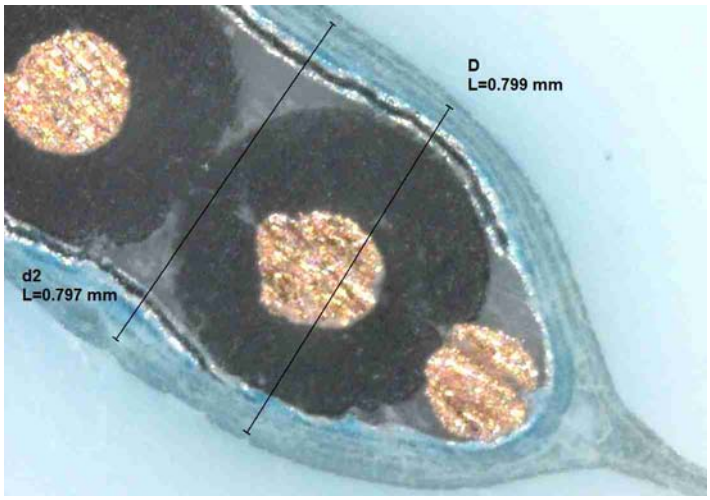

Figure 31. Separation Between Cover Portions of First and Second Layers

58. The Shielded Ribbon Cable displays a minimum separation between the pinched portions of the first and second layers on each side of the cable as d1, with d1/D being less than 0.25. In Figure 30 (above), the two values of d1 were 0.029 mm and 0.046 mm. In Figure 31 (above), the value of D is 0.799 mm. The resulting ratios are as follows:

$$\frac{d1}{D} = \frac{0.029\ mm}{0.799\ mm} = 0.04 < 0.25$$

$$\frac{d1}{D} = \frac{0.046\ mm}{0.799\ mm} = 0.06 < 0.25$$

Both resulting ratios are less than 0.25 and, therefore, satisfy the claim limitation.

59. The Shielded Ribbon Cable displays a minimum separation between the cover portions of the first and second layers in a region between the conductors of each conductor set, d2, with d2/D being greater than 0.33. In Figure 31 (above), the value of d2 is 0.797 mm and the value of D is 0.799 mm. The resulting ratio of d2/D (*i.e.*, (0.797 mm)/(0.799 mm)) is approximately 1.00, which is greater than 0.33 and, therefore, satisfies the claim limitation.

60. Accordingly, the Amphenol Shielded Ribbon Cable meets every limitation of at least claim 1 of the ’236 Patent either literally or under the doctrine of equivalents and thus

infringes at least claim 1. Upon information and belief, other exemplary cables of Amphenol's Shielded Ribbon Cables infringe at least claim 1 either literally or under the doctrine of equivalents because they operate in the same or similar ways to the Shielded Ribbon Cable, and any differences are minor and not material to the infringement analysis. Certain products (*e.g.*, electronic devices) containing Amphenol's Shielded Ribbon Cables likewise infringe at least claim 1 of the '236 Patent either literally or under the doctrine of equivalents.

61. Amphenol's acts of infringement have been without permission, consent, authorization or license of 3M.

62. Upon information and belief, at least as of the time it received notice of the original complaint in this case, Amphenol's inducement of infringement has been with full knowledge of the '236 Patent and with the intention of actively inducing direct infringement by others in the United States.

63. Despite Amphenol's awareness of the '236 Patent and 3M's allegations, Amphenol has continued to knowingly and actively induce the direct infringement of at least claim 1 of the '236 Patent by Amphenol's customers and/or end users. Upon information and belief, at least one Amphenol customer and/or end user has directly infringed one or more claims of the '236 Patent in view of Amphenol's knowing and active inducement.

64. Amphenol has provided and continues to provide promotional materials directed to the functionalities described and claimed in the '236 Patent. For example, Amphenol has promoted and continues to promote its Shielded Ribbon Cables. *See, e.g.*, Exhibit D at p. 2 (describing "features and benefits" of cable). As shown in Paragraphs 48-61 above, the Amphenol Cable infringes at least claim 1 of the '236 Patent. At least by promoting the

infringing functionalities of the Shielded Ribbon Cables, Amphenol has induced and is actively inducing the use of such products, which infringe at least claim 1 of the ’236 Patent.

65. In addition, Amphenol has indirectly infringed at least claim 1 of the ’236 Patent by contributing to infringement.

66. Amphenol’s Shielded Ribbon Cables are made solely for the purpose of permitting functionality in a manner that infringes the asserted claims of the ’236 Patent. Further, Amphenol’s Shielded Ribbon Cables are especially made and/or especially adapted for use in the infringement of the ’236 Patent, are not a staple commodity of commerce, and are not suitable for substantial non-infringing use. By selling its Shielded Ribbon Cables, Amphenol has contributed to the infringement of the ’236 Patent by customers and/or end users.

67. Upon information and belief, Amphenol will continue to infringe the ’236 Patent unless and until it is enjoined by this Court.

68. Amphenol has caused and will continue to cause 3M injury and damage by infringing the ’236 Patent. 3M will suffer further irreparable injury unless and until Amphenol is enjoined from infringing the ’236 Patent.

THIRD CLAIM FOR RELIEF
(Amphenol’s Infringement of the ’106 Patent)

69. 3M incorporates as if fully stated herein the allegations of the preceding paragraphs set forth above.

70. Upon information and belief, Amphenol has infringed and continues to infringe, has actively and knowingly induced and continues to actively and knowingly induce infringement, and contributes to and will contribute to infringement, of one or more claims of the ’106 Patent, including at least claim 7 of the ’106 Patent in this District and elsewhere under 35 U.S.C. §§ 271(a), (b), and (c).

71. Claim 7 of the ’106 Patent is dependent on claims 1 and 6. The three claims state as follows:

> 1. A shielded electrical ribbon cable, comprising:
>
> adjacent first and second conductor sets extending lengthwise along the cable, each conductor set including two or more insulated conductors, the first conductor set comprising a ground conductor generally lying in a plane of the two or more insulated conductors of the first conductor set, at least 90% of a periphery of each conductor set being encompassed by a shielding film; and
>
> first and second non-conductive polymeric films disposed on opposite sides of the cable, the first and second polymeric films including cover portions and pinched portions arranged such that, in transverse cross section, the cover portions of the polymeric first and second films in combination substantially surround each conductor set, and the pinched portions of the first and second polymeric films in combination form pinched portions of the cable on each side of the cable;
>
> wherein, when the cable is laid flat, a distance between a center of the ground conductor of the first conductor set and a center of the nearest insulated conductor of the second conductor set is σ1, a center-to-center spacing of the insulated conductors of the second conductor set is σ2, σ1/σ2 being greater than 0.7.
>
> 6. The shielded electrical ribbon cable of claim 1, wherein the ground conductor of the first conductor set is in electrical contact with the shielding film that encompasses at least 90% of the periphery of the first conductor set.
>
> 7. The shielded electrical ribbon cable of claim 6, wherein the first conductor set has a high frequency isolation between adjacent insulated conductors characterized by a crosstalk C1 at a specified frequency in a range from 3-15 GHz and for a 1 meter cable length, wherein a high frequency isolation between the first and second conductor sets is characterized by a crosstalk C2 at the specified frequency, and wherein C2 is at least 10 dB lower than C1.

72. Amphenol’s Shielded Ribbon Cables meet all the limitations of at least claim 7 of the ’106 Patent.

73. Figures 32 and 33 depict an exemplary cable of the accused Amphenol Shielded Ribbon Cables. The cable bears the name "Amphenol," as shown on the right side of Figure 32:

Figure 32. Top Side of an exemplary Shielded Ribbon Cable

Figure 33. Bottom Side of an exemplary Shielded Ribbon Cable

74. Upon information and belief, the particular Amphenol Shielded Ribbon Cable is sold under the designation "HP 747577-001 Mini-SAS Cable." Other designations for the accused Amphenol Shielded Ribbon Cable may include "HP Dual Mini SAS Ribbon Cable" with part number 747576 or "ProLiant DL380 G9 Mini-SAS Cable" with part number HP 747577.

75. The Shielded Ribbon Cable is a shielded electrical cable as depicted in Figures 32 and 33.

76. The Shielded Ribbon Cable comprises adjacent first and second conductor sets extending lengthwise along the cable, each conductor set including two or more insulated conductors, the first conductor set comprising a ground conductor generally lying in a plane of

the two or more insulated conductors of the first conductor set, at least 90% of a periphery of each conductor set being encompassed by a shielding film. Figure 34 shows a cross-section view of the full width of the Shielded Ribbon Cable, which includes twelve conductor sets extending lengthwise along the cable. Figure 35 shows a magnified view of six of the twelve conductor sets of the Shielded Ribbon Cable:

Figure 34. Full Width Cross-Section View

Figure 35. Cross-Section Depicting a Plurality of Conductor Sets

Figure 36 shows adjacent first and second conductor sets (110 and 120) that extend lengthwise along the cable. Each conductor set includes two insulated conductors (130) and two ground conductors (140). The ground conductors (140) generally lie in a plane of the two insulated conductors of the conductor sets:

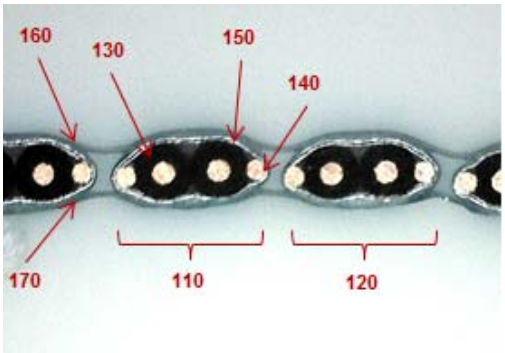

Figure 36. Cross-Section Depicting Two Conductor Sets

As shown in Figures 37 and 38, each conductor set (110 and 120) is encompassed by a conductive metallic foil. The metallic layer (150) forms a shield that encompasses at least 90% of the periphery of each conductor set:

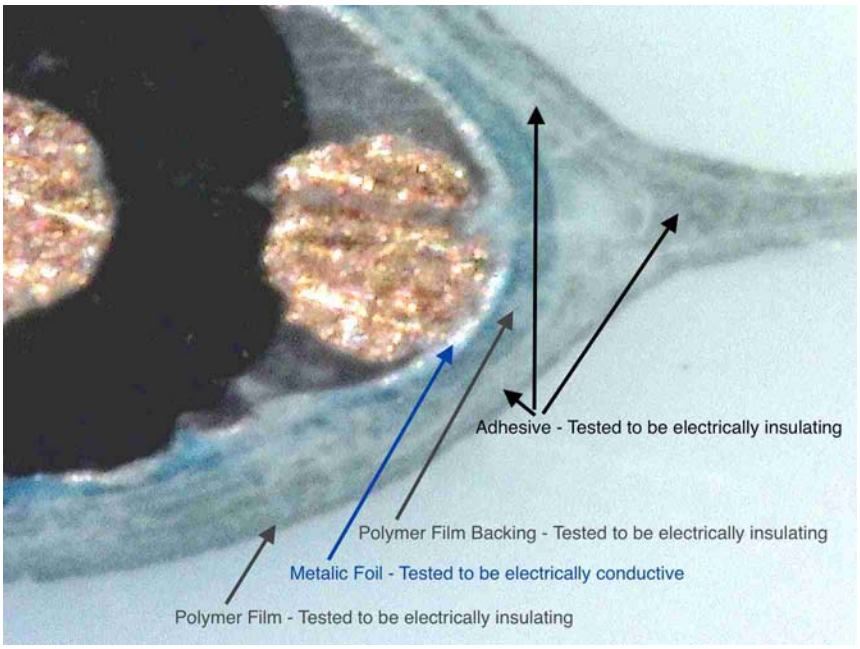

Figure 37. Layers of the Shielded Ribbon Cable

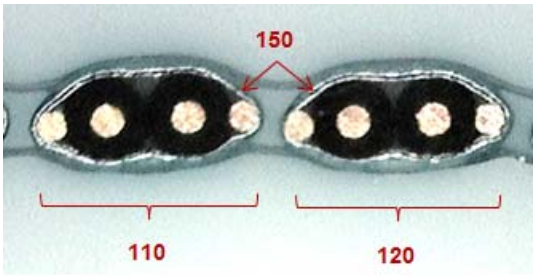

Figure 38. Cross-Section View Depicting Shield

77. The Shielded Ribbon Cable includes first and second non-conductive polymeric films disposed on opposite sides of the cable, the first and second polymeric films including cover portions and pinched portions arranged such that, in transverse cross section the cover portions of the polymeric first and second films in combination substantially surround each conductor set, and the pinched portions of the first and second polymeric films in combination form pinched portions of the cable on each side of the cable. As shown in Figures 39 and 40, the Shielded Ribbon Cable includes two polymer films (*i.e.*, non-conductive polymeric films) that are electrically insulating. The first non-conductive polymeric film (160) is on the top side of the

cable and the second non-conductive polymeric film (170) is on the bottom side of the cable, disposed opposite of the first film:

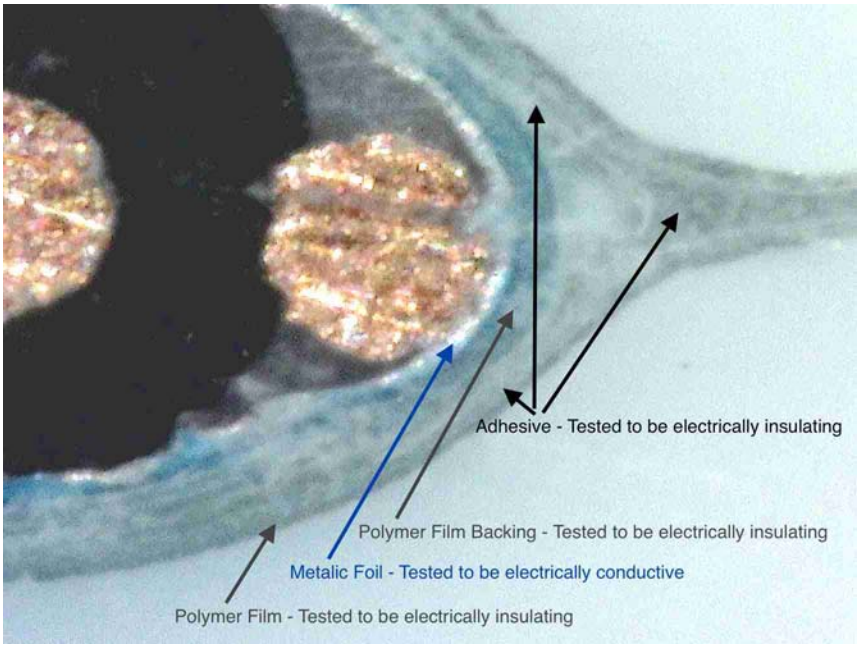

Figure 39. Layers of the Shielded Ribbon Cable

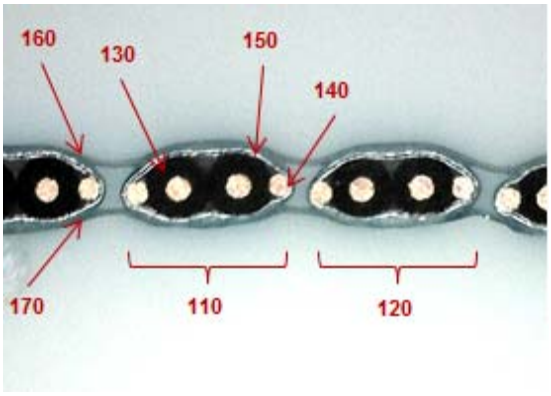

Figure 40. Cross-Section Depicting Two Conductor Sets

Figure 41 depicts cover portions (162 and 172) of the non-conductive polymeric films. In transverse cross-section, the cover portions – in combination – substantially surround each conductor set:

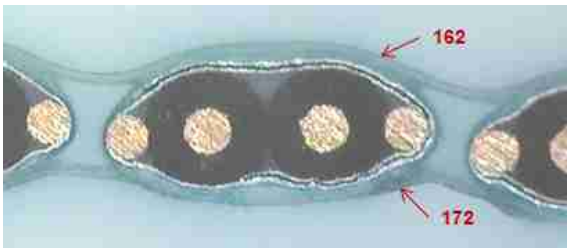

Figure 41. Cross-Section Depicting Cover Portions

Figures 42 and 43 depict two pinched portions (180) of the non-conductive polymeric films, which are located on each side of the Shielded Ribbon Cable:

Figure 42. Cross-Section Depicting Two Pinched Portions

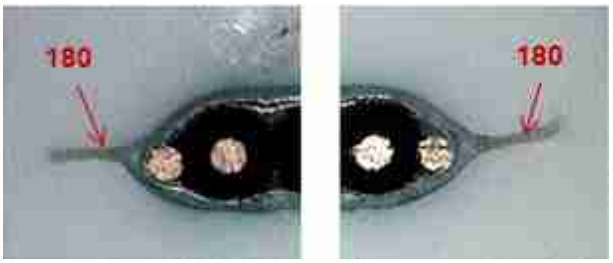

Figure 43. Close-up View of Two Pinched Portions

78. When the Shielded Ribbon Cable is laid flat, a distance between a center of the ground conductor of the first conductor set and a center of the nearest insulated conductor of the second conductor set is σ1, a center-to-center spacing of the insulated conductors of the second conductor set is σ2, and σ1/σ2 is greater than 0.7. Figure 44 shows distances σ1 and σ2 of the Shielded Ribbon Cable when the cable is laid flat. The value σ1 represents the distance between a center of the ground conductor (140) of the first conductor set (110) and a center of the nearest insulated conductor of the second conductor (120). The value σ2 is the center-to-center spacing of the insulated conductors of the second conductor set (120):

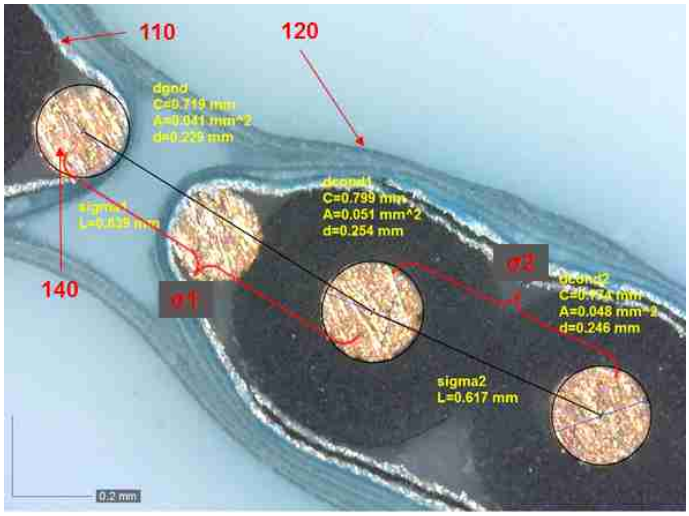

Figure 44. Calculation of σ1 and σ2

Based on the measurements taken of the Shielded Ribbon Cable, the values of σ1 and σ2 are as follows:

$$\sigma 1 = 0.839 \text{ mm}$$
$$\sigma 2 = 0.617 \text{ mm}$$

The ratio is greater than 0.7 and, therefore, meets the claim limitation:

$$\frac{\sigma 1}{\sigma 2} = \frac{0.839\ mm}{0.617\ mm} = 1.36 > 0.7$$

79. The Shielded Ribbon Cable also includes a ground conductor of the first conductor set in electrical contact with the shielding film that encompasses at least 90% of the periphery of the first conductor set. As shown in Figure 45, the ground conductor (140) in a first conductor set (110) of the Shielded Ribbon Cable is in electrical contact with the shielding film (150) that encompasses at least 90% of the periphery of the first conductor set. The ground conductor (140) is surrounded by the shielding film (150) and positioned directly in contact with it.

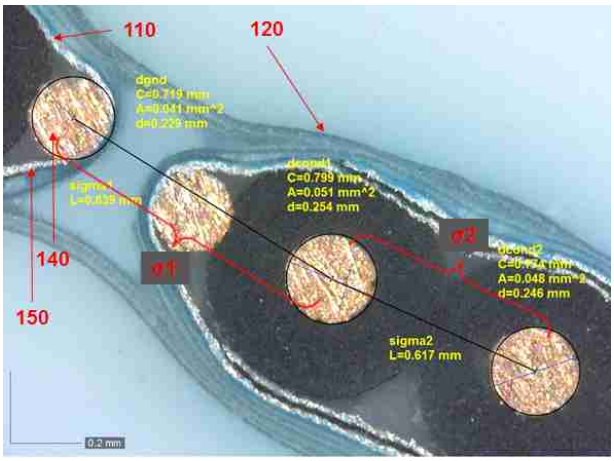

Figure 45. Electrical Contact Between Ground Conductor and Shielding Film

80. The Shielded Ribbon Cable also includes a first conductor set that has a high frequency isolation between adjacent insulated conductors characterized by a crosstalk C1 at a specified frequency in a range from 3-15 GHz and for a 1 meter cable length, wherein a high frequency isolation between the first and second conductor sets is characterized by a crosstalk C2 at the specified frequency, and wherein C2 is at least 10 dB lower than C1. The cross talk (high frequency isolation parameter) of the Amphenol Cable was measured and compared at two different points using a Teledyne LeCroy SPARQ Signal Integrity Network Analyzer. The high frequency isolation between adjacent insulated conductors was measured as crosstalk C1, for a frequency range of 3-15 GHz. Next, the high frequency isolation between the first and second conductor sets was measured as crosstalk C2, for a frequency range of 3-15 GHz. The measurements were made on a cable of 0.17 meter length and on a cable of 0.085 meter length, half the original length. The measurements were then scaled for a 1 meter cable length. Figure 46 shows the resulting high frequency isolation values for C1 and C2:

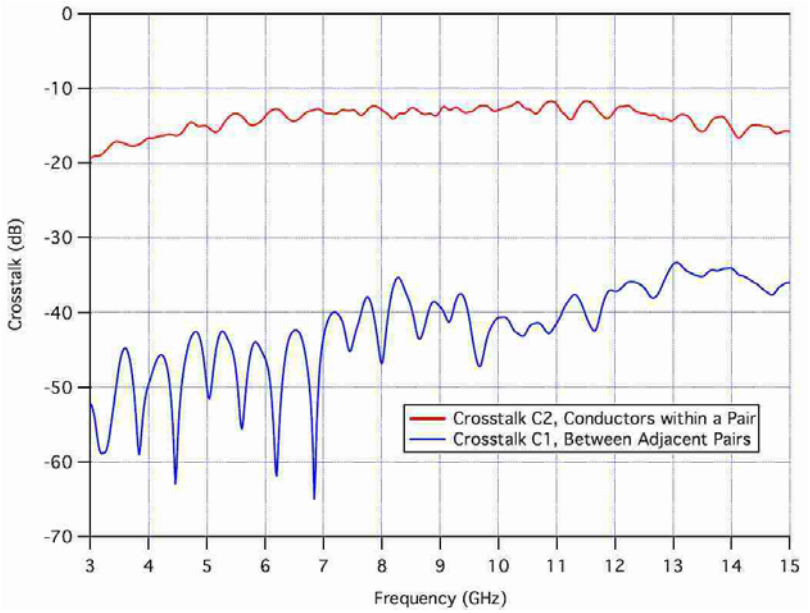

Figure 46. Graph Showing Crosstalk of C1 and C2

The test results show that C2 – C1 is greater than 10 dB between 3 GHz to 15 GHz. Another way of stating that relationship is that C2 is at least 10 dB lower than C1 for a specified frequency in a range from 3-15 GHz.

81. Accordingly, the Shielded Ribbon Cable meets every limitation of at least claim 7 of the ’106 Patent either literally or under the doctrine of equivalents and thus infringes at least claim 7. Upon information and belief, other exemplary cables of Amphenol’s Shielded Ribbon Cables infringe at least claim 7 either literally or under the doctrine of equivalents because they operate in the same or similar ways to the Shielded Ribbon Cable, and any differences are minor and not material to the infringement analysis. Certain products (*e.g.*, electronic devices) containing Amphenol’s Shielded Ribbon Cables likewise infringe the ’106 Patent either literally or under the doctrine of equivalents.

82. Amphenol’s acts of infringement have been without permission, consent, authorization or license of 3M.

83. Upon information and belief, at least as of the time it received notice of the First Amended Complaint in this case, Amphenol's inducement of infringement has been with full knowledge of the '106 Patent and with the intention of actively inducing direct infringement by others in the United States.

84. Despite Amphenol's awareness of the '106 Patent and 3M's allegations, Amphenol has continued to knowingly and actively induce the direct infringement of at least claim 7 of the '106 Patent by Amphenol's customers and/or end users. Upon information and belief, at least one Amphenol customer and/or end user has directly infringed one or more claims of the '106 Patent in view of Amphenol's knowing and active inducement.

85. Amphenol has provided and continues to provide promotional materials directed to the functionalities described and claimed in the '106 Patent. For example, Amphenol has promoted and continues to promote its Shielded Ribbon Cables. *See, e.g.*, Exhibit D at p. 2 (describing "features and benefits" of cable). As shown in Paragraphs 71-82 above, the Amphenol Cable infringes at least claim 7 of the '106 Patent. At least by promoting the infringing functionalities of the Shielded Ribbon Cables, Amphenol has induced and is actively inducing the use of such products, which infringe at least claim 7 of the '106 Patent.

86. In addition, Amphenol has indirectly infringed at least claim 7 of the '106 Patent by contributing to infringement.

87. Amphenol's Shielded Ribbon Cables are made solely for the purpose of permitting functionality in a manner that infringes at least claim 7 of the '106 Patent. Further, Amphenol's Shielded Ribbon Cables are especially made and/or especially adapted for use in the infringement of the '106 Patent, are not a staple commodity of commerce, and are not suitable

for substantial non-infringing use. By selling the Shielded Ribbon Cables, Amphenol has contributed to the infringement of the '106 Patent by customers and/or end users.

88. Upon information and belief, Amphenol will continue to infringe the '106 Patent unless and until it is enjoined by this Court.

89. Amphenol has caused and will continue to cause 3M injury and damage by infringing the '106 Patent. 3M will suffer further irreparable injury unless and until Amphenol is enjoined from infringing the '106 Patent.

PRAYER FOR RELIEF

WHEREFORE, 3M respectfully prays for judgment as follows:

a) Judgment that Amphenol has infringed one or more claims of each of the '333 Patent, the '236 Patent, and the '106 Patent;

b) Preliminarily and permanently enjoining Amphenol and its officers, agents, servants, employees, attorneys, and all persons in active concert or participation with any of them, from further infringement of the '333 Patent, the '236 Patent, and the '106 Patent;

c) An award to 3M of damages adequate to compensate it for all infringement occurring through the date of judgment, with prejudgment interest, and for any supplemental damages as appropriate and post-judgment interest after that date;

d) An award of enhanced damages for willful infringement as permitted by law;

e) A finding that Amphenol's conduct and therefore this action for infringement represent an exceptional case under 35 U.S.C. § 285 and an award of reasonable attorney fees and costs; and

f) An award of such other and further relief as the Court may deem just and proper.

DEMAND FOR TRIAL BY JURY

Pursuant to Federal Rule of Civil Procedure 38(b), 3M hereby demands a trial by jury of all issues so triable.

MORRIS, NICHOLS, ARSHT & TUNNELL LLP

/s/ Rodger D. Smith II

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July 24, 2017

CERTIFICATE OF SERVICE

I hereby certify that on July 24, 2017, I caused the foregoing to be electronically filed with the Clerk of the Court using CM/ECF, which will send notification of such filing to all registered participants.

I further certify that I caused copies of the foregoing document to be served on July 24, 2017, upon the following in the manner indicated:

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