

IPR2024-00936 (U.S. Patent No. 9,118,528)

Patent Owner's Sur-Reply

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TEXAS INSTRUMENTS INC.,

Petitioner,

v.

PARKERVISION, INC.

Patent Owner

U.S. Patent No. 9,118,528

Issue Date: August 25, 2015

Title: METHOD AND SYSTEM FOR DOWN-CONVERTING AN
ELECTROMAGNETIC SIGNAL, AND TRANSFORMS FOR SAME, AND
APERTURE RELATIONSHIPS

Inter Partes Review No. IPR2024-00936

PATENT OWNER'S SUR-REPLY

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PATENT OWNER'S EXHIBIT LIST

Exhibit No.	Description
2006	U.S. Patent No. 6,061,551
2007	Joint Claim Construction Statement, ParkerVision, Inc. v. Texas Instruments Inc., 6:23-cv-00384, Dkt. 50 (April 29, 2024)
2008	RESERVED
2009	UA741 datasheet
2010	Boeing Report dated April 29, 1998
2011	ParkerVision schematic dated January 20, 1998
2012	Eddie chip layout dated March 6, 1997
2013	ParkerVision circuit board layout
2014	ParkerVision schematic dated August 21, 1997
2015	Conception/Reduction to practice chart
2016	Declaration of David Sorrells
2017	RESERVED
2018	RESERVED
2019	ParkerVision Announces Breakthrough in Wireless Radio Frequency Technology
2020	Laboratory Tests Verify ParkerVision Wireless Technology
2021	Universal Direct Conversion Receiver Evaluation ASIC Contract between ParkerVision and The Boeing Company
2022	Notes from Boeing Tests
2023	RESERVED
2024	Declaration of Dr. David Ricketts
2025	Excerpts from Howe, R. et al., Microelectronics: An Integrated Approach
2026	RESERVED
2027	Development Agreement between ParkerVision and TriQuint Semiconductor dated March 4, 1997
2028	Default Protective Order
2029	Spreadsheet showing ParkerVision files
2030	Claim Construction Order dated 2/20/13 – No. 3:11-cv-00719 (MDFL)
2031	Excerpt of Graf, R., Modern Dictionary of Electronics, Seventh Edition

2032	Rofougaran, A., et al., A 1 GHz CMOS RF Front-End IC for a Direct Conversion Wireless Receiver
2033	RESERVED
2034	Deposition Transcript of Ian Galton, dated March 12, 2025
2035	Sedra, Microelectronic Circuits (4 th ed. 1998)
2036	ParkerVision's Disclosure of Additional Final Infringement Contentions, dated March 31, 2025.
2037	CMOS Analog Circuit Design
2038	Full table of contents for Howe, R. et al., Microelectronics: An Integrated Approach
2039	Full table of contents for Sedra, Microelectronic Circuits (4th ed. 1998)
2040	Full table of contents for CMOS Analog Circuit Design
2041	Declaration of Taylor Lepore
2042	Deposition Transcript of Ian Galton, dated July 16, 2025
2043	Deposition Transcript of James Dickens, dated July 18, 2025
2044	Exhibit 3 of Ex.-2043, Figure 7-3 from Ex.-2010

I. Petitioner's Reply Violates 37 C.F.R. § 42.6(a)(3) and C.F.R. § 42.22(a)(2).

Petitioner's Reply improperly attempts to circumvent the word limits by incorporating arguments by reference from its expert declarations, in violation of 37 C.F.R. § 42.6(a)(3). Petitioner's Reply further fails to cite the expert declarations with the specificity required under C.F.R. § 42.22(a)(2).

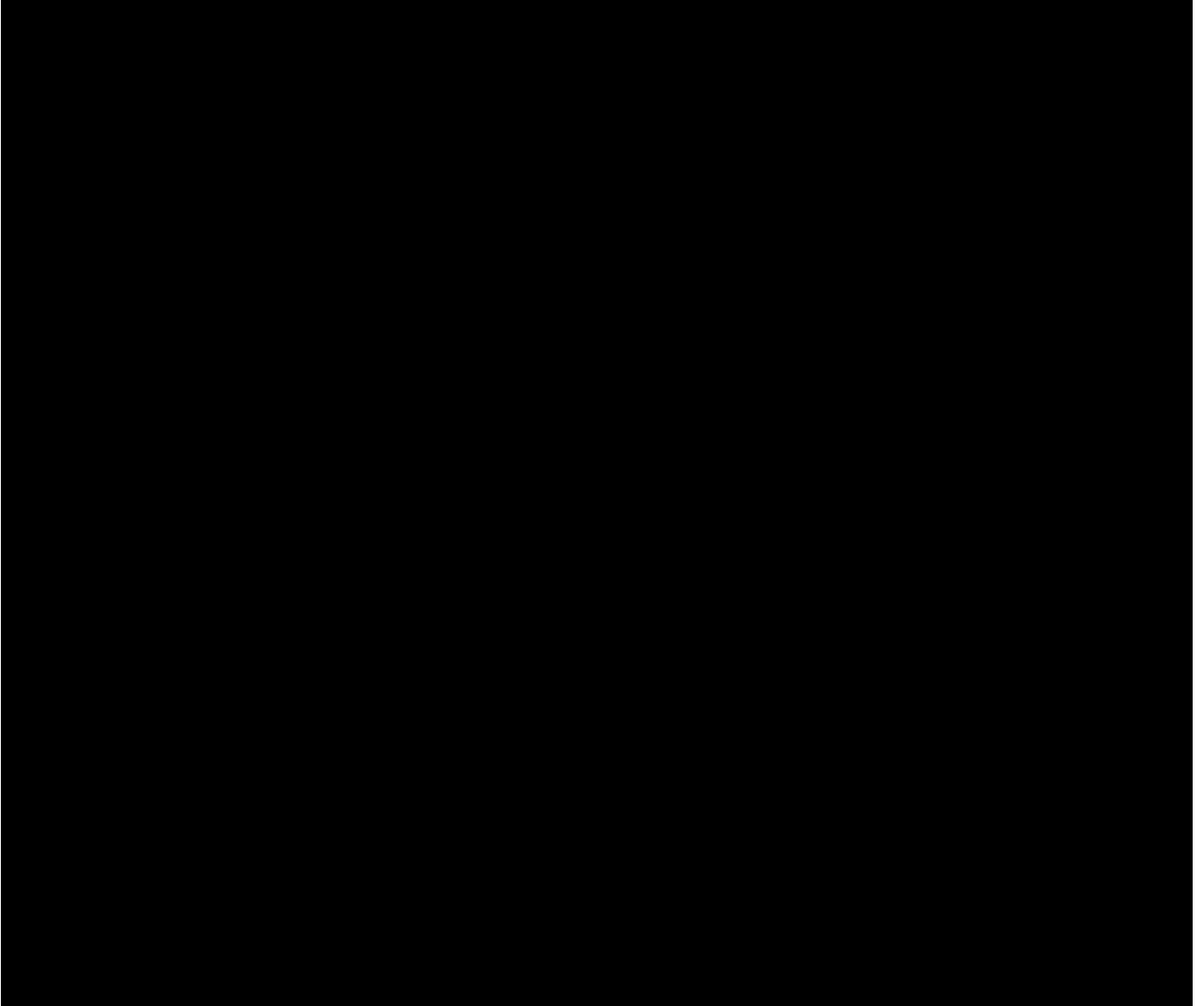
Petitioner submitted two expert declarations collectively spanning **107 pages** (over **20,000 words/185 paragraphs**) of *substantive* analysis. But the Reply itself contains only short, conclusory arguments, followed by citations to numerous paragraphs in these declarations. *See, e.g.*, Reply, 10 (citing TI-1067, ¶¶16-20), 12 (citing TI-1067, ¶¶19-22), 23 (citing TI-1066, ¶¶11-35), 24 (citing TI-1066, ¶¶36-40), 25 (citing TI-1066, ¶¶44-51), 32-33 (citing TI-1066, ¶¶102-139).

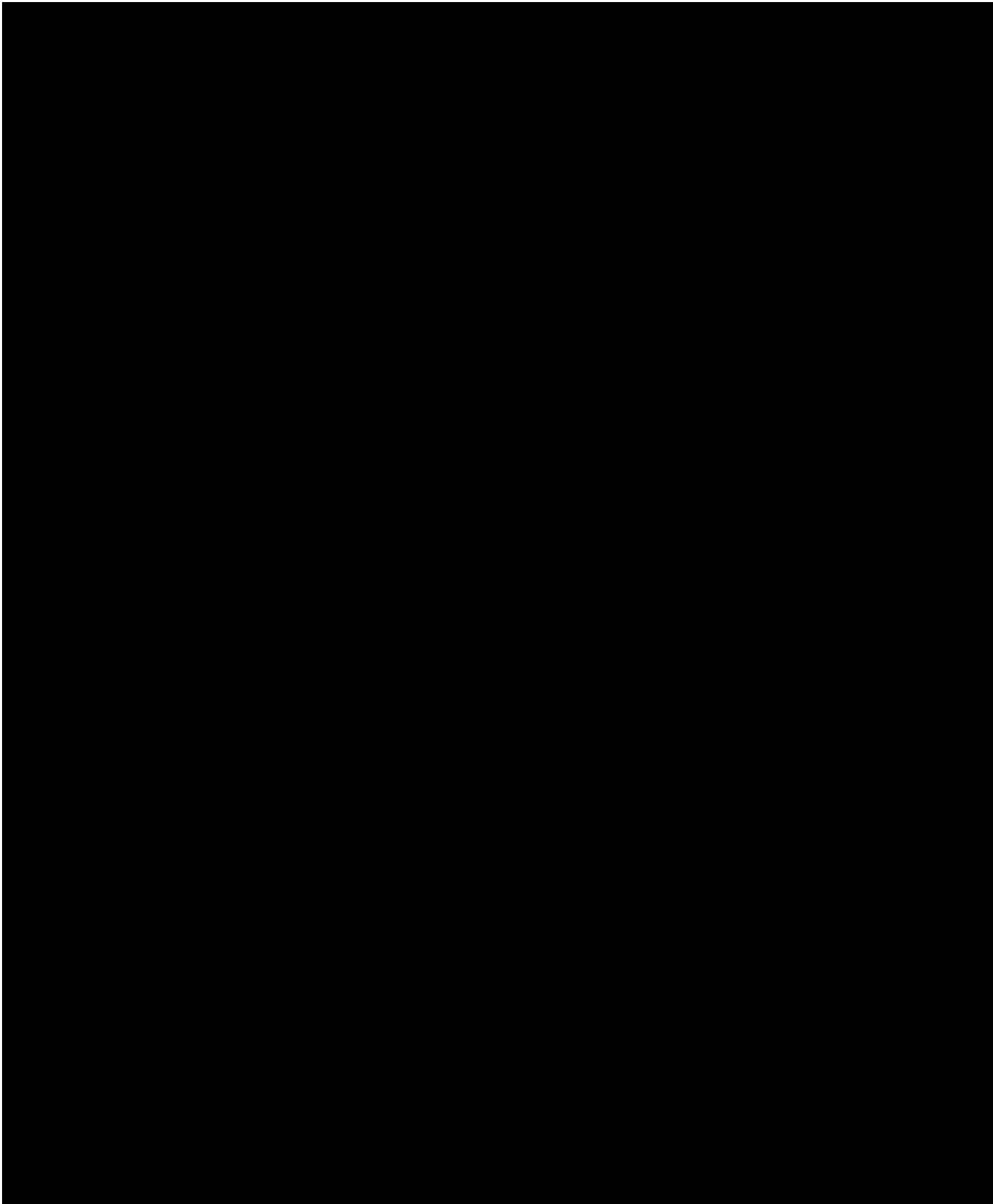
Critically, the declarations contain specific arguments/analysis not found in the Reply. PO is unfairly prejudiced because it cannot possibly address even a fraction of this within its sur-reply word limit. Moreover, Petitioner's vague and expansive citations force PO (and the Board) to wade through expert declarations just to piece together the bases for Petitioner's allegations.

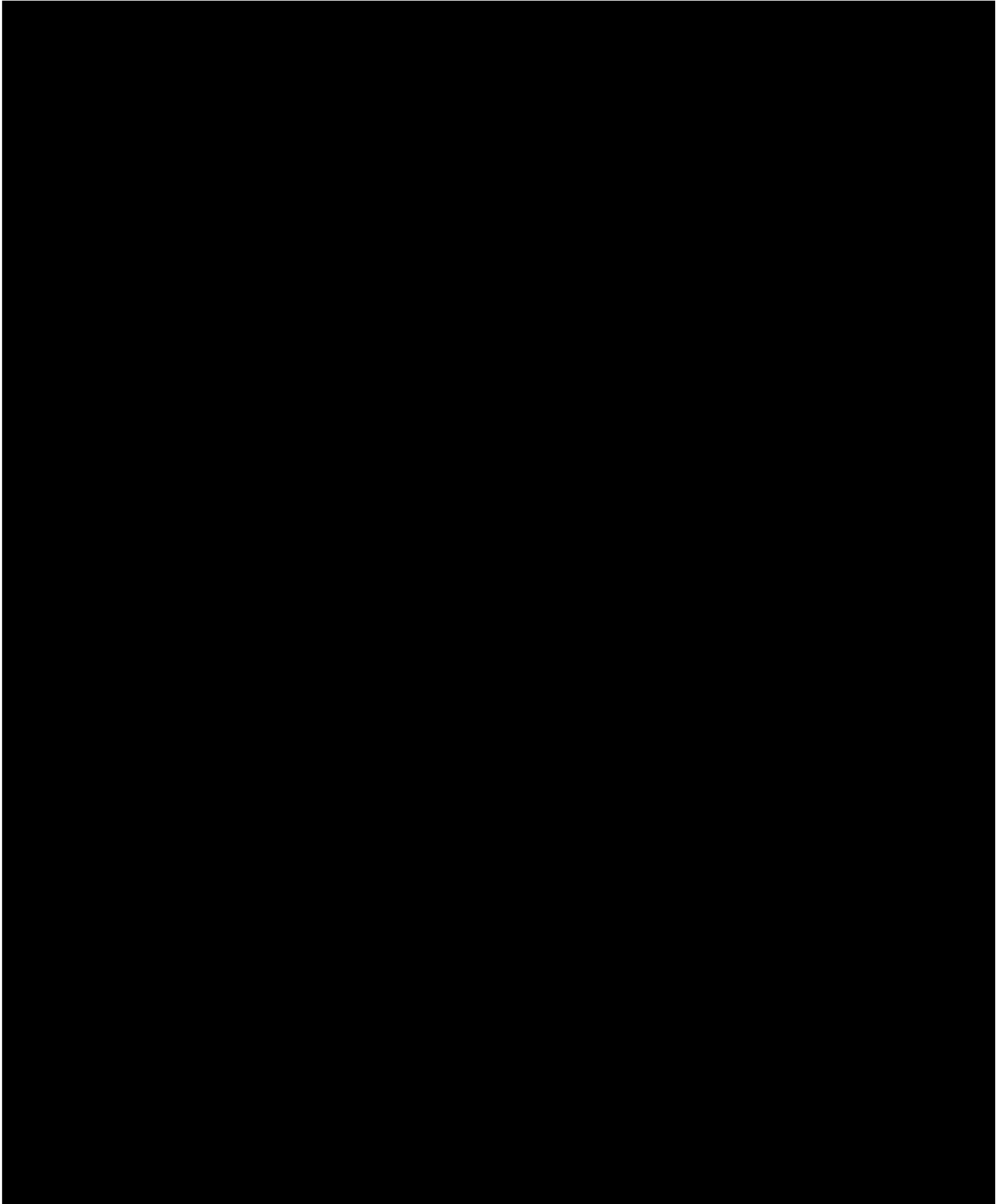
Thus, PO respectfully requests that the Board decline to consider arguments/analysis/expert testimony and supporting exhibits not specifically discussed in the Reply. *See Apple Inc. v. Masimo Corp.*, IPR2022-01291, Paper 75,

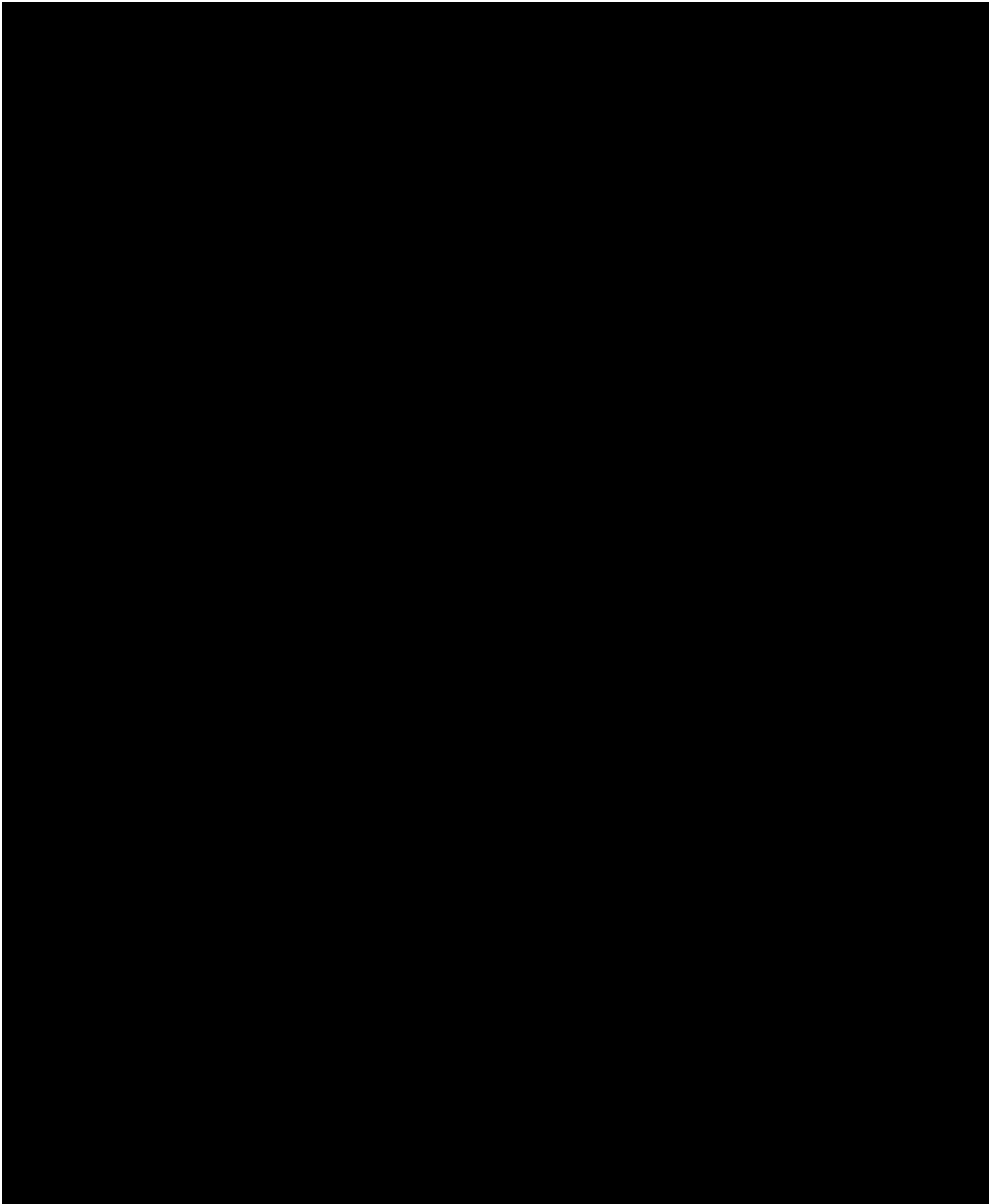
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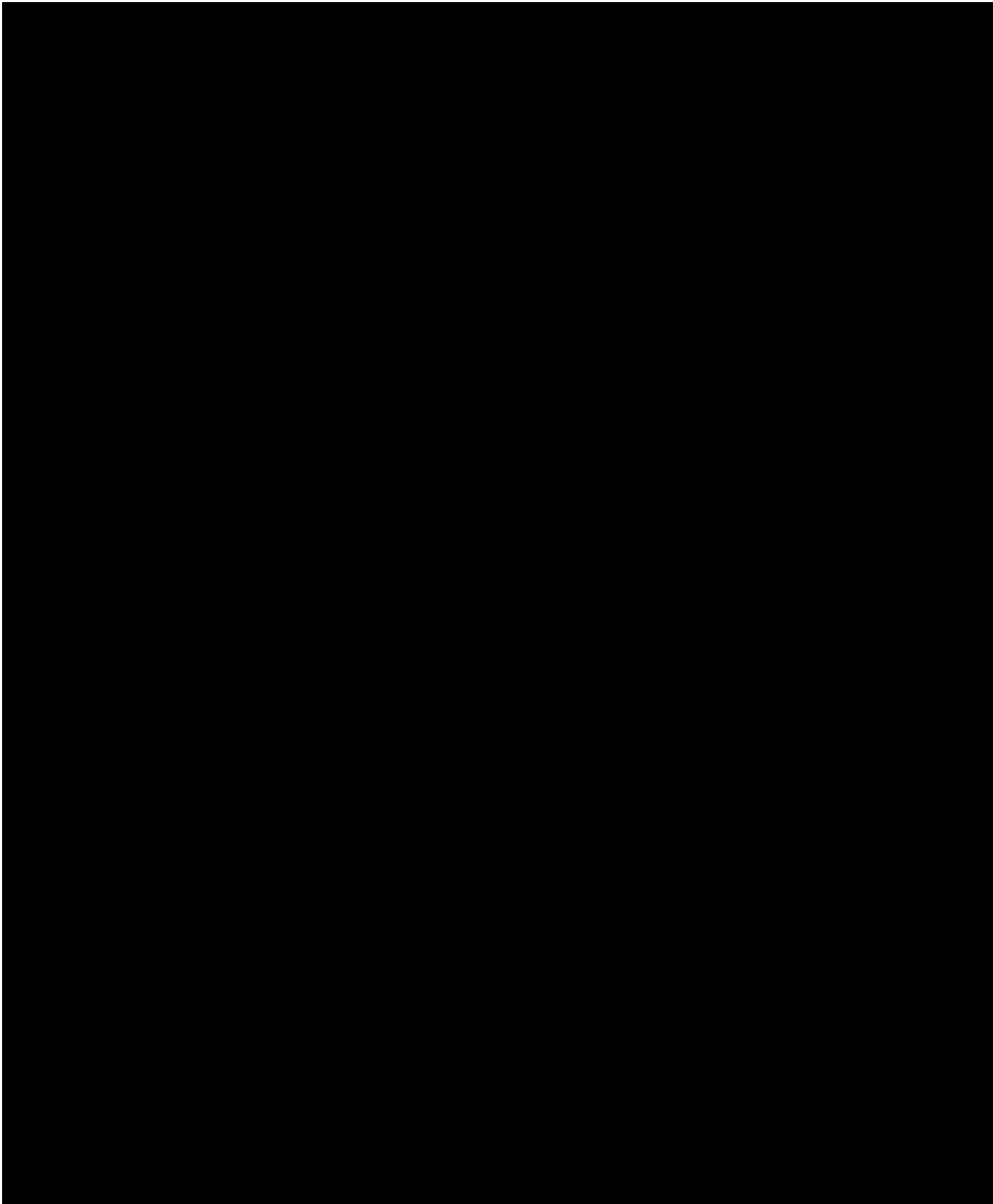
90-91 (P.T.A.B. Jan. 30, 2024) (declining to consider expert testimony/supporting exhibits); *Google LLC v. Parus Holdings Inc.*, IPR2020-00846, Paper 31,13-14 (P.T.A.B. Oct. 19, 2021) (same).

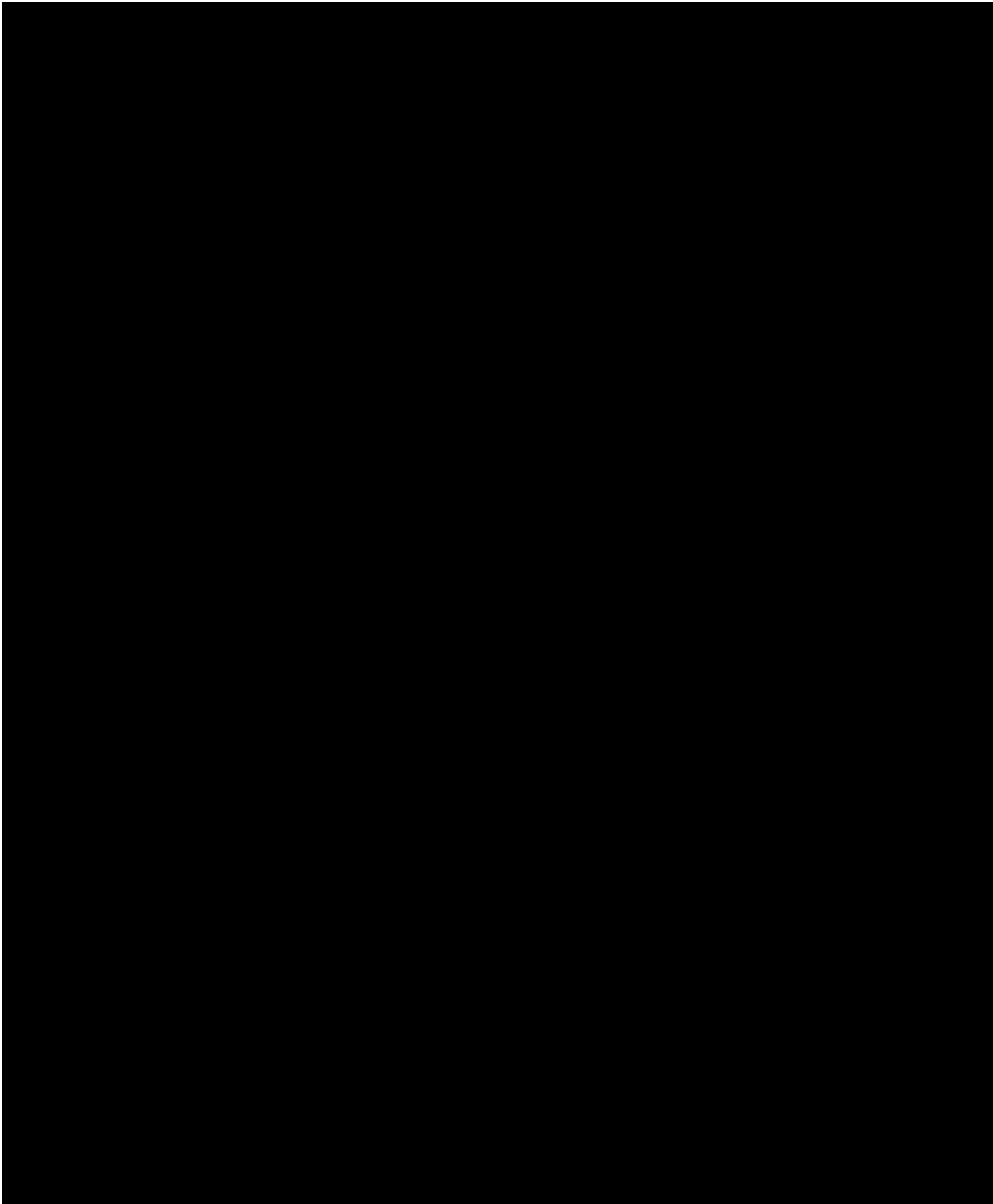


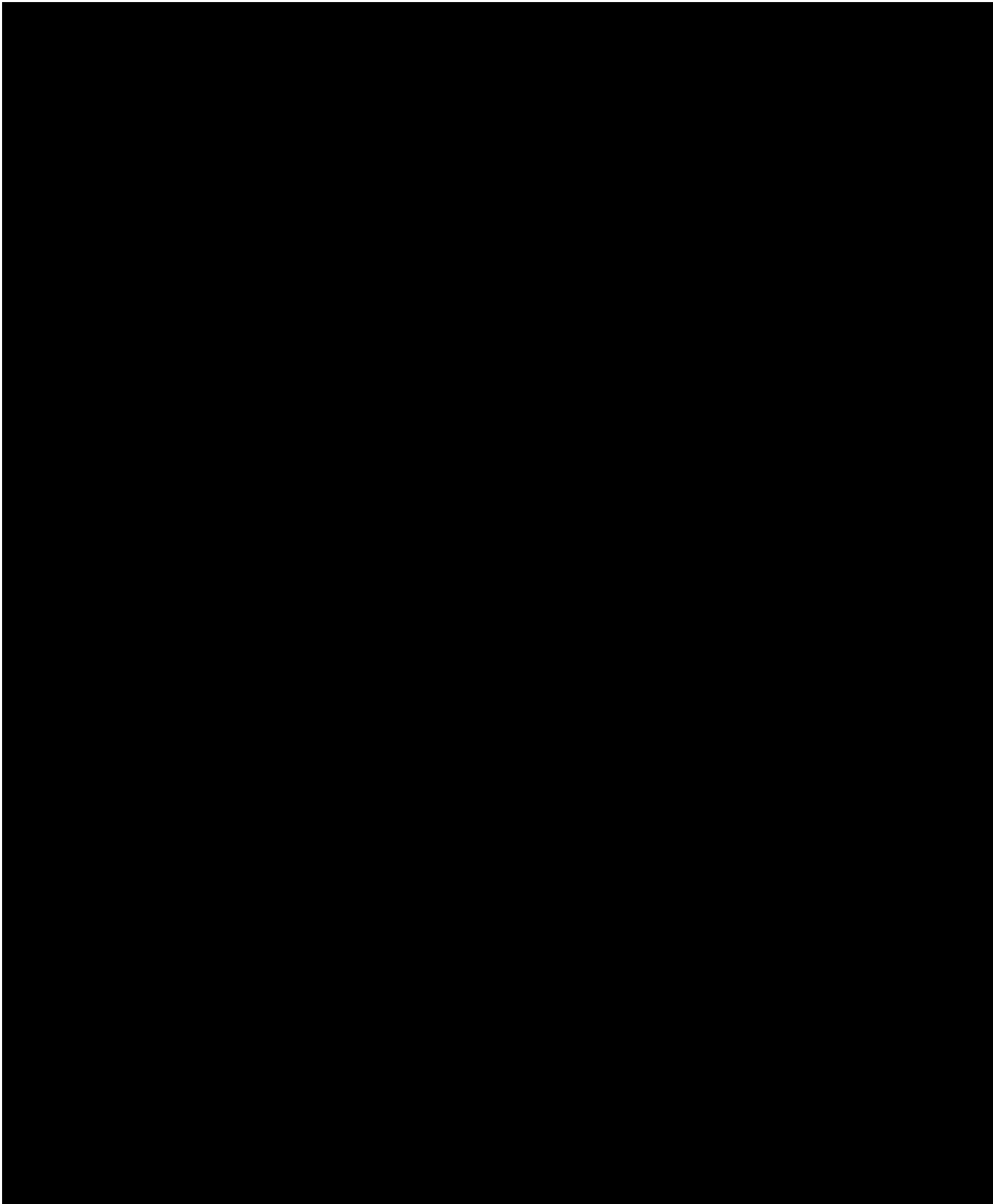


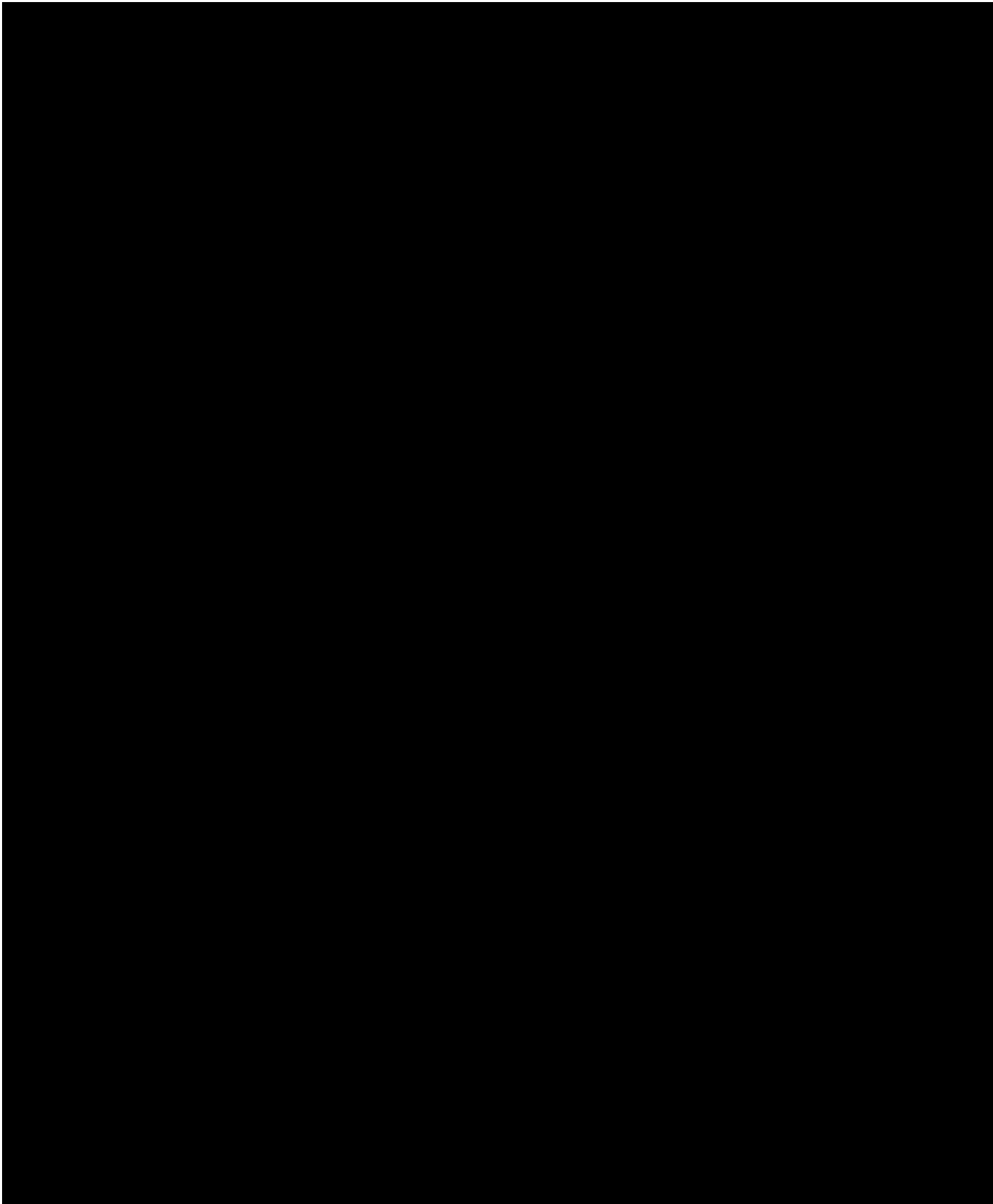


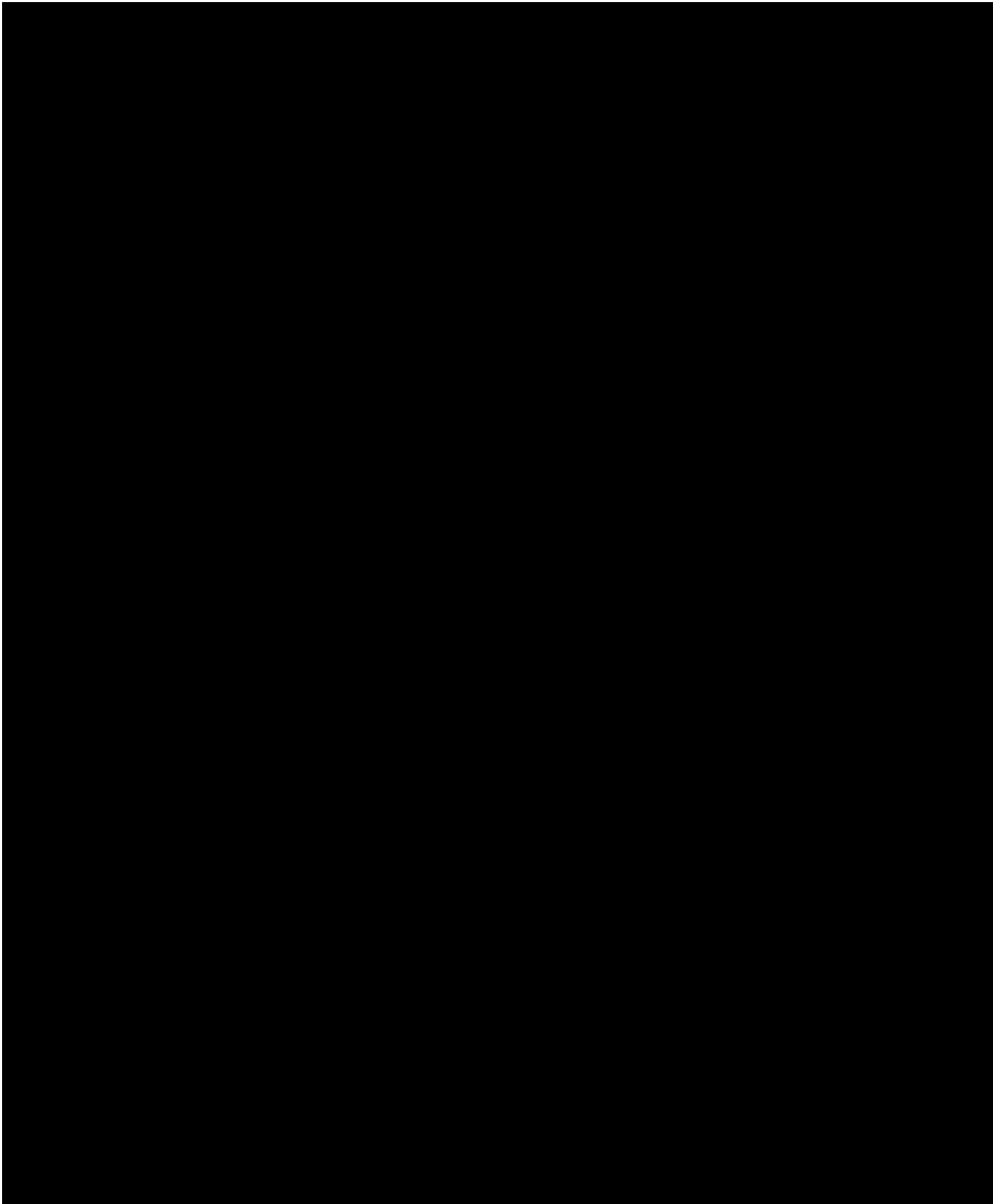


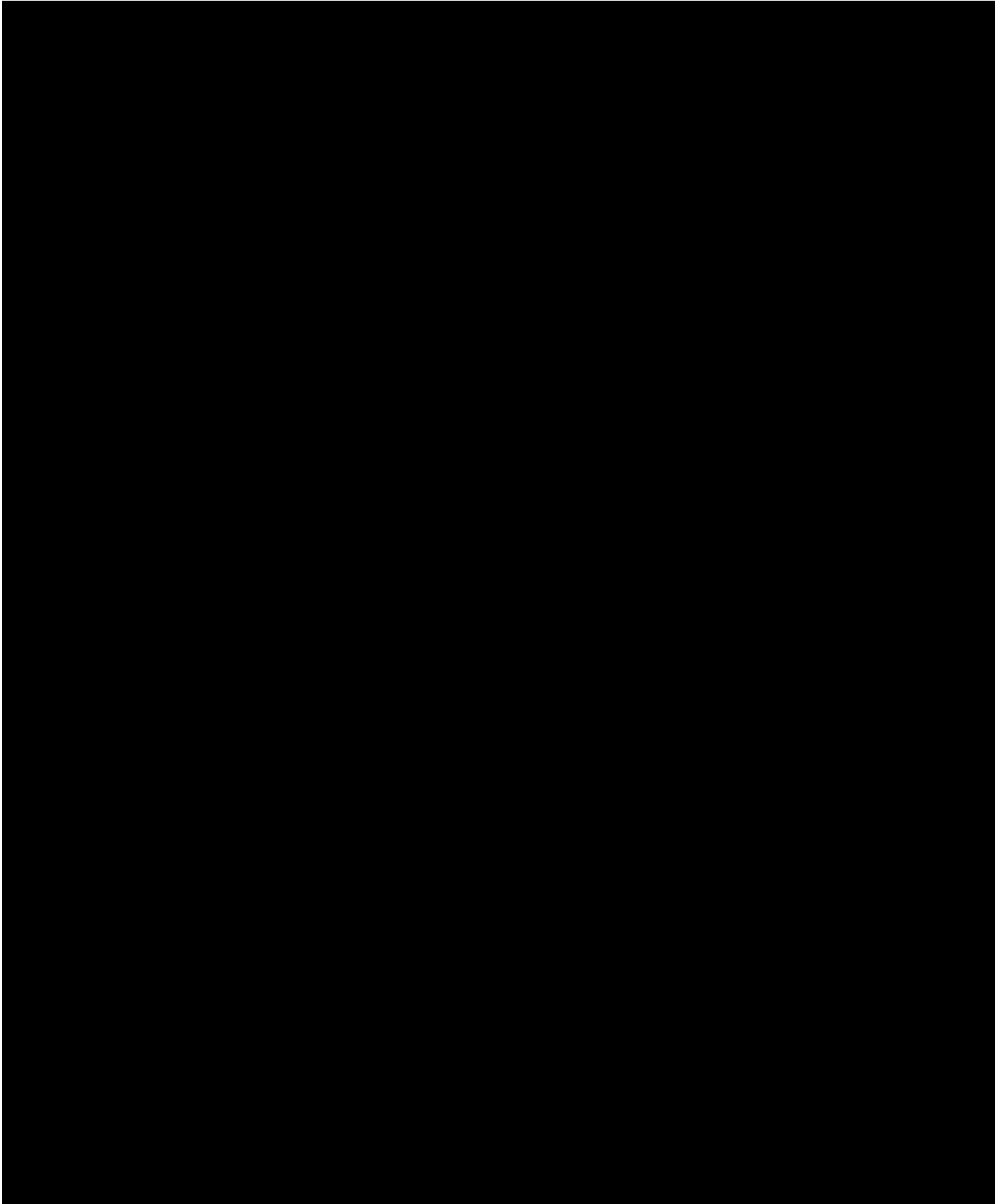


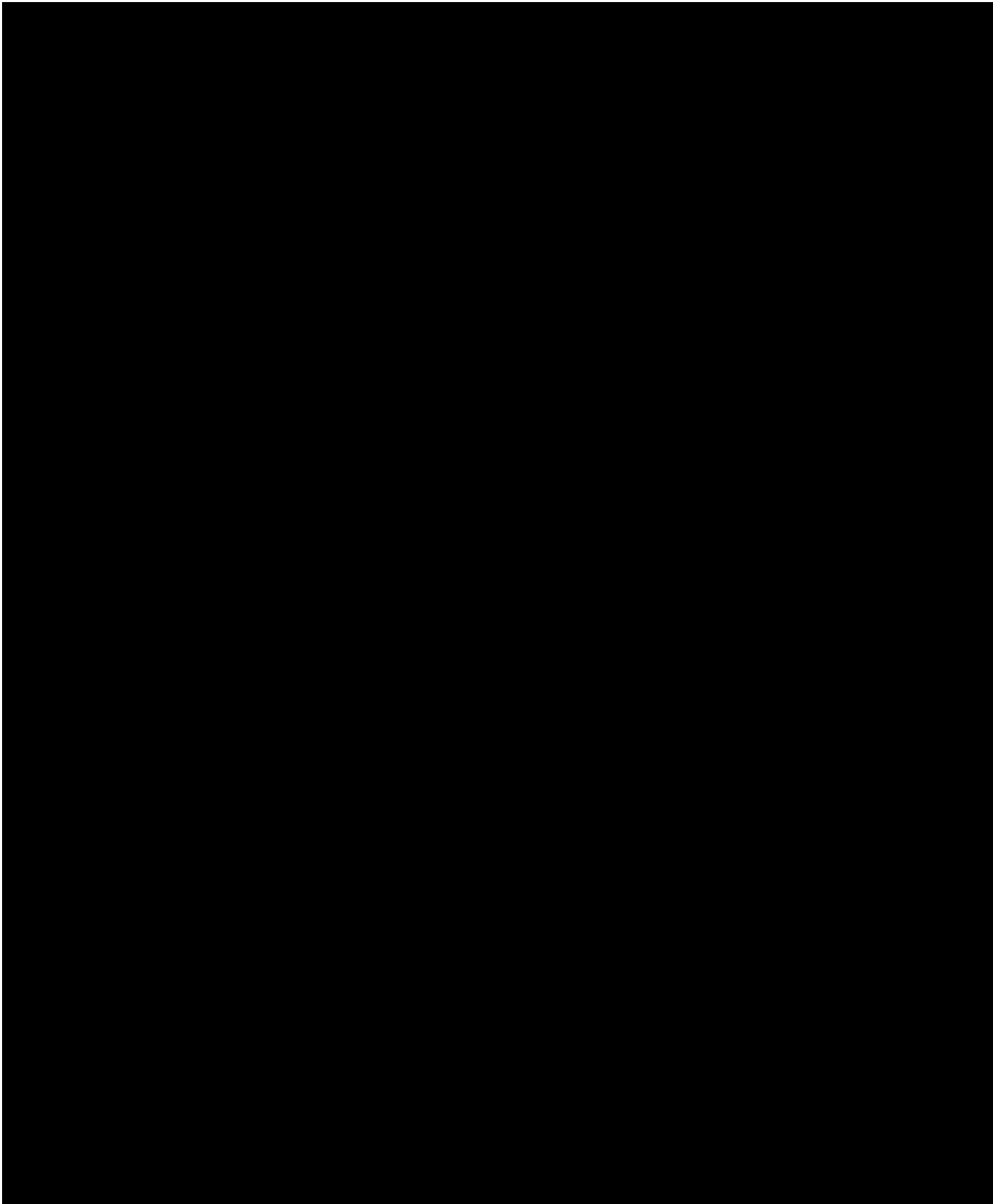


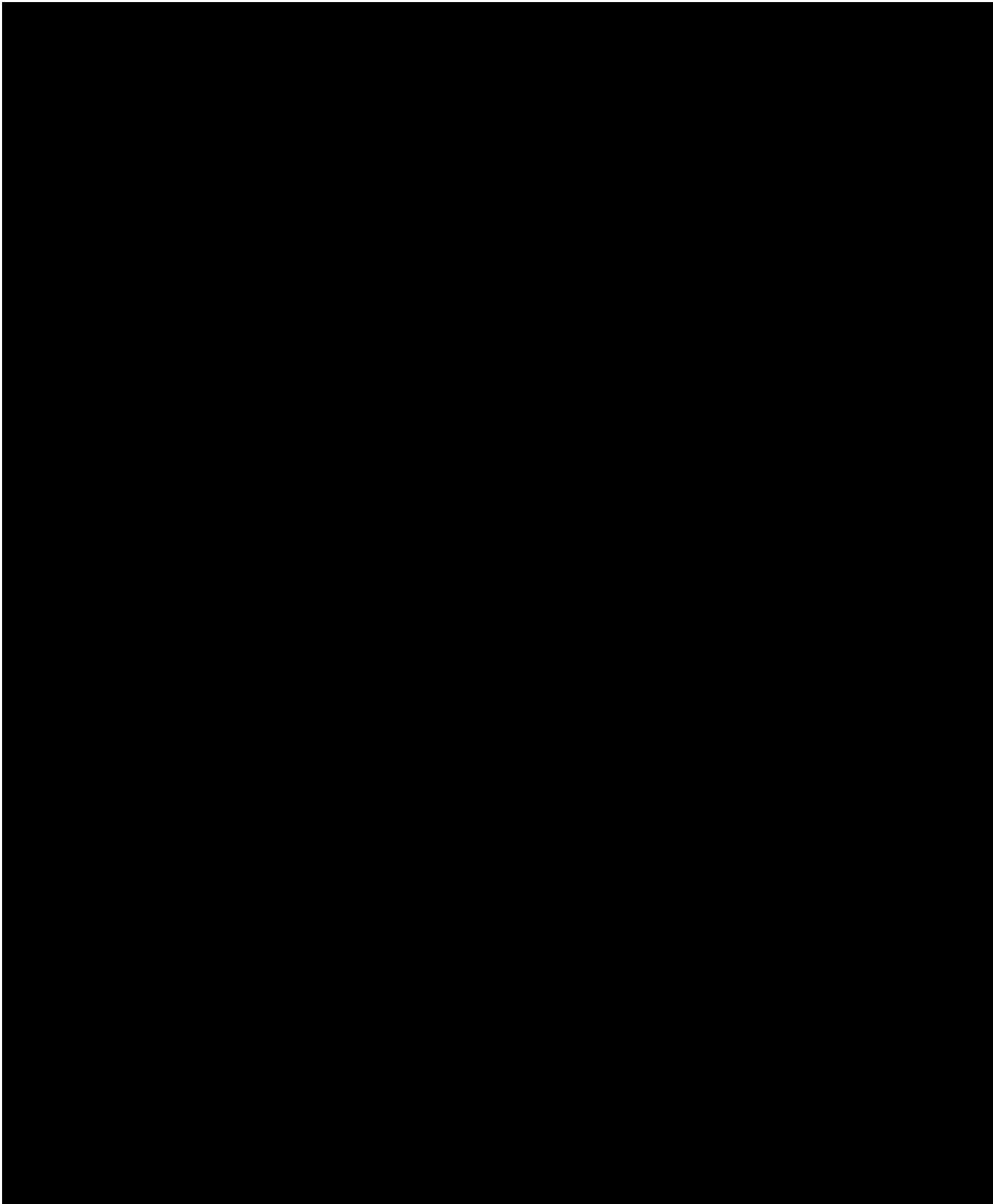


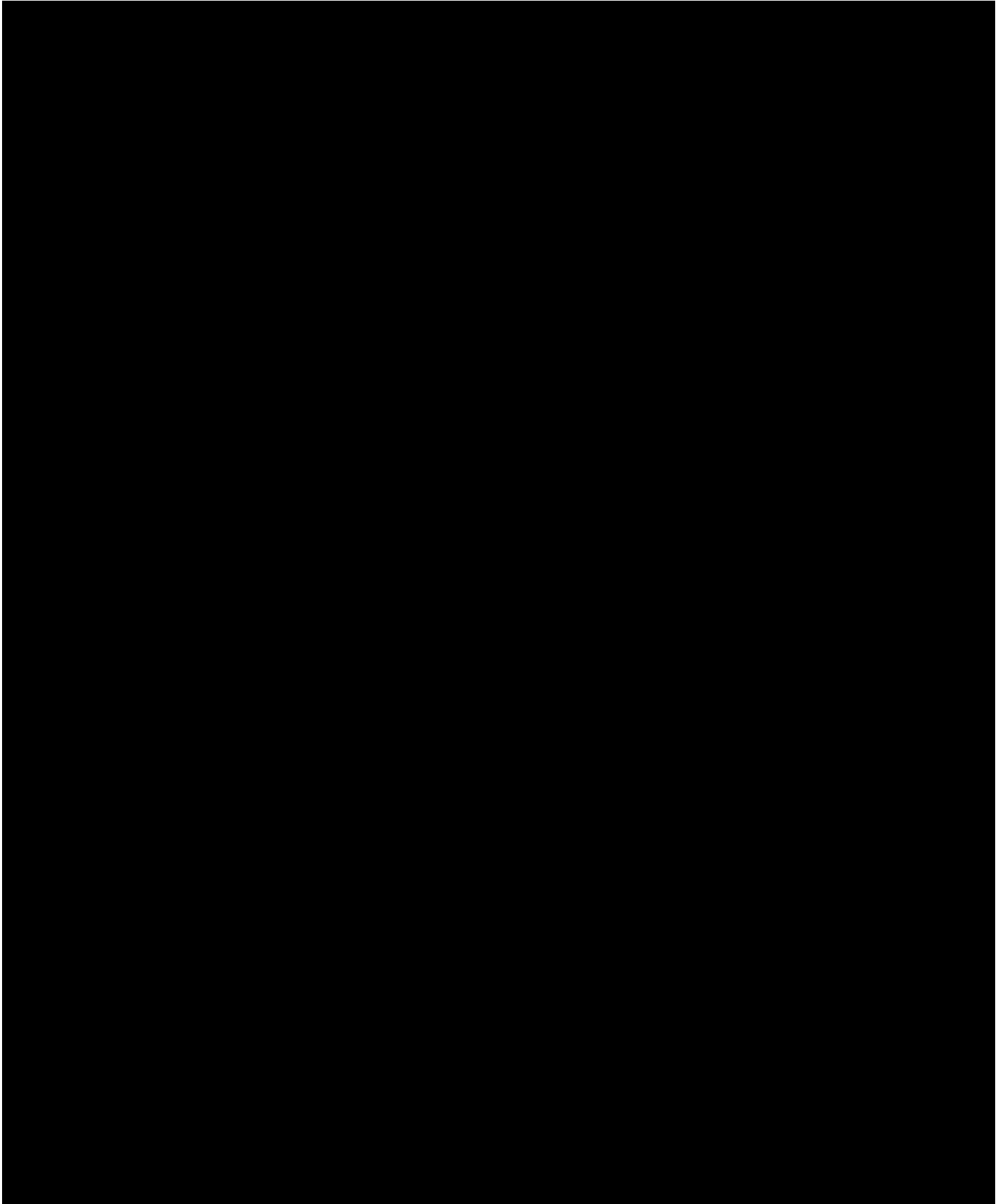


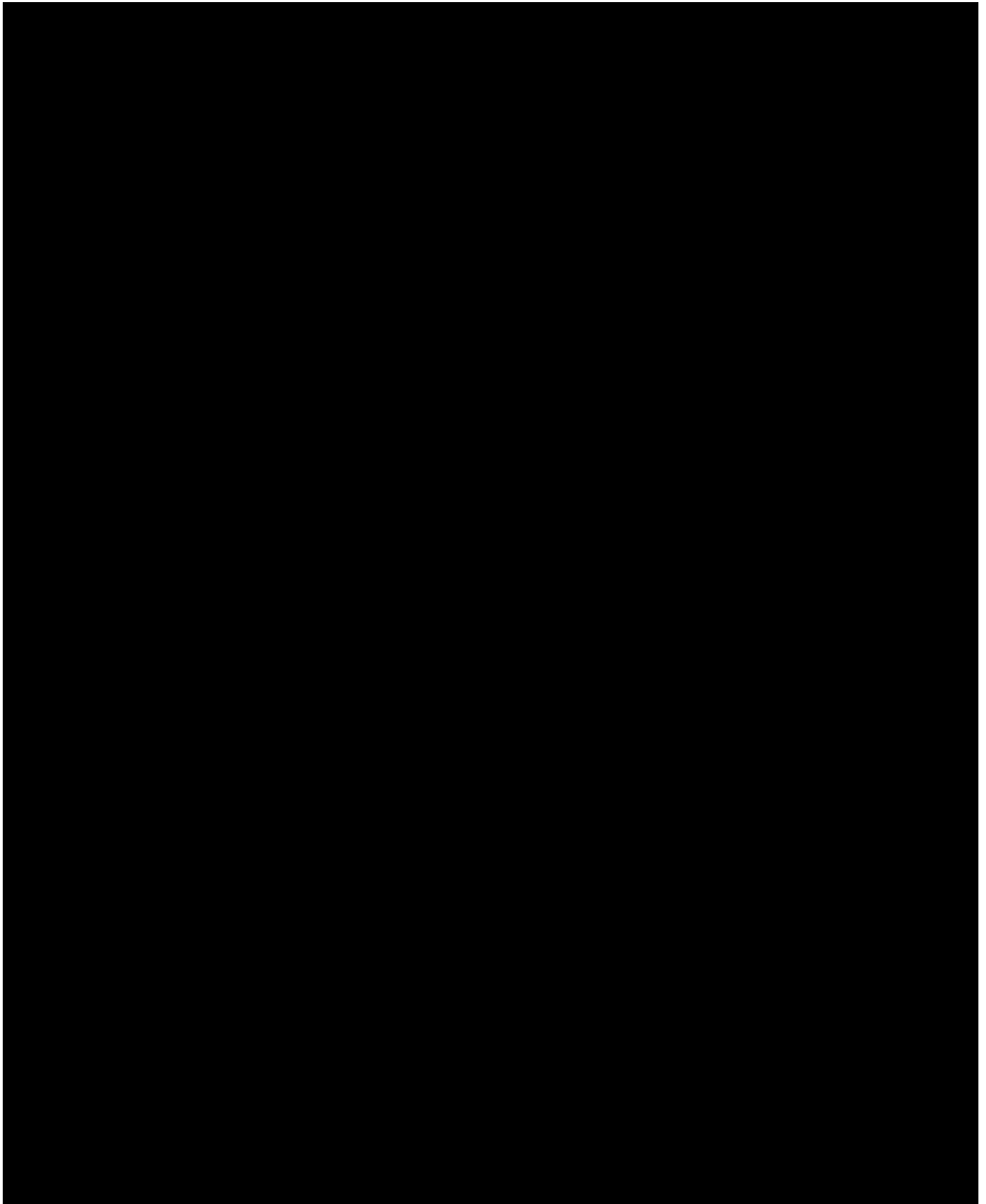


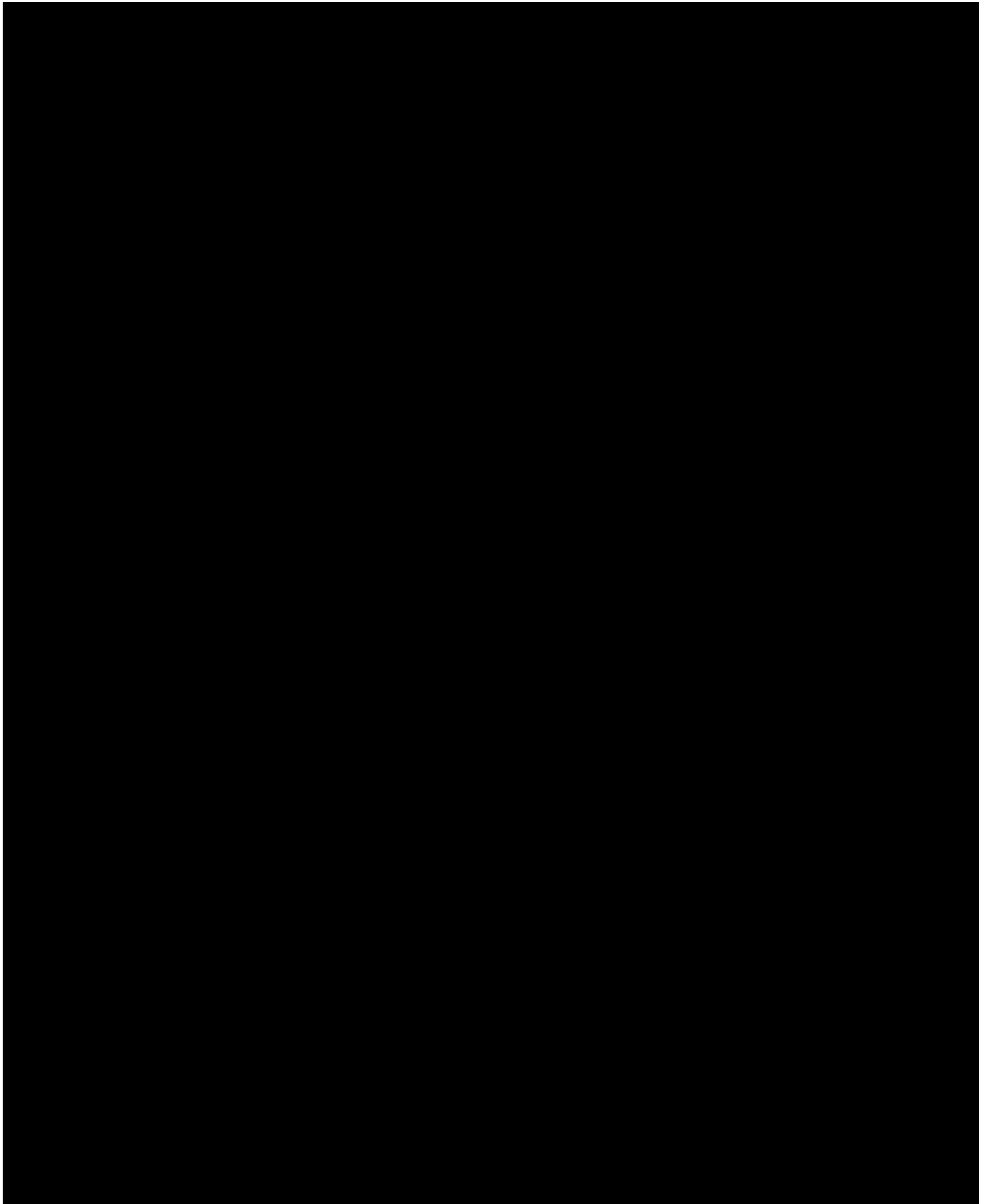


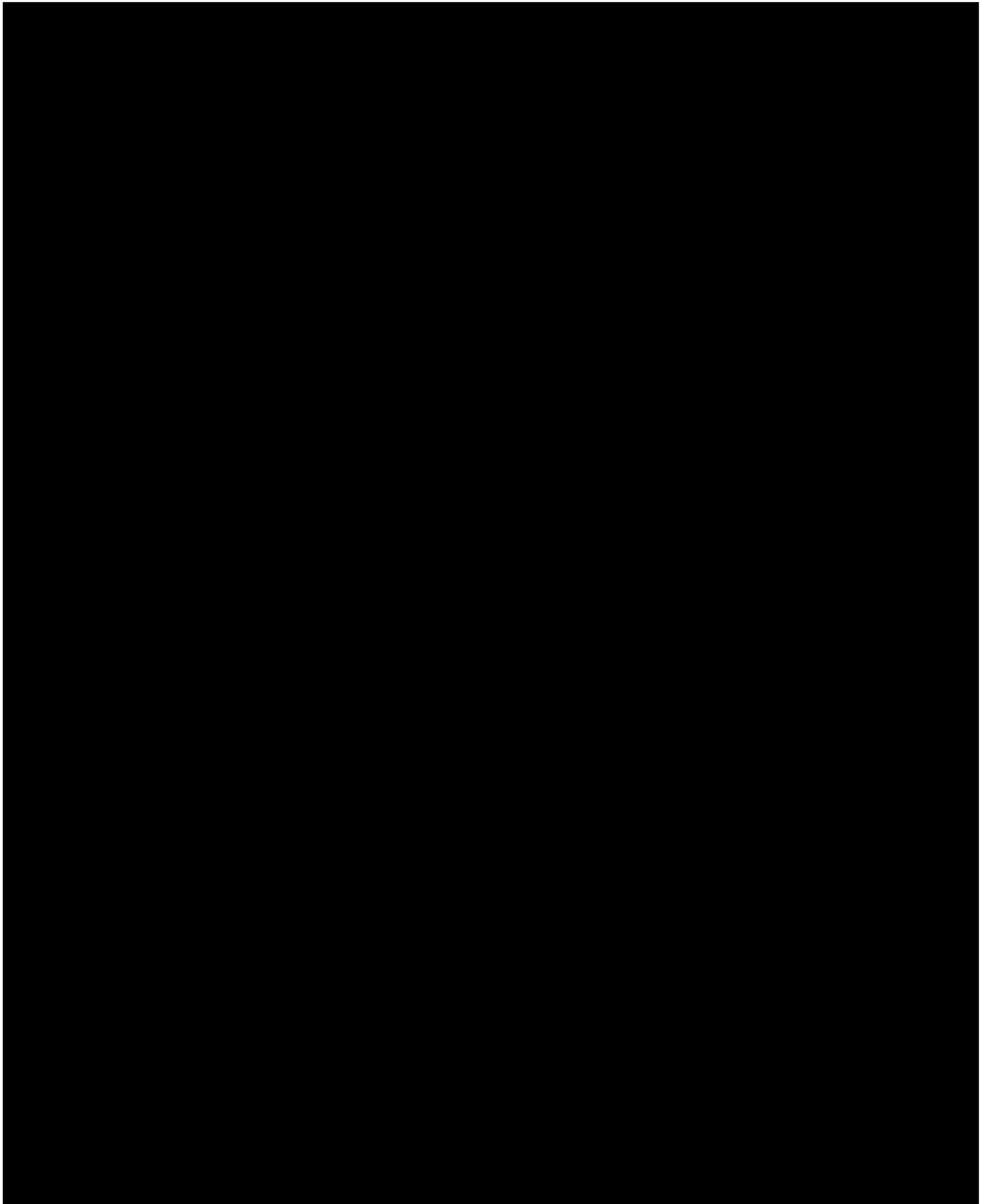


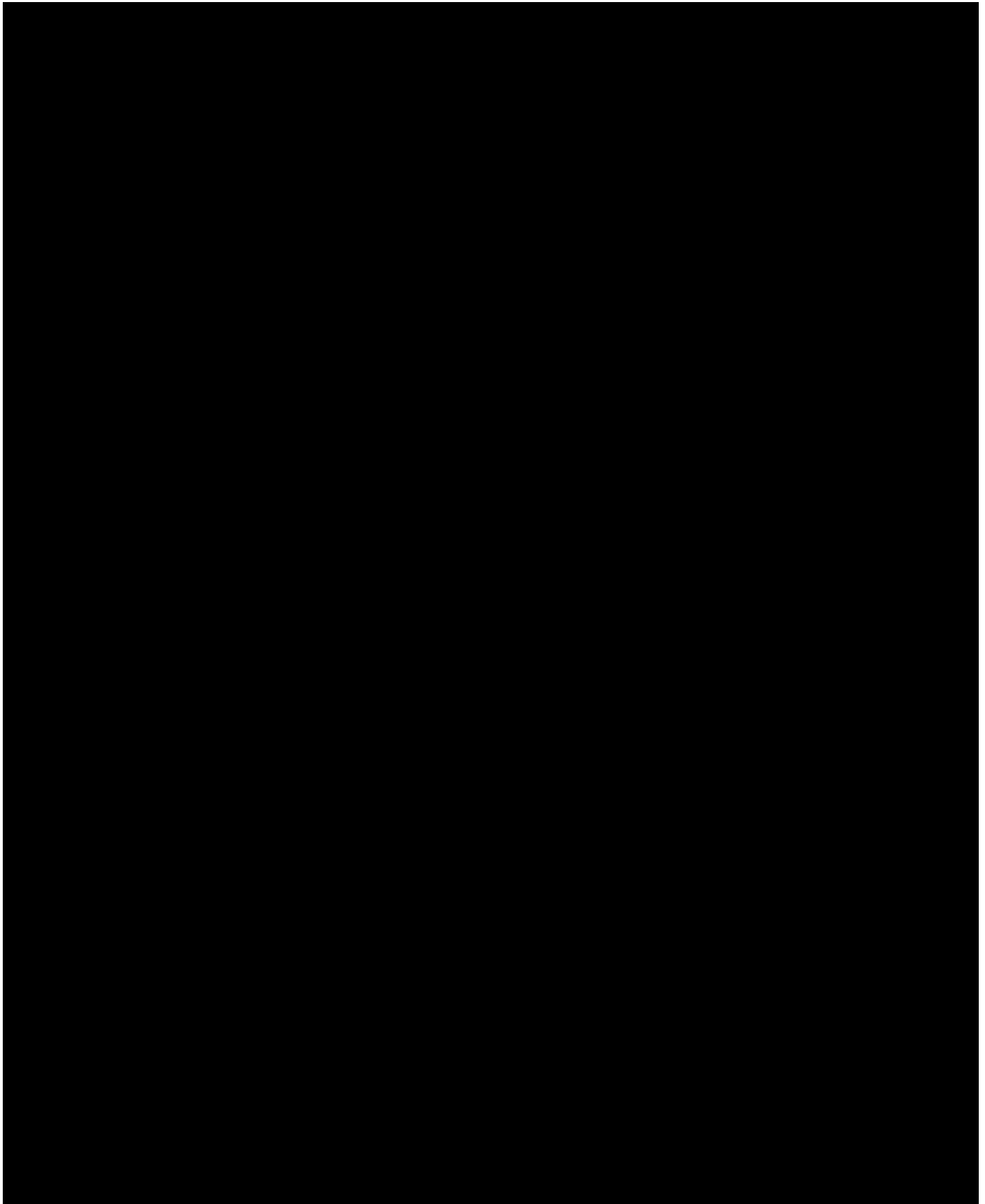


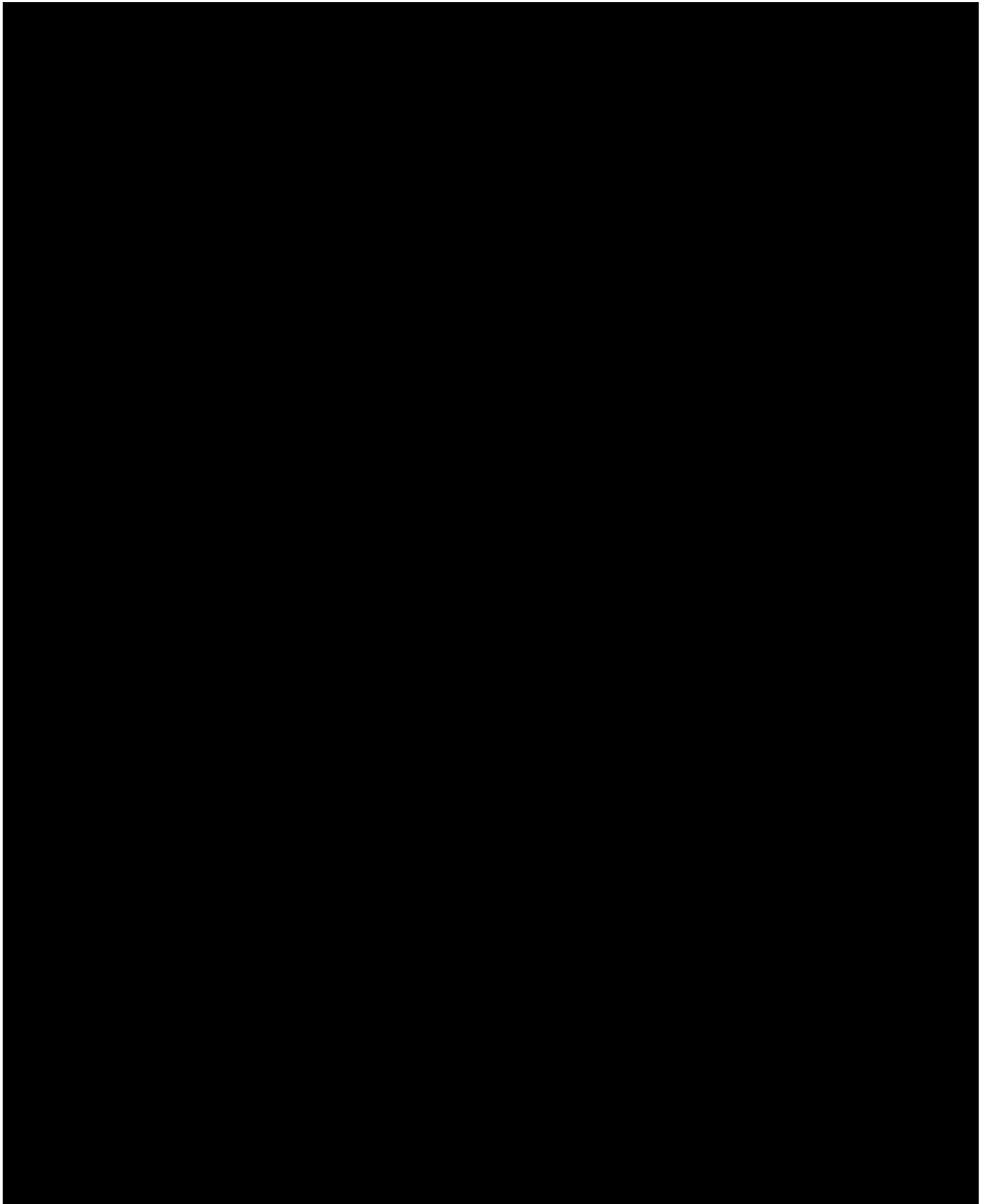


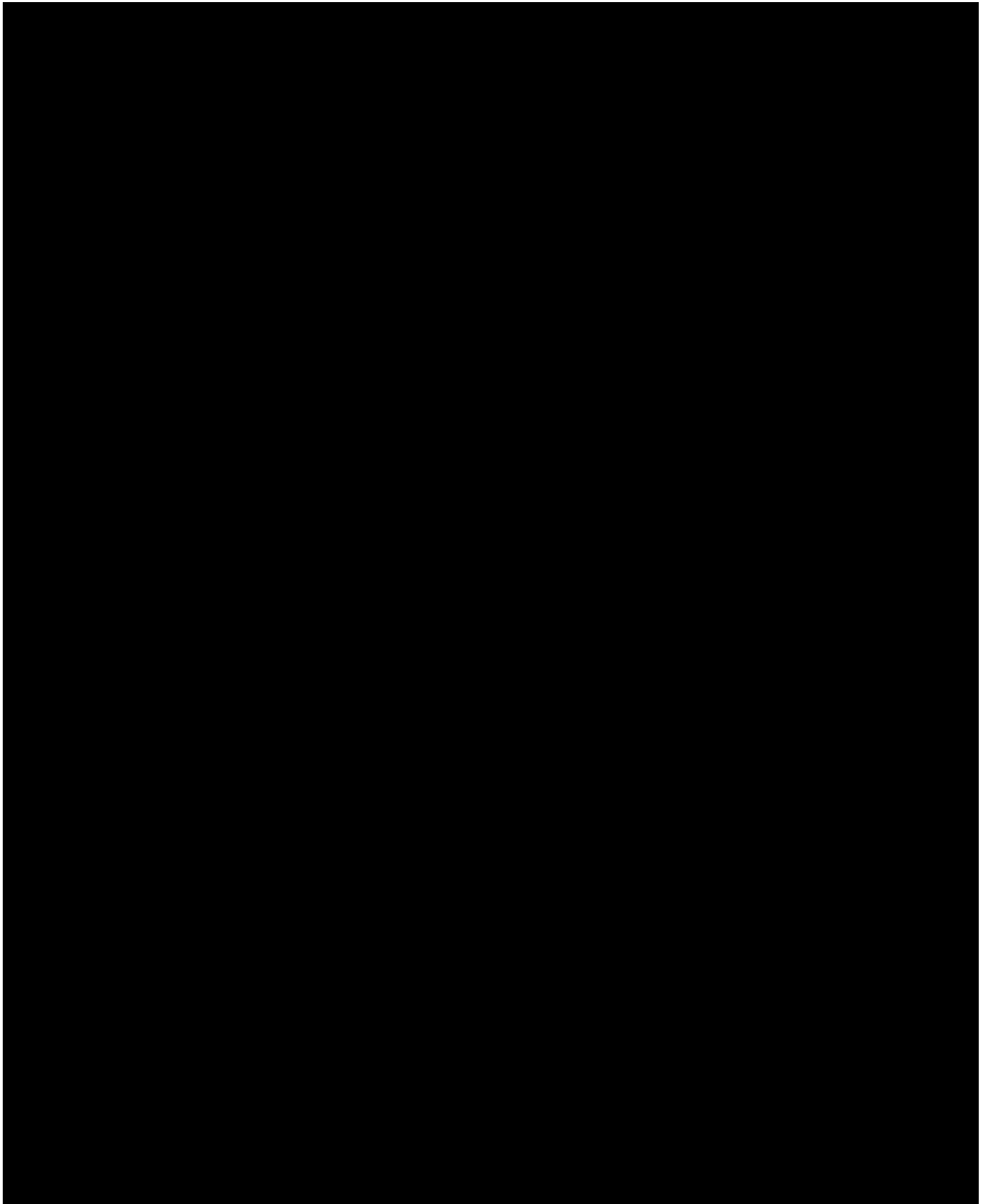


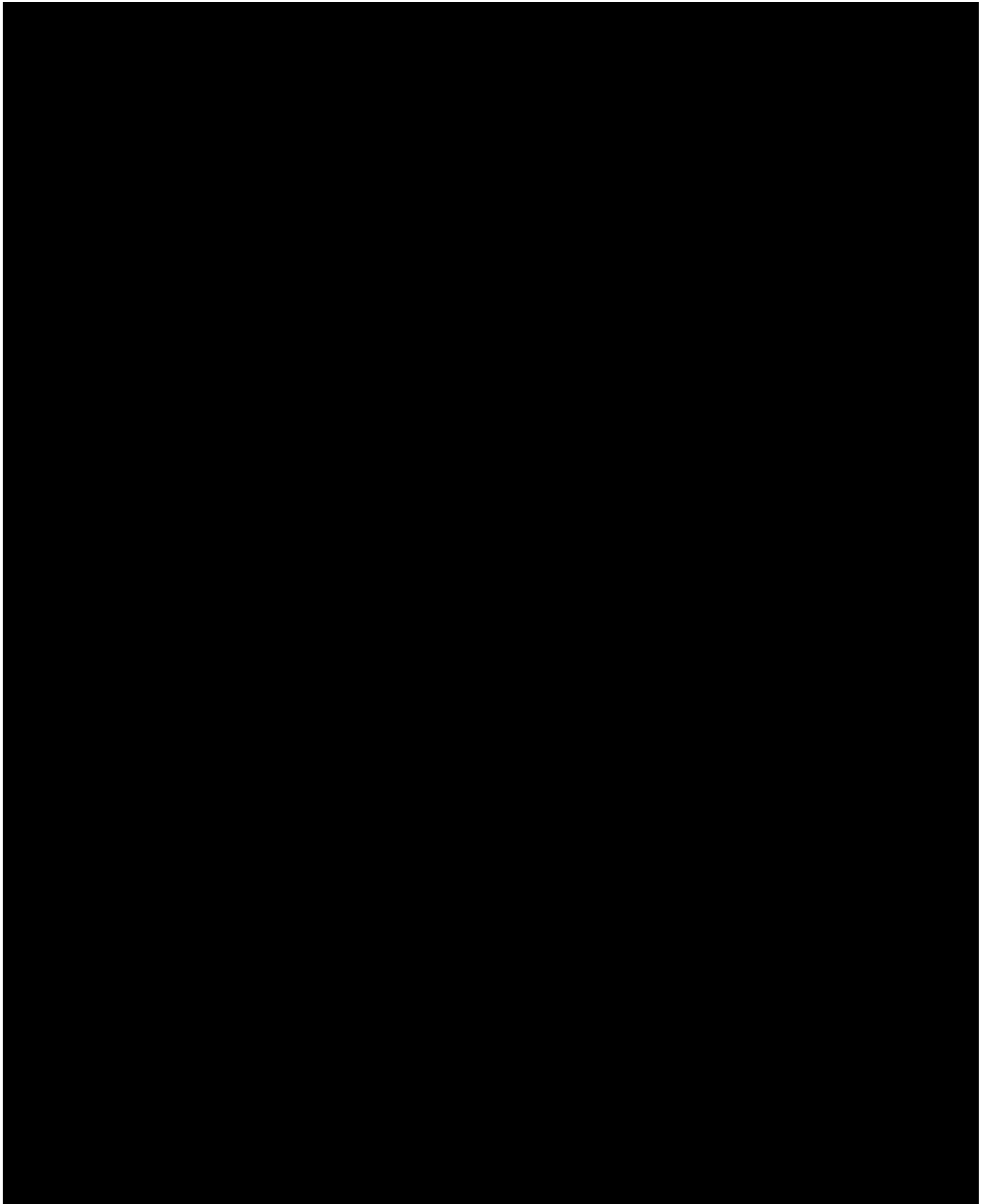


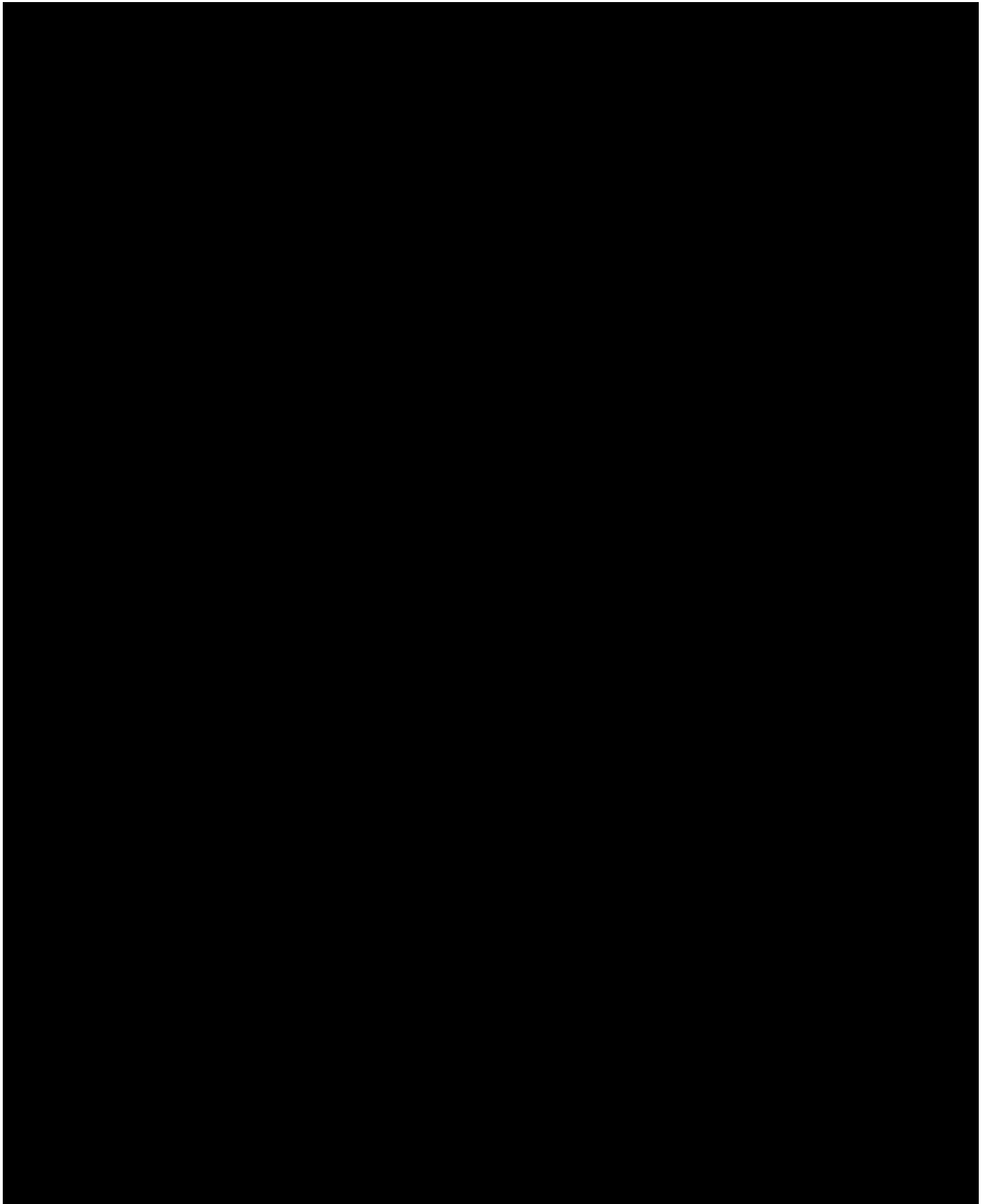


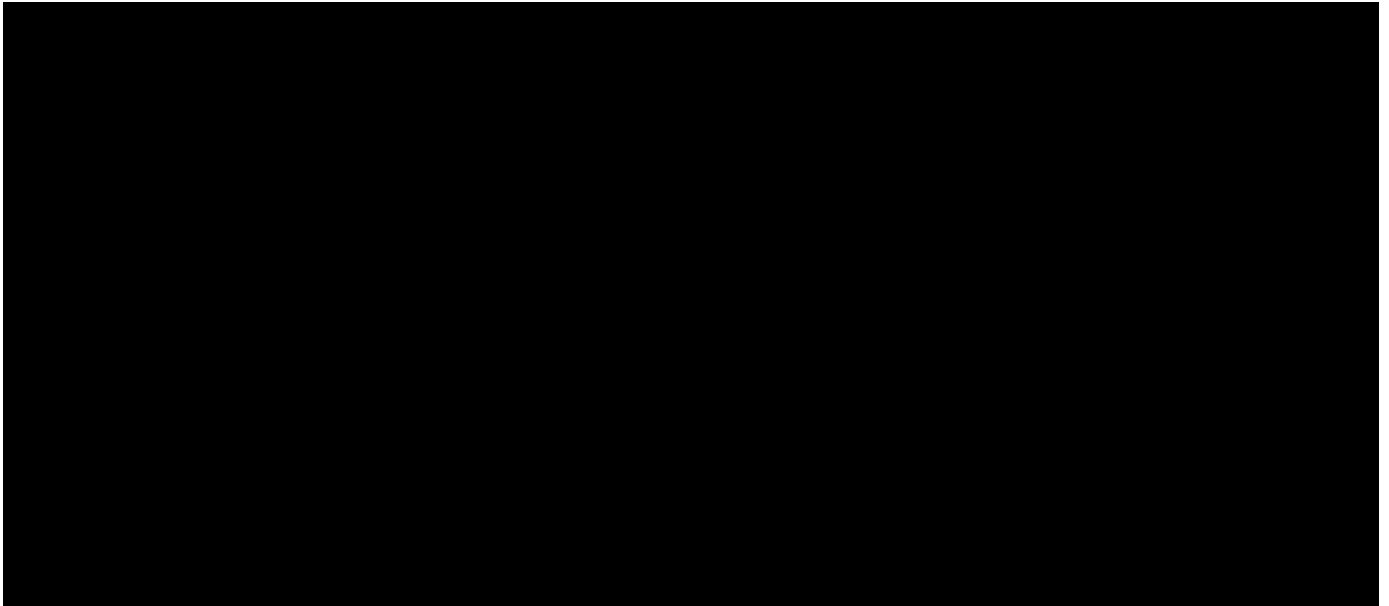












VI. Ground 1A/1B

A. There Is No Motivation to Combine Tayloe with Macnally.

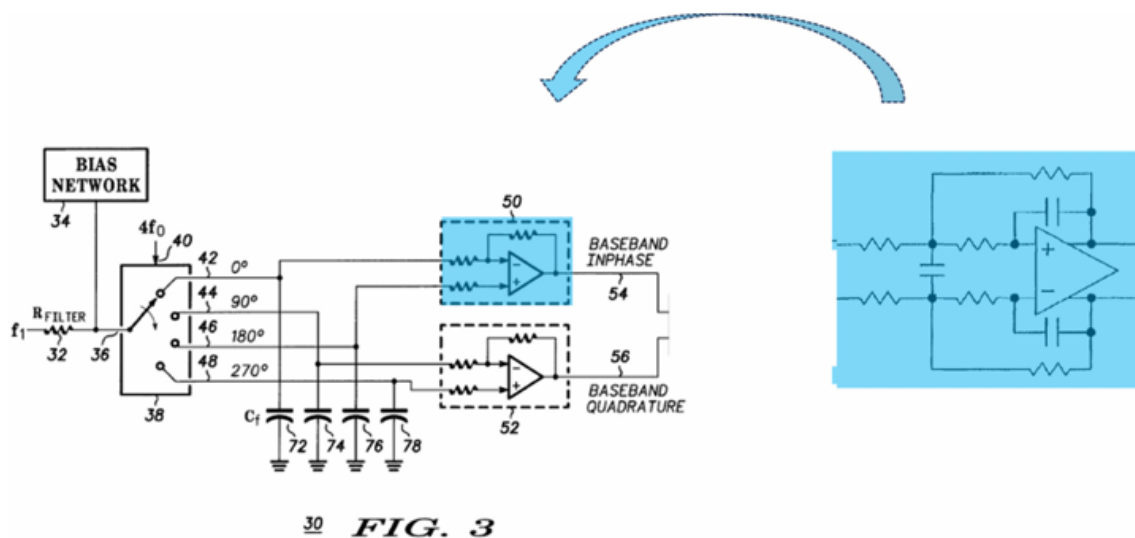
Petitioner misunderstands PO's discussion of Tayloe/TI-Datasheet. The point is straightforward: Petitioner concedes that Tayloe/TI-Datasheet alone do *not* disclose all elements of the challenged claims. So, Petitioner must rely on the combination of Tayloe/TI/Macnally to prove invalidity. And if Petitioner fails to meet its burden to establish motivation to combine, Grounds 1A/1B fail regardless of what the combination might disclose. Here, Petitioner fails to meet that burden.

Tellingly, Petitioner buries the discussion of this issue in the Reply and gives it little attention (two short sentences). *See* Reply, 27-28. Petitioner downplays the issue because it's fatal to Grounds 1A/1B.

In the Petition, the *only* motivation offered for combining Tayloe/Macnally is to "adapt Tayloe's system as a *single*-chip (i.e., integrated circuit known as

IC)...” Pet.,27-30 (citing Ex.-1003,¶¶140-42). By framing the motivation this way, Petitioner sets its own standard.⁷ Yet, Petitioner fails to meet it.

“*Single-chip*” is exactly what it sounds like: a *single* chip that contains all essential functionality. Galton admitted this, stating that for Tayloe, a *single-chip* means that “the essential functionality of Tayloe’s system [is] on a single IC.” Ex.-2042,50:11-16.



TI-1004, Fig. 3 (left)

TI-1021/TI-1022, Fig. 3 (right)

Ex.-1003,¶140 (original).

⁷ To distract from the real issue, Petitioner incorrectly asserts that, by discussing capacitor size, PO is arguing bodily incorporation. Reply,27. PO is simply showing that Petitioner cannot meet its own stated motivation-to-combine standard.

As shown above, when discussing his motivation to combine Tayloe/Macnally, Galton identified the components in Tayloe's Figure 3 as the relevant "system" to be adapted. *Id.* The proposed combination would therefore need to implement all switches/resistors/capacitors of Tayloe, along with Macnally's filter (blue box, above right), on a single IC.

In the POR, Ricketts explained why this motivation fails: the combination cannot be implemented on a *single*-chip IC as described in the Petition.

Specifically, Tayloe's capacitors (which are fundamental/critical to the operation of Tayloe's system) have values of 0.3 μ F, which are far too large to be fabricated on-chip (i.e., Tayloe's capacitors must be off-chip). POR, 83-84 (citing Ex.-2024,¶306). Galton admits this. Ex.-2042,41:19-22. Galton also admits that combining Macnally with Tayloe does not fix this problem. *Id.*,58:9-16. In other words, even when combined with Macnally, Tayloe's capacitors would still need to be off-chip.

Ricketts's un rebutted testimony eviscerates Petitioner's only stated motivation to combine. Faced with this fatal problem, Petitioner *changes* positions in the Reply. Galton now conveniently carves out the capacitors from "Tayloe's system," claiming Tayloe/Macnally can still be considered a single-chip IC even with off-chip capacitors. Reply,27-28 (citing Ex.-1066,¶¶58-63). But moving

Tayloe's capacitors (essential components) off-chip defeats the entire purpose of the *single*-chip IC rationale. Galton's new position simply seeks to salvage Grounds 1A/1B after the fact. He is simply not a credible witness.

B. Macnally's filter fundamentally changes the behavior of Tayloe's circuit.

Another reason a POSITA would not be motivated to replace Tayloe's amplifiers with Macnally's filter is that the two components do not use comparable input impedances. Substituting Macnally's filters in place of Tayloe's amplifiers would fundamentally alter the behavior of Tayloe's circuit—something a POSITA would avoid, not be motivated to do. POR,92-94. But that is precisely the point of Petitioner's proposed combination. Petitioner seeks to *change* Tayloe's behavior, using Macnally's filter to achieve a different operation in an attempt to show the claimed invention.

Tellingly, Petitioner makes much ado about Macnally being low impedance. This is because it is precisely this change in impedance that alters Tayloe's behavior in a way that Petitioner believes helps meet the claims—transferring

energy from a switch to a capacitor and the capacitor integrating/accumulating and outputting that energy to derive the baseband signal.⁸

Notably, Petitioner recognizes that replacing Tayloe's amplifiers with Macnally's filters could alter the behavior of Tayloe's circuit if the input impedances of these components are not "comparable." Reply,31. Yet, Petitioner provides no evidence or analysis demonstrating that the input impedances of Tayloe's amplifier and Macnally's filter are actually *comparable*.⁹

To the contrary, Petitioner concedes that Tayloe's and Macnally's input impedances are *not* comparable. According to Petitioner, Macnally's filters present

⁸ Petitioner's asserts that, in Tayloe, baseband is derived from accumulated transferred energy because, generally, Tayloe teaches producing baseband from charge build-up in its capacitor. Reply,24. This vague characterization is not what the claims require. The claims make it clear that the storage elements output baseband signal portions from the integrated/accumulated energy – i.e., the down-converted baseband signal portions is made up of discharged energy from the storage elements. A capacitor's voltage is not what the claims recite.

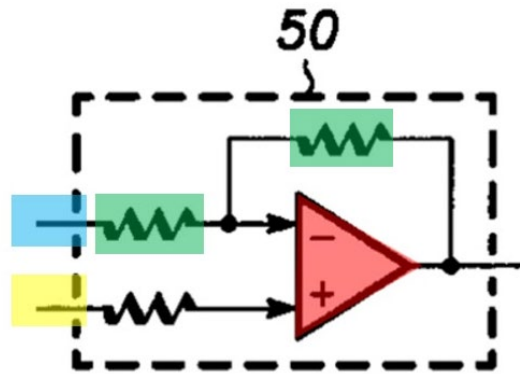
⁹ Even then, Petitioner recognizes that with comparable input impedances, Tayloe's circuit behavior could be altered – just not "significantly." Reply,31.

low impedance at *both* “+” and “–” inputs, whereas Tayloe’s amplifiers are low impedance at only *one* input—the “–” input. Petitioner states that only “the *top* inputs” (“–” inputs) are low impedance and that “only two of Tayloe’s four capacitors are [] coupled to low impedance loads.” Reply,31.¹⁰

This is fatal to Petitioner’s motivation to combine. So Petitioner/Galton yet again *change* position. Petitioner newly asserts that the “+” inputs are now “optional.” *Id.*,24,31. But, as discussed in Section VI.C, this is *incorrect*. Petitioner then tries to change the topic altogether, asserting that using Macnally’s filter would improve the system’s signal-to-noise ratio. *Id.*,31. But Petitioner cannot get away from the fact that, under Petitioner’s own view, using Macnally’s filters in place of Tayloe’s amplifiers (which have non-comparable input impedances) would necessarily alter the behavior of Tayloe’s circuit. Thus, there is no motivation to combine.

¹⁰ Petitioner is forced to concede this because of Galton’s admission that the “+” input of Tayloe’s amplifiers are high resistance/impedance. POR,60 (citing Ex.-2034,72:14-73:6, 85:1-7; Ex.-2024,¶217).

Further, the Reply fails to rebut Ricketts' position that the input impedances of Tayloe's amplifiers and Macnally's filters are not comparable.



As shown above, the experts agree that the yellow input has high resistance/impedance. Ricketts explains that the blue input must match the yellow input's impedance/resistance, meaning it also must be high.¹¹ POR,61 (citing Ex.-2024,¶220). The Reply fails to address this argument. Thus, the POR/Ricketts remain un rebutted on this point.¹²

¹¹ Because there is no mechanism in Tayloe's amplifier to change the high impedance "+" input to low impedance, the only way to match inputs is to make the green resistors high resistance.

¹² The Reply generally discusses Sedra (TI-1046). But Sedra, which has its "+" input connected to ground, is not the same configuration as shown in Tayloe. Ex.-2042,15:5-11.

In view of the foregoing, Petitioner has failed to demonstrate that replacing Tayloe's amplifiers with Macnally's filter would not alter the behavior of Tayloe's circuit. To the contrary, the substitution would fundamentally alter the operation—undermining any motivation to combine.

C. Petitioner Makes Misrepresentations And Fails To Address Issues

Unable to address PO's/Ricketts's arguments, Petitioner resorts to *misrepresentations* and avoiding issues altogether.

First, Grounds 1A/1B rely on combining Tayloe's Figure 6 with the TI Datasheet. But Tayloe never suggests this combination, and specifically discloses combining the TI Datasheet only with Figures 3 or 7—not Figure 6. POR,80-81. Unable to address this, Petitioner attempts to tie Figure 6 to Figure 3, asserting that Tayloe describes Figure 6 as an embodiment of Figure 3. Reply,25 (citing Ex.-1004,4:46-49). This is a misrepresentation—the cited passage merely identifies Figure 6 as its own *separate* embodiment.

Second, in response to PO's arguments that Tayloe's amplifiers present high input impedance, Petitioner pretends that the “+” inputs are “optional.” *Id.*,24-25,31 (citing Ex.-1004,5:12-15). Again, this is another misrepresentation—the cited passage only states that these inputs can be used to achieve greater gain, nothing more.

Third, regarding Galton's *sole* basis for motivation to combine Tayloe/TI/Macnally (i.e., achieve a single-chip IC), Ricketts explains that single-chips can be realized by operating at higher frequencies (e.g., 915MHz, as in Macnally), which allows for smaller-sized components compatible with IC design. POR,85-86 (citing Ex.-2024, ¶¶311-15). But, as Ricketts explains, the switches disclosed in the TI Datasheet (the same switches Galton relies on for invalidity) cannot operate at the speeds needed to handle high frequencies (e.g., 915MHz). *Id.* The Reply does not address this.

Fourth, in response to Galton's argument that fully differential amplifiers (like Macnally's) provide gain, Ricketts explains that Tayloe's own amplifiers already provide gain and fulfill that function. POR,87-88 (citing Ex.-2024, ¶¶320-23). Thus, a POSITA would have no motivation to replace one amplifier for another simply to obtain gain. *Id.* Again, the Reply ignores this.

Fifth, Galton sets up a strawman by claiming Tayloe has specific problems that motivate a combination with Macnally. But as PO/Ricketts explain, Tayloe's architecture already address those very issues. POR,88-91. Yet again, the Reply ignores this.

Sixth, Ricketts explains that Tayloe's circuit provides performance benefits that *already* address the issues Petitioner/Galton allege drive the motivation to combine. POR,91-92 (citing Ex.-2024,¶¶336-37). The Reply ignores this.

Seventh, Ricketts explains that Macnally's filters would draw current from Tayloe's capacitors, resulting in inaccurate voltage readings needed to recreate the baseband signal. POR,93-94 (citing Ex.-2024,¶¶340-42). The Reply does not address this or deny it.

Finally, regarding expectation of success, the Reply has no response whatsoever to Ricketts's argument that (1) incorporating Macnally's filter would require redesigning the signal chain after the filter, which would not lead to predictable results/expectation of success, requires considerable experimentation, and provides no guarantee of improved performance benefits as compared to using Tayloe's amplifiers (*Id.*,95-96 (citing Ex.-2024,¶¶347-49)); (2) using the alleged low impedance Macnally filters instead of Tayloe's amplifiers would have a completely different effects on the circuit (*Id.*,96-97(citing Ex.-2024,¶¶350-53)); and (3) Tayloe already incorporates a filter and Petitioner provides no explanation of how adding Macnally's filter would affect the circuit response (*Id.*,97 (citing Ex.-2024,¶354)).

VII. Grounds 2A/2B

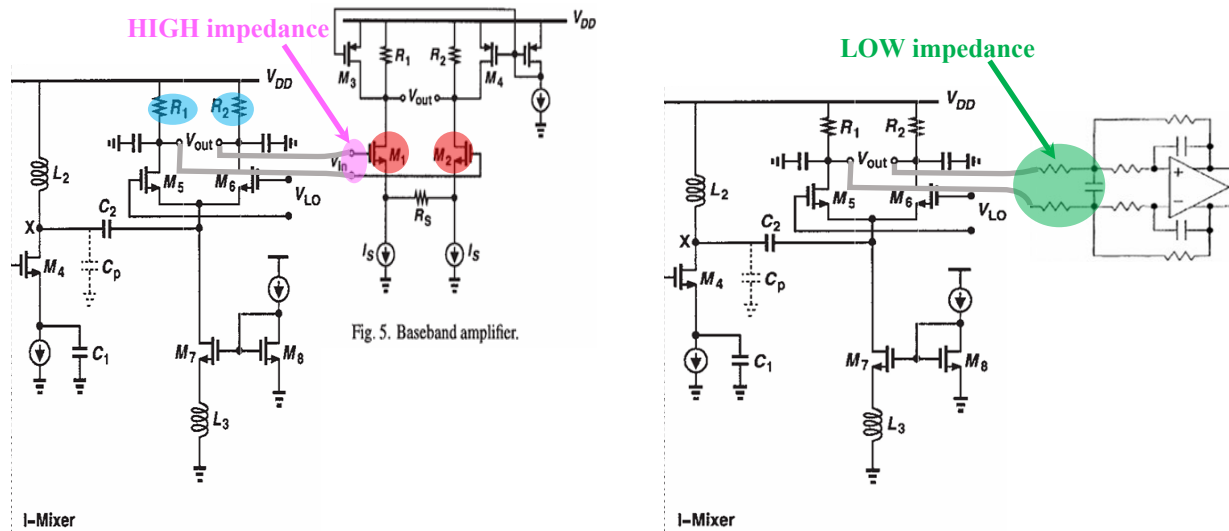
A. There Is No Motivation to Combine Razavi with Macnally.

According to Petitioner, Razavi alone does *not* disclose all elements of the challenged claims. So Petitioner must rely on the combination of Razavi/Macnally to prove invalidity. And if Petitioner fails to meet its burden on motivation to combine, Petitioner's Grounds 2A/2B fail regardless of what the combination may show. Here, Petitioner fails to meet its burden.

As Petitioner recognizes with regard to Tayloe, replacing circuit components can fundamentally alter the behavior of circuit behavior when the component's input impedances are not "comparable." Reply,31. Yet, here, Petitioner provides no evidence or analysis demonstrating that the input impedances of Razavi's amplifier and Macnally's filter are actually *comparable*. *Id.*

Tellingly, Petitioner fails to address this issue in the Reply (and, as discussed below, pivots to a wholly unrelated discussion about resistors R_1/R_2) to avoid drawing too much attention to this issue, because it is fatal to Grounds 2A/2B.

A POSITA would not be motivated to replace Razavi's amplifier with Macnally's filter because the two components do not use comparable input impedances.



As shown above left, the output (V_{out}) of Razavi's mixer connects to the gates of FETs M_1 and M_2 (red) in Razavi's amplifier. Galton admits that the gates of FETs are very high resistance/impedance. POR,60 (citing Ex.-2034,72:14-73:6, 85:1-7). Thus, Razavi's amplifiers have a *high* input impedance. According to Petitioner, however, Macnally's filter has a *low* input impedance. Pet.,70.

This difference is critical. Razavi's circuit works by reading voltage¹³ to recreate the baseband signal (hence, the reference to voltage (V_{out}) at the mixer's output). POR,111 ("Razavi's amplifier operates as a high impedance load, which is *critical to ensuring accurate baseband voltage representation*"). To allow for an accurate reading, Razavi holds the voltage steady by connecting a high input

¹³ POR,1.

impedance amplifier to V_{out} of the mixer.¹⁴ In the Reply, Petitioner does not (and cannot) dispute that Razavi's amplifier has a high input impedance. Nor does Petitioner dispute that Razavi's circuit operates by holding/reading voltages to recreate the baseband signal. Replacing Razavi's amplifier with the alleged low impedance load of MacNally's filter would distort the signal because an accurate reading of voltage could not be obtained. POR,111.

In other words, using Macnally's filter in place of Razavi's amplifier would alter the fundamental behavior of Razavi's circuit—not something a POSITA would be motivated to do. POR,111,113-114.

But altering the behavior of Razavi is exactly the reason that Petitioner seeks to use Macnally's filter. If MacNally's filter truly preserved Razavi's circuit behavior, there would be no reason to swap these components in the first place.

¹⁴ Petitioner asserts that Razavi shows Figure 4(a). Reply,35. But Razavi clearly provides this figure to show what *not* to do. To imply otherwise flies in the face of Razavi's express teaching that “[t]he present design is intended for permutations in Figs. 4(b) and (c).” Ex.-1017,1. Razavi also says that in Figure 4(a), A_1 is *nonlinear* and presents noise issues – the opposite of what Razavi says is needed. *Id.*

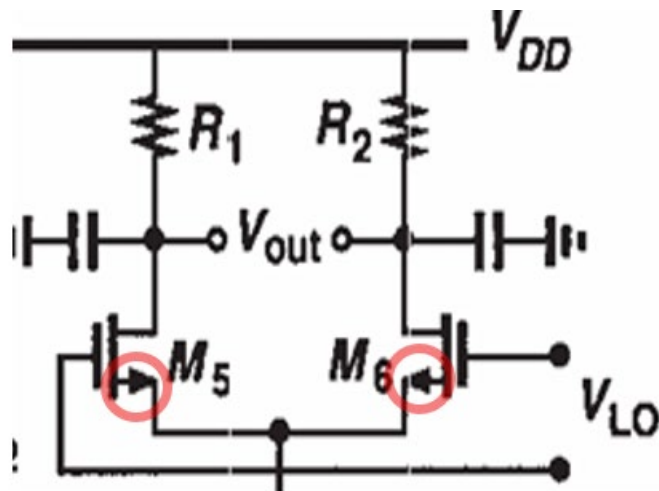
Petitioner needs McNally's low impedance to alter Razavi's circuit behavior to get to the claimed invention.

With no way to address this issue, Petitioner pivots to a wholly unrelated issue—that Galton calculated values of resistor R_1 and R_2 in Razavi's mixer (shown above in blue) as being low impedance. Reply,35-36. But this has nothing to do with the connection to V_{out} . Petitioner does not even attempt to address how changing impedances connected to V_{out} will affect Razavi's circuit.

In view of the foregoing, Petitioner fails to demonstrate that using Macnally's filter in place of Razavi's amplifiers would not alter the behavior of Razavi's circuit such that a POSITA would be motivated to combine.

B. Razavi/Macnally Does Not Teach Transferring Energy When A Switch Is ON.

As Ricketts explains, when transistors M_5 and M_6 in Razavi's mixer are ON, energy is *not* transferred from the modulated carrier signal (RF input) upward through transistors M_5/M_6 (as an output) towards the capacitors C_p/C_m . POR,98-103. Instead, as shown below, current only flows downward from V_{DD} in the direction of the transistor arrows (red).



Indeed, Razavi expressly states that transistors M_5 and M_6 “must remain in saturation.” Ex.-1017,1. Galton concedes that transistors M_5 and M_6 are NMOS transistors and that, in saturation, NMOS transistors conduct current from drain to source—here, from V_{DD} downwards. Ex.-2042,62:3-10, 63:8-20. Thus, Razavi does not meet this claim element.

Without any way of countering this, Petitioner/Galton *change* positions—yet again—by reframing the issue in terms of electron flow rather than current flow. This pivot underscores Petitioner’s lack of substantive rebuttal and seeks to create confusion where none exists.

There are two ways to look at current flow – conventional current¹⁵ and the flow of electrons. The two are opposites. For conventional current, charge flows from a higher to lower potential (V_{DD} to ground). *Id.*,19:1-4. Electron flow is the opposite. Reply,32.

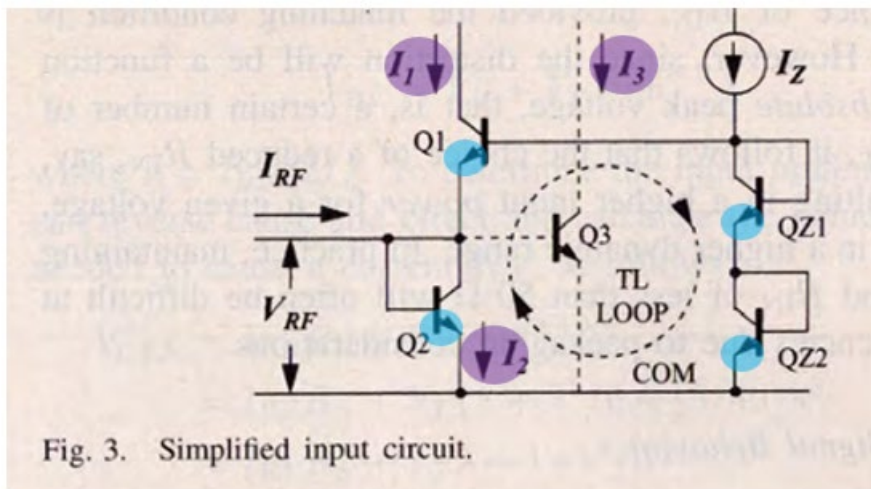
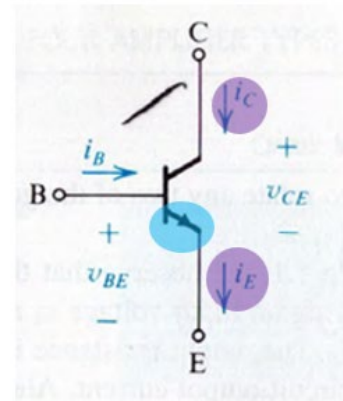
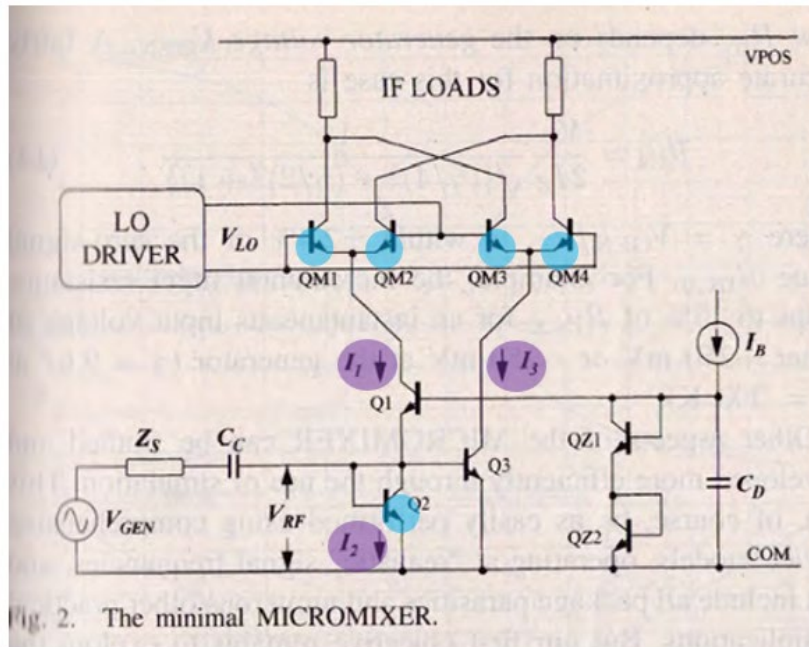
The claims must be looked at from the point of view of how the patent discusses the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (“claims must be read in view of the specification, of which they are a part.” (internal quotation omitted)). And Galton admits, the '528 patent is written from the perspective of conventional current, including its description of charging and discharging storage elements (capacitors). Ex.-2042,61:16-62:2; 59:21-60:9 (when discussing the patent, referring to conventional current flowing into and out of capacitors). Indeed, the claims refers to transfer, storage, and output of energy. And Galton admits that the fundamental electrical equations used to describe energy transfer (power) (*see* Ex.-2024,¶50) are expressed in terms of conventional current (denoted as “I”/“i”). Ex.-2042,21:19-24:5; *see also id.*,19:16-20:1

¹⁵ Conventional current is a well-known concept taught in engineering classes and discussed in the electronic industry. Ex.-2042,18:12-22.

(admitting that “I” or “i” refers to conventional current). This should end the inquiry.

Consistent with this (and Petitioner's own submitted literature), Ricketts analyzes the claims/prior art using conventional current—as would a POSITA. Petitioner, on the other hand, offers no evidence that a POSITA would rely on electron flow to interpret circuit operation other than Galton's bald assertions/say-so.

Notably, the technical references relied on by Petitioner/Galton use the standard conventional current notation (the letter “I” or “i”) and analyze current flow accordingly.



Ex.-1053,13; Ex.-1046,40.

As shown above, for example, with regard to mixers and transistors *just like those shown in Razavi*, Galton's own references describe circuit operation in terms of conventional current, not electron flow. *See also* Ex.-1045, 25, 34, 76, 77.

Current (I/i , highlighted above in purple) flows in the direction of the transistor

arrows (blue). In other words, current flows downward from VPOS (i.e., V_{DD}), not upward.

For the foregoing reasons, the claims should be analyzed from the point of view of conventional current, not flow of electrons, as Ricketts has done.

C. Other Issues Petitioner Fails To Address

First, Ricketts explains that Razavi uses an amplifier specifically designed to achieve high gain, improve linearity, and reduce noise. Thus, there is no motivation to replace Razavi's amplifier with Macnally's filter. POR,105-106 (citing Ex.-2024,¶385). Petitioner does not counter this in the Reply.

Second, in response to Galton's strawman argument that Macnally's filter offers advantages (e.g., cancelling interference, minimizing distortion, and improving linearity) that motivate a combination, Ricketts explained that Razavi's design already addressed these issues. POR,106-107(citing Ex.-2024,¶¶388-89). There is no evidence that Macnally's filter would improve upon these things. Again, the Reply is silent in response.

Third, Ricketts quotes Razavi as explaining why Figure 4(a) depicts an approach that should not be used. POR,110. The Reply fails to address the quoted language.

Finally, regarding expectation of success, the Reply has no response whatsoever to Ricketts' argument that (1) Petitioner's reliance of Figure 4 ignores

Razavi's explicit warning against doing so (POR,112), (2) incorporating Macnally's filter would require designing a complicated circuit, with no guarantee of improved performance over Razavi's amplifier (*id.*), and (3) because Macnally's filter would change Razavi's operation, there is no reasonable expectation of success of reproducing a baseband signal (POR,113-114).

Dated: July 25, 2025

Respectfully submitted,

By: /Jason S. Charkow/

Jason S. Charkow (USPTO Reg. No. 46,418)*

Richard Juang (USPTO Reg. No. 71,478)*

Chandran B. Iyer (USPTO Reg. No. 48,434)

Stephanie Mandir (USPTO Reg. No. 72,930)

Ronald M Daignault*

jason.s.charkow@gmail.com

richard.juang@gmail.com

cbiyer@daignaultiyer.com

rdaignault@daignaultiyer.com

DAIGNAULT IYER LLP

8229 Boone Boulevard

Suite 450

Vienna, VA 22182

**Not admitted in Virginia*

Attorneys for ParkerVision, Inc.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that this Patent Owner's Response complies with the type-volume limitation of 37 C.F.R. § 42.24(b) because it contains 5,560 words, as determined by the word-processing program used to prepare the brief, excluding the parts of the brief exempted by 37 C.F.R. § 42.24(a)(1).

Respectfully submitted,

By: /Jason S. Charkow/

Jason S. Charkow

USPTO Reg. No. 46,418

CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing PATENT OWNER'S SUR-REPLY and Exhibits were served electronically via email on July 25, 2025, on the following counsel of record for Petitioners:

Joshua A. Griswold
Rishi Gupta
Yao Wang
Patrick J. Bisenius
Fish & Richardson P.C.
IPR12189-0092IP1@fr.com
PTABInbound@fr.com
griswold@fr.com
rgupta@fr.com
ywang@fr.com
bisenius@fr.com

Robert S. Magee
Blue Peak Law Group LLP
robert@bluepeak.law

John J. Patti
Patti Pershern, PLLC
john@mppfirm.com

Christopher Crumbley
Michael Chibib
Christopher Mierzejewski
Bracewell LLP
kit.crumbley@bracewell.com
michael.chibib@bracewell.com
christopher.mierzejewski@bracewell.com
anna.hearn-darst@bracewell.com

Dated: July 25, 2025

Respectfully Submitted,

By: / Jason S. Charkow /
Jason S. Charkow
USPTO Reg. No. 46,418