UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SIG SAUER INC.,
Petitioner,

v.

TRUE VELOCITY, INC.,
Patent Owner.

Case No. IPR2025-00861
U.S. Patent No. 8,561,543

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,561,543

TABLE OF CONTENTS

I. INTRODUCTION 1

II. CERTIFICATION OF STANDING 1

III. GROUNDS FOR THE UNPATENTABILITY OF THE '543 PATENT 1

IV. OVERVIEW OF THE '543 PATENT 2

A. The Purported Invention 2

B. Prosecution History 5

C. The Challenged Claims of the '543 Patent 10

V. OVERVIEW OF THE PRIOR ART 11

A. Daubenspeck 11

B. Chung 12

C. Kay-Clough 13

D. Nonte 14

E. Anderson 14

F. Dittrich 15

VI. LEVEL OF ORDINARY SKILL IN THE ART 16

VII. CLAIM CONSTRUCTION 17

VIII. DETAILED EXPLANATION OF INVALIDITY GROUNDS 17

A. GROUND 1: CLAIMS 1, 7 AND 18 OF THE '543 PATENT ARE ANTICIPATED BY DAUBENSPECK 17

1. Claim 1 18

a) [1 [Preamble]]: "A polymeric ammunition cartridge comprising:" 18

TABLE OF CONTENTS (cont.)

b) [1 [1]]: "a substantially cylindrical insert comprising" .19

(1) [1 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface," ..20

(2) [1 [1b]]: "a primer recess in the top surface that extends toward the bottom surface;" 22

(3) [1 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface, and" 23

(4) [1 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface; and" 24

c) [1 [2]]: "a substantially cylindrical polymeric middle body comprising" 25

(1) [1 [2a]]: "a substantially cylindrical polymeric bullet-end and" 26

(2) [1 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole." 27

2. Claim 7: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end comprises a forward opening end having a first and a second mechanical interlock for engagement between the forward opening end and a bullet. 29

3. Claim 18: 30

<u>TABLE OF CONTENTS</u> (cont.)

a) [18 [Preamble]]: "A polymeric ammunition cartridge comprising:" 30

b) [18 [1]]: "a substantially cylindrical insert 18comprising"....................30

(1) [18 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface," ..30

(2) [18 [1b]]: "a primer recess in the top surface that extends toward the bottom surface,"............31

(3) [18 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface,"....................31

(4) [18 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface;"....................31

c) [18 [2]]: "a substantially cylindrical polymeric middle body comprising" 32

(1) [18 [2a]]: "a substantially cylindrical polymeric bullet-end and" 32

(2) [18 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole." 32

(3) [18 [2c]]: "a substantially cylindrical polymeric bullet-end upper portion comprising a bullet-end coupling element connected to the substantially

TABLE OF CONTENTS (cont.)

cylindrical polymeric bullet end and a forward opening end to engage a bullet.” 33

B. GROUND 2: CLAIMS 2, 4-6, 10-14 AND 19 OF THE ’543 PATENT ARE RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF CHUNG. 34

1. Motivation to Combine 35
2. Claim 2: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a ductile polymer. 36
3. Claim 4: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a fiber-reinforced polymeric composite. 36
4. Claim 5: The polymeric ammunition cartridge of claim 4, wherein the fiber-reinforced polymeric composite contains between about 10 and about 70 wt % glass fiber fillers, mineral fillers, or mixtures thereof. 36
5. Claim 6: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end and bullet are further welded or bonded together. 37
6. Claim 10: The polymeric ammunition cartridge of claim 1, wherein the forward opening end is crimped so that a polymeric material flows into an annular groove of a bullet. ... 37
7. Claim 11: The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end. 37
8. Claim 12: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprise a polymers selected from the group consisting of polyurethane prepolymer, cellulose, fluoro-polymer, ethylene inter-polymer alloy elastomer, ethylene vinyl acetate, nylon,

TABLE OF CONTENTS (cont.)

polyether imide, polyester elastomer, polyester sulfone, polyphenyl amide, polypropylene, polyvinylidene fluoride or thermoset polyurea elastomer, acrylics, homopolymers, acetates, copolymers, acrylonitrile-butadinen-styrene, thermoplastic fluoro polymers, inomers, polyamides, polyamide-imides, polyacrylates, polyatherketones, polyaryl-sulfones, polybenzimidazoles, polycarbonates, polybutylene, terephthalates, polyether imides, polyether sulfones, thermoplastic polyimides, thermoplastic polyurethanes, polyphenylene sulfides, polyethylene, polypropylene, polysulfones, polyvinylchlorides, styrene acrylonitriles, polystyrenes, polyphenylene, ether blends, styrene maleic anhydrides, polycarbonates, allyls, aminos, cyanates, epoxies, phenolics, unsaturated polyesters, bismaleimides, polyurethanes, silicones, vinylesters, urethane hybrids, polyphenylsulfones, copolymers of polyphenylsulfones with polyethersulfones or polysulfones, copolymers of poly-phenylsulfones with siloxanes, blends of polyphenylsulfones with polysiloxanes, poly(etherimide-siloxane) copolymers, blends of polyetherimides and polysiloxanes, and blends of polyetherimides and poly(etherimide-siloxane) copolymers. ..38

9. Claim 13: The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises a neck with a plurality of internal structures for supporting a bullet. 39

10. Claim 14: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical coupling element is a male coupling element with a straight skirt interlock surface that tapers to a smaller diameter at the forward portion on the skirt tip to mate with a female coupling element of the substantially cylindrical polymeric coupling end. 39

11. Claim 19: The polymeric ammunition cartridge of claim 18, wherein the forward opening end has one or more annular rings positioned to receive a corresponding two or more annular grooves in the bullet. 40

TABLE OF CONTENTS (cont.)

C. GROUND 3: CLAIM 3 OF THE ’543 PATENT IS RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF KAY-CLOUGH....42

1. Motivation to Combine 42

2. Claim 1 43

3. Claim 3. The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprises a nylon polymer. 43

D. GROUND 4: CLAIMS 8 AND 9 OF THE ’543 PATENT ARE RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF NONTE 44

1. Motivation to Combine 44

2. Claim 1 45

3. Claim 8: The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises one or more cannelures formed on an outer circumferential surface of the forward opening end. 45

4. Claim 9: The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises one, two, three, or more annular rings that mate with one, two, three, or more corresponding annular grooves positioned on the bullet. 47

E. GROUND 5: CLAIMS 15-17 OF THE ’543 PATENT ARE RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF ANDERSON. 49

1. Motivation to combine 49

2. Claim 1 51

3. Claim 15: The polymeric ammunition cartridge of claim 1, further comprising a diffuser positioned in the primer recess

TABLE OF CONTENTS (cont.)

comprising a diffuser flash hole aligned with the primer flash hole. 51

4. Claim 16: 53

a) 16 [Preamble]: "A polymeric ammunition cartridge having a diffuser comprising:" 53

b) [16 [1]]: "a substantially cylindrical insert comprising" 53

(1) [16 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface," 53

(2) [16 [1b]]: "a primer recess in the top surface that extends toward the bottom surface," 54

(3) [16 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface," 54

(4) [16 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface;" 54

c) [16 [2]]: "a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole; and;" 55

d) [16 [3]]: "a substantially cylindrical polymeric middle body comprising" 57

(1) [16 [3a]]: "a substantially cylindrical polymeric bullet-end and" 57

(2) [16 [3b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially

TABLE OF CONTENTS (cont.)

cylindrical coupling element and covers an circumferential surface of the primer flash hole." 57

5. Claim 17: The polymeric ammunition cartridge of claim 16, wherein the diffuser has a primer flash hole with a flash hole lip extending into a bore of the primer flash hole. 58

F. GROUND 6: CLAIMS 1, 2, 4-6, AND 10-14 OF THE '543 PATENT ARE RENDERED OBVIOUS BY CHUNG IN VIEW OF DAUBENSPECK. 58

1. Motivation to Combine 58

2. Claim 1 59

a) [1 [Preamble]]: "A polymeric ammunition cartridge comprising:" 59

b) [1 [1]]: "a substantially cylindrical insert comprising" .60

(1) [1 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface," ..60

(2) [1 [1b]]: "a primer recess in the top surface that extends toward the bottom surface;" 61

(3) [1 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface, and" 62

(4) [1 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface; and" 64

c) [1 [2]]: "a substantially cylindrical polymeric middle body comprising" 64

TABLE OF CONTENTS (cont.)

(1) [1 [2a]]: "a substantially cylindrical polymeric bullet-end and" 65

(2) [1 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole." 66

3. Claim 2: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a ductile polymer. 68

4. Claim 4: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a fiber-reinforced polymeric composite...........68

5. Claim 5: The polymeric ammunition cartridge of claim 4, wherein the fiber-reinforced polymeric composite contains between about 10 and about 70 wt % glass fiber fillers, mineral fillers, or mixtures thereof. 69

6. Claim 6: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end and bullet are further welded or bonded together.....................69

7. Claim 10: The polymeric ammunition cartridge of claim 1, wherein the forward opening end is crimped so that a polymeric material flows into an annular groove of a bullet....69

8. Claim 11: The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end. 69

9. Claim 12: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprise a polymers selected from the group consisting of

TABLE OF CONTENTS **(cont.)**

polyurethane prepolymer, cellulose, fluoro-polymer, ethylene inter-polymer alloy elastomer, ethylene vinyl acetate, nylon, polyether imide, polyester elastomer, polyester sulfone, polyphenyl amide, polypropylene, polyvinylidene fluoride or thermoset polyurea elastomer, acrylics, homopolymers, acetates, copolymers, acrylonitrile-butadinen-styrene, thermoplastic fluoro polymers, inomers, polyamides, polyamide-imides, polyacrylates, polyatherketones, polyaryl-sulfones, polybenzimidazoles, polycarbonates, polybutylene, terephthalates, polyether imides, polyether sulfones, thermoplastic polyimides, thermoplastic polyurethanes, polyphenylene sulfides, polyethylene, polypropylene, polysulfones, polyvinylchlorides, styrene acrylonitriles, polystyrenes, polyphenylene, ether blends, styrene maleic anhydrides, polycarbonates, allyls, aminos, cyanates, epoxies, phenolics, unsaturated polyesters, bismaleimides, polyurethanes, silicones, vinylesters, urethane hybrids, polyphenylsulfones, copolymers of polyphenylsulfones with polyethersulfones or polysulfones, copolymers of poly-phenylsulfones with siloxanes, blends of polyphenylsulfones with polysiloxanes, poly(etherimide-siloxane) copolymers, blends of polyetherimides and polysiloxanes, and blends of polyetherimides and poly(etherimide-siloxane) copolymers. ..70

10. Claim 13: The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end. 70

11. Claim 14: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical coupling element is a male coupling element with a straight skirt interlock surface that tapers to a smaller diameter at the forward portion on the skirt tip to mate with a female coupling element of the substantially cylindrical polymeric coupling end. 71

G. GROUND 7: CLAIM 1 OF THE ’543 PATENT IS ANTICIPATED BY DITTRICH 71

<u>TABLE OF CONTENTS</u> (cont.)

1. Claim 1 71

a) [1 [Preamble]]: "A polymeric ammunition cartridge comprising:" 71

b) [1 [1]]: "a substantially cylindrical insert comprising" .71

(1) [1 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface," ..72

(2) [1 [1b]]: "a primer recess in the top surface that extends toward the bottom surface;" 73

(3) [1 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface, and" 74

(4) [1 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface; and" 74

c) [1 [2]]: "a substantially cylindrical polymeric middle body comprising" 75

(1) [1 [2a]]: "a substantially cylindrical polymeric bullet-end and" 76

(2) [1 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole." 77

IX. SECONDARY CONSIDERATIONS 78

X. MANDATORY NOTICES 79

TABLE OF CONTENTS (cont.)

A. Real Party-In-Interest 79

B. Related Matters..79

C. Lead Counsel, Backup Counsel and Service Information 79

D. Payment of Fees – 37 C.F.R. § 42.103...79

XI. CONCLUSION...80

TABLE OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 8,561,543 ("the '543 Patent")
1002	Prosecution History of U.S. Patent No. 8,561,543 ("Prosecution History")
1003	Declaration of John Nixon ("Nixon Decl.")
1004	U.S. Patent No. 3,099,958 ("Daubenspeck")
1005	U.S. Patent Application No. 2007/0261587 ("Chung")
1006	George C. Nonte, Jr., *Handloading for Handgunners* (1978) ("Nonte")
1007	U.S. Patent No. 3,977,326 ("Anderson")
1008	International PCT Application No. WO 2008091245 ("Dittrich")
1009	International PCT Application No. WO 0034732A1 ("Kay-Clough")
1010	Declaration of Dr. Sylvia D. Hall-Ellis
1011	Definition of cannelure: https://www.merriam-webster.com/dictionary/cannelure
1012	Curriculum Vitae of John Nixon

LIST OF CHALLENGED CLAIMS

Claim	Limitation
1[Pre]	A polymeric ammunition cartridge comprising:
1[1]	a substantially cylindrical insert comprising
1[1a]	a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,
1[1b]	a primer recess in the top surface that extends toward the bottom surface,
1[1c]	a primer flash hole positioned in the primer recess to extend through the bottom surface, and
1[1d]	a flange that extends circumferentially about an outer edge of the top surface; and
1[2]	a substantially cylindrical polymeric middle body comprising
1[2a]	a substantially cylindrical polymeric bullet-end and
1[2b]	a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole.
2	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical pol[ymeric middle body is formed from a ductile polymer.

Claim	Limitation
3	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middlebody comprise a nylon polymer.
4	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a fiber-reinforced polymeric composite.
5	The polymeric ammunition cartridge of claim 4, wherein the fiber-reinforced polymeric composite contains between about 10 and about 70 wt % glass fiber fillers, mineral fillers, or mixtures thereof.
6	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end and bullet are further welded or bonded together.
7	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end comprises a forward opening end having a first and a second mechanical interlock for engagement between the forward opening end and a bullet.
8	The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises one or more cannelures formed on an outer circumferential surface of the forward opening end.

Claim	Limitation
9	The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises one, two, three, or more annular rings that mate with one, two, three, or more corresponding annular grooves positioned on the bullet.
10	The polymeric ammunition cartridge of claim 1, wherein the forward opening end is crimped so that a polymeric material flows into an annular groove of a bullet.
11	The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end.
12	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprise a polymers selected from the group consisting of polyurethane prepolymer, cellulose, fluoro-polymer, ethylene inter-polymer alloy elastomer, ethylene vinyl acetate, nylon, polyether imide, polyester elastomer, polyester sulfone, polyphenyl amide, polypropylene, polyvinylidene fluoride or thermoset polyurea elastomer, acrylics, homopolymers, acetates, copolymers, acrylonitrile-butadinen-styrene, thermoplastic fluoro polymers, inomers, polyamides, polyamide-imides, polyacrylates, polyatherketones, polyaryl-sulfones, polybenzimidazoles, polycarbonates, polybutylene, terephthalates, polyether imides, polyether sulfones, thermoplastic polyimides, thermoplastic polyurethanes, polyphenylene sulfides, polyethylene, polypropylene, polysulfones, polyvinylchlorides, styrene acrylonitriles, polystyrenes, polyphenylene, ether blends, styrene maleic anhydrides, polycarbonates, allyls, aminos, cyanates, epoxies, phenolics, unsaturated polyesters, bismaleimides, polyurethanes, silicones, vinylesters, urethane hybrids, polyphenylsulfones, copolymers of polyphenylsulfones with

Claim	Limitation
	polyethersulfones or polysulfones, copolymers of poly-phenylsulfones with siloxanes, blends of polyphenylsulfones with polysiloxanes, poly (etherimide-siloxane) copolymers, blends of polyetherimides and polysiloxanes, and blends of polyetherimides and poly(etherimide-siloxane) copolymers.
13	The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises a neck with a plurality of internal structures for supporting a bullet.
14	The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical coupling element is a male coupling element with a straight skirt interlock surface that tapers to a smaller diameter at the forward portion on the skirt tip to mate with a female coupling element of the substantially cylindrical polymeric coupling end.
15	The polymeric ammunition cartridge of claim 1, further comprising a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole.
16[Pre]	A polymeric ammunition cartridge having a diffuser comprising:
16[1]	a substantially cylindrical insert comprising
16[1a]	a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,
16[1b]	a primer recess in the top surface that extends toward the bottom surface,

Claim	Limitation
16[1c]	a primer flash hole positioned in the primer recess to extend through the bottom surface, and
16[1d]	a flange that extends circumferentially about an outer edge of the top surface;
16[2]	a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole; and
16[3]	a substantially cylindrical polymeric middle body comprising
16[3a]	a substantially cylindrical polymeric bullet-end and
16[3b]	a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole.
17	The polymeric ammunition cartridge of claim 16, wherein the diffuser has a primer flash hole with a flash hole lip extending into a bore of the primer flash hole.
18[Pre]	A polymeric ammunition cartridge comprising:
18[1]	a substantially cylindrical insert comprising
18[1a]	a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface.
18[1b]	a primer recess in the top surface that extends toward the bottom surface,

Claim	Limitation
18[1c]	a primer flash hole positioned in the primer recess to extend through the bottom surface, and
18[1d]	a flange that extends circumferentially about an outer edge of the top surface;
18[2]	a substantially cylindrical polymeric middle body comprising
18[2a]	a substantially cylindrical polymeric bullet-end and
18[2b]	a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole; and
18[2c]	a substantially cylindrical polymeric bullet-end upper portion comprising a bullet-end coupling element connected to the substantially cylindrical polymeric bullet end and a forward opening end to engage a bullet.
19	The polymeric ammunition cartridge of claim 18, wherein the forward opening end has one or more annular rings positioned to receive a corresponding two or more annular grooves in the bullet.

I. INTRODUCTION

SIG Sauer Inc. ("SIG Sauer" or "Petitioner") respectfully petitions for *inter partes* review of claims 1-19 ("Challenged Claims") of U.S. Patent No. 8,561,543 to Burrow (EX1001, "the '543 Patent"), which is assigned to True Velocity, Inc. As explained herein, a reasonable likelihood exists that Petitioner will prevail with respect to the Challenged Claims. Accordingly, Petitioner respectfully requests that the Board institute *inter partes* review and cancel the Challenged Claims.

II. CERTIFICATION OF STANDING

Petitioner SIG Sauer Inc. certifies under Rule 42.104(a) that the patent for which review is sought is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

III. GROUNDS FOR THE UNPATENTABILITY OF THE '543 PATENT

SIG Sauer requests *inter partes* review of claims 1-19 of the '543 Patent and a determination that those claims are unpatentable based on the following grounds:

Ground	References	Basis	Claims Challenged
1	Daubenspeck	§102(a)	1, 7, 18
2	Daubenspeck, Chung	§103	2, 4-6, 10-14, 19
3	Daubenspeck, Kay-Clough	§103	3
4	Daubenspeck, Nonte	§103	8, 9
5	Daubenspeck, Anderson	§103	15-17
6	Chung, Daubenspeck	§103	1, 2, 4-6, 10-14
7	Dittrich	§102(a)	1

This Petition, supported by the declaration of John Nixon (EX1003), the declaration of Dr. Sylvia Hall-Ellis (EX1010), the prior art (EX1005-EX1009), and other exhibits filed herewith, demonstrates that there is a reasonable likelihood that Petitioner will prevail with respect to one or more, if not all, of the Challenged Claims. *See* 35 U.S.C. § 314(a).

IV. OVERVIEW OF THE '543 PATENT

A. The Purported Invention

The '543 Patent generally describes a configuration of a round of ammunition in which a portion of the powder chamber is of a polymeric composition. EX1001 at 1:19-24. The patent states that "Conventional ammunition cartridge casings for rifles and machine guns, as well as larger caliber weapons, are made from brass, which is heavy, expensive, and potentially hazardous." *Id*. at 1:32-35. The patent states that a lighter weight replacement for brass, such as a polymer, could improve ammunition capabilities. *Id*. at 1:35-38. However, ammunition using polymer cartridge casings must still "meet the reliability and performance standards of existing fielded ammunition and be interchangeable with brass cartridge casing ammunition in existing weaponry." *Id*. at 1:38-41. Although the specification focuses extensively on manufacturing practices, the claims of the '543 Patent are apparatus claims that relate primarily to ammunition having polymeric components. *See, e.g.*, *Id*. at 7:55-8:10; EX1003 at ¶25.

As the ’543 Patent concedes, “plastic cartridge casings have been known for many years” prior to the filing of the ’543 Patent’s application. EX1001 at 1:47. Indeed, the patent describes prior art patents as disclosing:

> an ammunition cartridge assembled from a substantially cylindrical polymeric cartridge casing body defining a casing headspace with an open projectile-end and an end opposing the projectile-end, wherein the casing body has a substantially cylindrical injection molded polymeric bullet-end component with opposing first and second ends, the first end of which is the projectile end of the casing body and the second end has a male or female coupling element; and a cylindrical polymeric middle body component with opposing first and second ends, wherein the first end has a coupling element that is a mate for the projectile-end coupling element and joins the first end of the middle body component to the second end of the bullet end component, and the second end is the end of the casing body opposite the projectile end and has a male or female coupling element; and a cylindrical cartridge casing head-end component with an essentially closed base end with a primer hole opposite an open end with a coupling element that is a mate for the coupling element on the second end of the middle body and joins the second end of the middle body component to the open end of the head-end component; wherein the middle body component is formed from a material more ductile than

the material head-end component is formed from but equal or less ductile than the material the bullet-end component is formed from.

Id. at 1:60-2:18; EX1003 at ¶26.

Indeed, the only limitation recited in the independent claims of the '543 Patent adding to this description of admitted prior art is "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end <u>extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole</u>." *See, e.g.*, EX1001. at Claim 1, limitation 2b (emphasis added); EX1003 at ¶27.

The '543 Patent describes the purpose of the invention as overcoming shortcomings in "the known methods of producing plastic or substantially plastic ammunition," which the patent owner argues include bullets being pushed into the casing, bullets falling out of the casing, the bullet pull being insufficient to create sufficient pressure, the bullet pull not being uniform from round to round, and parts of the casing breaking off and jamming the weapon or becoming projectiles themselves. EX1001 at 2:25-35. The only claim limitations that appear directed to these alleged problems are those added with dependent claims, claiming groove or "cannelure"-type structures in the bullet end of the casing. *Id.* at Claim 8. As shown in detail below, however, such structures are old and well known in the art.

It would be obvious for one skilled in the art to make use of such structures, as well as other well-known means of securing bullets into casings, with the alleged invention. EX1003 at ¶28

B. Prosecution History

U.S. Patent Application No. 13/292,843 (the "'843 Application"), titled "LIGHTWEIGHT POLYMER AMMUNITION CARTRIDGE CASINGS," was filed on November 9, 2011. EX1002 at 1. The '843 Application issued as the '543 Patent on October 22, 2013. EX1001 at 1. The '843 Application was filed with 23 original claims (including 5 independent claims) and listed Lonnie Burrow as the inventor. EX1002 at 1, 41-47.

The application received a first office action on November 28, 2012. *Id*. at 112. The first office action was a restriction and/or election requirement. *Id*. at 113-120. The examiner noted that the application claimed three separate inventions: (1) claims 1-19 claimed a polymeric ammunition cartridge, which is in class 102, subclass 465; (2) claims 20-21 claimed a metal insert for a cartridge, which is in class 102, subclass 469; and (3) claims 22-23 claimed a method of forming an ammunition cartridge, which is in class 86, subclass 19.5. *Id*. at 114; EX1003 at ¶30.

The examiner concluded that the two inventions in claim groups (1) and (2) were distinct because the claims in group (1) could be practiced using an insert that was not made from metal and thus were distinct from group (2), which claimed a metal insert, and because group (2) could be practiced with a casing that was not of polymer, such as a metal casing. EX1002 at 114. Groups (2) and (3) were distinct because, as with group (1), the claims covering group (3) could be practiced with an insert that was not made from metal. *Id*. at 115. Groups (1) and (3) were distinct from each other because the cartridge in group (1) could be manufactured by a method different from that claimed in group (3), such as by molding the cartridge as a single entity rather than making the bullet end, the middle body, and the coupling end separately and then assembling them. *Id*. In the November 8, 2012 office action, the examiner further noted that the claims addressed to claimed invention (1) were directed to two patentably distinct species—Cartridge Species A and Cartridge Species B. *Id*. at 117; EX1003 at ¶31.

The examiner instructed the Applicant to make an election to one of the three claimed inventions, even if the Applicant also traversed the restriction requirement. EX1002 at 118. The examiner further instructed the Applicant that, if it elected claimed invention (1), it should elect one of the two claimed species, even if it traversed the Examiner's requirement to elect a species: Cartridge Species A, as shown in Figure 1 of the application, or Cartridge Species B, as shown in Figure 7 of the application. *Id.* at 117. If the Applicant chose Species A, then it was required to elect only one of the cartridge portions shown in Figures 2, 3, 5 and 6. If the Applicant chose Species B, then it was required to elect only one of the diffusers shown in Figures 7, 8, 9a, 9b, 9c, 9d, 9e, 9f, 9g, and 9h. *Id.*; EX1003 at ¶34.

On January 9, 2013, the Applicant responded to the restriction requirement by electing claimed invention (1) and claims 1-19 of the pending application and cancelling claims 20-23. *Id.* at 128. The Applicant further elected Species A, corresponding to Figure 1, and the cartridge portion shown in Figure 2, shown below:

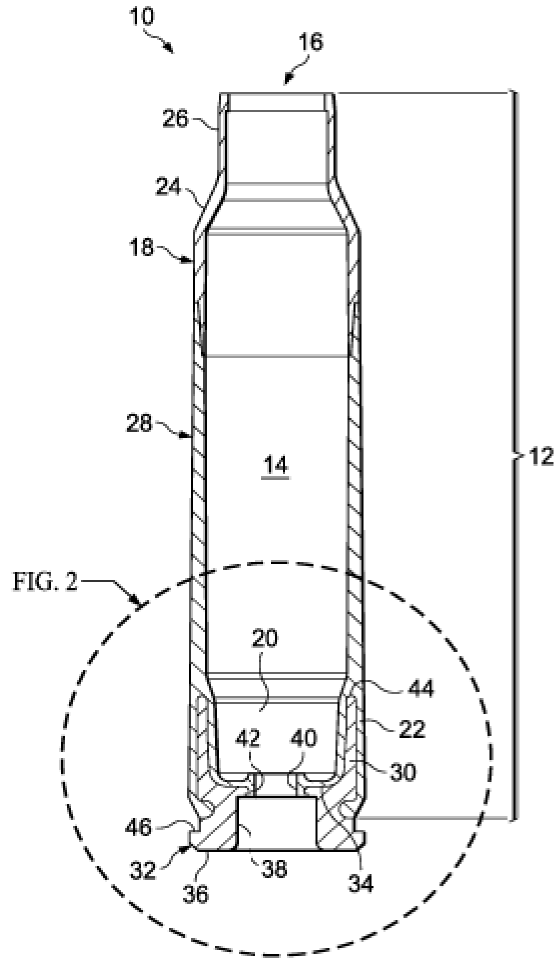


FIG. 1

2/7

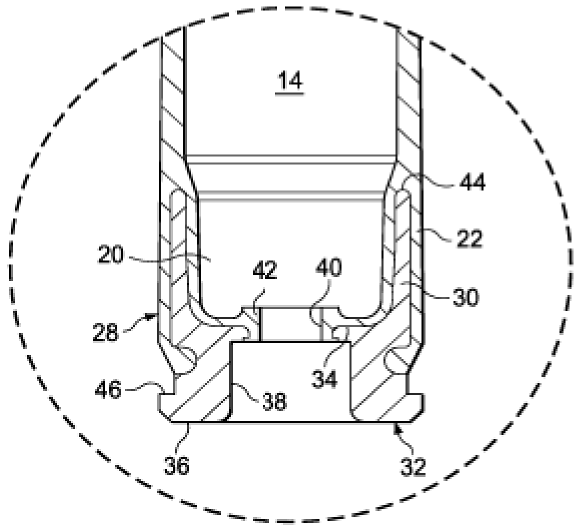


FIG. 2

On April 16, 2013, the examiner issued a Notice of Informal or Non-Responsive Amendment, noting that the Applicant's response was not fully responsive to the Office Action. EX1002 at 146, 148. Specifically, the examiner noted that the Applicant failed to inform the examiner which of elected claims 1-19 are generic to cartridge species A and B, which of claims 1-19 are specific to the elected Species A (Figs. 1 and 2) and which of claims 1-19 are specific to any of the features depicted in the non-elected figures related to species A—3, 5, or 6—or specific to the non-elected Species B (shown in figures 7, 8, 9a, 9b, 9c, 9d, 9e, 9f, 9g, and 9h). *Id.* at 148. As an example, the examiner noted that elected claims 15-17 included a diffuser, which is not a component of elected Species A. *Id.*; EX1003 at ¶¶33-34.

The Applicant responded to this office action on April 23, 2013, and noted that the diffuser in claims 15-17 was merely an added element of those claims. EX1002 at 157. The Applicant argued that the mere fact that the Species B embodiments also included diffusers did not preclude their use in claims directed to other species. *Id.* The Applicant made clear that all claims other than those directed to Figures 1 and 2 had been cancelled. *Id.;* EX1003 at ¶35.

On August 16, 2013, the Examiner issued a Notice of Allowance, allowing claims 1-19 and withdrawing the restriction as to species. EX1002 at 166, 169. The Examiner stated that his reasons for allowing the patent were that "the known prior art does not disclose a polymeric ammunition cartridge comprising the substantially cylindrical polymeric coupling end of the polymeric middle body extending over the substantially cylindrical coupling element of the substantially cylindrical insert and covers a circumferential surface of the primer flash hole of the insert, including the other structure and structural relationships as recited in independent claim 1." *Id.* at 169; EX1003 at ¶36.

C. The Challenged Claims of the '543 Patent

The Petitioner challenges claims 1-19 of the '543 Patent. For ease of reference, the Challenged Claims are provided in a listing above, with numbered claim limitations corresponding to the numbering used throughout this petition.

V. OVERVIEW OF THE PRIOR ART

A. Daubenspeck

U.S. Patent No. 3,099,958 to Daubenspeck (EX1004, "Daubenspeck") was filed January 12, 1960, and constitutes prior art to the '543 Patent under at least pre-AIA 35 U.S.C. § 102(a). The inventors were Benjamin K. Daubenspeck, Rex E. Dickey, Donald S. Foote, and Justin H. Whipple. EX. 1004 at 1:4-6. The patent was assigned to the Remington Arms Co., Inc. *Id.* at 1:6-7. Daubenspeck discloses that it relates to "to firearm cartridges and method of manufacture and assembly thereof." *Id.* at 1:11-12; EX1003 at ¶38.

Daubenspeck further states that a "primary object of the invention is to combine materials of different properties in a way that utilizes the favorable properties of each to its fullest advantage." EX1004 at 1:14-16. Daubenspeck clarified that this meant that the invention included a primer-carrying head made of a material with high compressive strength that may be precision formed, and "a body or casing of plastic material having high tensile strength and controlled flexibility under expansive pressure." *Id.* at 1:20-22; EX1003 at ¶39.

The disclosure in Daubenspeck that is most relevant to this petition is the embodiment illustrated in Figures 37, 38, and 40. As described in Daubenspeck, this embodiment comprises a rigid head, and a "molded plastic body 101 which is injection molded and simultaneously assembled with the head as an insert in the molding die." EX1004 at 7:67-69. The head comprises a base 102 having a laterally projecting extractor rim 103, and provided at its forward side with a battery cup portion 104 having an inwardly extending annular lip 105 at its forward end. A plurality of annular teeth or ribs 106 are provided upon the outer surface of the battery cup portion for interlocking engagement with the plastic body or casing 101, as will presently more fully appear. The plastic casing 101 is substantially cylindrical and is provided with a powder containing chamber 107, the base of which is in the form of an integral overlay portion 108 molded over the inner end of the battery cup and extended inwardly about the lip 105 to the interior of the primer pocket, a central vent or flash hole 109 being provided in the overlay portion. Additionally, the body is molded into interlocking relation with the ribbed outer side of the battery cup as at 110. EX1003 at ¶40.

Daubenspeck was not considered during prosecution of the '543 Patent. *See generally* EX1002. A POSITA would not consider Daubenspeck to be cumulative of the references that were cited during prosecution of the '543 Patent. EX1003 at ¶41.

B. Chung

Published Patent Application No. 2007/0261587 A1 to Chung (EX1005, "Chung") was filed November 16, 2006, and published November 15, 2007, and constitutes prior art to the '543 Patent under at least pre-AIA 35 U.S.C. § 102(a).

The inventor was Sengshin Chung. EX1005 at p. 1. Although the patent that resulted from the Chung application was disclosed by the applicant during prosecution of the ’543 Patent, Chung was not discussed in the file history and did not form the basis of any office action. As shown in detail below, a POSITA would be motivated to combine Chung and Daubenspeck in a manner that renders obvious claims 1, 2, 4-6, 10-14 of the ’543 Patent; EX1003 at ¶42.

C. Kay-Clough

International PCT Application No. WO 2000/ 034732A1 to Kay-Clough (EX1009, “Kay-Clough”) was filed December 7, 1999, and constitutes prior art to the ’543 Patent under at least pre-AIA 35 U.S.C. § 102(a). The inventor is Mark Hamilton Raymond Kay-Clough. EX1009 at p. 1. Kay-Clough discloses a cartridge case (202), a cartridge (200) and protection means (140) for protecting a primer (232) of a cartridge. *Id.*

Kay-Clough was not cited by the Applicant or the Examiner during prosecution of the ’543 Patent. Kay-Clough should be considered here because, although it is not anticipatory in its own right, Kay-Clough discloses the use of nylon as a polymeric material suitable for composite cartridge casings. EX1009, at claims 35, 36. As shown below, a POSITA would be motivated to combine Daubenspeck and Kay-Clough to provide this missing limitation in claim 3 of the ’543 Patent, thus rendering the claim unpatentable as obvious. EX1003 at ¶44.

D. Nonte

Nonte is a printed publication titled *Handloading for Handgunners,* authored by Maj. George C. Nonte, Jr., which was published no later than December 31, 1978, and constitutes prior art to the ’543 Patent under at least pre-AIA 35 U.S.C. § 102(b). EX 1006. Specifically, on its face, Nonte is dated 1987. EX1006 at 2. *See Hulu v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29, at 9 (PTAB Dec. 20, 2019) (precedential). In addition, expert testimony establishes that Nonte had been received, indexed, and cataloged by subject matter in multiple ways around or shortly after December 31, 1978. EX1010; *see also Samsung Elecs. Co. v. Infobridge Pte. Ltd.*, 929 F.3d 1363, 1369 (Fed. Cir. 2019). Therefore, Nonte is prior art under at least pre-AIA 35 U.S.C. § 102(b); EX1003 at ¶45.

Nonte contains detailed descriptions of ammunition casings. In particular, Nonte depicts two casings having cannelures in the form of annular rings formed around the circumference of the casing. EX1006 at 29, 77; EX1003 at ¶46.

E. Anderson

U.S. Patent No. 3,977,326 to Anderson (EX1007, “Anderson”) was filed February 6, 1975, and constitutes prior art to the ’543 Patent under at least pre-AIA 35 U.S.C. § 102(a). The inventors were Raymond A. Anderson and John J. Scanlon. EX1007 at p. 1. The patent was assigned to the Remington Arms

Company, Inc. *Id.* Anderson discloses a composite cartridge casing having a plurality of parts, with the parts being made from various materials. *Id.*

Anderson was cited by the Examiner during the prosecution of the ’543 Patent. However, Anderson was not discussed in the file history and did not form the basis of any office action. Anderson should be considered here because, although it is not anticipatory in its own right, Anderson discloses the use of what the ’543 Patent refers to as a “diffuser” in a polymeric cartridge to provide additional stability to the cartridge. EX1003 at ¶48. As shown below, a POSITA would be motivated to combine Anderson and Daubenspeck to provide this missing limitation in claims 16 and 17 of the ’543 Patent, thus rendering those claims unpatentable as obvious. EX1003 at ¶¶47-48.

F. Dittrich

International PCT Application No. WO 2008/091245A2 to Dittrich (EX1008, “Dittrich”) was filed January 19, 2007, and constitutes prior art to the ’543 Patent under at least pre-AIA 35 U.S.C. § 102(a). The inventor is William A. Dittrich. EX1008 at p. 1. The patent was assigned to General Dynamics Ordnance and Tactical System – Simunition Operations, Inc. *Id.* Dittrich discloses a composite cartridge casing having a plurality of parts, with the parts being made from various materials. *Id.,* Abstract.

Dittrich was not cited by Applicant or the Examiner during the prosecution of the ’543 Patent; therefore, it has not been previously considered. Dittrich should be considered here because it qualifies as an anticipatory reference for at least claim 1 of the ’543 Patent. Dittrich discloses “*[a] cartridge or ammunition casing … made of two principal components, one providing the outer casing sidewall and the other, in the form of an external reinforcing member or plug, defining the head end*.” EX1008, Abstract. Dittrich further discloses that the cylindrical casing shell or the outer plug can be formed of polymeric plastic materials. *Id*. at pg. 20, ll. 18-26. As will be shown below, the casing shell disclosed in Dittrich has components that extend over coupling ends of the outer plug and cover a surface of a flash hole within a primer recess. *Id.* Figs. 1-2.

Dittrich was not considered in the prosecution of the ’543 Patent. A POSITA would not consider Dittrich to be cumulative the references that were cited during prosecution of the ’543 Patent. EX1003 at ¶¶49-51.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art, at the time the ’543 Patent was filed, would have had at least an undergraduate degree in mechanical engineering or a closely related engineering or scientific field such as industrial engineering, or materials science, plus experience in the design and injection molding and joining/fabrication of polymeric material components. EX1003, ¶52. Less work experience may be compensated for by a higher level of education or vice versa. *Id*. Petitioners' expert, Mr. John Nixon, exceeded this definition at the time the '543 Patent was filed, and has offered opinions from the perspective of a POSITA. EX1003 at ¶¶5-7; EX1012.

VII. CLAIM CONSTRUCTION

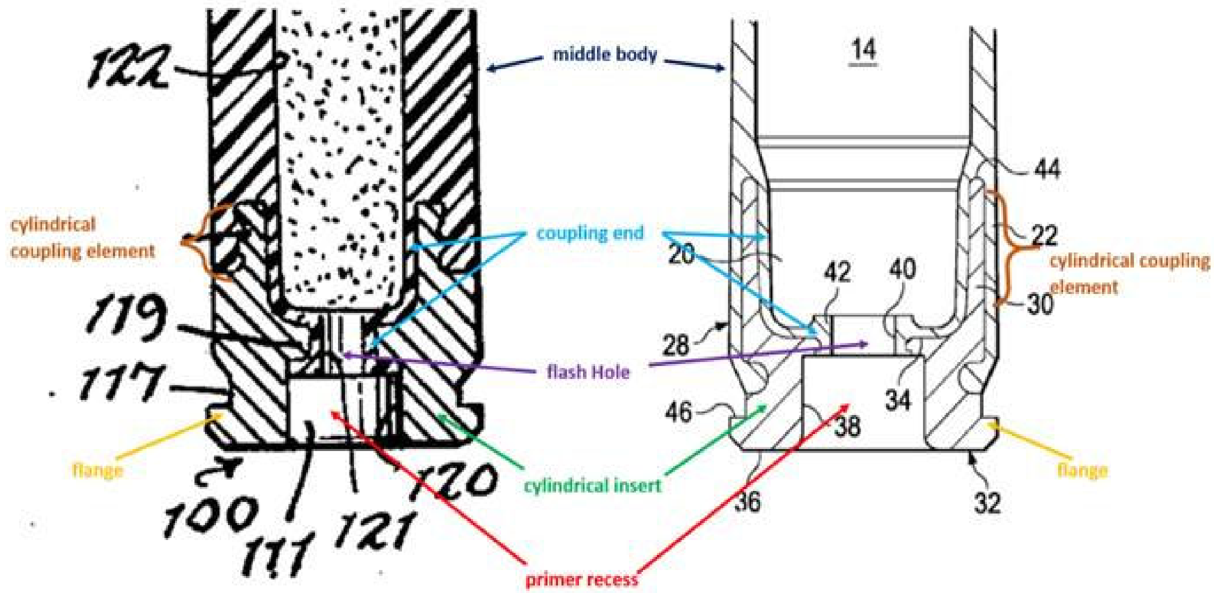
Petitioners have applied the ordinary and customary meaning of the claim terms as they would have been understood by a POSITA at the time of the alleged invention, in the context of the '543 Patent and its prosecution history. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). Petitioners do not believe any term needs to be expressly construed beyond its plain and ordinary meaning. EX1003 at ¶53.

VIII. DETAILED EXPLANATION OF INVALIDITY GROUNDS

The following grounds establish a reasonable likelihood that the Petitioners will prevail with respect to the Challenged Claims. EX1003, ¶¶55-157.

A. GROUND 1: CLAIMS 1, 7 AND 18 OF THE '543 PATENT ARE ANTICIPATED BY DAUBENSPECK

For at least the reasons set forth below, claims 1, 7, and 18 of the '543 Patent are invalid as anticipated by Daubenspeck. The following comparative illustration shows the claim elements of the '543 Patent mapped onto the Daubenspeck reference. This summary illustration is provided for ease of reference.



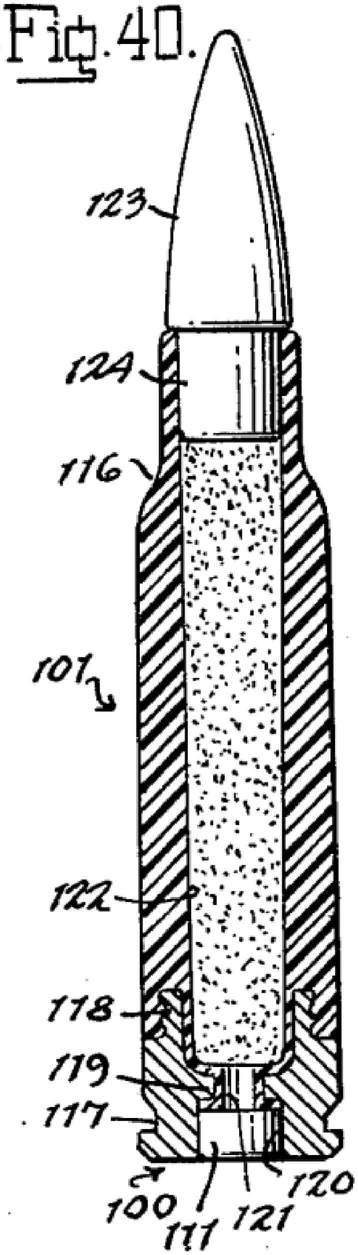
Daubenspeck Fig 40 (left)
annotated for comparison to Fig 2 of the '543 Patent (right)

1. Claim 1

a) [1 [Preamble]]: "A polymeric ammunition cartridge comprising:"

To the extent the preamble is limiting, Daubenspeck discloses this limitation. Daubenspeck discloses that it relates "to firearm cartridges and method of manufacture and assembly thereof," including "a body or casing of plastic material having high tensile strength and controlled flexibility under expansive pressure." EX1004 at 1:11-12, 20-22; EX1003 at ¶56.

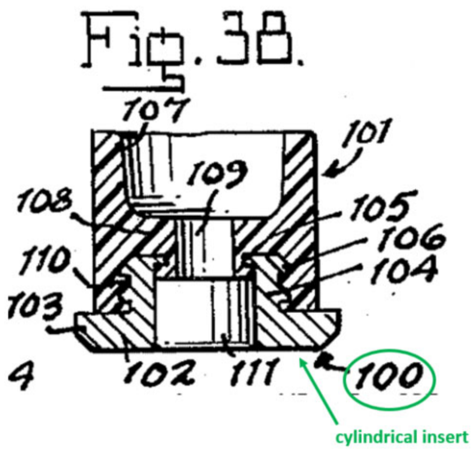
Fig. 40.

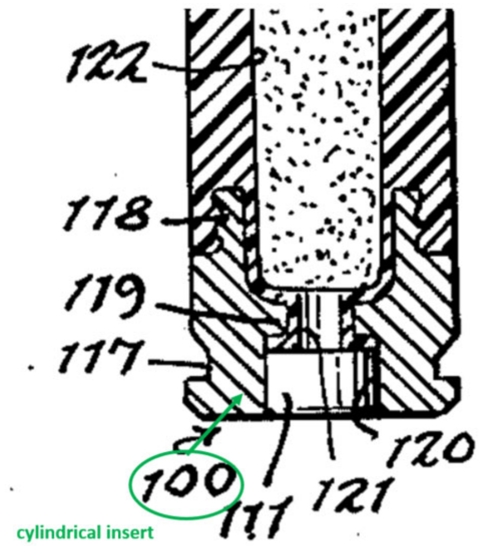


<u>Daubenspeck, Fig. 40 (part 101 is "plastic body," *Id.* at 7:57)</u>

b) [1 [1]]: "a substantially cylindrical insert comprising"

Daubenspeck discloses this limitation. EX1003, ¶45. As shown in Fig. 38 and 40 of Daubenspeck, Daubenspeck describes "a substantially cylindrical insert" and that "[t]he embodiment illustrated in FIGS. 37 and 38 comprises a rigid head 100 of high compressive strength material. . . and a molded plastic body 101 which is injection molded and simultaneously assembled with the head as an insert in the molding die." EX1004 at 7:54-59; EX1003 at ¶57.

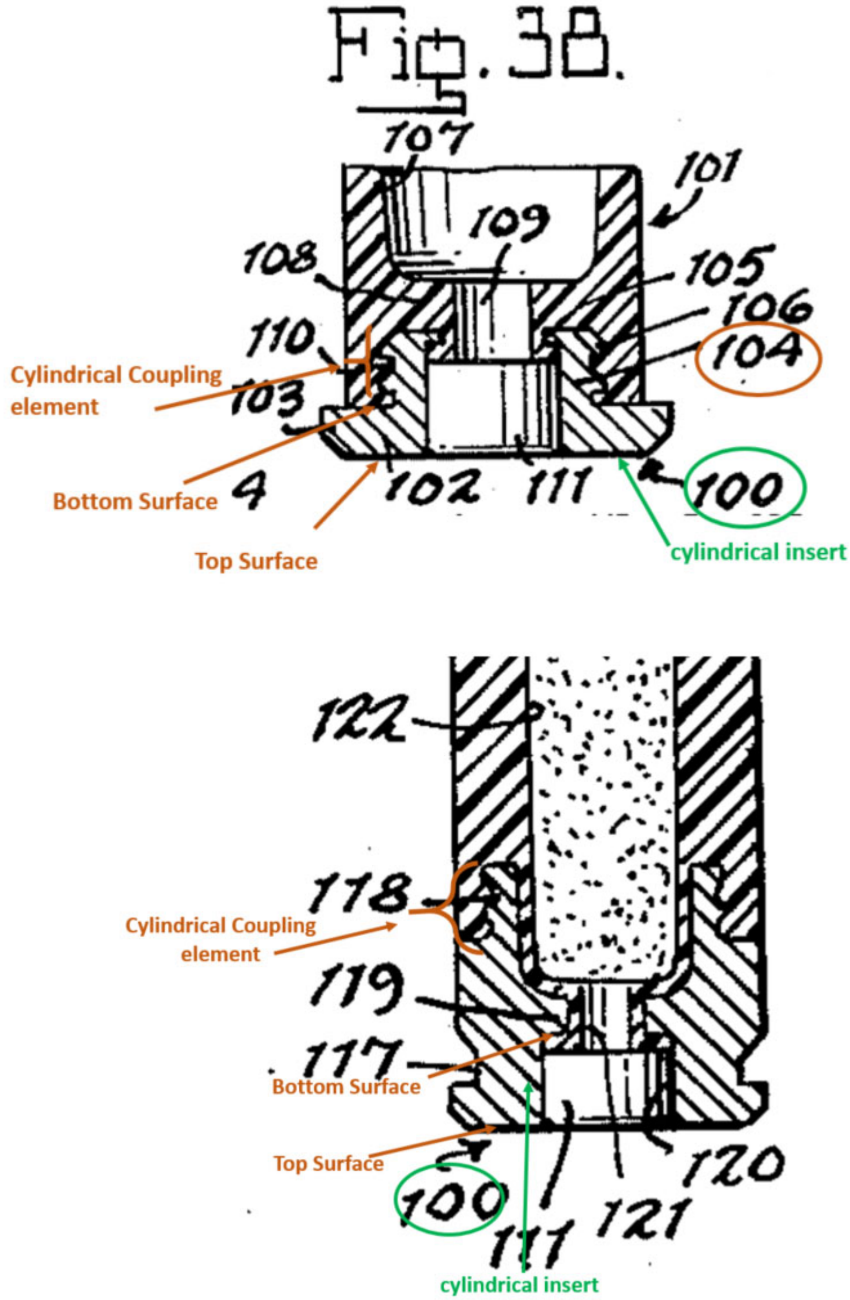




<u>**Daubenspeck, Figs. 38 (left) and 40 (right) (annotated to show insert)**</u>

(1) [1 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,"

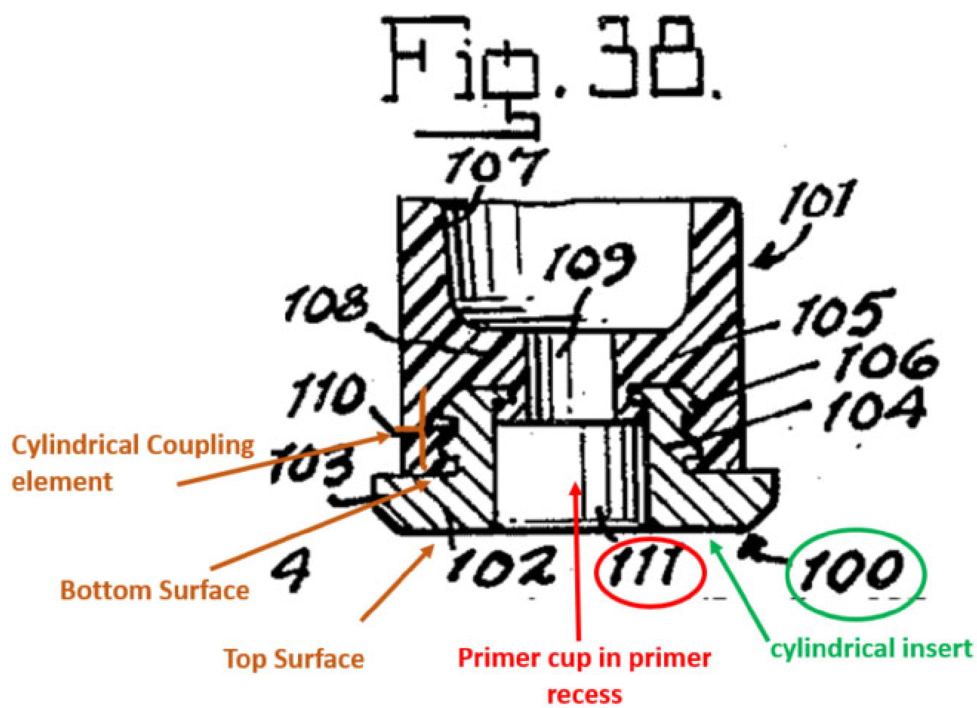
Daubenspeck discloses this limitation. EX1003, ¶46. As shown in Figs. 38 and 40 of Daubenspeck, shown below, Daubenspeck describes a substantially cylindrical coupling element in the form of battery cup portion **104** that extends from the bottom surface. EX1004 at 7:59-66 ("The head [100] comprises a base 102 having a laterally projecting extractor rim 103, and provided at its forward side with a battery cup portion 104 having an inwardly extending annular lip 105 at its forward end. "); EX1003 at ¶58.

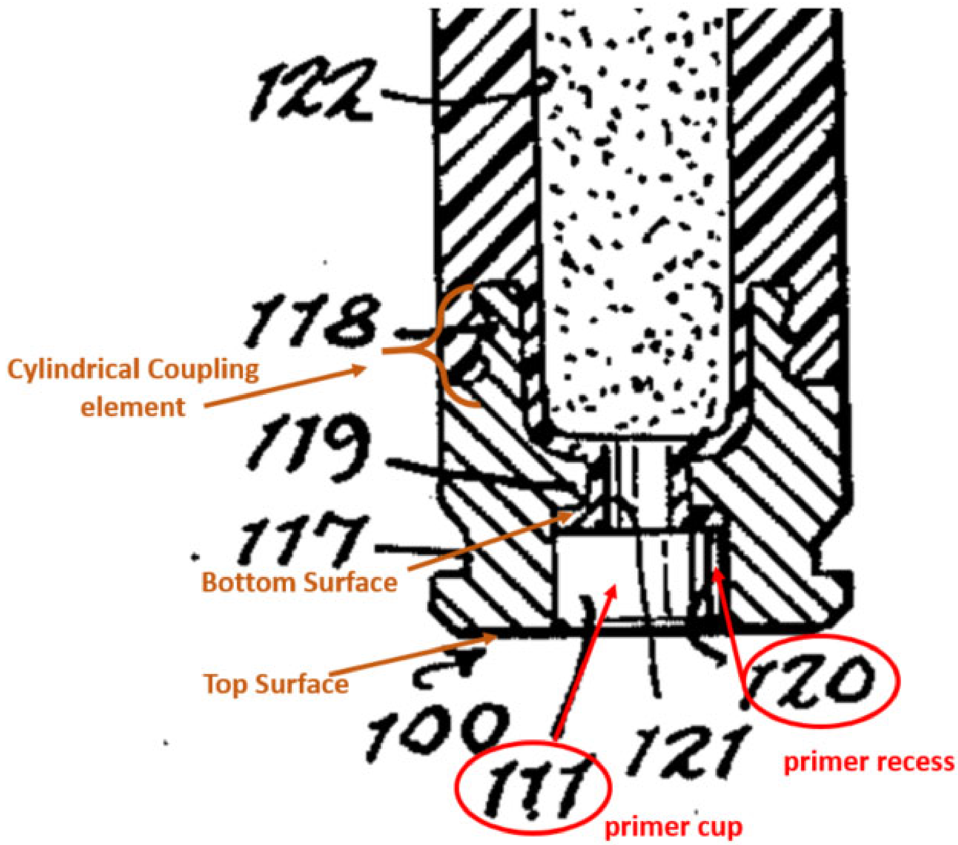


<u>Daubenspeck, Figs. 38 (top) and 40 (bottom) (annotated)</u>

(2) [1 [1b]]: "a primer recess in the top surface that extends toward the bottom surface;"

Daubenspeck discloses this limitation. The cylindrical insert of Daubenspeck comprises a primer recess (referred to in the patent as a "primer pocket") in the top surface that extends to the bottom surface. EX1003, ¶59; EX1004 at Figs. 38-40. Daubenspeck states, "A conventional primer cup 111 is inserted in the primer pocket 120." EX1003, ¶59; EX1004 at 7:75-8:1 (emphasis added).

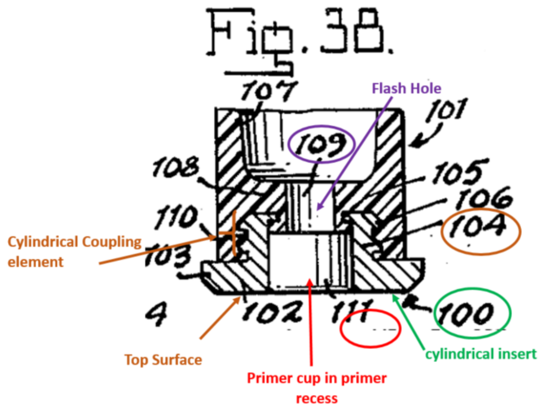


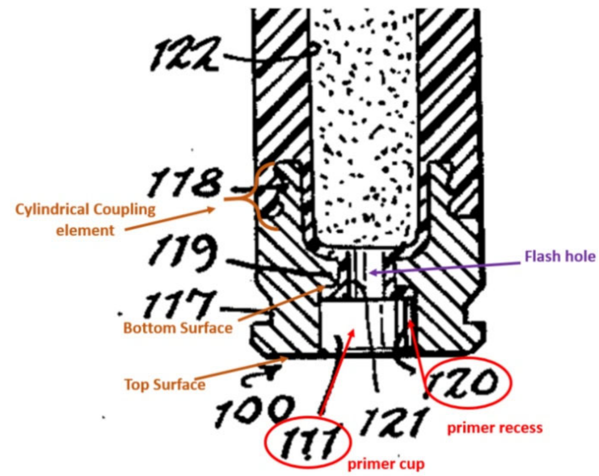


Daubenspeck, Figs 38 (top) and 40 (bottom) (annotated)

(3) [1 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface, and"

Daubenspeck discloses this limitation. Daubenspeck describes a central vent or flash hole 109 being provided in the overlay portion. EX1003, ¶48; EX1004 at Figs. 38-40. As shown in Fig. 38 below, the primer recess comprises a primer flash hole 109, and the embodiment show in Fig. 40 illustrates that the primer flash hole 109 extends through the bottom surface. EX1003 at ¶60.

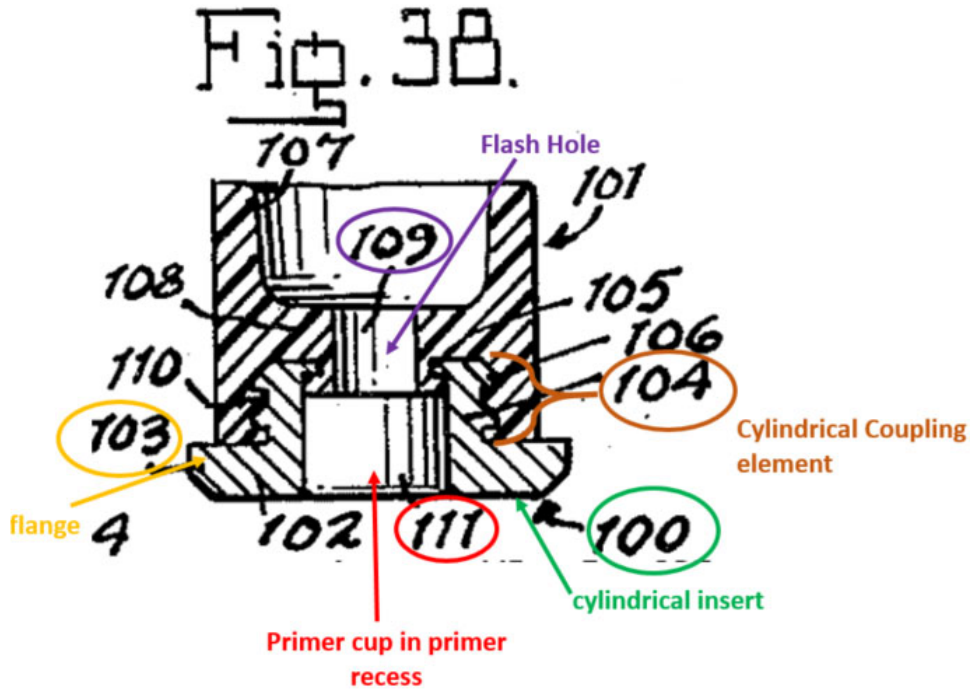




Daubenspeck, Fig. 38 (left) and Fig. 40 (right) (annotated)

(4) [1 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface; and"

Daubenspeck discloses this limitation. Daubenspeck describes this "flange" as an "extractor rim" and discloses that "The head comprises a base 102 having a laterally projecting extractor rim 103." EX1003 at ¶61.

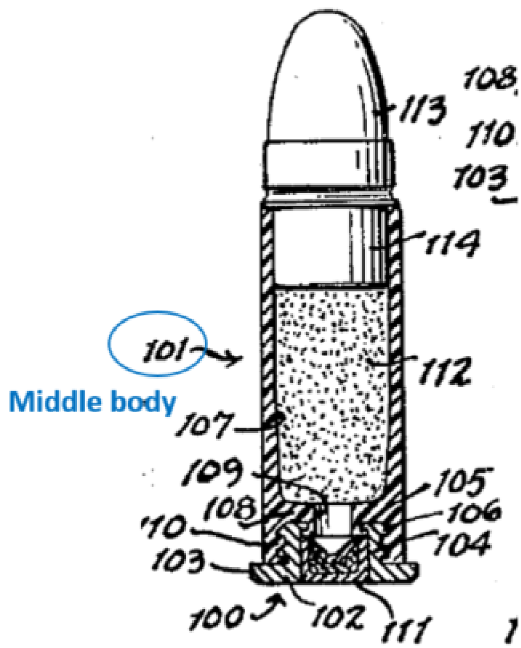


<u>Daubenspeck, Fig. 38 (annotated)</u>

c) [1 [2]]: "a substantially cylindrical polymeric middle body comprising"

Daubenspeck discloses this limitation. Daubenspeck discloses that it relates "to firearm cartridges and method of manufacture and assembly thereof," including "a body or casing of plastic material having high tensile strength and controlled flexibility under expansive pressure." EX1004 at 1:11-12, 20-22; EX1003 at ¶62.

Fig.37.



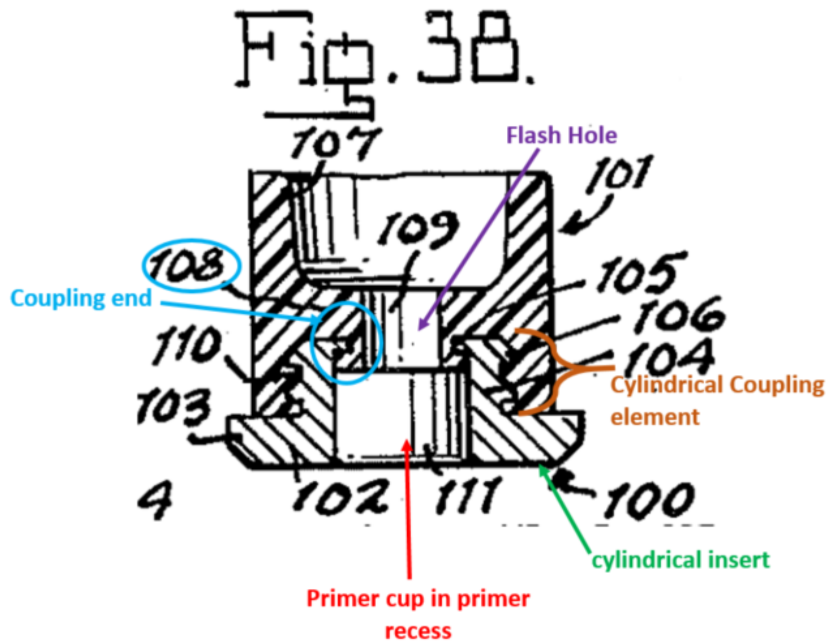
Daubenspeck, Fig. 37 (annotated)

(1) [1 [2a]]: "a substantially cylindrical polymeric bullet-end and"

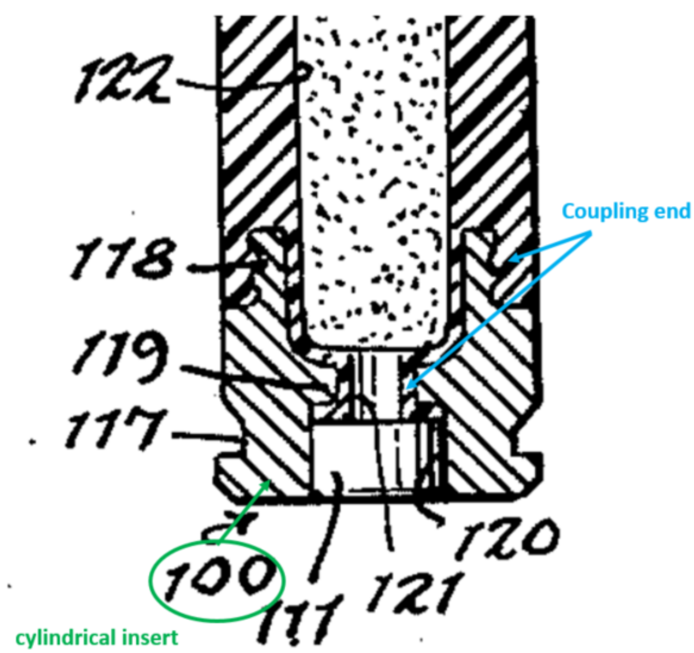
Daubenspeck discloses this limitation. The cartridge disclosed in Daubenspeck has a polymeric middle body **101** that comprises a substantially cylindrical end with an opening for receiving a bullet **113**, where the bullet **113** has a reduced heel **114** that is engaged with a friction fit into the forward open end of the body **101**.EX1003 at ¶63; EX1004 at 2:32-40.

(2) [1 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole."

Daubenspeck discloses this limitation. "The plastic casing 101 is substantially cylindrical and is provided with a powder containing chamber 107, the base of which is in the form of an integral overlay portion 108 ***molded over the inner end of the battery cup and extended inwardly about the lip 105 to the interior of the primer pocket, a central vent or flash hole 109*** ***being provided in the overlay portion***." EX1004 at 7:67-72 (emphasis added); EX1003 at ¶64. Embodiments disclosed in Figs. 38 and 40 of Daubenspeck clearly show this element is met:



<u>Daubenspeck, Fig. 38 (annotated)</u>



<u>Daubenspeck, Fig. 40 (annotated)</u>

2. Claim 7: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end comprises a forward opening end having a first and a second mechanical interlock for engagement between the forward opening end and a bullet.

Daubenspeck discloses the limitations added in dependent claim 7. Specifically, Daubenspeck discloses a first and a second mechanical interlock for engagement between the forward opening end and a bullet: "Instead of an integral overlay, however, a separate plastic overlay 129 is provided, and this is preferably joined to the head by insert injection molding. An annular flange 130 surrounding an annular recess 131 is provided upon the head and in the pre-assembled relation this flange projects outwardly and the recess 131 is straight walled, as shown in FIG. 42. In assembling the head and casing the recessed end 132 of the body is engaged in the recess 131 of the head, and thereupon the flange 130 is swaged inwardly by a suitable ring die into interlocking relation with the casing as shown in FIG. 41. The construction of FIG. 41 can be obtained by separate fabrication of the casing and bullet which can be later assembled by a 'snap fit'." EX1004 at 8:35-48. Thus, Daubenspeck clearly discloses a "first and second mechanical interlock for engagement between the forward opening end and a bullet." In Daubenspeck, the first and second mechanical interlock are the inner swage in the bullet head and the adjacent groove in the casing that joins the parts together. EX1003 at ¶65.

3. Claim 18:

a) [18 [Preamble]]: "A polymeric ammunition cartridge comprising:"

In the case of claim 18, the preamble is not limiting because the preamble merely recites limitations restated in the body of the claim. However, to the extent the preamble is construed as limiting, Daubenspeck discloses this limitation. EX1003, ¶66. As discussed above, Daubenspeck discloses "A polymeric ammunition cartridge."

b) [18 [1]]: "a substantially cylindrical insert comprising"

Daubenspeck discloses this limitation. EX1003, ¶67. As discussed above, Daubenspeck discloses "a substantially cylindrical insert." *Supra* at VIII.A.1.b. Daubenspeck discloses this limitation for the same reasons.

(1) [18 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,"

Daubenspeck discloses this limitation. EX1003, ¶68. As discussed above, Figures 37 and 38 of Daubenspeck show "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface." *Supra* at VIII.A.1.b.1.

(2) [18 [1b]]: "a primer recess in the top surface that extends toward the bottom surface,"

Daubenspeck discloses this limitation. EX1003, ¶69. As discussed above, Daubenspeck discloses a primer recess in the top surface of the substantially cylindrical insert that extends toward the bottom surface. *Supra* at VIII.A.1.b.2. Daubenspeck discloses this limitation for the same reasons.

(3) [18 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface,"

Daubenspeck discloses this limitation. EX1003, ¶70. As discussed above, Daubenspeck discloses "a primer flash hole positioned in the primer recess to extend through the bottom surface." *Supra* at VIII.A.1.b.3. Daubenspeck therefore discloses this limitation for the same reasons.

(4) [18 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface;"

Daubenspeck discloses this limitation. EX1003, ¶71. As discussed above, Daubenspeck discloses "a flange that extends circumferentially about an outer edge of the top surface" of the substantially cylindrical insert. *Supra* at VIII.A.1.b.4.

c) [18 [2]]: "a substantially cylindrical polymeric middle body comprising"

Daubenspeck discloses this limitation. As described above, Daubenspeck discloses that it relates "to firearm cartridges and method of manufacture and assembly thereof," including "a body or casing of plastic material having high tensile strength and controlled flexibility under expansive pressure." EX1004 at 1:11-12, 20-22. *Supra* VIII.A.1.c; EX1003, ¶72.

(1) [18 [2a]]: "a substantially cylindrical polymeric bullet-end and"

Daubenspeck discloses this limitation. As shown above, the cartridge disclosed in Daubenspeck has a polymeric middle body **101** that comprises a substantially cylindrical end with an opening for receiving a bullet. EX1003, ¶73; EX1004 at 2:32-40. *Supra* VIII.A.1.c.1.

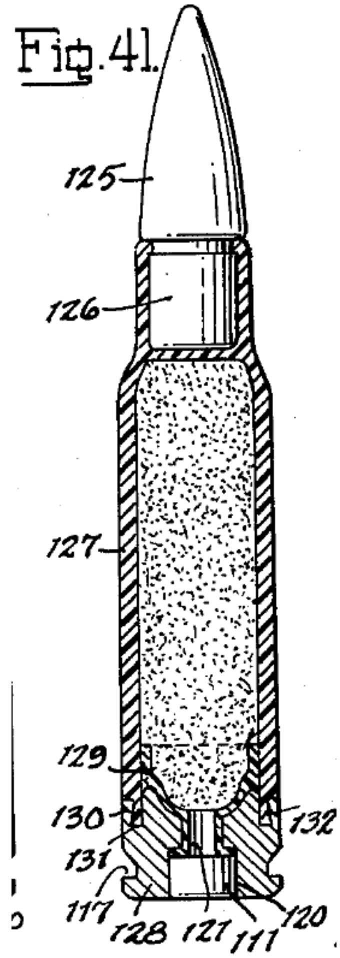
(2) [18 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole."

As shown above, Daubenspeck discloses this limitation. "The plastic casing 101 is substantially cylindrical and is provided with a powder containing chamber 107, the base of which is in the form of an integral overlay portion 108 ***<u>molded over the inner end of the battery cup and extended inwardly about the lip 105 to</u>***

the interior of the primer pocket, a central vent or flash hole 109 ***being provided in the overlay portion***." EX1004, 7:67-72 (emphasis added); EX1003 at ¶74. *Supra* VIII.A.1.c.2.

(3) [18 [2c]]: "a substantially cylindrical polymeric bullet-end upper portion comprising a bullet-end coupling element connected to the substantially cylindrical polymeric bullet end and a forward opening end to engage a bullet."

Daubenspeck discloses this limitation. One skilled in the art would understand that Figure 41 of Daubenspeck discloses a substantially cylindrical polymeric cartridge having a bullet-end upper portion **126** connected via a bullet-end coupling element with a forward opening end to engage a bullet. EX1003 at ¶75:



Daubenspeck, Fig. 41

Daubenspeck further discloses that "[t]he construction of Fig. 41 can be obtained by separate fabrication of the casing and bullet which can be later assembled by a 'snap' fit." EX1004, 8:46-48; EX 1003 at ¶75.

B. GROUND 2: CLAIMS 2, 4-6, 10-14 AND 19 OF THE '543 PATENT ARE RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF CHUNG.

For at least the reasons below, claims 2, 4-6, 10-14 and 19 of the '543 Patent are invalid as obvious over Daubenspeck in view of Chung.

1. Motivation to Combine

A POSITA would have been motivated to combine Daubenspeck with Chung, and would have had a reasonable expectation of success. Both references are from the same field of endeavor: polymeric cartridge casings for ammunition. EX1004 at 1:1-34; EX1005, abstract; EX1003 at ¶77.

A POSITA would have reasonably expected the proposed combination of Daubenspeck and Chung to succeed. Daubenspeck provides a polymer cartridge structure having high tensile strength and controlled flexibility under expansive pressure. EX1005 at 2:31-65. Chung similarly provides polymer cartridge casings for bullets, having a polymeric middle body having high tensile strength to sustain deformation under high interior ballistic pressure, and Chung highlights specific polymers and fastening or interlocking means that are preferred to achieve these goals. EX1005 at ¶100. Incorporating Chung's teachings into Daubenspeck would be a straightforward combination and well within the capabilities of a POSITA. ; EX1003 at ¶78.

Daubenspeck, Chung and the '543 Patent are analogous art, as they are all directed to polymeric ammunition cartridges. *See* EX1001, Abstract; EX1004 at 1:1-3; EX1005, Abstract; EX1003 at ¶79.

2. Claim 2: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a ductile polymer.

Daubenspeck discloses the limitations of independent claim 1. *Supra* at VIII.A.1.

Chung discloses the limitations added in dependent claim 2. Namely, Chung discloses a middle body of a polymer casing is comprised of a ductile polymer. EX1005, abstract, ¶16, claim 2; EX1003 at ¶¶80-81.

3. Claim 4: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a fiber-reinforced polymeric composite.

Chung discloses the limitations added in dependent claim 4. Specifically, Chung discloses that the middle body is "formed from a fiber-reinforced polymeric composite." EX1005, ¶17, claim 3; EX1003 at ¶82.

4. Claim 5: The polymeric ammunition cartridge of claim 4, wherein the fiber-reinforced polymeric composite contains between about 10 and about 70 wt % glass fiber fillers, mineral fillers, or mixtures thereof.

Chung discloses the limitations added in dependent claim 5. With respect to the fiber reinforced polymeric composite, Chung discloses in terms that are curiously identical to the language used in the later claims of the '543 Patent, that the polymeric composite contains "between about 10 and about 70 wt % glass fiber fillers, mineral fillers, or mixtures thereof.". EX1005, ¶73, claim 4; EX1003 at ¶83.

5. Claim 6: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end and bullet are further welded or bonded together.

Chung discloses the limitations added in dependent claim 6. Chung discloses a substantially cylindrical polymeric bullet-end and bullet are welded or bonded together, when consolidate powder is used. EX1005, ¶77, claim 56; EX1003 at ¶¶84.

6. Claim 10: The polymeric ammunition cartridge of claim 1, wherein the forward opening end is crimped so that a polymeric material flows into an annular groove of a bullet.

Chung discloses the limitations added in dependent claim 10. Specifically, Chung discloses that the casing mouth can be crimped at the tip to increase further the frictional resistance. Crimping the case mouth 17 with or without heat can force polymeric material to flow into the annular grove 13 of the projectile, thus increasing the bullet pull force. EX1005, ¶83, Figs. 6a and 6b. *See also,* claim 17 of Chung, "…wherein said casing mouth is crimped at said tip so that polymeric material at said tip flows into said annular groove of said projectile." EX1003 at ¶85.

7. Claim 11: The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end.

Chung discloses the limitations added in dependent claim 11. Specifically, Chung notes that the middle body and bullet-end components may be joined by adhesive bonding. "The middle body and bullet-end components may be joined by adhesive bonding, solvent welding, spin welding, vibration welding, ultrasonic welding or laser welding" EX1005, ¶20; EX1003 at ¶86.

8. Claim 12: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprise a polymers selected from the group consisting of polyurethane prepolymer, cellulose, fluoro-polymer, ethylene inter-polymer alloy elastomer, ethylene vinyl acetate, nylon, polyether imide, polyester elastomer, polyester sulfone, polyphenyl amide, polypropylene, polyvinylidene fluoride or thermoset polyurea elastomer, acrylics, homopolymers, acetates, copolymers, acrylonitrile-butadinen-styrene, thermoplastic fluoro polymers, inomers, polyamides, polyamide-imides, polyacrylates, polyatherketones, polyaryl-sulfones, polybenzimidazoles, polycarbonates, polybutylene, terephthalates, polyether imides, polyether sulfones, thermoplastic polyimides, thermoplastic polyurethanes, polyphenylene sulfides, polyethylene, polypropylene, polysulfones, polyvinylchlorides, styrene acrylonitriles, polystyrenes, polyphenylene, ether blends, styrene maleic anhydrides, polycarbonates, allyls, aminos, cyanates, epoxies, phenolics, unsaturated polyesters, bismaleimides, polyurethanes, silicones, vinylesters, urethane hybrids, polyphenylsulfones, copolymers of polyphenylsulfones with polyethersulfones or polysulfones, copolymers of poly-phenylsulfones with siloxanes, blends of polyphenylsulfones with polysiloxanes, poly(etherimide-siloxane) copolymers, blends of polyetherimides and polysiloxanes, and blends of polyetherimides and poly(etherimide-siloxane) copolymers.

Chung discloses the limitations added in dependent claim 12. Specifically, Chung discloses that the middle body component can comprise various polymers, including poly-phenylsulfones with siloxanes. EX1005, ¶20, claim 12. EX1003 at ¶87.

9. Claim 13: The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises a neck with a plurality of internal structures for supporting a bullet.

Chung discloses the limitations added in dependent claim 13. Specifically, Chung discloses "[i]n an alternate embodiment, the bullet-end component may be made of a ductile polymer and is molded with a plurality of internal structures for supporting the projectile and holding it in place". EX1005, ¶22.

10. Claim 14: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical coupling element is a male coupling element with a straight skirt interlock surface that tapers to a smaller diameter at the forward portion on the skirt tip to mate with a female coupling element of the substantially cylindrical polymeric coupling end.

Chung discloses the limitations added in dependent claim 14. Chung discloses that the "[t]he interlock surface 36 of male coupling element 32 also preferably *tapers from a larger diameter at the rearward most portion thereof to a smaller diameter at the forward portion*, while the thickness of skirt 44 also increases from skirt base 39 to skirt tip 37 so that when contacted with the interlock surface 36 of male coupling element 32, a physical snap-fit or molded-in mechanical interlock results between head-end component 38 and middle body component 28." EX1005, ¶¶74-75, claim 23, (emphasis added). Chung further notes that this straight skirt interlock configuration with tapering ends can be reversed where the female component of the interlock is on the middle body and male component (i.e. tapering skirt tip) is on the end component insert, as required in claim 14. "In an alternate embodiment, the female coupling element can be formed on the second end of the middle body component and the male coupling element can be formed on the open end of the casing head-end component. Thus, the middle body component can have male coupling elements on both ends, female coupling elements on both ends, or a male coupling element on one end and a female coupling element on the opposite end." EX1005, ¶75. In addition, claim 28 of Chung discloses "… wherein said male coupling element of said middle body component is formed with a straight interlock surface that tapers to a smaller diameter at the coupling element tip, and said female coupling element of said head-end component is formed with a straight skirt interlock surface that tapers to a smaller diameter at the forward portion on the skirt tip." EX1003 at ¶89.

11. Claim 19: The polymeric ammunition cartridge of claim 18, wherein the forward opening end has one or more annular rings positioned to receive a corresponding two or more annular grooves in the bullet.

Chung discloses the limitations added in dependent claim 19. Chung discloses an embodiment in FIGS. 6a, where projectile 14 has an annular groove 13 positioned to receive the tip of casing mouth 17 to increase the frictional resistance of the interference fit between projectile 14 and casing neck 26. Chung further discloses the cartridge comprises "neck and shoulder define an *annular inner recess* for supporting a projectile." EX1003 at ¶90; EX1005, claim 35 (emphasis added). The reference to "corresponding two or more annular grooves in the bullet" is a typographical or clerical error, given that the antecedent reference in Claim 19 is to "**one or more** annular rings" (emphasis added). In an embodiment with more annular rings on the cartridge case than grooves on the bullet, the system would not work because when assembled the superfluous annular ring (or rings) on the cartridge case would cause a bulge that would render the round of ammunition unusable (unchamberable). In fact, a POSITA would understand that such an imbalance would create problems. It seems clear that "one of more annular rings" on the case would correspond in equal number with "one or more annular grooves" on the bullet.

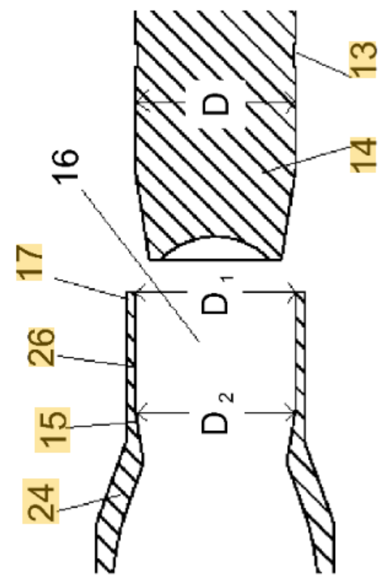


Fig. 6a of Chung (annotated)

C. GROUND 3: CLAIM 3 OF THE '543 PATENT IS RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF KAY-CLOUGH

For at least the reasons below, claim 3 of the '543 Patent is invalid as obvious over Daubenspeck in view of Kay-Clough.

1. Motivation to Combine

A POSITA would have been motivated to combine Daubenspeck with Kay-Clough, and would have had a reasonable expectation of success. Both references are from the same field of endeavor: polymeric cartridge casings for ammunition. EX1004 at 1:1-34; EX1009 at Abstract; EX1003 at ¶92.

A POSITA would have reasonably expected the proposed combination of Daubenspeck and Kay-Clough to succeed. Daubenspeck provides a polymer cartridge comprising a primer and material structure having high tensile strength and controlled flexibility under expansive pressure. Daubenspeck discloses that the polymer cartridge can be product by injection molding. Kay-Clough similarly discloses polymer cartridge casings for ammunition, wherein the cartridge can be injection molded from a polymeric material, such as nylon. EX1009, claims 35 and 36. Thus, Kay-Clough suggests that nylon is a known and suitable polymer for use with injection molded ammunition cartridges. Using nylon as the polymer in the ammunition disclosed by Daubenspeck would have been straightforward combination and well within the capabilities of a POSITA. EX1003 at ¶93.

2. Claim 1

Daubenspeck discloses the limitations of independent claim 1. *Supra* at VIII.A.1; EX1003 at ¶94.

3. Claim 3. The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprises a nylon polymer.

Daubenspeck discloses the limitations of claim 1. Supra at VIII.A.1. Daubenspeck further discloses a variety of polymeric compounds which can be used for the middle body casing, although it is silent as to the use of nylon. Kay-Clough discloses use of nylon as suitable material for polymeric material for a cartridge casing (i.e. a polymeric middle body). EX1003 at ¶95; EX1009, claims 35 and 36. Therefore, the use of nylon as the specific polymer of choice would have been obvious and well within the knowledge of a POSITA.

D. GROUND 4: CLAIMS 8 AND 9 OF THE ’543 PATENT ARE RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF NONTE

For at least the reasons below, claims 8 and 9 of the ’543 Patent are invalid as obvious over Daubenspeck in view of Nonte.

1. Motivation to Combine

A POSITA would have been motivated to combine Daubenspeck with Nonte, and would have had a reasonable expectation of success. Both references are from the same field of endeavor: cartridge casings for ammunition. EX1004 at 1:1-34; EX1006 at 29, 77; EX1003 at ¶97.

A POSITA would have reasonably expected the proposed combination of Daubenspeck and Nonte to succeed. Daubenspeck provides a polymer cartridge structure having high tensile strength and controlled flexibility under expansive pressure. EX1004 at 2:31-65. Nonte similarly depicts polymer cartridge casings for bullets. EX1006 at 29, 77. Incorporating Nonte’s teachings into Daubenspeck would be a straightforward combination and well within the capabilities of a POSITA. EX1003 at ¶98.

Daubenspeck, Nonte and the ’543 Patent are analogous art, as they are all directed to ammunition cartridges. *See* EX1001, Abstract; EX1004 at 1:1-3; EX1006, 29, 27; EX1003 at ¶99.

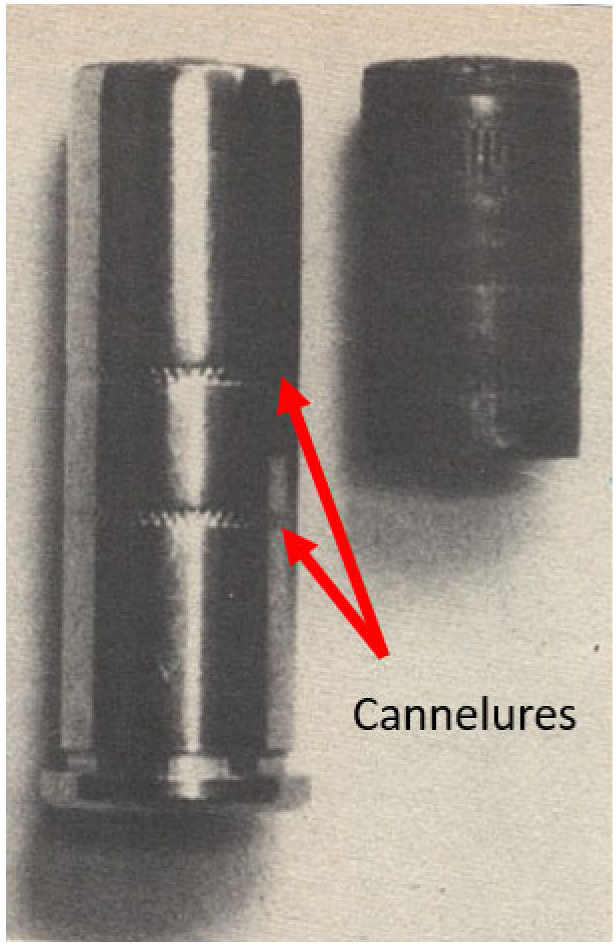
2. Claim 1

Daubenspeck discloses the limitations of independent claim 1. *Supra* at VIII.A.1; EX1003 at ¶100.

3. Claim 8: The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises one or more cannelures formed on an outer circumferential surface of the forward opening end.

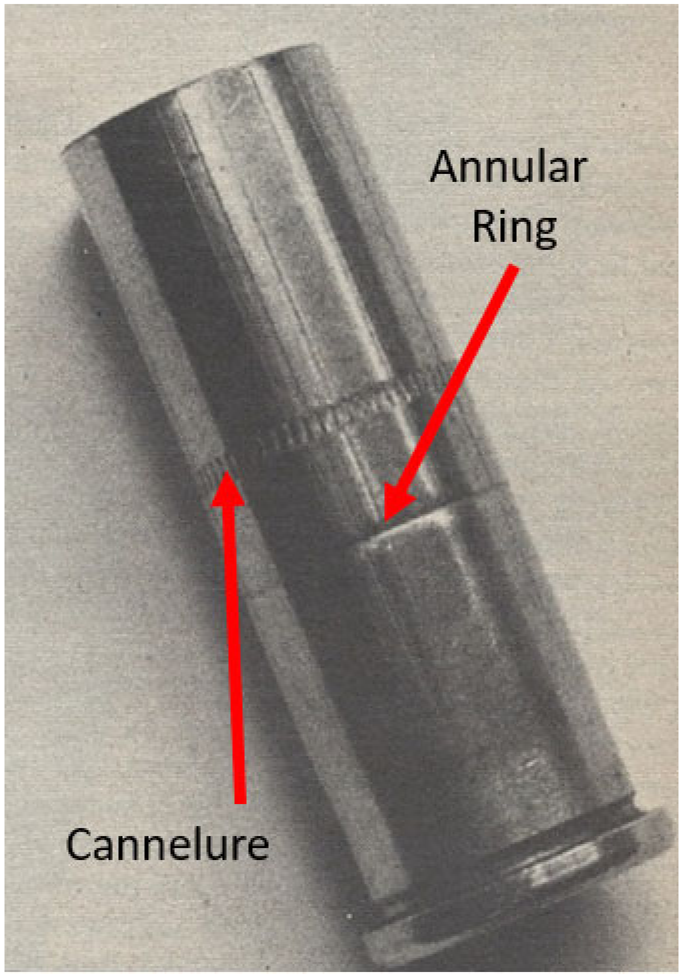
Nonte discloses the limitations added in dependent claim 8. Nonte depicts a .38 Special, mid-range, full wadcutter target load and bullet depicting two cannelures formed on an outer circumferential surface of the forward opening end. EX1006 at 29. This disclosure teaches one or more cannelures formed on an outer circumferential surface of the forward opening end. EX1003 at ¶101. For context, a cannelure is defined as follows in the Merriam-Webster Dictionary (EX 1011):

> **1:** a groove running lengthwise on the surface of a cylinder or column
>
> **2**
>
> **a:** a groove around the cylinder of an elongated bullet for small arms to contain a lubricant
>
> **b:** a groove around a bullet into which the edge of the cartridge case is crimped
>
> **c:** a groove around the rotating band of a gun projectile to lessen the resistance offered to the rifling
>
> **d:** a groove around the base of a cartridge where the extractor takes hold



Nonte at 29 (figure, annotated)

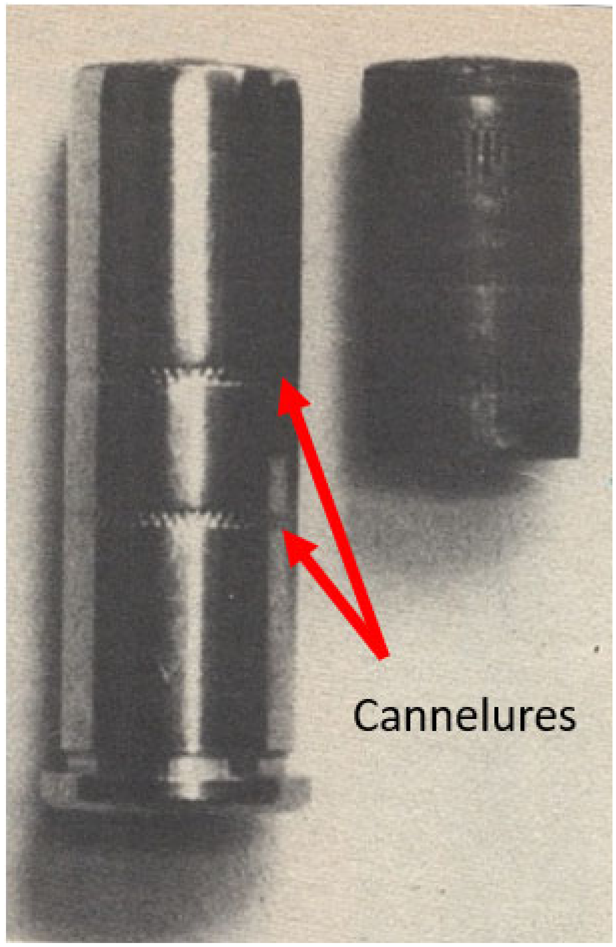
Nonte depicts a second casing having one cannelure formed on an outer circumferential surface of the forward opening end. EX1006 at 29. This disclosure also teaches one or more cannelures formed on an outer circumferential surface of the forward opening end. EX1003 at ¶102.



<u>**Nonte at 77 (figure, annotated)**</u>

4. Claim 9: The polymeric ammunition cartridge of claim 1, wherein the forward opening end comprises one, two, three, or more annular rings that mate with one, two, three, or more corresponding annular grooves positioned on the bullet.

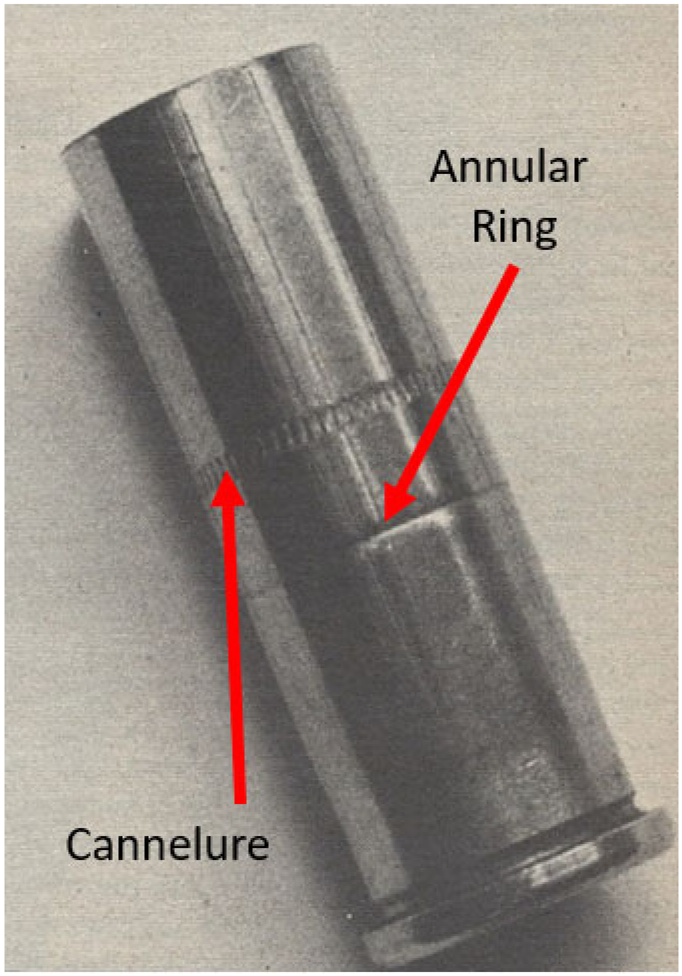
Nonte discloses the limitations added in dependent claim 9. Nonte depicts a .38 Special, mid-range, full wadcutter target load and bullet depicting two cannelures, which form annular rings that are configured to mate with corresponding annular grooves positioned on the bullet. EX1006 at 29. This disclosure teaches one, two, three, or more annular rings that mate with one, two, three, or more corresponding annular grooves positioned on the bullet. EX1003 at ¶103.



Nonte at 29 (figure, annotated)

Nonte depicts a second casing having one cannelure formed on an outer circumferential surface of the forward opening end as well as a second annular ring. EX1006 at 29. One, two, three, or more annular rings that mate with one, two, three, or more corresponding annular grooves positioned on the bullet.

EX1003 at ¶104.



Nonte at 77 (figure, annotated)

E. GROUND 5: CLAIMS 15-17 OF THE '543 PATENT ARE RENDERED OBVIOUS BY DAUBENSPECK IN VIEW OF ANDERSON.

1. Motivation to combine

A POSITA would have been motivated to combine Daubenspeck with Anderson, and would have had a reasonable expectation of success. Both references are from the same field of endeavor: polymer cartridge casings for ammunition. EX1004 at 1:1-34; EX1007, Abstract; EX1003 at ¶105.

A POSITA would have reasonably expected the proposed combination of Daubenspeck and Anderson to succeed. Daubenspeck provides a polymer cartridge comprising a primer and material structure having high tensile strength and controlled flexibility under expansive pressure. Daubenspeck discloses the use of a traditional primer cup inserted in the primer recess base insert. EX1004 at 2:31-65. Anderson similarly discloses composite polymer cartridge casings for bullets, having a primer recess in a base insert. EX1007, Abstract, Figs 4 and 5. Anderson further discloses a flanged cup which has a cylindrical recess into which a conventional primer is inserted. A circumferential flange extends about the primer cup and extends into the flash hole with a tubular extension and tip/lip. EX1007 at 3:43-67, Figs. 4 and 5. A conventional primer is then inserted into flanged cup 50 when the cartridge is to be loaded. A POSITA would understand that placing this reinforcing flanged cup 50 between the polymeric casing and a primer recess would provide protection to the polymer against heat and pressure caused from the primer ignition. Incorporating Anderson's teachings into Daubenspeck would result in providing a more secure fit of the base insert to the casing. This would be a straightforward combination and well within the capabilities of a POSITA. EX1003 at ¶106.

Daubenspeck, Anderson and the ’543 Patent are analogous art, as they are all directed to composite polymeric ammunition cartridges. *See* EX1001, Abstract; EX1004 at 1:1-3; EX1007, Abstract; EX1003, ¶107.

2. Claim 1

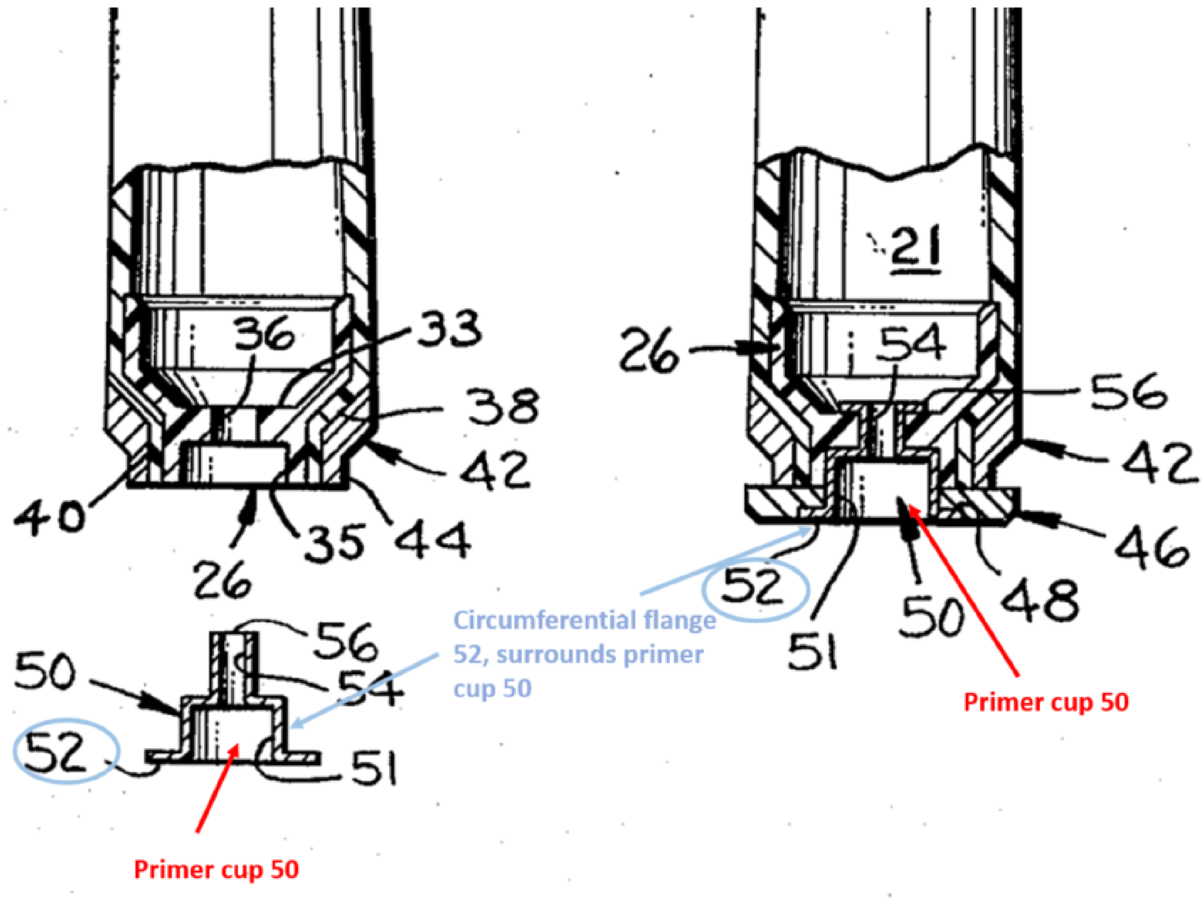
Daubenspeck discloses the limitations of independent claim 1. *Supra* at VIII.A.1 EX1003 at ¶108.

3. Claim 15: The polymeric ammunition cartridge of claim 1, further comprising a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole.

Daubenspeck discloses a primer recess. *Supra* at VIII.A.1.b.2. Daubenspeck also discloses a primer flash hole. *Supra* at VIII.A.1.b.3. Daubenspeck does not disclose a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole. Anderson remedies this deficiency in Daubenspeck. EX1003 at ¶109.

Anderson discloses a flanged cup member 50, having a circumferential flange 52. Figures 4 and 5 of Anderson, shown below, disclose a flanged cup member 50 having a structure surrounding it (flange 52, with a flash hole having tubular walls 54). The flash hole of the cup member aligns with the primer flash hole 36. EX1007 at 3:43-67, Figs. 4 and 5. Anderson discloses that”[t]he flanged cup 50, shown prior to assembly with the casing in FIG. 4, has a cylindrical recess

51 into which a conventional primer (not shown) is later inserted when the cartridge casing is to be loaded" *Id*. The flanged cup 50 with circumferential structure 52 disclosed in Anderson acts as a diffuser and has a similar structure to the diffuser claimed in the '543 Patent. EX1003 at ¶110.



<u>Anderson, Fig. 4 (left) and Fig. 5 (right), (annotated)</u>

4. Claim 16:

a) 16 [Preamble]: "A polymeric ammunition cartridge having a diffuser comprising:"

In the case of claim 16, the preamble is not limiting because the preamble merely recites limitations restated in the body of the claim. However, to the extent the preamble is construed as limiting, Daubenspeck discloses this limitation. EX1003, ¶111. As discussed above, Daubenspeck discloses "A polymeric ammunition cartridge." EX1004 at 7:75-8:2; EX1003 at ¶111.

b) [16 [1]]: "a substantially cylindrical insert comprising"

Daubenspeck discloses this limitation. EX1003 at ¶112. As discussed above, Daubenspeck discloses "a substantially cylindrical insert." *Supra* at VIII.A.1.b. Daubenspeck discloses this limitation for the same reasons.

(1) [16 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,"

Daubenspeck discloses this limitation. EX1003 at ¶113. As discussed above, Figures 37 and 38 of Daubenspeck show "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface." *Supra* at VIII.A.1.b.1.

(2) [16 [1b]]: "a primer recess in the top surface that extends toward the bottom surface,"

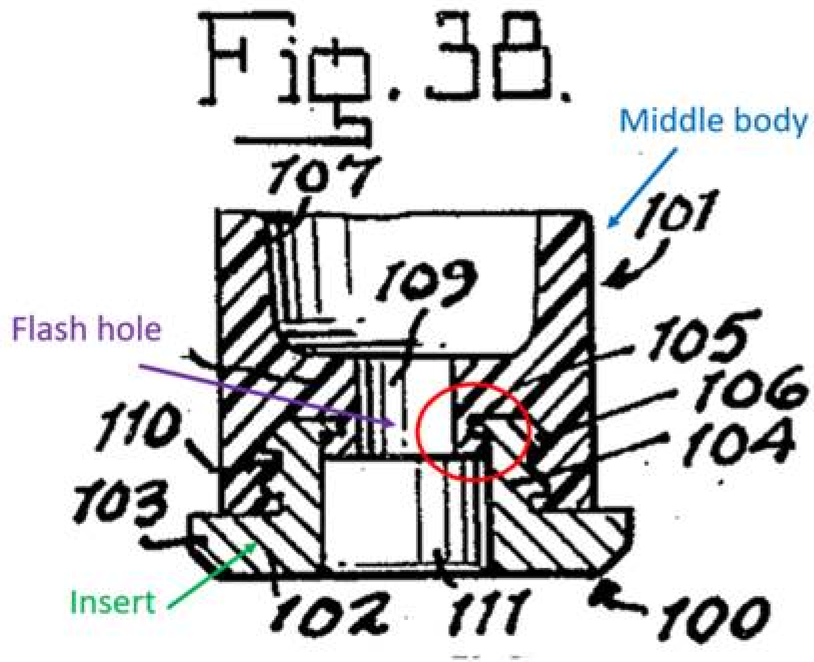
Daubenspeck discloses this limitation. EX1003 at ¶114. As discussed above, Daubenspeck discloses a primer recess in the top surface of the substantially cylindrical insert that extends toward the bottom surface. *Supra* at VIII.A.1.b.2. Daubenspeck discloses this limitation for the same reasons.

(3) [16 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface,"

Daubenspeck discloses this limitation. EX1003 at ¶115. As discussed above, Daubenspeck discloses "a primer flash hole positioned in the primer recess to extend through the bottom surface." *Supra* at VIII.A.1.b.3. Daubenspeck therefore discloses this limitation for the same reasons.

(4) [16 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface;"

Daubenspeck discloses this limitation. EX1003 at ¶116. As discussed above, Daubenspeck discloses "a flange that extends circumferentially about an outer edge of the top surface" of the substantially cylindrical insert. *Supra* at VIII.A.1.b.4.



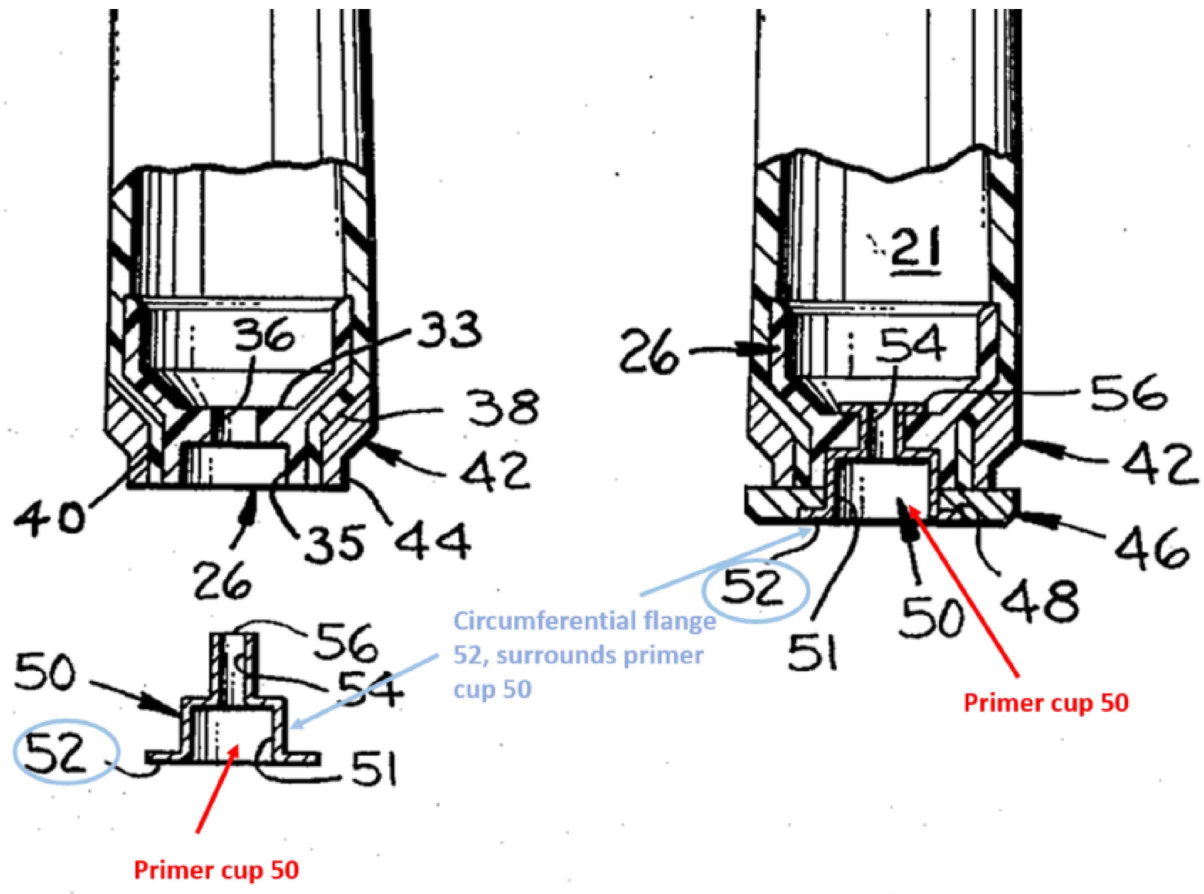
Annotated Daubenspeck Fig. 38 Showing Insert and Flange

c) [16 [2]]: "a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole; and;"

Although Daubenspeck discloses a primer recess and flash hole, Daubenspeck does not disclose a diffuser positioned in the primer recess comprising a diffuser flash hole aligned with the primer flash hole. Anderson remedies this deficiency in Daubenspeck. EX1003 at ¶117.

Anderson discloses a flanged primer cup 50, having a circumferential flange 52. Figures 4 and 5 of Anderson, shown below, disclose a flanged cup 50 having a structure surrounding it (flange 52, with a flash hole having tubular walls 54). The flash hole of the flange cup 50 aligns with the primer flash hole 36. EX1007, col 3:

43-67, Figs. 4 and 5. A conventional primer is then inserted into flanged cup 50. A POSITA would understand that placing this reinforcing flanged cup 50 between the polymeric casing and a primer recess would provide protection to the polymer against heat and pressure caused from the primer ignition, in addition to improving structural integrity. The flanged cup structure 50 disclosed in Anderson is a similar structure to the "diffuser" claimed in the Patent '543. EX1003 at ¶118.



Anderson, Fig. 4 (left) and Fig. 5 (right), (annotated)

d) [16 [3]]: "a substantially cylindrical polymeric middle body comprising"

Daubenspeck discloses this limitation. As described above, Daubenspeck discloses that it relates "to firearm cartridges and method of manufacture and assembly thereof," including "a body or casing of plastic material having high tensile strength and controlled flexibility under expansive pressure." EX1004 at 1:11-12, 20-22. *Supra* VIII.A.1.c. EX1003 at ¶119.

(1) [16 [3a]]: "a substantially cylindrical polymeric bullet-end and"

Daubenspeck discloses this limitation. As shown above, the cartridge disclosed in Daubenspeck has a polymeric middle body **101** that comprises a substantially cylindrical end with an opening for receiving a bullet. EX1003, ¶120; EX1004 at 2:32-40. *Supra* VIII.A.1.c.1. EX1003 at ¶120.

(2) [16 [3b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole."

As shown above, Daubenspeck discloses this limitation. "The plastic casing 101 is substantially cylindrical and is provided with a powder containing chamber 107, the base of which is in the form of an integral overlay portion 108 ***<u>molded over the inner end of the battery cup and extended inwardly about the lip 105 to</u>***

the interior of the primer pocket, a central vent or flash hole 109 ***being provided in the overlay portion***." EX1004 at 7:67-72 (emphasis added); EX1003 at ¶121. *Supra* VIII.A.1.c.2.

5. Claim 17: The polymeric ammunition cartridge of claim 16, wherein the diffuser has a primer flash hole with a flash hole lip extending into a bore of the primer flash hole.

Anderson discloses the limitations of this claim. Specifically, Anderson, in Fig. 5 (reproduced above),discloses a diffuser with a primer flash hole having a flash hole lip extending into a primer flash hole (elements 54 and 56 of Fig. 5 reproduced above). EX1007, Fig. 5. EX1003 at ¶122.

F. GROUND 6: CLAIMS 1, 2, 4-6, AND 10-14 OF THE '543 PATENT ARE RENDERED OBVIOUS BY CHUNG IN VIEW OF DAUBENSPECK.

For at least the reasons below, claims 1, 2, 4-6, and 10-14 of the '543 Patent are invalid as obvious over Chung in view of Daubenspeck.

1. Motivation to Combine

A POSITA would have been motivated to combine Chung and Daubenspeck, and would have had a reasonable expectation of success. Both references are from the same field of endeavor: polymer cartridge casings for ammunition. EX1004 at 1:1-34; EX1005, abstract; EX1003 at ¶124.

A POSITA would have reasonably expected the proposed combination of Chung and Daubenspeck to succeed. Chung provides polymer cartridge casings for bullets, having polymeric middle body which has high tensile strength to sustain deformation under high interior ballistic pressure and highlights specific polymers and fastening or interlocking means which are preferred to achieve these goals. EX1005, ¶100. Daubenspeck similarly provides a polymer cartridge structure having high tensile strength and controlled flexibility under expansive pressure. EX1005 at 2:31-65. Incorporating Daubenspeck's teachings into Chung would be a straightforward combination and well within the capabilities of a POSITA. EX1003 at ¶125.

Chung, Daubenspeck and the '543 Patent are analogous art, as they are all directed to polymeric ammunition cartridges. *See* EX1001, Abstract; EX1004 at 1:1-3; EX1005, Abstract; EX1003 at ¶126.

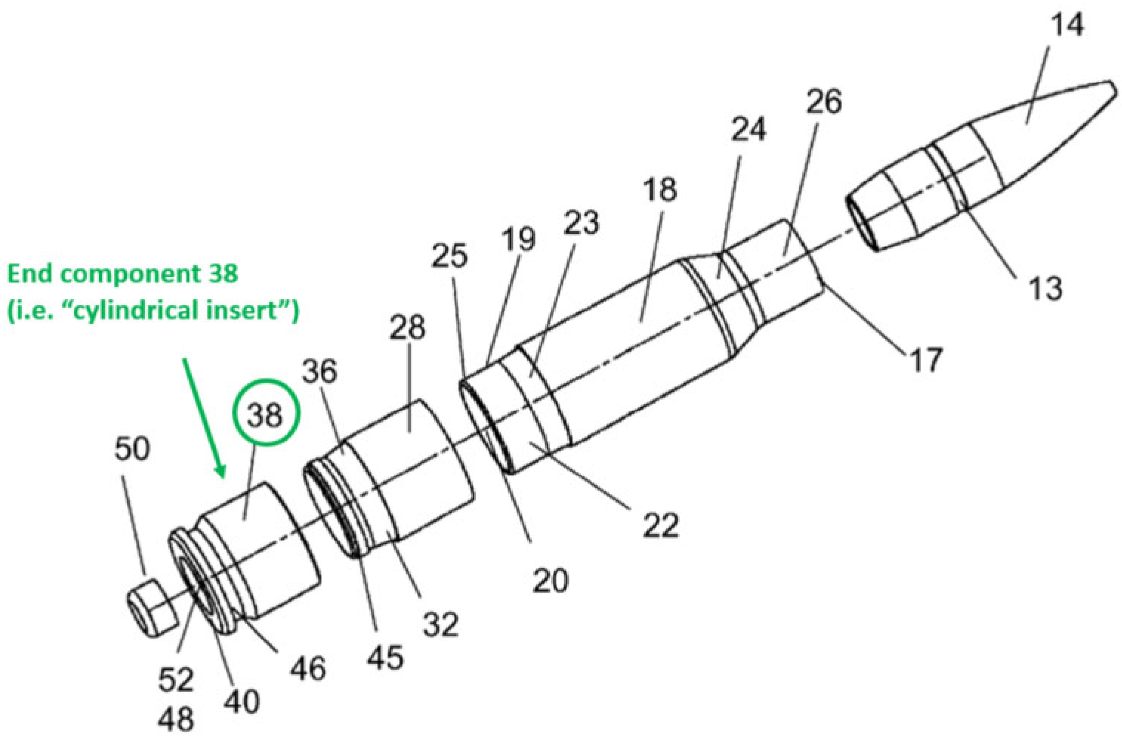
2. Claim 1

a) [1 [Preamble]]: "A polymeric ammunition cartridge comprising:"

To the extent the preamble is limiting, Chung discloses this limitation. Chung discloses that it relates to *"[a]n ammunition cartridge assembled from (1) a substantially cylindrical polymeric cartridge casing*…." EX1005, Abstract, claim 1; EX1003 at ¶127.

b) [1 [1]]: "a substantially cylindrical insert comprising"

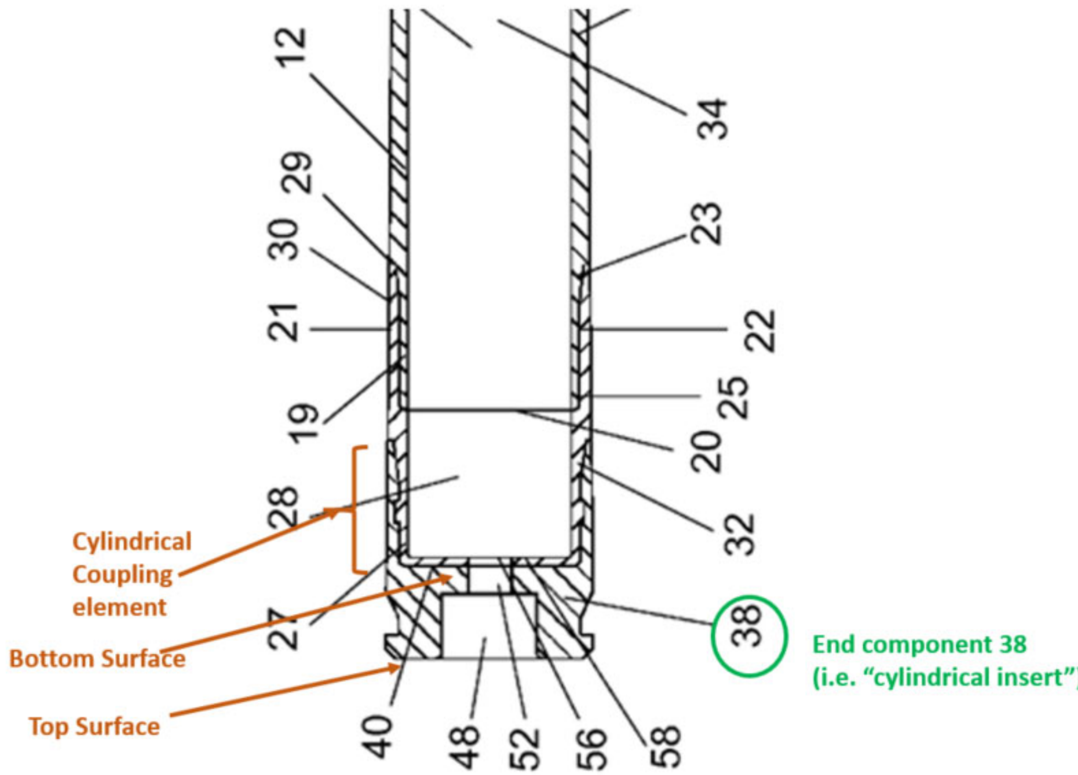
Chung discloses this limitation. EX1005, abstract; EX1003, ¶128. As shown in Fig. 3 reproduced below, Chung discloses an "end component 38" which is cylindrical in shape. EX1003 at ¶128.



Chung, Fig. 3 (annotated to show cylindrical insert)

(1) [1 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,"

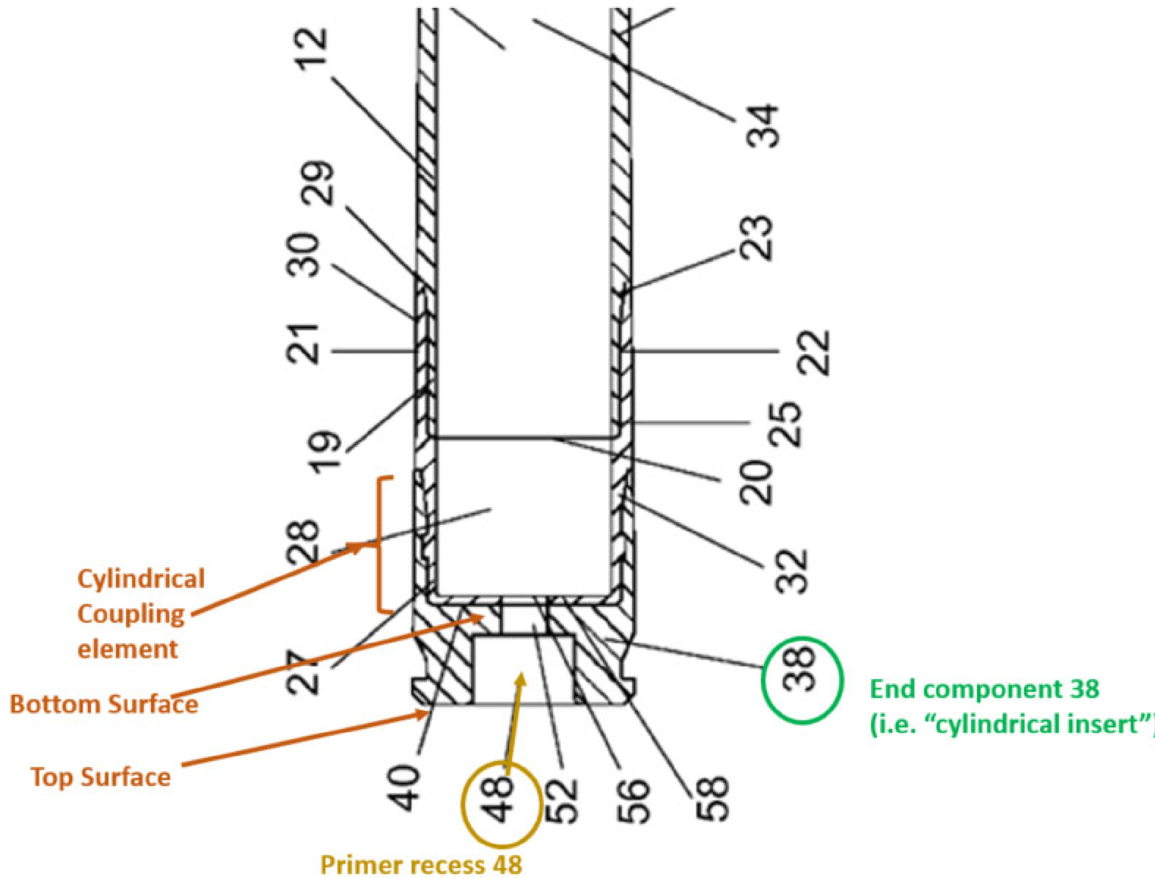
Chung discloses this limitation. EX1005, ¶72, Fig. 2. As shown in Fig. 2 of Chung, reproduced below, Chung describes a substantially cylindrical coupling element that extends from the bottom surface of the end component 38 (i.e. "cylindrical insert"). EX1003 at ¶129.



Chung, Fig. 2 (annotated to show "cylindrical coupling element")

(2) [1 [1b]]: "a primer recess in the top surface that extends toward the bottom surface;"

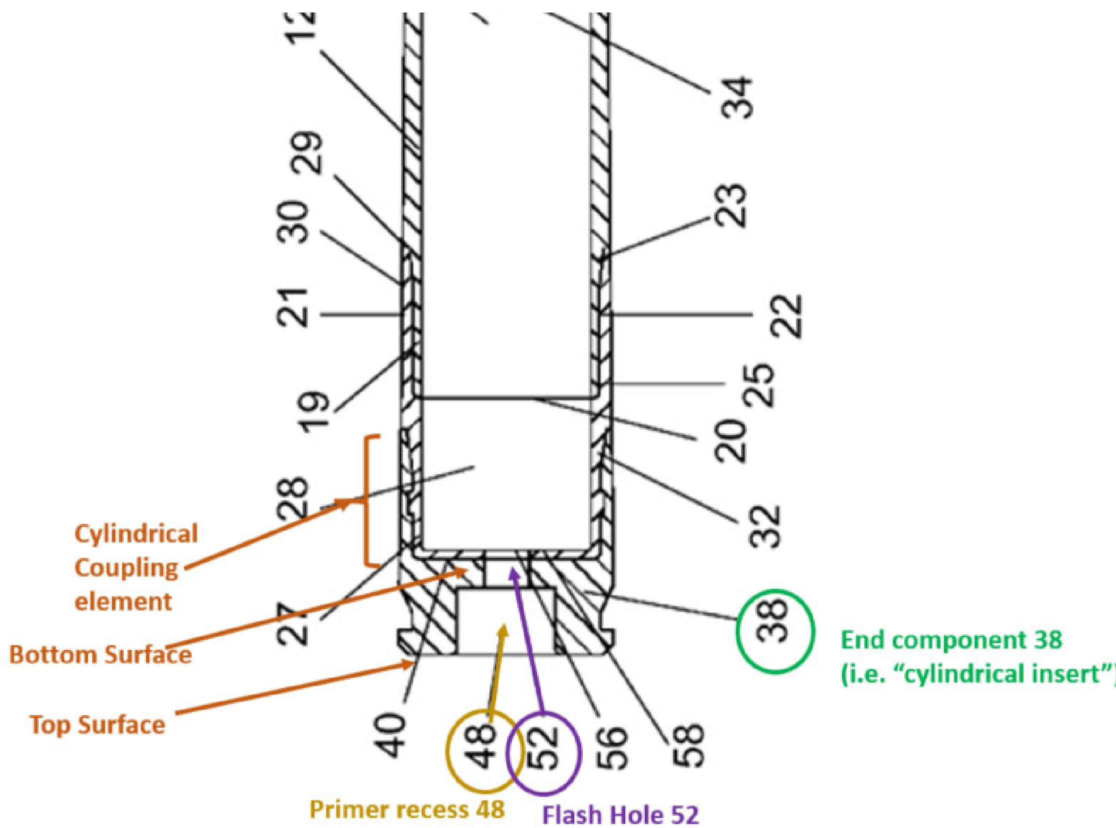
Chung discloses this limitation. The cylindrical insert of Chung comprises a primer recess in the top surface that extends to the bottom surface, as shown below in annotated Fig. 2. Chung specifically discloses "*[h]ead-end component 38 has an extraction groove 46 cut therein and a <u>primer recess 48</u> formed therein for ease of* *insertion of the primer 50.*" EX1003 at ¶130; EX1005, ¶76 (emphasis added), Fig. 2.



Chung, Fig. 2 (annotated to show "primer recess")

(3) [1 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface, and"

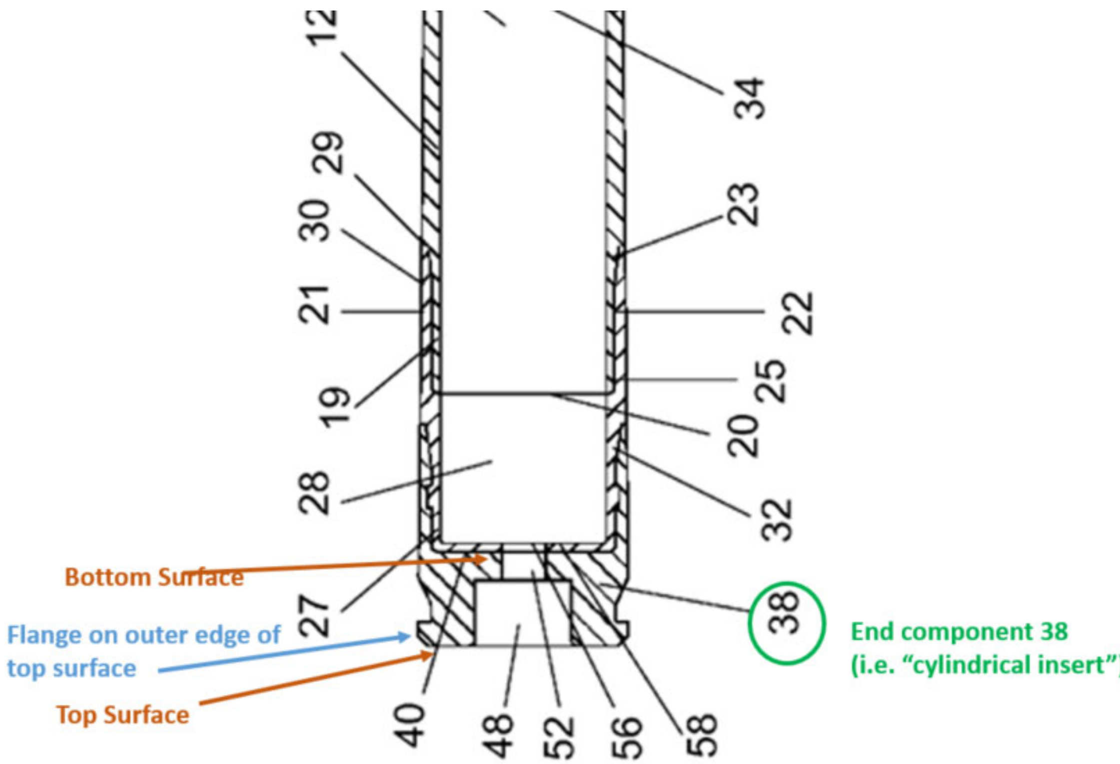
Chung discloses this limitation. Chung describes a primer flash hole 52. Specifically, Chung notes *"[a] <u>primer flash hole 52</u> communicates through the base end 40 of head-end component 38 into the powder chamber 34 so that* *upon detonation of primer 50 the powder in powder chamber 34 will be ignited."* EX1003 at ¶131; EX1005, ¶76 (emphasis added), Fig. 2. As shown in Fig. 2 below, the flash hole 52 extends through the bottom surface.



<u>Chung, Fig. 2 (annotated to show "flash hole")</u>

(4) [1 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface; and"

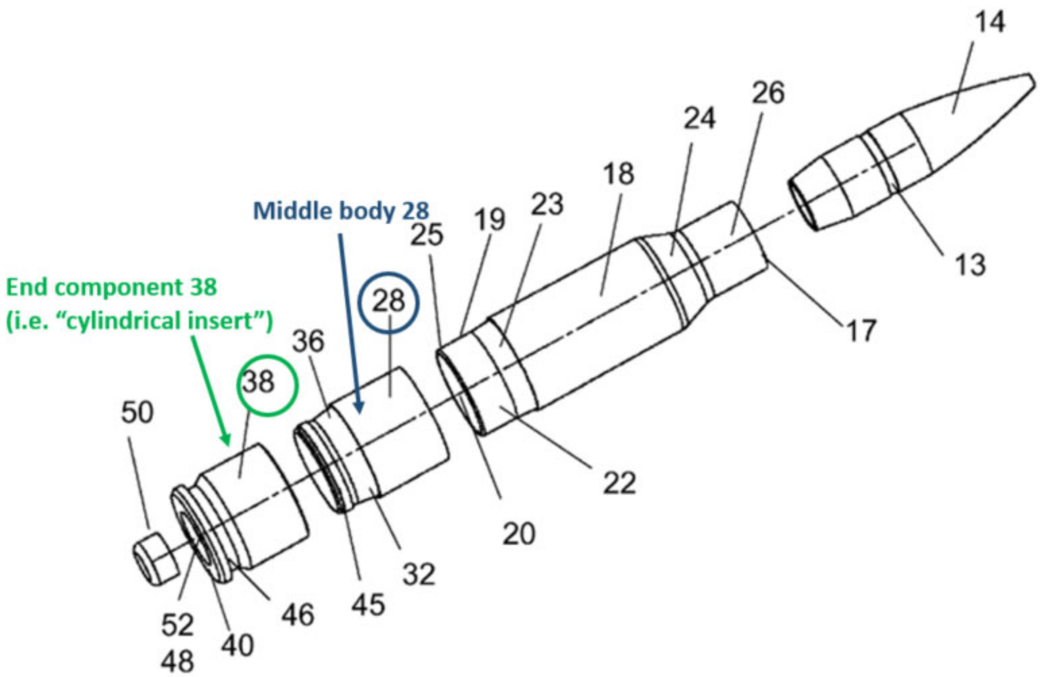
Chung discloses this limitation. Fig. 2 below shows a flange that is circumferential about an exterior edge of the top surface of the end component 38. EX1003 at ¶132



Chung, Fig. 2 (annotated to show flange of end component 38)

c) [1 [2]]: "a substantially cylindrical polymeric middle body comprising"

Chung discloses this limitation. Chung discloses *"[p]olymer casing 12 also has a* *substantially cylindrical* *open-ended middle body component 28. The middle body component extends from a first end with a female coupling element 30 to a* *second end with a male coupling element 32."* Chung also discloses the middle body is comprised of a polymeric material. EX1005, ¶¶51, 67 (emphasis added), Fig. 3; EX1003 at ¶133.



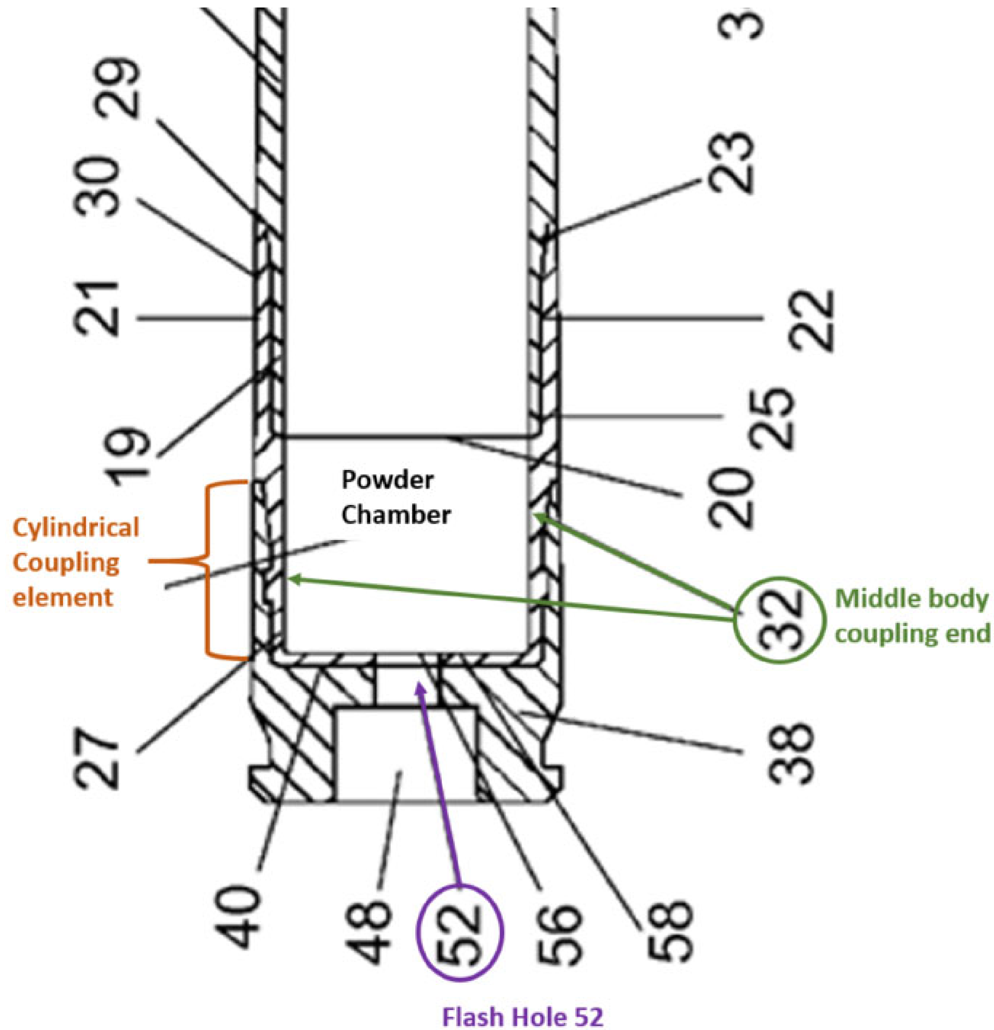
<u>**Chung, Fig. 3 (annotated to show "middle body 28")**</u>

(1) [1 [2a]]: "a substantially cylindrical polymeric bullet-end and"

Chung discloses this limitation. The polymeric middle body disclosed in Chung comprises *"…opposing first and second ends, wherein the <u>first end has a coupling element that is a mate for the bullet-end coupling element</u> and thereby joins the first end of the middle body component to the second end of the bullet-end component…"* EX1003 at ¶134; EX1005, ¶51 (emphasis added).

(2) [1 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole."

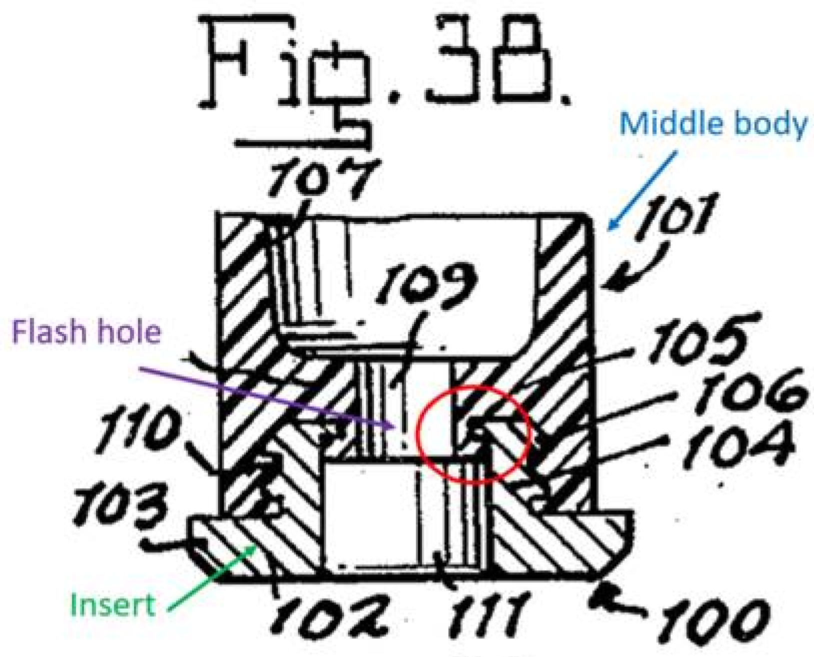
Chung discloses portions of this limitation. Chung discloses that the middle body has a substantially polymeric coupling end connected by a powder chamber. EX1005, ¶71, Figs, 2 and 4. As shown in Fig. 2 of Chung, reproduced below, the coupling end 32 of middle body 28 is connected to the powder chamber. The coupling end 32 also extends over the substantially cylindrical coupling element of the insert 38 and covers a surface of the insert 38. EX1005, ¶74, EX1003 at ¶135.



Chung, Fig. 2 (annotated to show coupling end)

Although Chung discloses that the coupling end extends over and around the flash hole, as seen in Fig. 2 above, Chung does not appear to disclose that the coupling end covers a circumferential surface of the primer flash hole.

Daubenspeck remedies this deficiency in Chung. Daubenspeck discloses an embodiment wherein a polymeric middle body comprises a cylindrical coupling end that covers a circumferential surface of the primer flash hole, as shown in the section within the red circle in Fig. 38 below. EX1005 at Fig. 38. It would have been obvious to a POSITA to combine the configuration taught in Daubenspeck into the design of Chung, to provide an improved fit to the cartridge to withstand heat and pressure stress and avoid separation between the casing and the insert. EX1003 at ¶137.



Daubenspeck, Fig. 38 (annotated)

3. Claim 2: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a ductile polymer.

Chung discloses this limitation. *Supra* at VIII.B.2. EX1003 at ¶138.

4. Claim 4: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body is formed from a fiber-reinforced polymeric composite.

Chung discloses this limitation. *Supra* at VIII.B.3. EX1003 at ¶139.

5. **Claim 5: The polymeric ammunition cartridge of claim 4, wherein the fiber-reinforced polymeric composite contains between about 10 and about 70 wt % glass fiber fillers, mineral fillers, or mixtures thereof.**

Chung discloses this limitation. *Supra* at VIII.B.4. EX1003 at ¶140.

6. **Claim 6: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric bullet-end and bullet are further welded or bonded together.**

Chung discloses this limitation. *Supra* at VIII.B.5. EX1003 at ¶141.

7. **Claim 10: The polymeric ammunition cartridge of claim 1, wherein the forward opening end is crimped so that a polymeric material flows into an annular groove of a bullet.**

Chung discloses this limitation. *Supra* at VIII.B.6. EX1003 at ¶142.

8. **Claim 11: The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end.**

Chung discloses this limitation. *Supra* at VIII.B.7. EX1003 at ¶143.

9. Claim 12: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical polymeric middle body comprise a polymers selected from the group consisting of polyurethane prepolymer, cellulose, fluoro-polymer, ethylene inter-polymer alloy elastomer, ethylene vinyl acetate, nylon, polyether imide, polyester elastomer, polyester sulfone, polyphenyl amide, polypropylene, polyvinylidene fluoride or thermoset polyurea elastomer, acrylics, homopolymers, acetates, copolymers, acrylonitrile-butadinen-styrene, thermoplastic fluoro polymers, inomers, polyamides, polyamide-imides, polyacrylates, polyatherketones, polyaryl-sulfones, polybenzimidazoles, polycarbonates, polybutylene, terephthalates, polyether imides, polyether sulfones, thermoplastic polyimides, thermoplastic polyurethanes, polyphenylene sulfides, polyethylene, polypropylene, polysulfones, polyvinylchlorides, styrene acrylonitriles, polystyrenes, polyphenylene, ether blends, styrene maleic anhydrides, polycarbonates, allyls, aminos, cyanates, epoxies, phenolics, unsaturated polyesters, bismaleimides, polyurethanes, silicones, vinylesters, urethane hybrids, polyphenylsulfones, copolymers of polyphenylsulfones with polyethersulfones or polysulfones, copolymers of poly-phenylsulfones with siloxanes, blends of polyphenylsulfones with polysiloxanes, poly(etherimide-siloxane) copolymers, blends of polyetherimides and polysiloxanes, and blends of polyetherimides and poly(etherimide-siloxane) copolymers.

Chung discloses this limitation. *Supra* at VIII.B.8. EX1003 at ¶144.

10. Claim 13: The polymeric ammunition cartridge of claim 1, wherein a bullet is adhesively fitted to the forward opening end.

Chung discloses this limitation. *Supra* at VIII.B.9. EX1003 at ¶145.

11. Claim 14: The polymeric ammunition cartridge of claim 1, wherein the substantially cylindrical coupling element is a male coupling element with a straight skirt interlock surface that tapers to a smaller diameter at the forward portion on the skirt tip to mate with a female coupling element of the substantially cylindrical polymeric coupling end.

Chung discloses this limitation. *Supra* at VIII.B.10. EX1003 at ¶146.

G. GROUND 7: CLAIM 1 OF THE '543 PATENT IS ANTICIPATED BY DITTRICH

For at least the reasons below, claim 1 of the '543 Patent is invalid as anticipated by Dittrich.

1. Claim 1

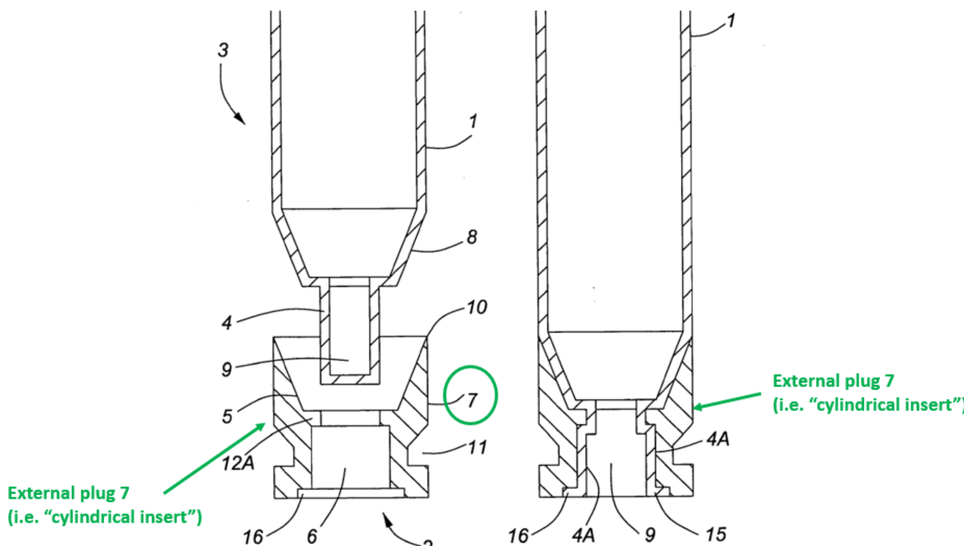
a) [1 [Preamble]]: "A polymeric ammunition cartridge comprising:"

To the extent the preamble is limiting, Dittrich discloses this limitation. Dittrich discloses that it relates to "[a] cartridge or ammunition casing" and further details that "[m]aterials which may be used for the outer cylindrical sidewall and casing shell..." include "polymeric plastic materials". EX1003 at ¶148; EX1008 at abstract, p. 18, ll. 18-24.

b) [1 [1]]: "a substantially cylindrical insert comprising"

Dittrich discloses this limitation. EX1003 at ¶149. As shown in Figs. 1 and 2 from Dittrich, an "external plug 7" having a substantially cylindrical outer shape aligns with cylindrical casing 1 and is fitted together as shown in Fig. 2 below.

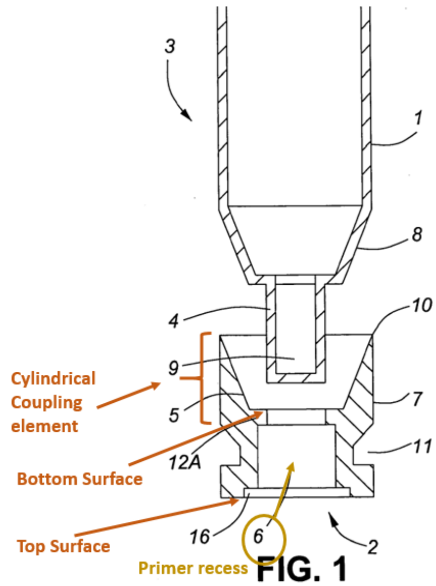
Dittrich specifically discloses that "[t]he casing wall 1 extends with seamless continuity inwardly from its maximum circular cross-section, over the inner surface of the external plug 7, conforming to the shape of such plug 7 until such casing wall extension or "casing shell" 8 reaches the boundary 5 of the primer well opening 6." *Id.;* EX1008 at pg. 18, ll. 5-9.



<u>Dittrich, Figs. 1 and 2 (annotated to show cylindrical insert)</u>

(1) [1 [1a]]: "a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface,"

Dittrich discloses this limitation. EX1008, Fig. 1. As shown in Fig.1 of Dittrich, annotated below, Dittrich discloses that the external plug 7 has a top surface opposite a bottom surface and a substantially cylindrical coupling element that extends from the bottom surface. "The exterior plug 7… is dimensioned to extend sufficiently forwardly along the cartridge casing sidewall 1 to ensure that the forward end 10 of the exterior plug 7 extends at least to and preferably a little beyond the open portion at the breach of a firearm…" EX1003 at ¶150; EX1008 at pg. 17, ll. 26-27 to pg. 18, ll. 1-4.



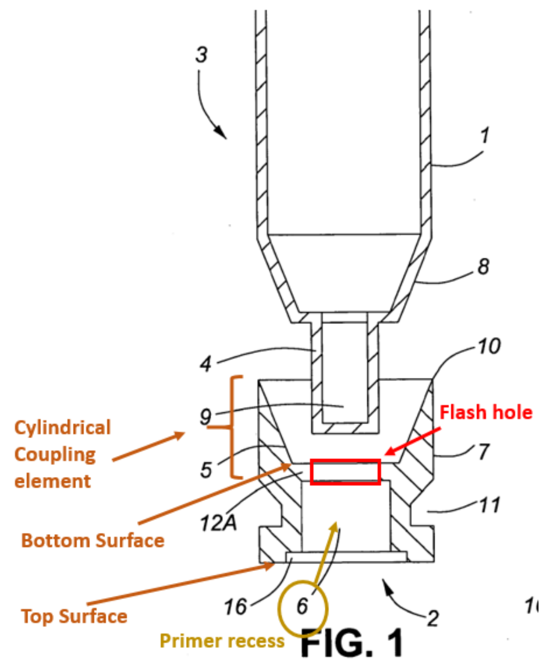
Dittrich, Fig. 1 (annotated to show cylindrical coupling element)

(2) [1 [1b]]: "a primer recess in the top surface that extends toward the bottom surface;"

Dittrich discloses this limitation. The cylindrical insert of Dittrich, as shown in Fig. 1 above, comprises a primer recess (referred to as a "primer well opening 6") in the top surface that extends to the bottom surface. EX1008 at Figs 1-2. Dittrich discloses, "…the primer well [is intended to receive] the primer cap with a friction fit…" EX1003 at ¶151; EX1008 at p.18, LL. 15-19.

(3) [1 [1c]]: "a primer flash hole positioned in the primer recess to extend through the bottom surface, and"

Dittrich discloses this limitation. Dittrich shows a smaller opening at one end of the primer well 6, said opening extending through the bottom surface, as seen in annotated Fig. 1 below. EX1003 at ¶152; EX1008 at Figs. 1-2.



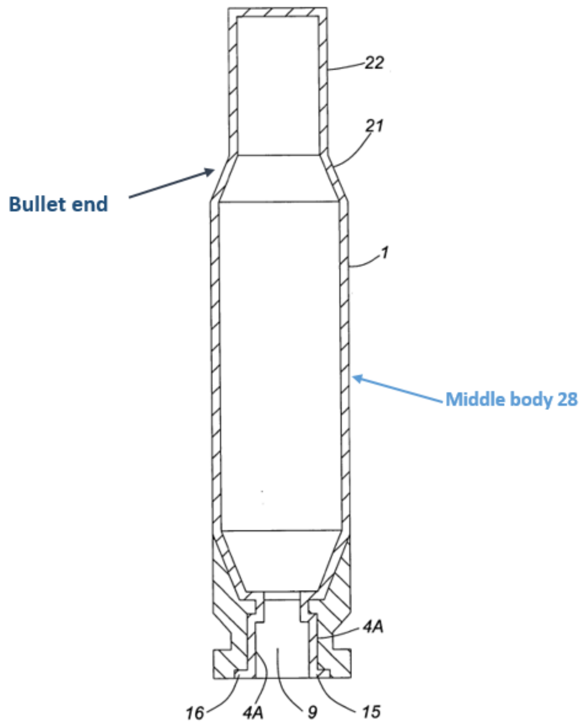
Dittrich, Fig. 1 (annotated to show flash hole)

(4) [1 [1d]]: "a flange that extends circumferentially about an outer edge of the top surface; and"

Dittrich discloses this limitation. Dittrich describes "extraction groove 11" which is formed at one end of the plug 7 and has a protruding flange section about an outer edge of the top surface, as can be seen in Fig. 1 shown above. EX1008 at Fig. 1. EX1003 at ¶153.

c) [1 [2]]: "a substantially cylindrical polymeric middle body comprising"

Dittrich discloses this limitation. Dittrich discloses cylindrical casing 3 having a casing side wall 1, which can also be referred to as a "middle body" and has a forward end 22, where a bullet or projectile would be fitted thereon. EX1008 at Fig. 2. "Once a casing is formed as described above, it may be followed by a reduction in the diameter of the forward end of the casing 3 as shown in Figure 2 to form a shoulder 21 and forward extension 22 of reduced diameter the casing. Materials which may be used for the outer cylindrical sidewall and casing shell in accordance with the invention include … *polymeric plastic material*." EX1003 at ¶154; EX1008 at pg. 20, ll. 18-26 (emphasis added).



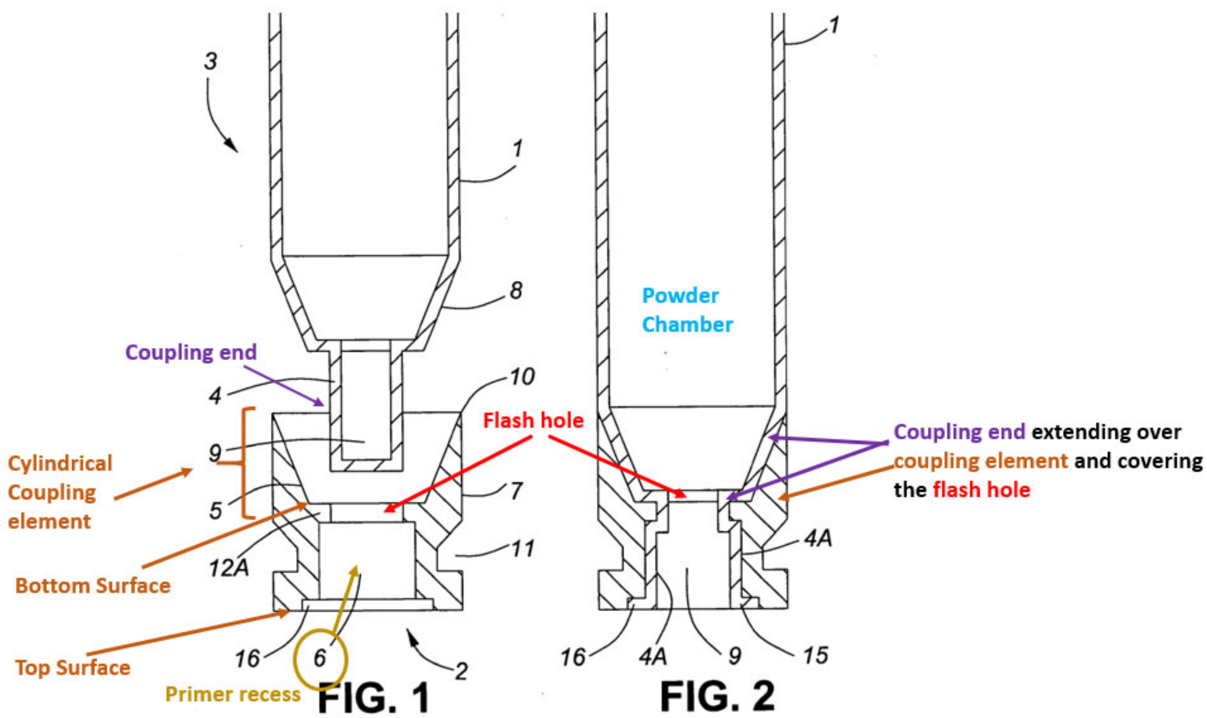
<u>Dittrich, Fig. 2 (annotated to show middle body and bullet-end)</u>

(1) [1 [2a]]: "a substantially cylindrical polymeric bullet-end and"

Dittrich discloses this limitation. The cartridge disclosed in Dittrich has a polymeric middle body, as shown above in Fig. 2 that comprises a substantially cylindrical end for receiving a projectile (annotated on Fig. 2 above). EX1003 at ¶155; EX1008 at p. 22, ll. 4-7.

(2) [1 [2b]]: "a substantially cylindrical polymeric coupling end connected by a powder chamber, wherein the substantially cylindrical polymeric coupling end extends over the substantially cylindrical coupling element and covers an circumferential surface of the primer flash hole."

Dittrich discloses this limitation. The casing disclosed by Dittrich is substantially cylindrical, can be comprised of polymeric materials, and is provided with a powder containing chamber ("A casing for cartridge ammunition, the casing having a head end and an interior volume for containing propellant") EX1008, Claim 1.



Dittrich, Figs. 1 and 2 (annotated to show coupling end)

The casing disclosed in Dittrich has a coupling end (referred to as "casing shell extension 4", shown in Figs. 1-2 above) which extends over the cylindrical coupling element of the plug 7, and further extends down to cover a circumferential surface of the flash hole (shown at Fig. 2 above). Dittrich specifically details that "*[t]he casing shell extension 4 defines the actual walls of the primer well. That is, the casing shell extension 4 extends along the side of the wall of the central opening 6 in the external plug 7, reaching outwardly to the exterior face of the head end 2 of the casing 3 and thus forming the cylindrical walls of the primer well for receiving the primer cap with a friction fit*." EX1008, pg.18, ll. 15-19 (emphasis added); EX1003 at ¶¶156-157.

IX. SECONDARY CONSIDERATIONS

Petitioner is not presently aware of any secondary considerations of non-obviousness in connection with any of Grounds 2-6. *Supra* at VIII.B – VIII.F. Petitioner believes that each of Grounds 2-6 present such strong cases of obviousness that secondary considerations could not overcome the fact that the claimed invention is a known use of prior art elements. Petitioner reserves the right to address any secondary considerations raised by the Patent Owner or its expert.

X. MANDATORY NOTICES

A. Real Party-In-Interest

The real party-in-interest is SIG Sauer Inc. Additionally, in an abundance of caution, SIG Sauer identifies its parent company, SIG Sauer US Holding LP, and that company's parent companies, L&O Finance GmbH and SIG Sauer Management LLC as additional real parties-in-interest.

B. Related Matters

There are no related matters.

C. Lead Counsel, Backup Counsel and Service Information

Lead Counsel	Backup Counsel
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Petitioner consents to electronic service of documents to the email addresses of the counsel identified above.

D. Payment of Fees – 37 C.F.R. § 42.103

The required fee is submitted herewith. Petitioner also authorizes the United States Patent and Trademark Office to charge Deposit Account No. 041061 for any underpayment of fees in this proceeding.

XI. CONCLUSION

Based on the foregoing, the Challenged Claims are unpatentable. Accordingly, Petitioner requests institution of an *inter partes* review to cancel these claims.

Respectfully submitted,

DICKINSON WRIGHT PLLC

Dated: April 14, 2025

/ *Steven R. Daniels* /
Steven R. Daniels, Registration No. 45,345
Attorney for Petitioner
SIG Sauer Inc.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on April 14, 2025 true and correct copies of the foregoing PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 8,561,543, Petitioner's Power of Attorney, and all associated exhibits were served in their entireties on the following parties via FedEx Express or Express Mail:

Sean Burdick
Burdick Patents, P.A.
300 N. 6th Street, Suite 200
Boise, ID 83702

And served by email to: kris@burdickpatents.com,
docketing@burdickpatents.com

Dated: April 14, 2025

DICKINSON WRIGHT PLLC

/ Steven R. Daniels /
Steven R. Daniels, Registration No. 45,345
Attorney for Petitioner
SIG Sauer Inc.

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE REQUIREMENTS

1. This Petition complies with the type-volume limitation in 37 C.F.R. §42.24(d) in that it contains 11,755 words, excluding the parts exempted by 37 C.F.R. §42.24(a), as measured by the word processing software used to prepare the document.

2. This Petition complies with the general format requirements of 37 C.F.R. §42.6(a) and has been prepared using Microsoft Word 2016 in 14 point Times New Roman.

Dated: April 14, 2025

DICKINSON WRIGHT PLLC

/ Steven R. Daniels /
Steven R. Daniels, Registration No. 45,345
Attorney for Petitioner
SIG Sauer Inc.