

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. 7,865,177

Issue Date: January 4, 2011

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

Inter Partes Review No. IPR2024-00935

PATENT OWNER'S SUR-REPLY

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PATENT OWNER'S EXHIBIT LIST

Exhibit No.	Description
2001	Complaint, ParkerVision, Inc. v. Texas Instruments Inc., Case No. 6:23-cv-00384-ADA (WDTX)
2002	Agreed Scheduling Order, ParkerVision, Inc. v. Texas Instruments Inc., Case No. 6:23-cv-00384-ADA (WDTX)
2003	Dani Kass, "Catching Up On Patent Litigation With Judge Albright," LAW360 (Mar. 14, 2023)
2004	Sonrai Memory Ltd. v. Kingston Tech. Co., Inc., Case No. 6:21-cv-1284-ADA, Order Denying Kingston Tech. Co. and Kingston Tech. Corp.'s Opposed Motion to Stay Pending Resolution of Inter Partes Review, Dkt. 94 (W.D. Tex., Oct. 18, 2022)
2005	Docket Order, Kerr Machine Co. d/b/a Kerr Pumps v. Vulcan Industrial Holdings, LLC, No. 6:20-cv-00200 (W.D. Tex. Aug. 2, 2020)
2006	Court Order adopting Special Master's Report and Recommendation, dated January 21, 2025 (Dkt. 65) – CA No. 6:23-cv-00389 (WDTX)
2007	Court Claim Construction Order dated April 29, 2020 –No. 6:14-cv-687 (MDFL)
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

IPR2024-00935 (U.S. Patent No. 7,865,177)
Patent Owner's Sur-Reply

2017	Proakis, J. et al., Communication Systems Engineering
2018	09/550,644 prosecution history excerpt
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	Sklar B., Digital Communications Fundamentals and Applications
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	U.S. Patent No. 6,061,551
2034	Deposition Transcript of Ian Galton, dated March 12, 2025
2035	Special Master's Report and Recommendation Regarding Claim Construction, dated October 21, 2024 (Dkt. 45) – CA No. 6:23-cv-00389 (WDTX)

2036	Full table of contents for Proakis, J. et al., Communication Systems Engineering
2037	Full table of contents for Sklar B., Digital Communications Fundamentals and Applications
2038	Full table of contents for Howe, R. et al., Microelectronics: An Integrated Approach
2039	Declaration of Taylor Lepore
2040	Deposition Transcript of Ian Galton, dated July 16, 2025
2041	Deposition Transcript of James Dickens, dated July 18, 2025
2042	Exhibit 3 of Ex.-2043, Figure 7-3 from Ex.-2010

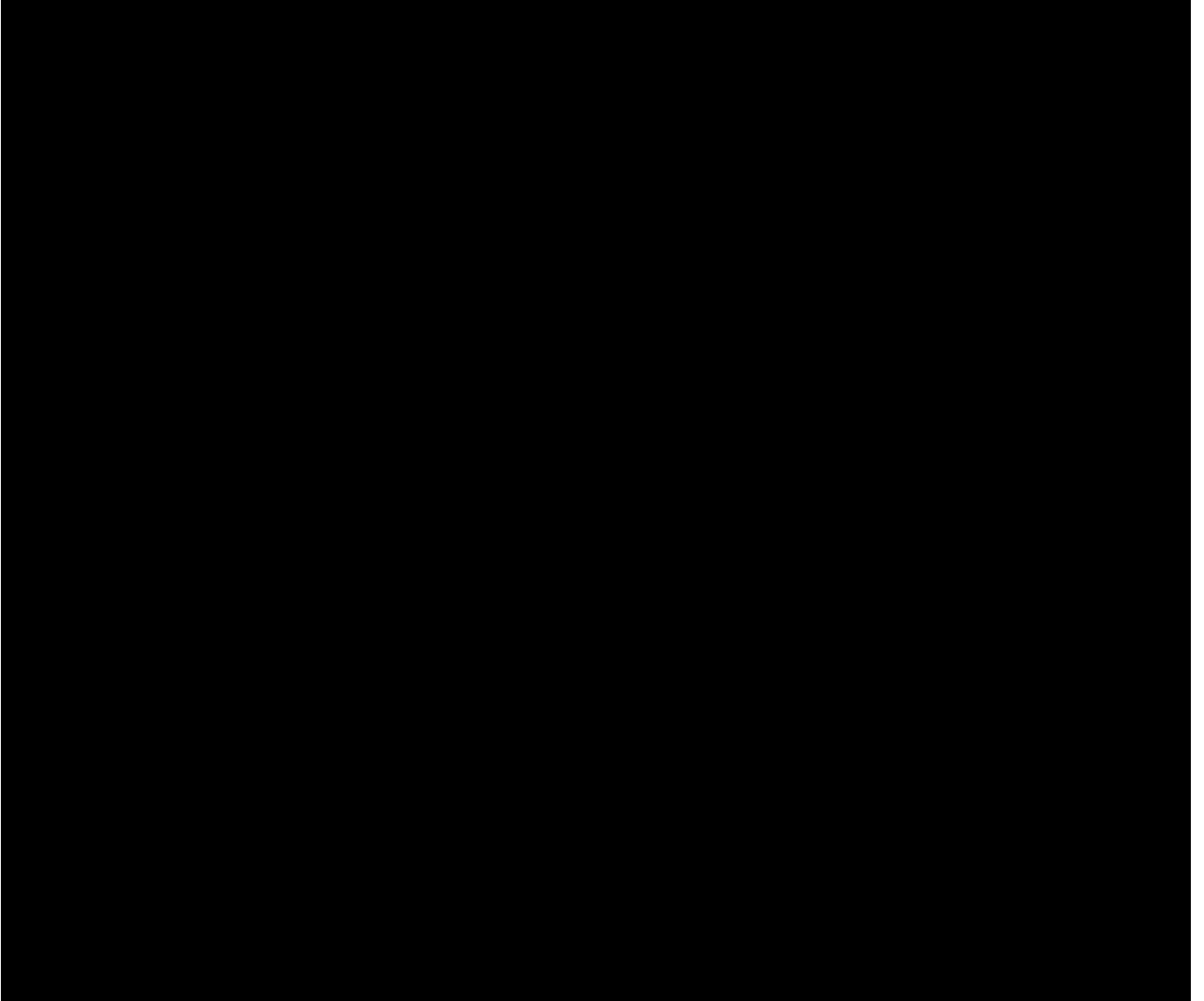
I. Petitioner's Reply Violates 37 C.F.R. § 42.6(a)(3) and C.F.R. § 42.22(a)(2).

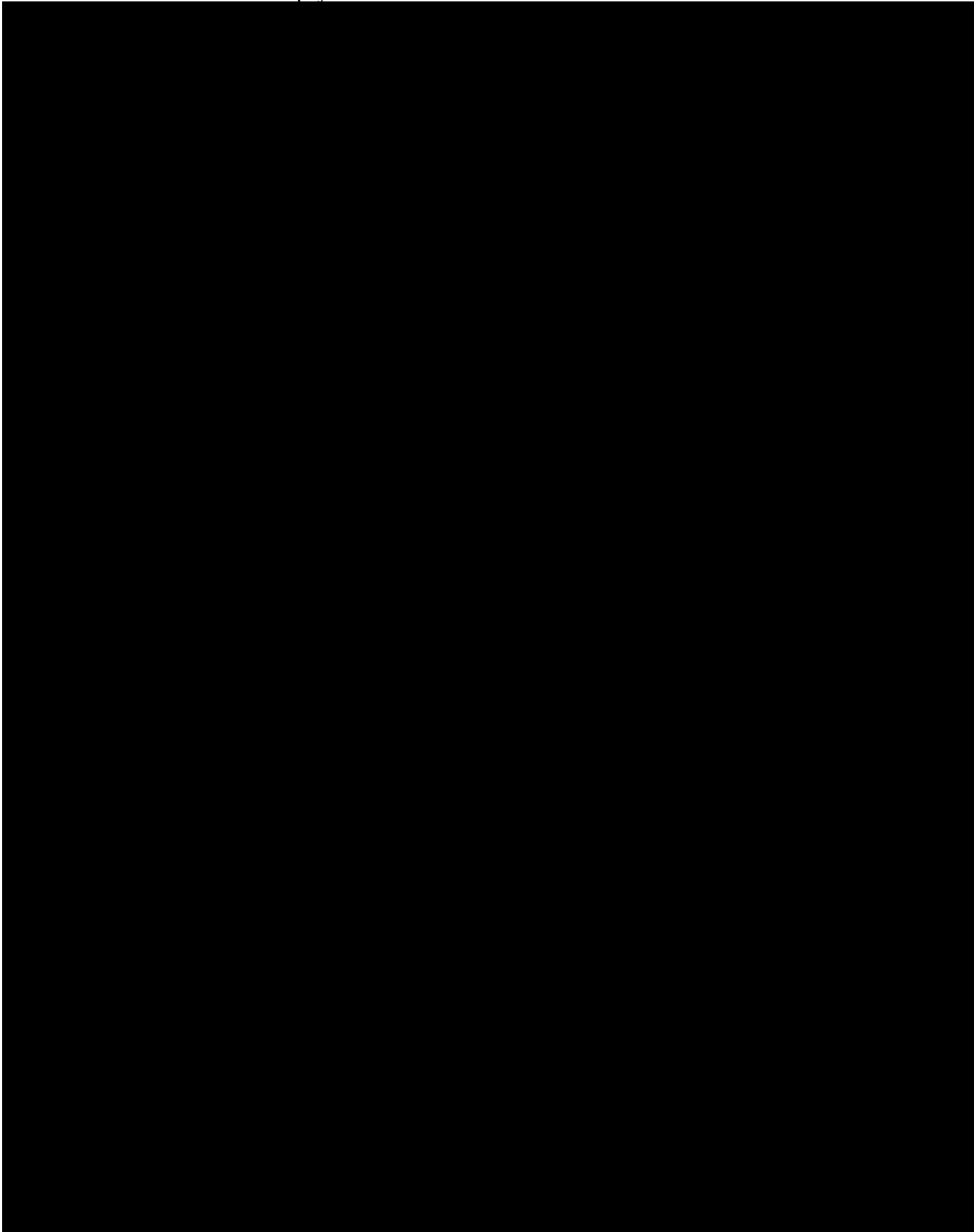
Petitioner's Reply improperly attempts to circumvent the word limits by incorporating arguments by reference from its expert declarations, in violation of 37 C.F.R. § 42.6(a)(3). Petitioner's Reply further fails to cite to the expert declarations with the specificity required under C.F.R. § 42.22(a)(2).

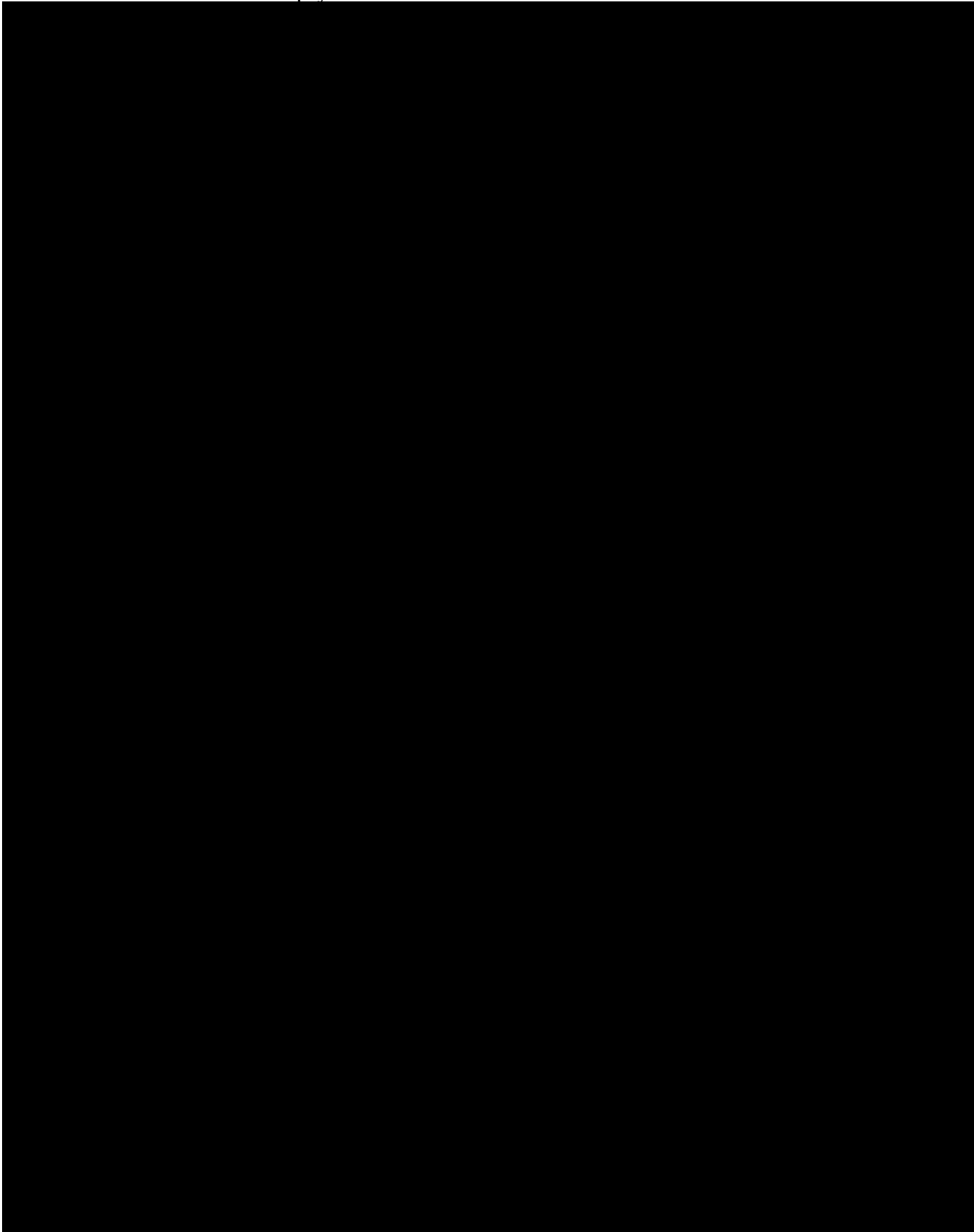
Petitioner submitted two expert declarations collectively spanning **78 pages** (nearly **14,000 words/120 paragraphs**) of *substantive* analysis. But the Reply itself contains only short, conclusory arguments, followed by citations to numerous paragraphs in these declarations. *See, e.g.*, Reply, 11 (citing TI-1067, ¶¶16-20), 13 (citing TI-1067, ¶¶19-22), 29-30 (citing TI-1066, ¶¶8-11), 33, (citing TI-1066, ¶¶15-21, 92-97), 34 (citing TI-1066, ¶¶5-26), 37 (citing TI-1066, ¶¶ 32-45, 49-55), 38 (citing TI-1066, ¶¶49-53), 39 (citing TI-1066, ¶¶32-55), 40 (citing TI-1066, ¶¶65-71), 41 (citing TI-1066, ¶¶72-82, 89-99).

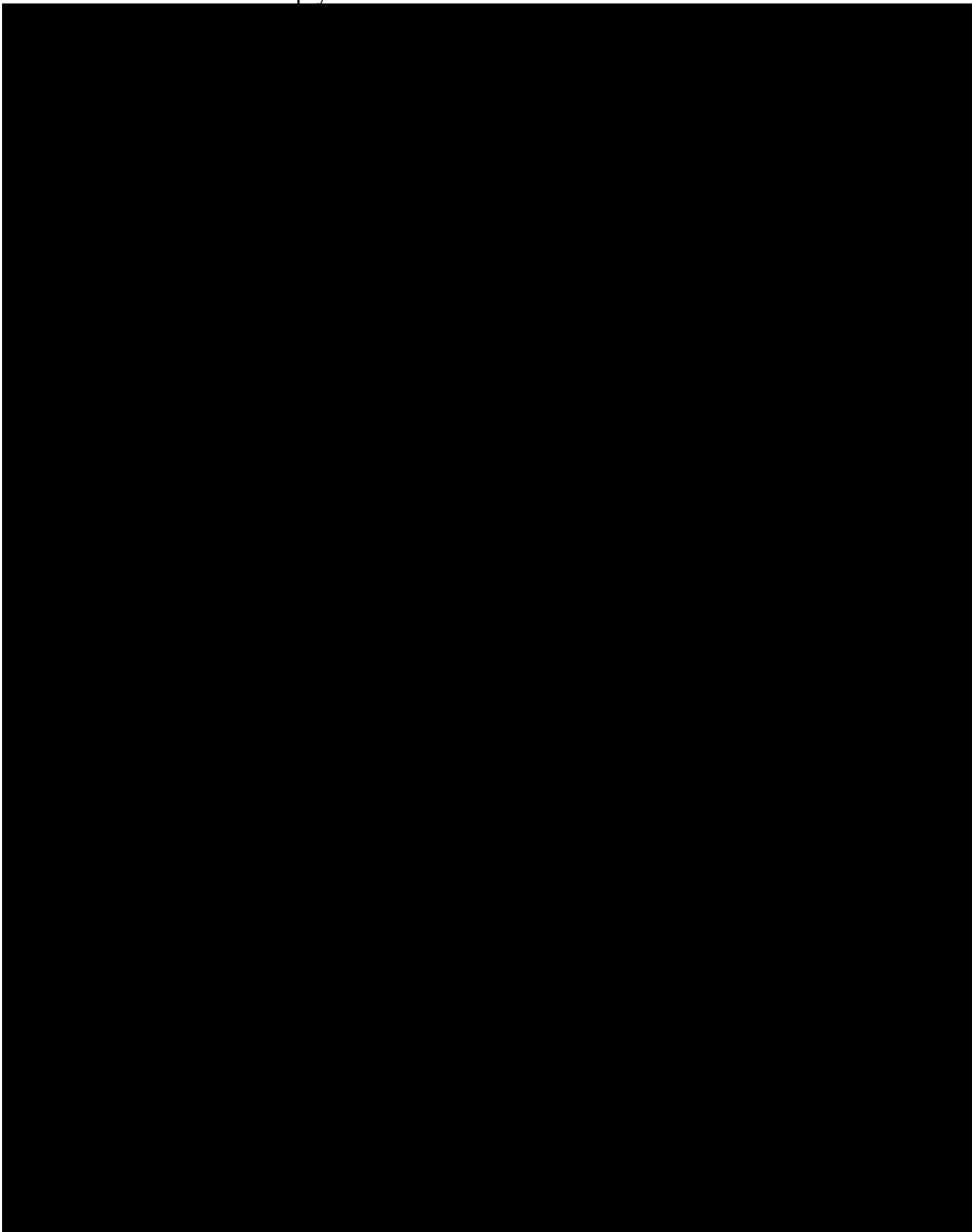
Critically, the declarations contain specific arguments/analysis not found in the Reply. PO is unfairly prejudiced because it cannot possibly address even a fraction of this within its sur-reply word limit. Moreover, Petitioner's vague and expansive citations force PO (and the Board) to wade through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

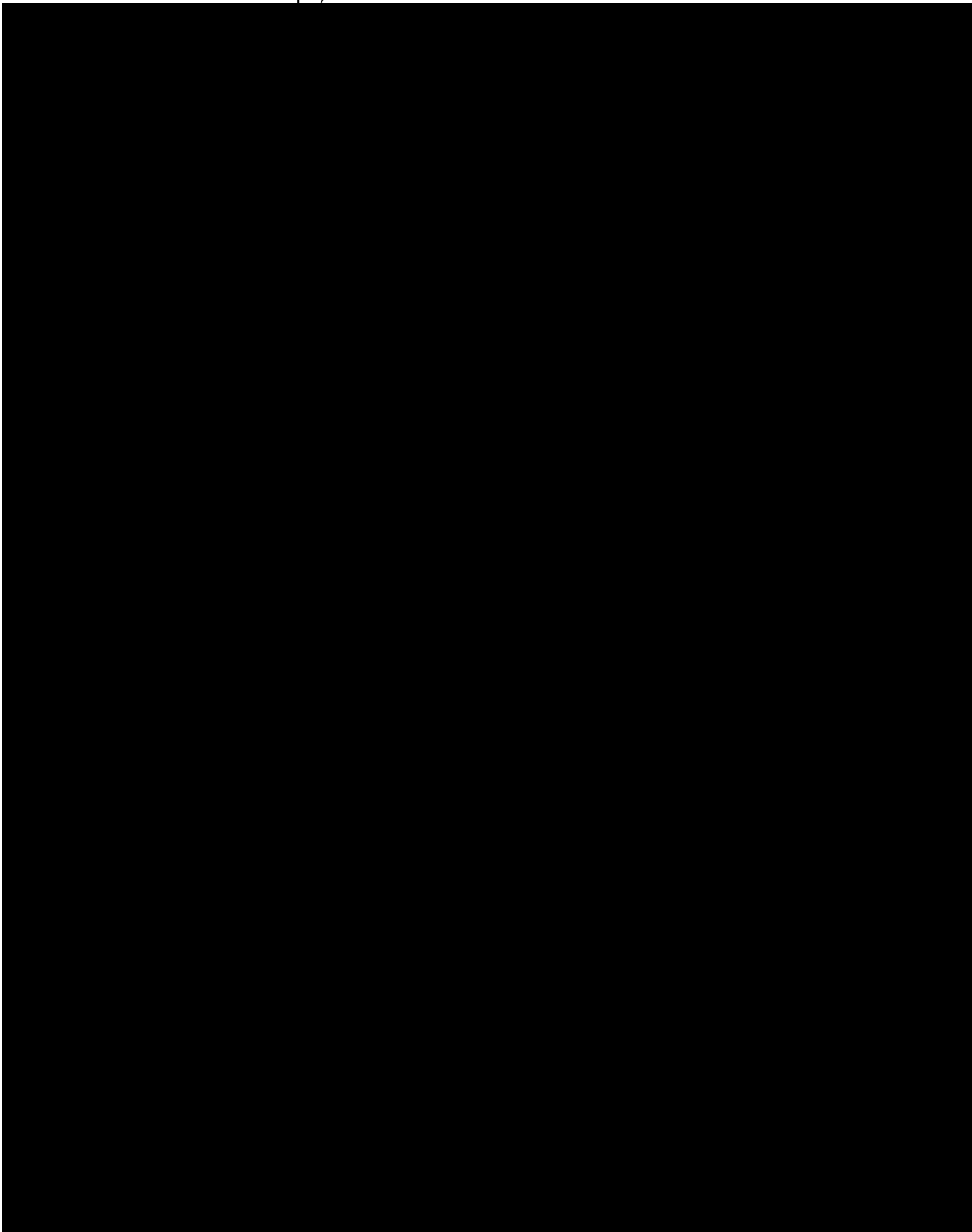
Thus, PO respectfully requests that the Board decline to consider arguments/analysis/expert testimony and supporting exhibits not specifically discussed in the Reply. *See Apple Inc. v. Masimo Corp.*, IPR2022-01291, Paper 75, 90-91 (P.T.A.B. Jan. 30, 2024) (declining to consider expert testimony/supporting exhibits); *Google LLC v. Parus Holdings Inc.*, IPR2020-00846, Paper 31,13-14 (P.T.A.B. Oct. 19, 2021) (same).

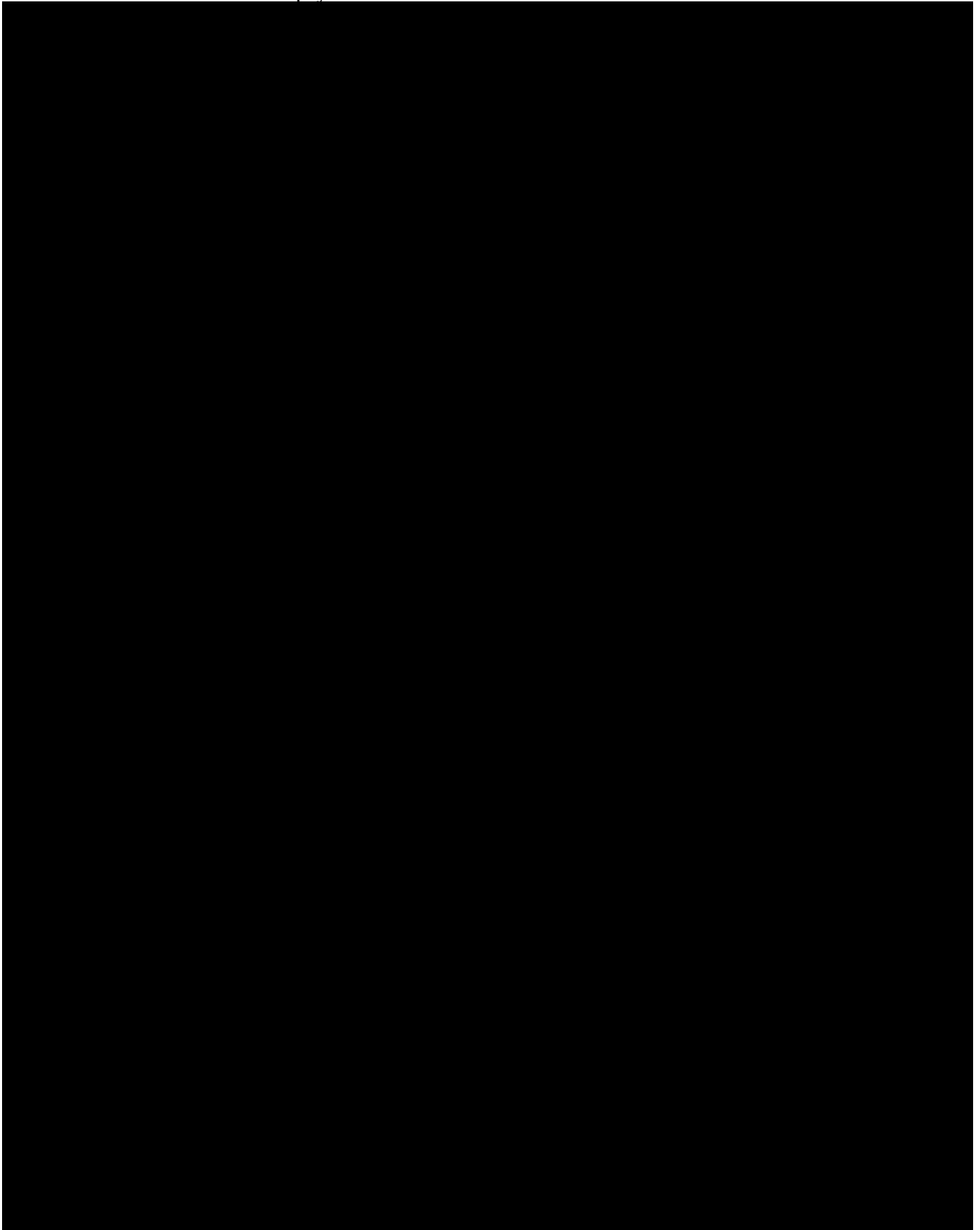


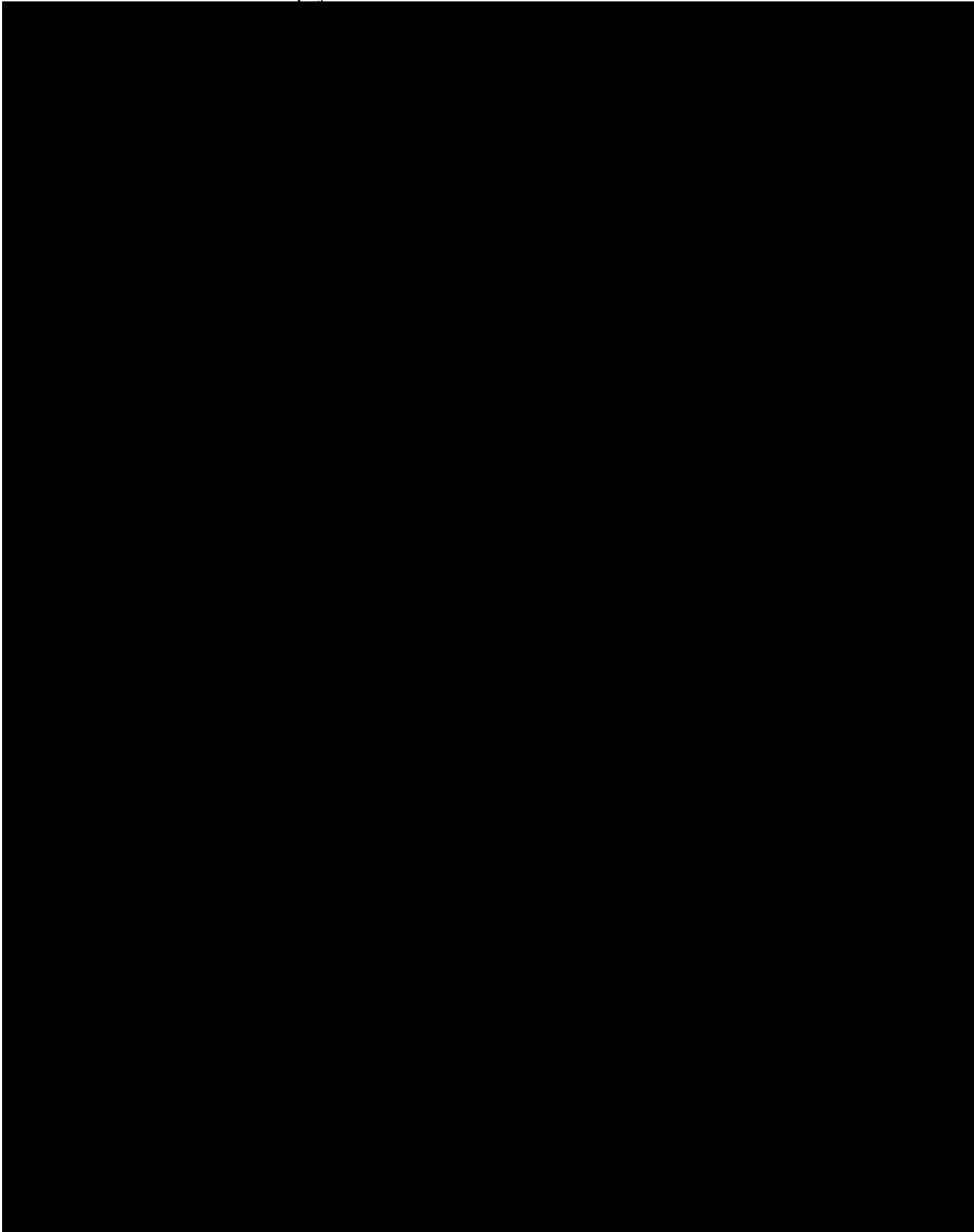


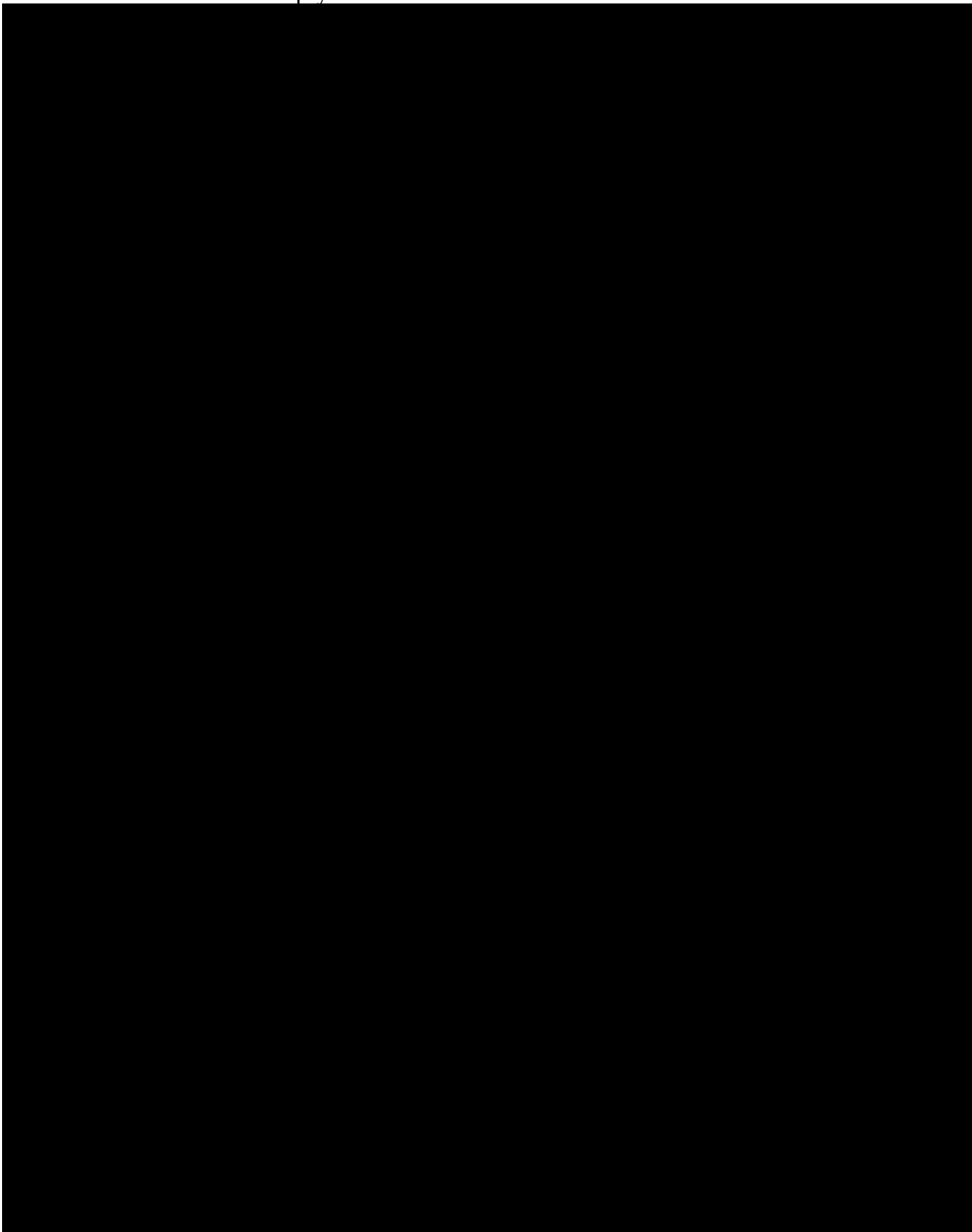


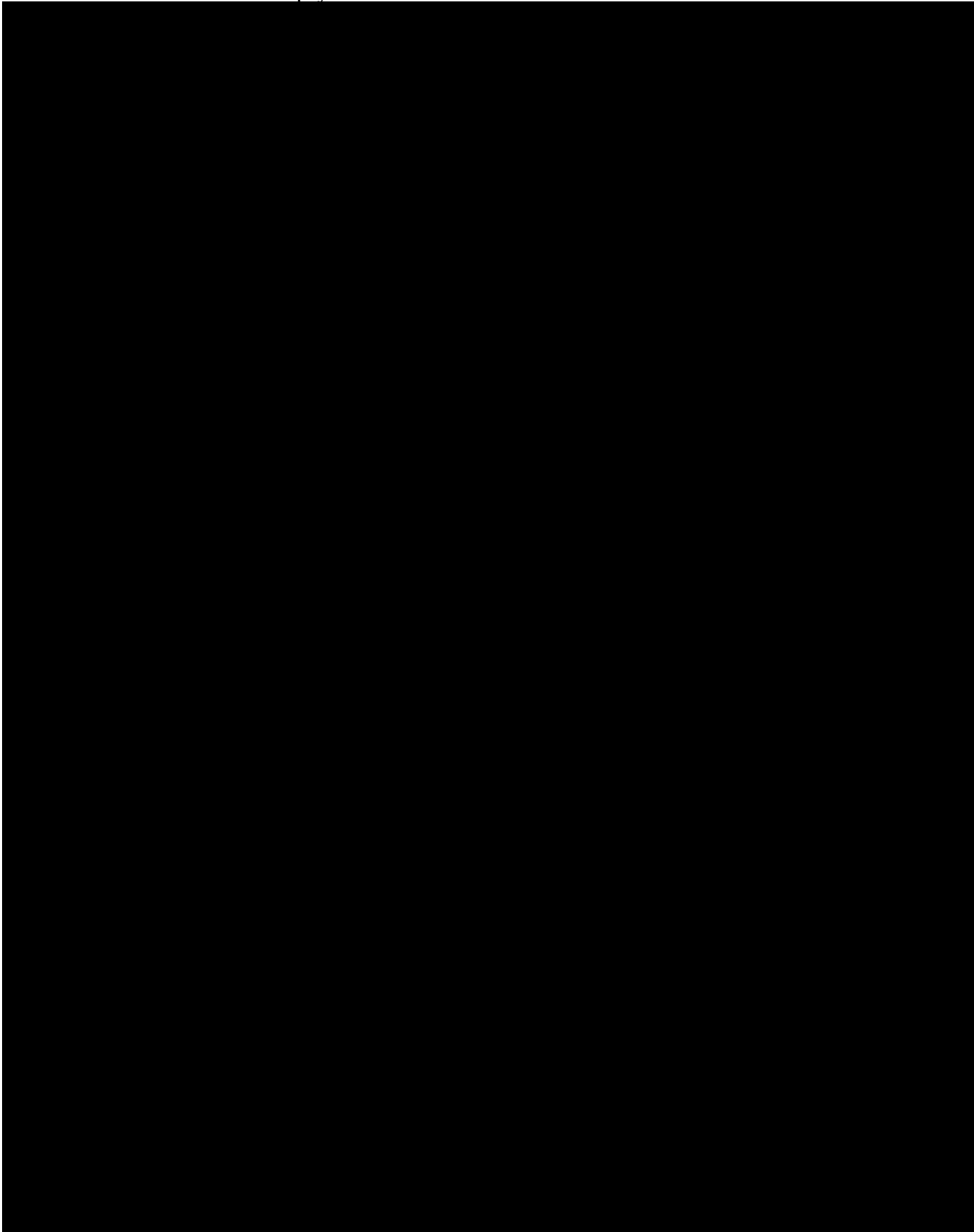


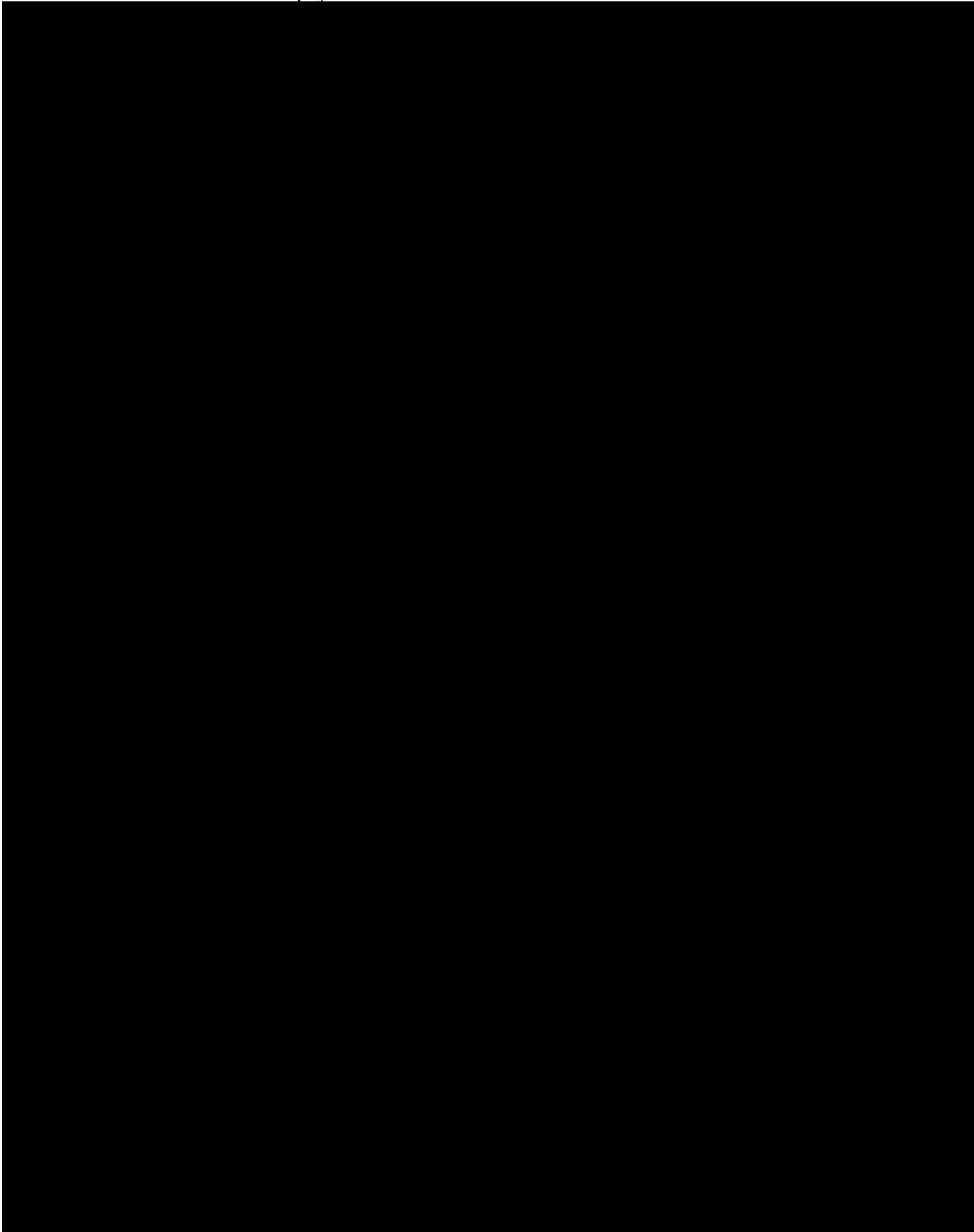


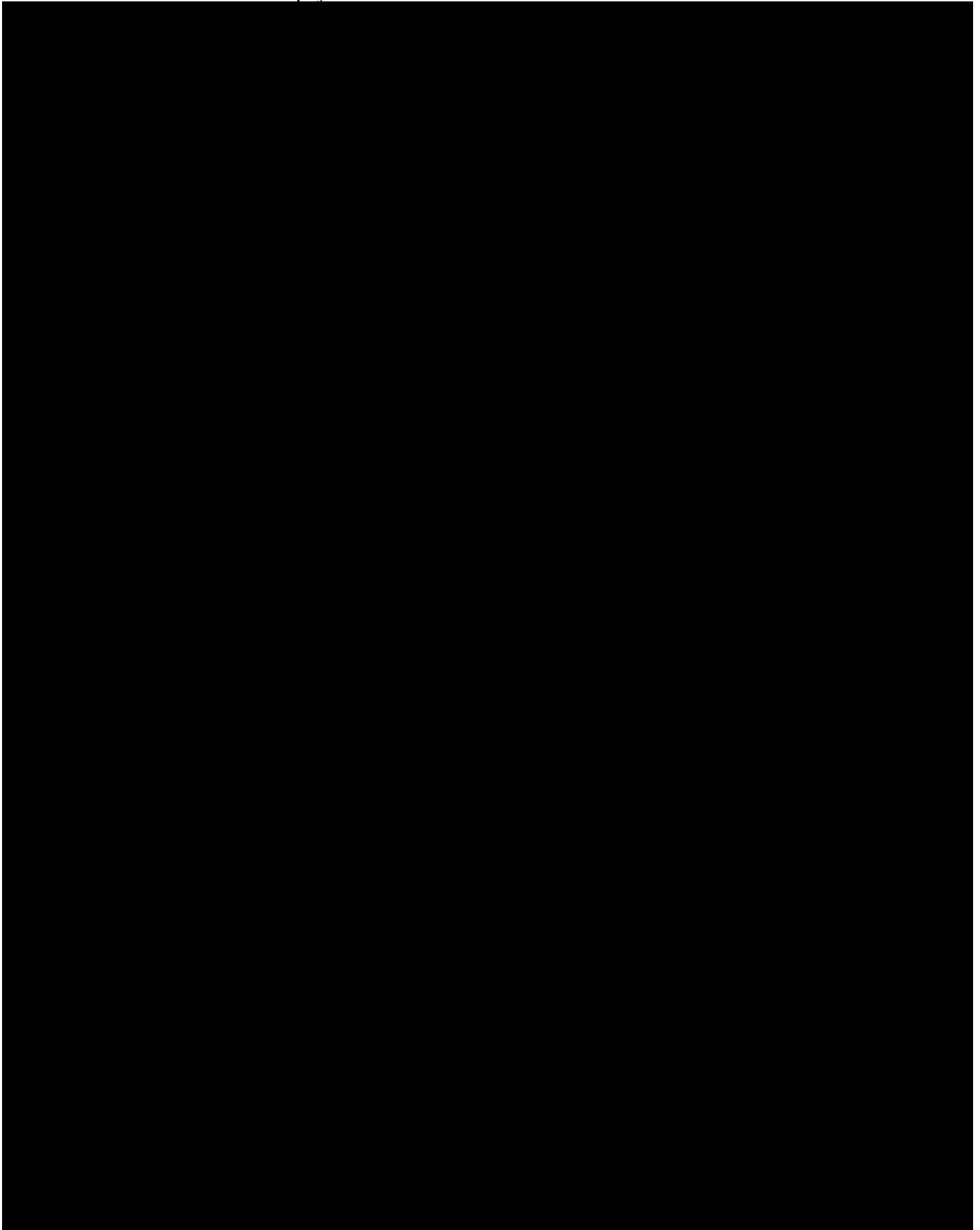


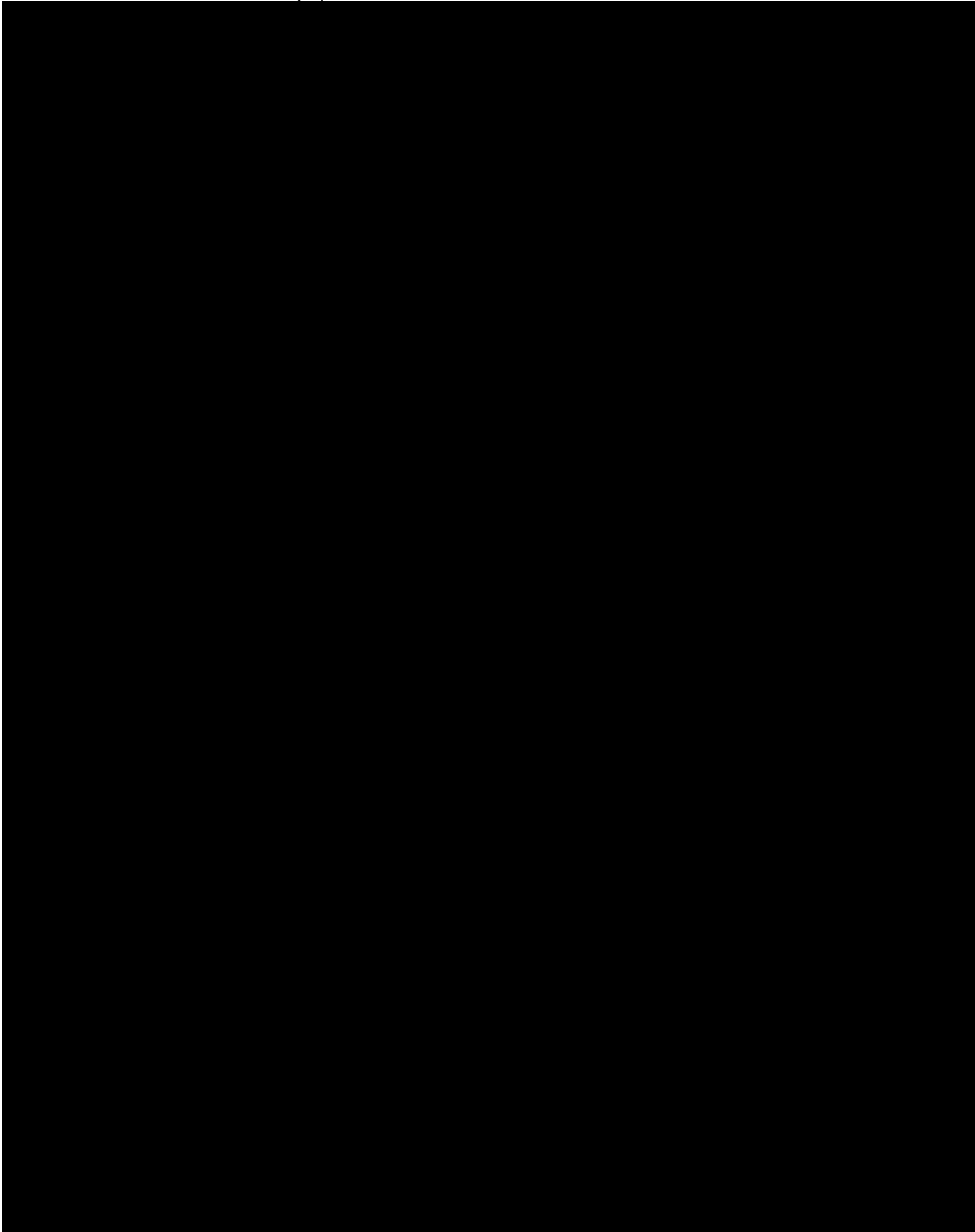


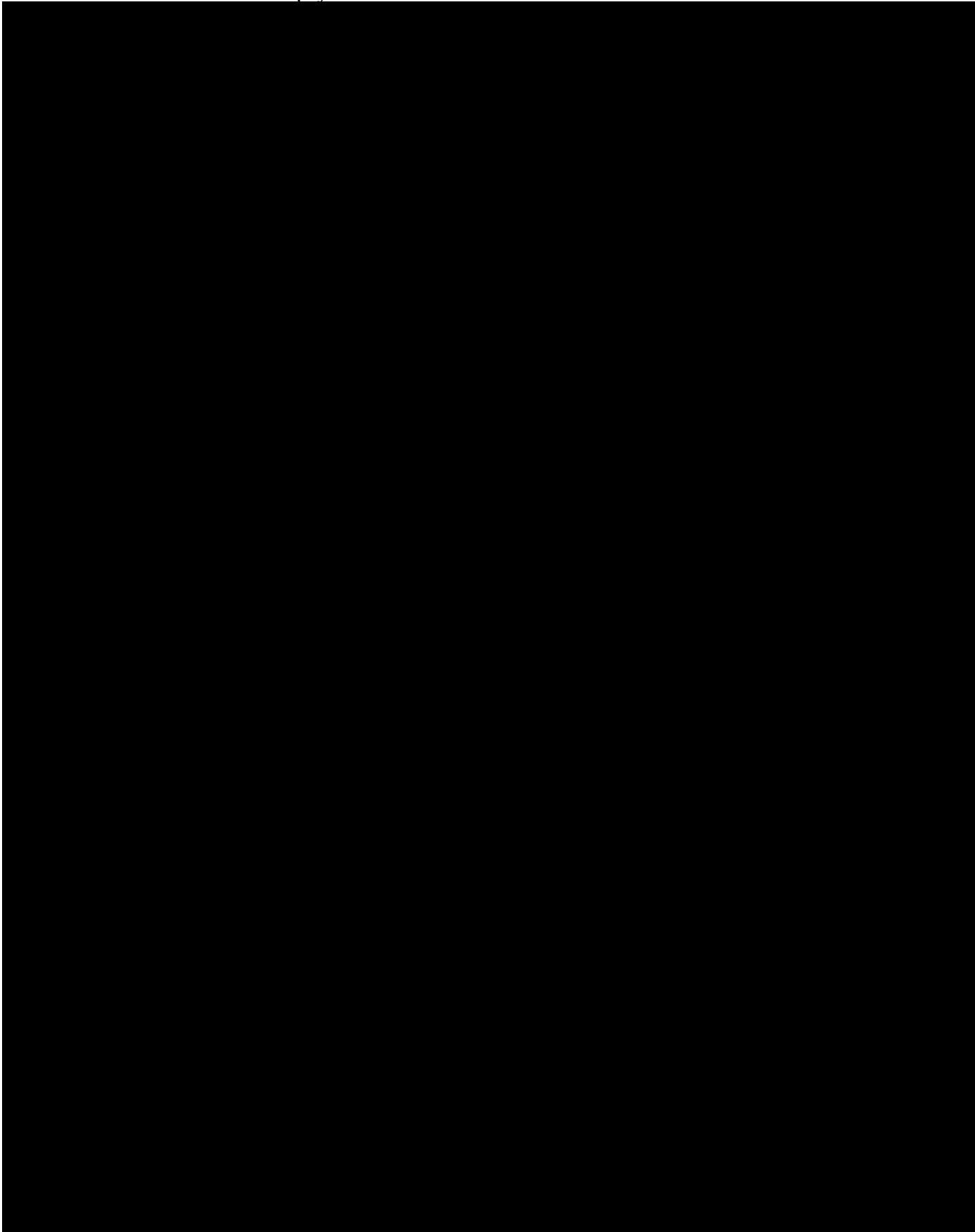


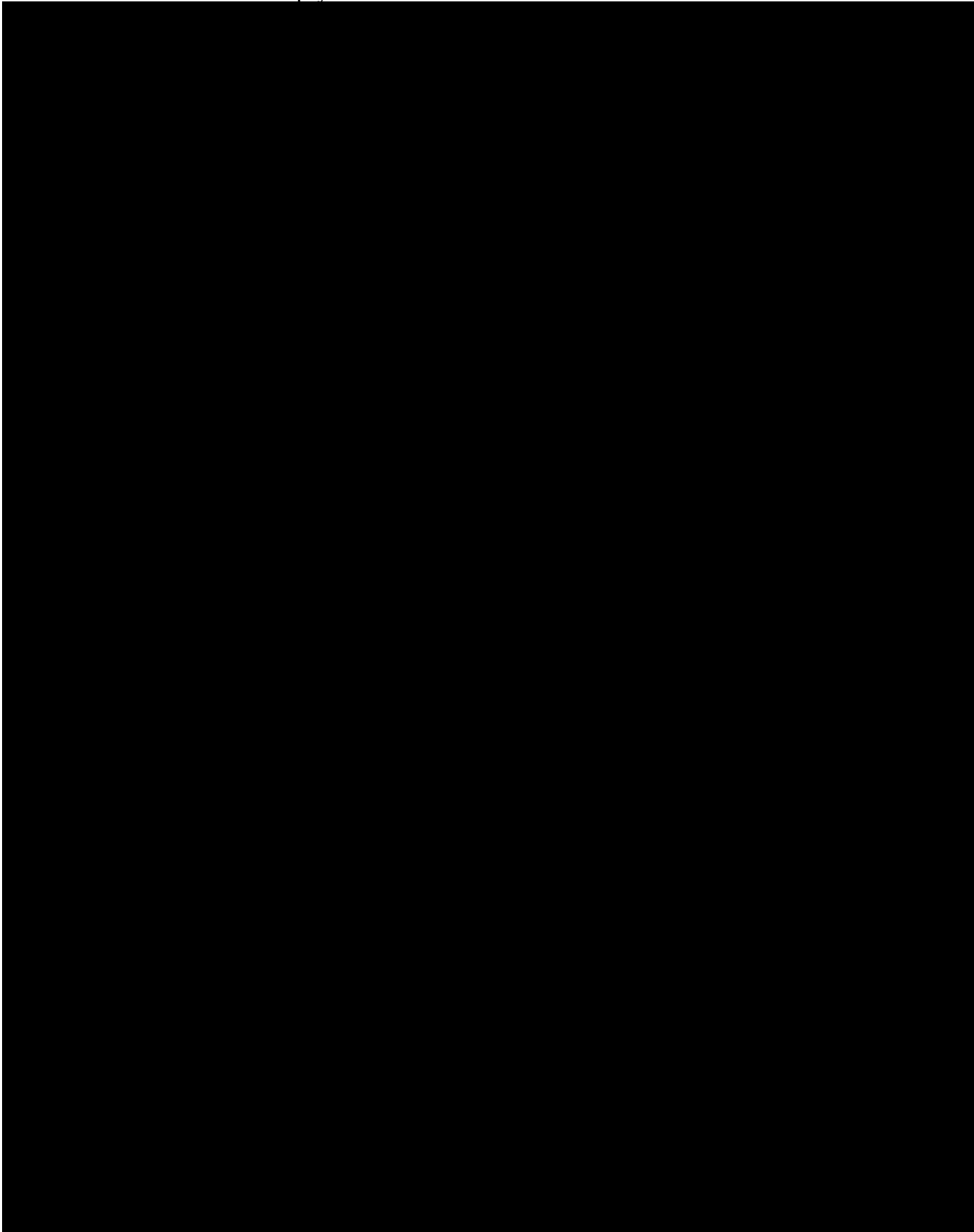


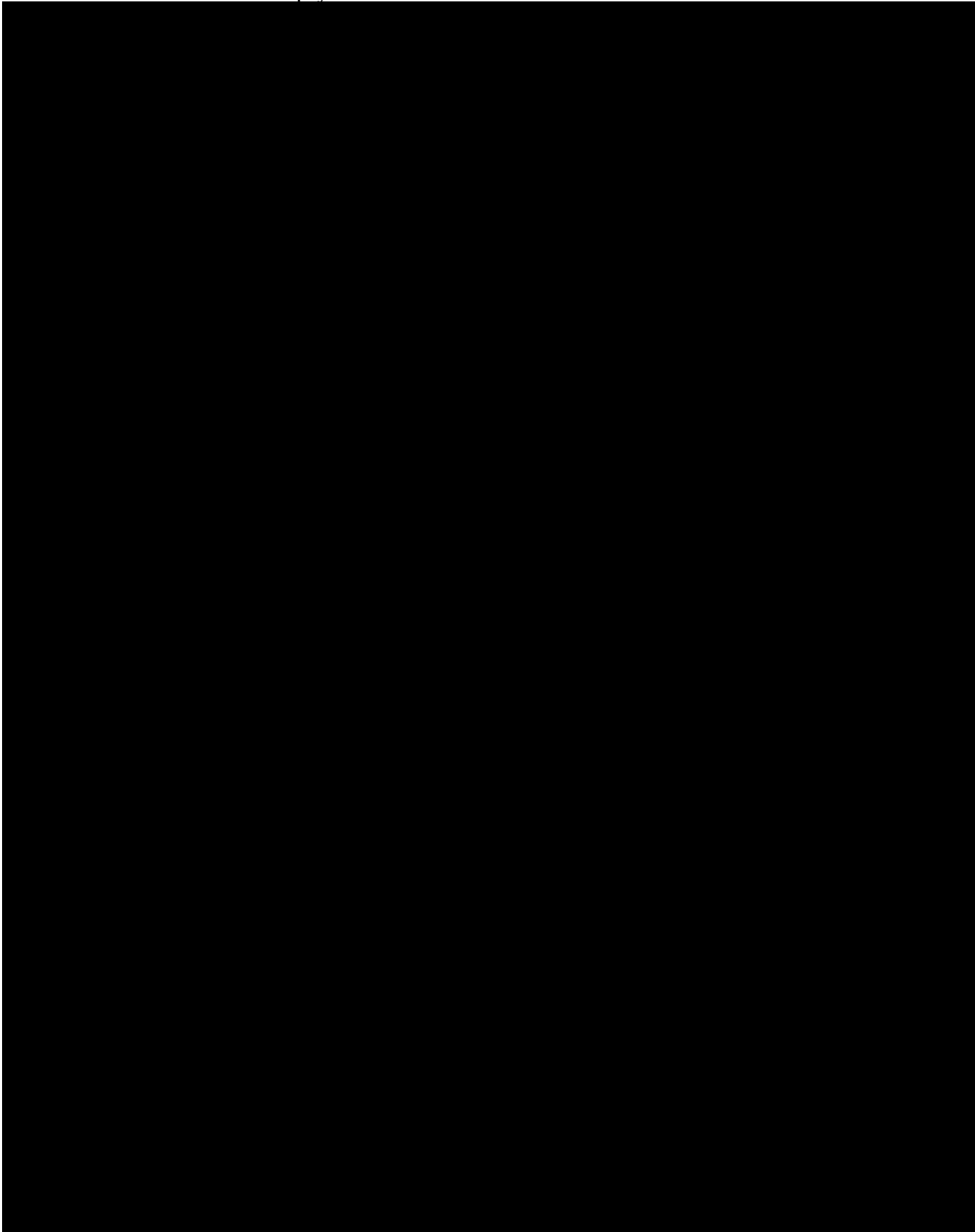


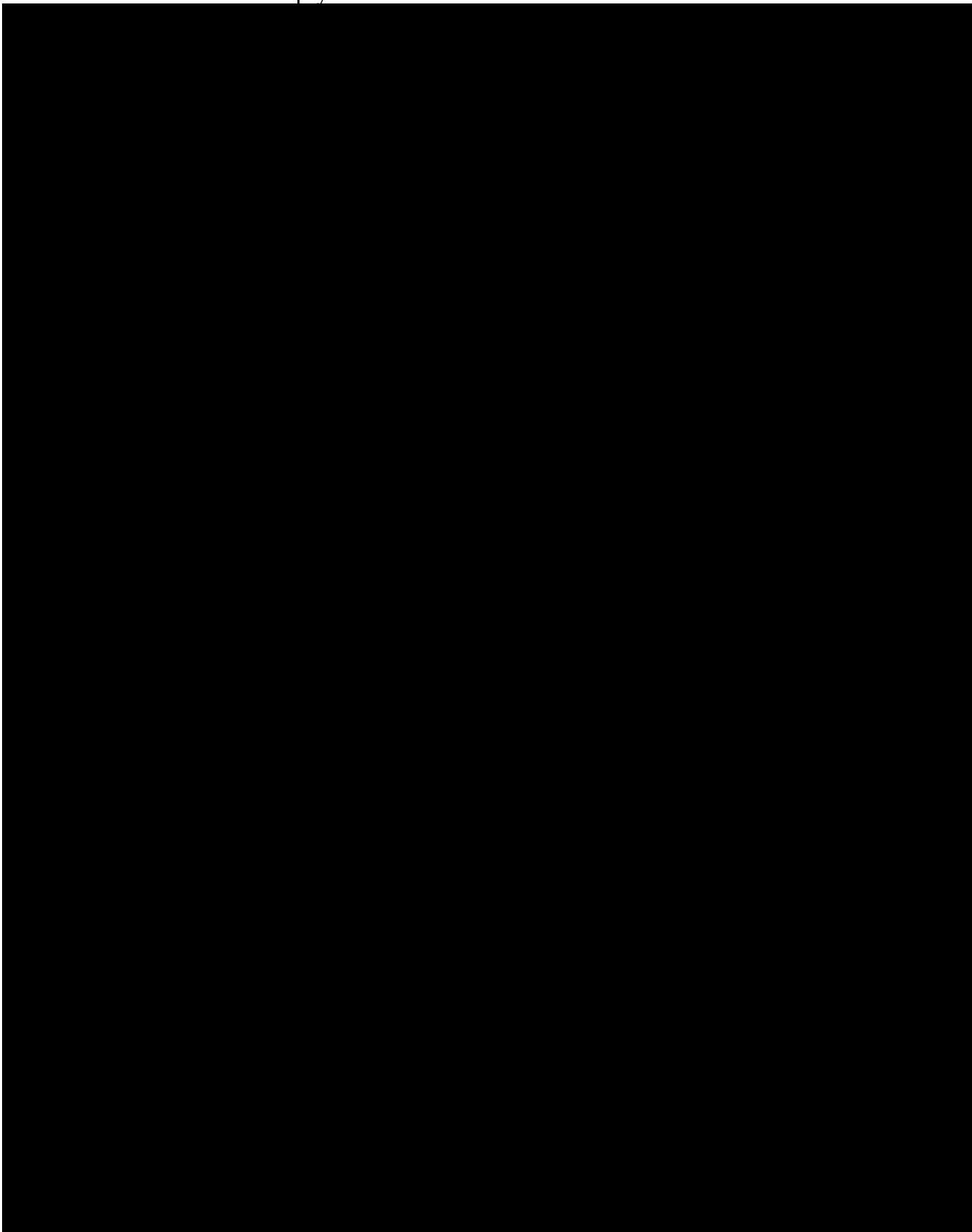


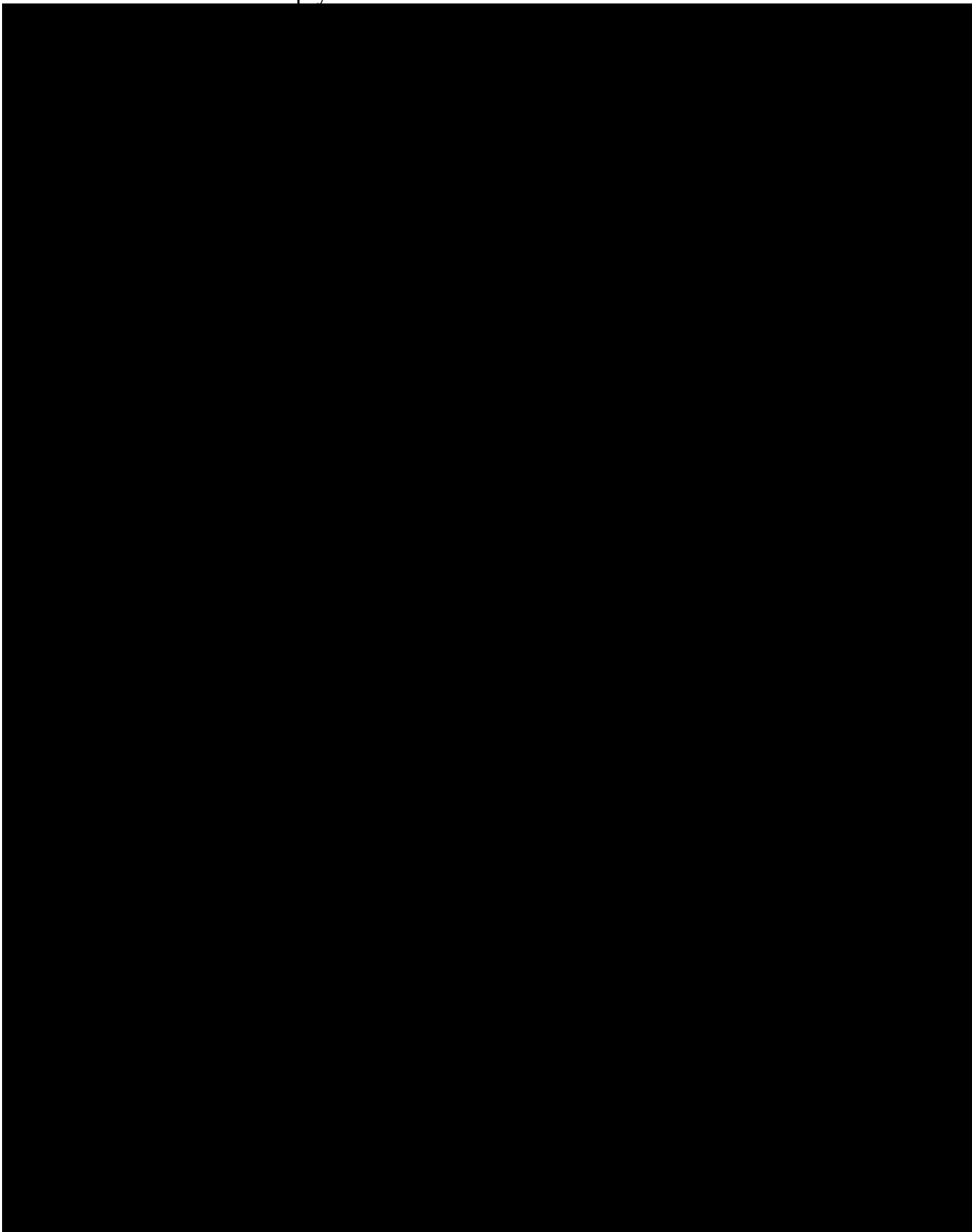


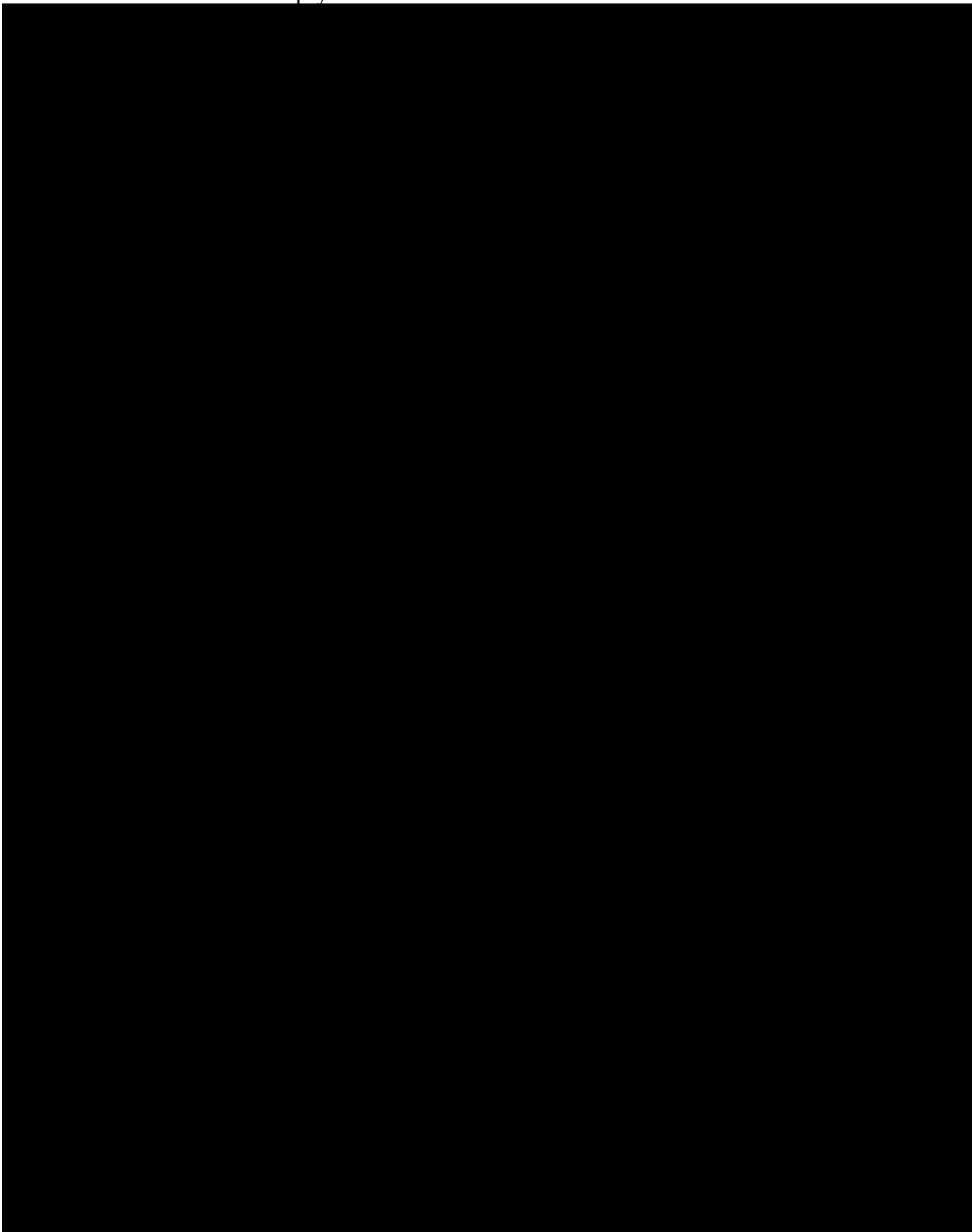


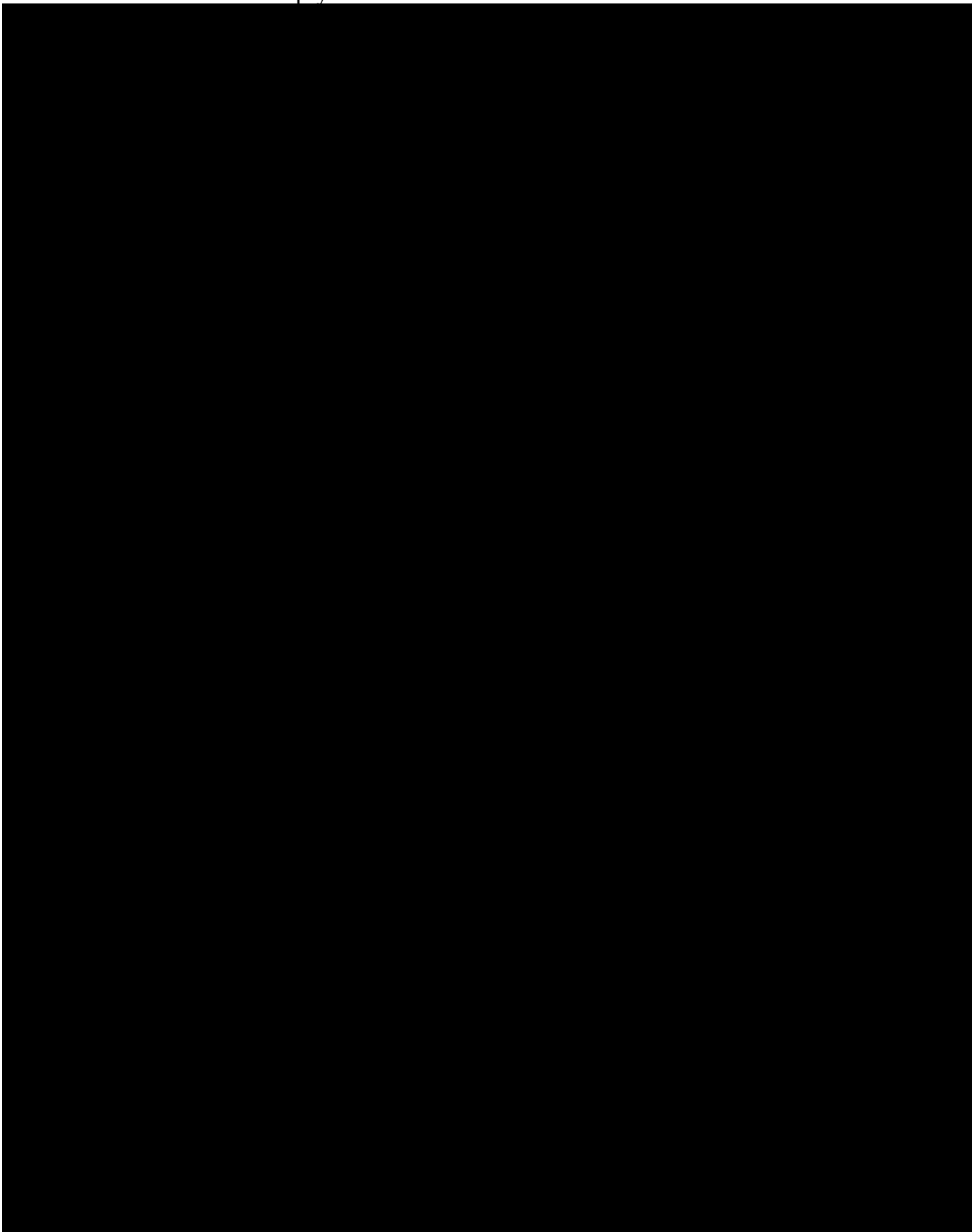


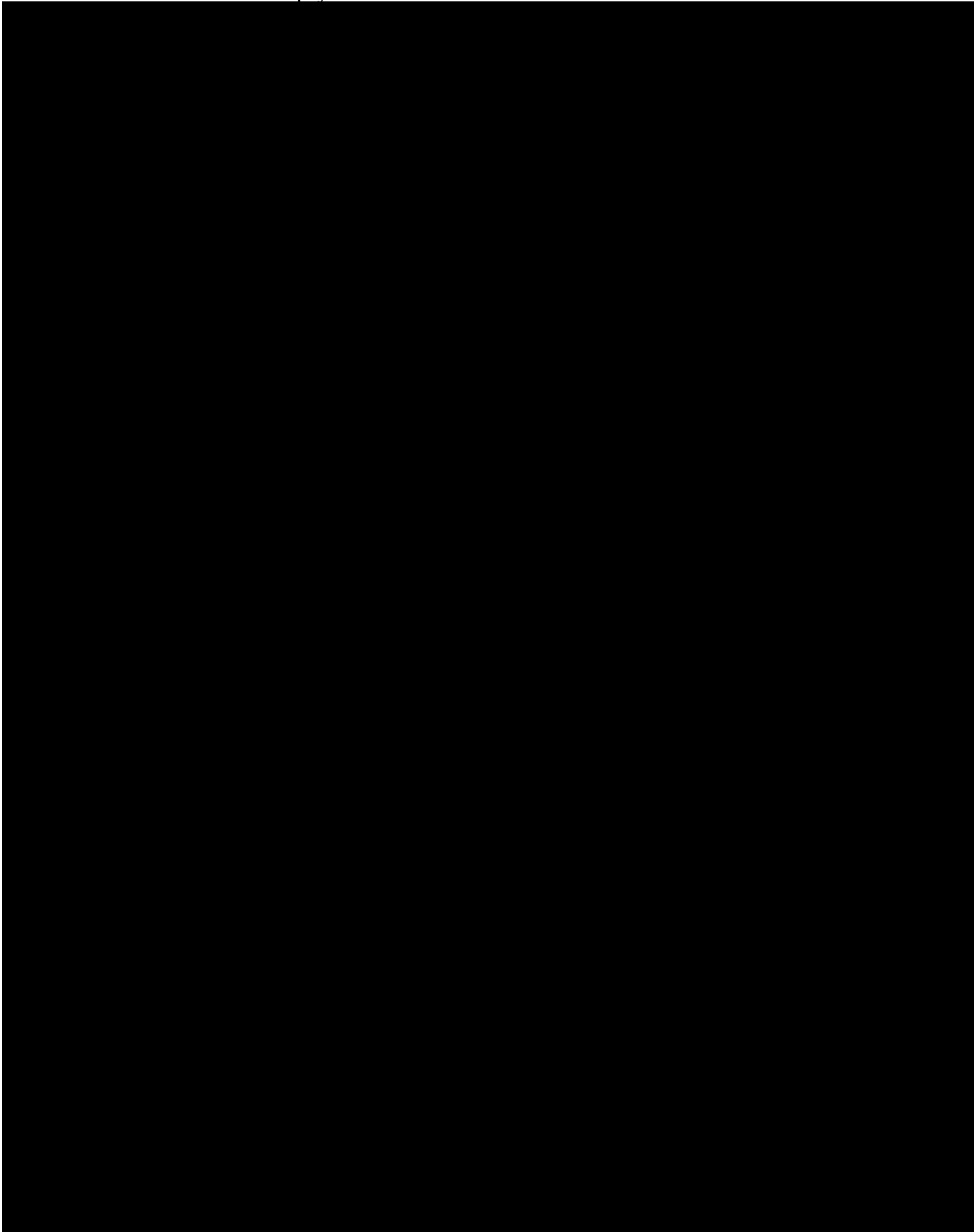


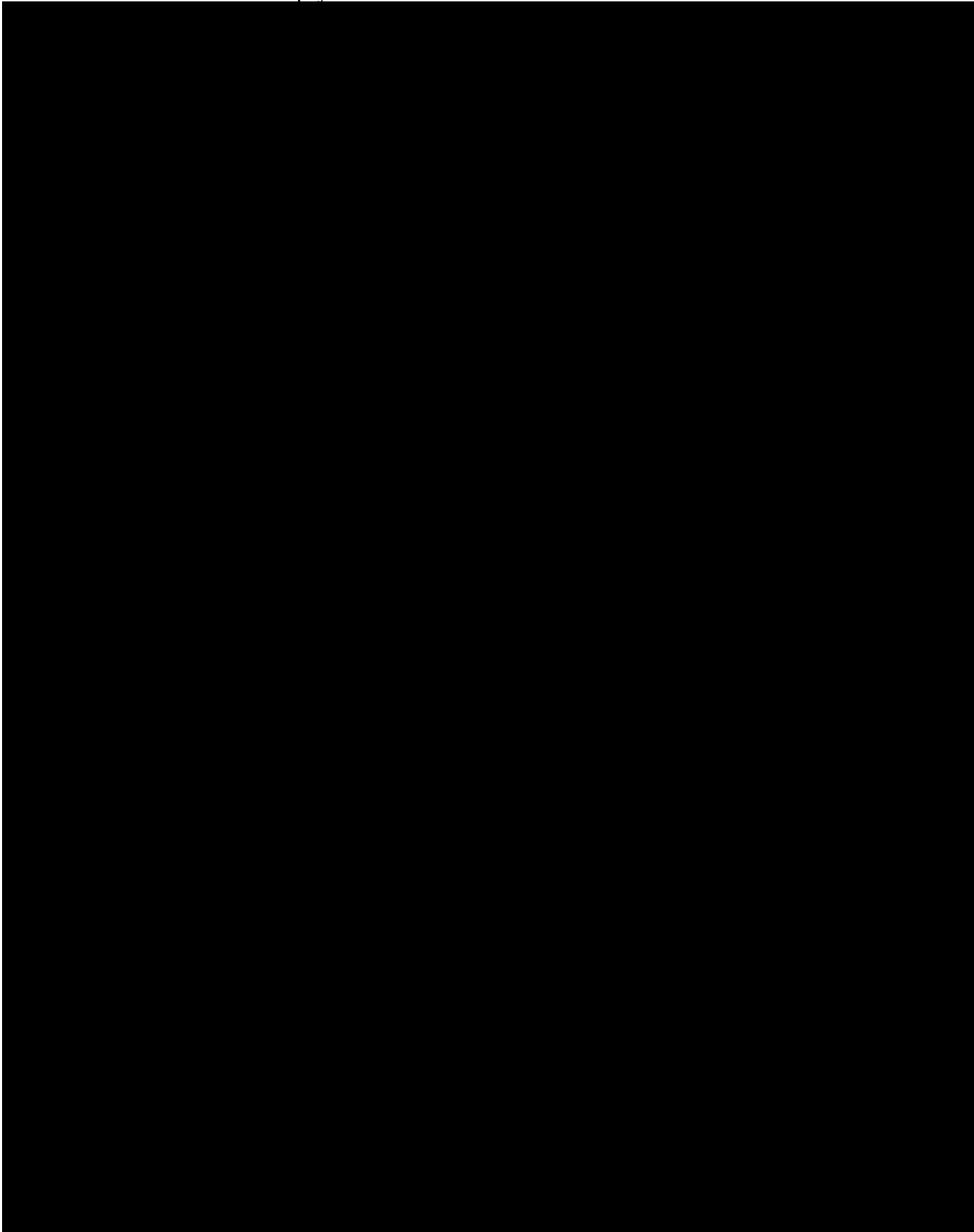


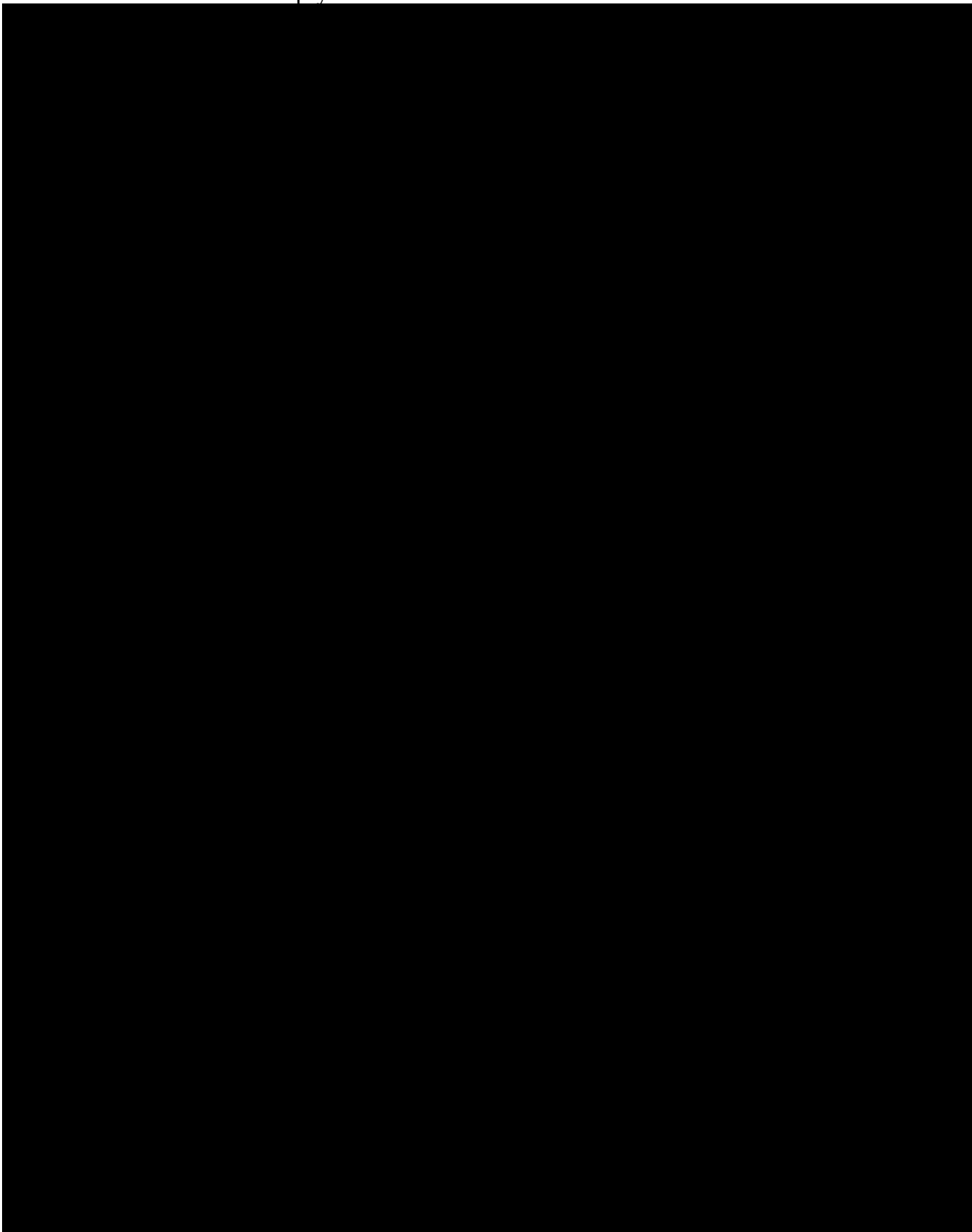


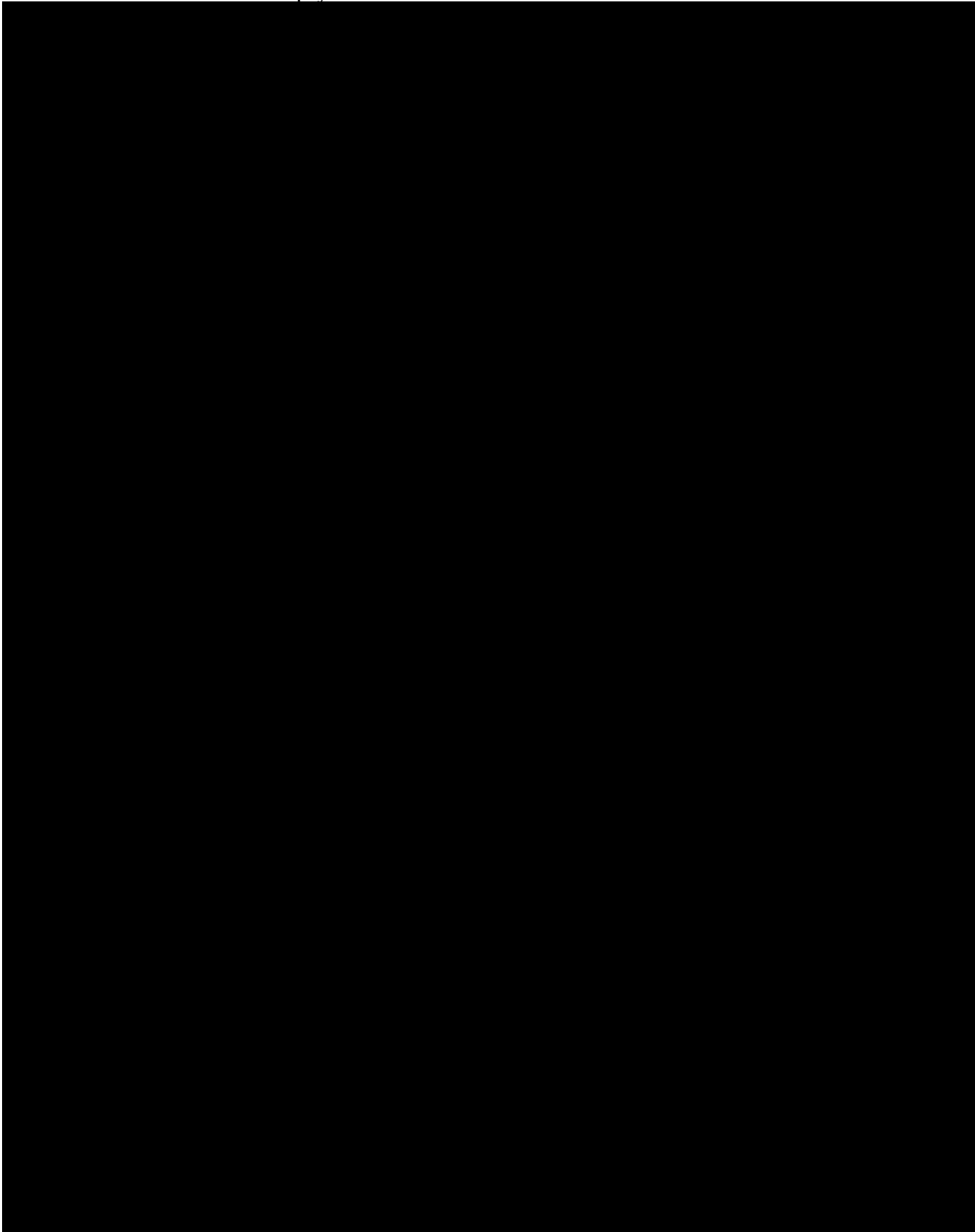


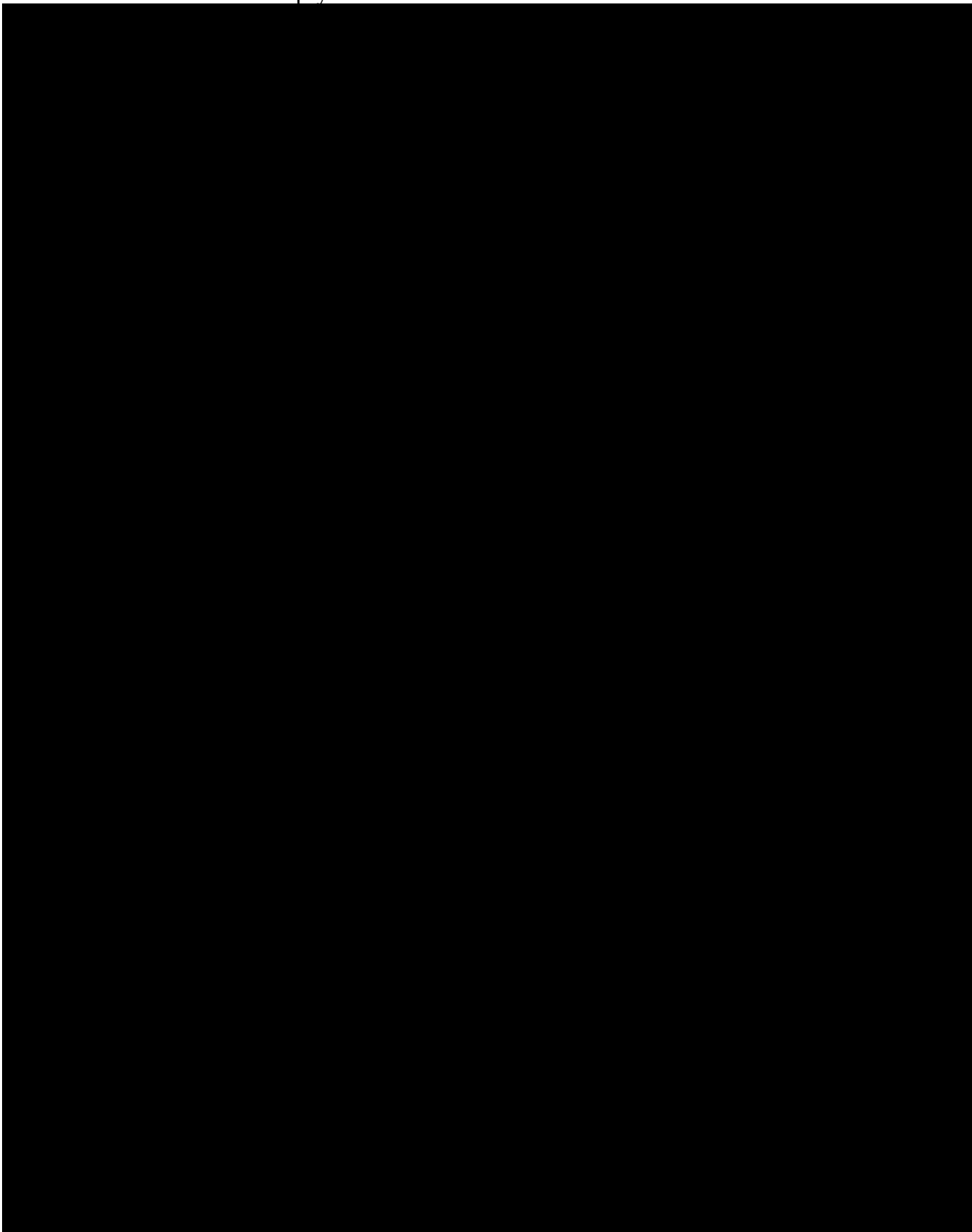












V. CLAIM CONSTRUCTION

As explained in the POR, the claimed “matched filtering/correlation module” should include that energy is “transferred to a load to form a down-

converted signal.” POR,63-68. Petitioner asserts that the matched filtering/correlating module does not include this concept. Reply,25. Not so.

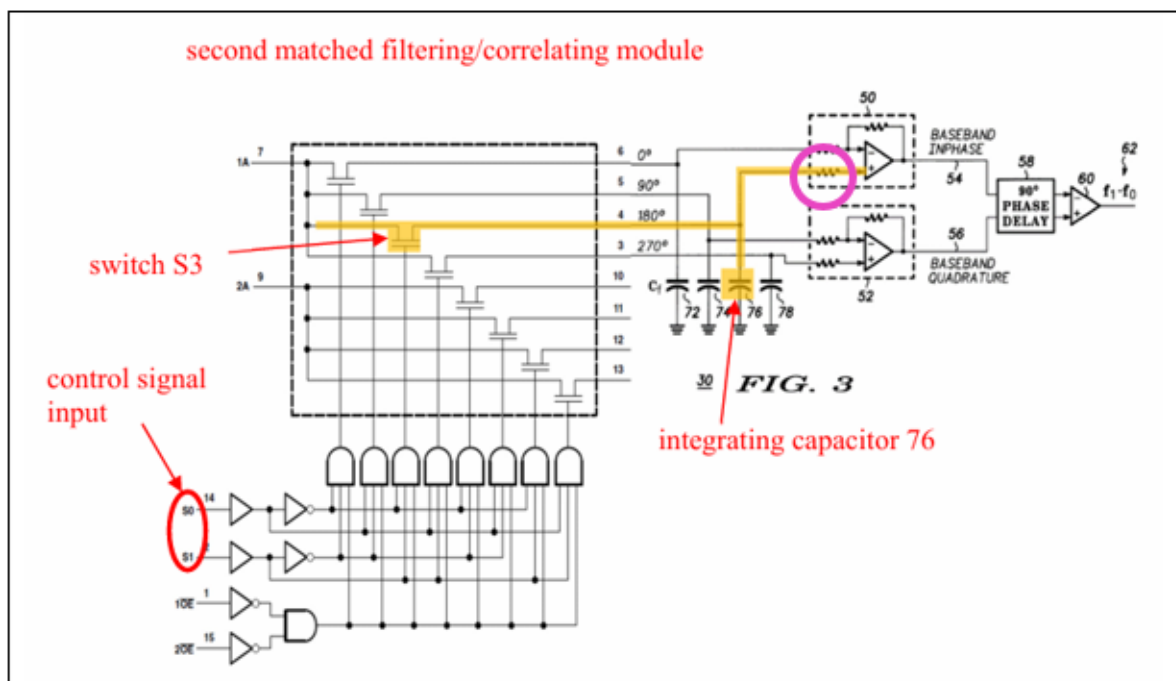
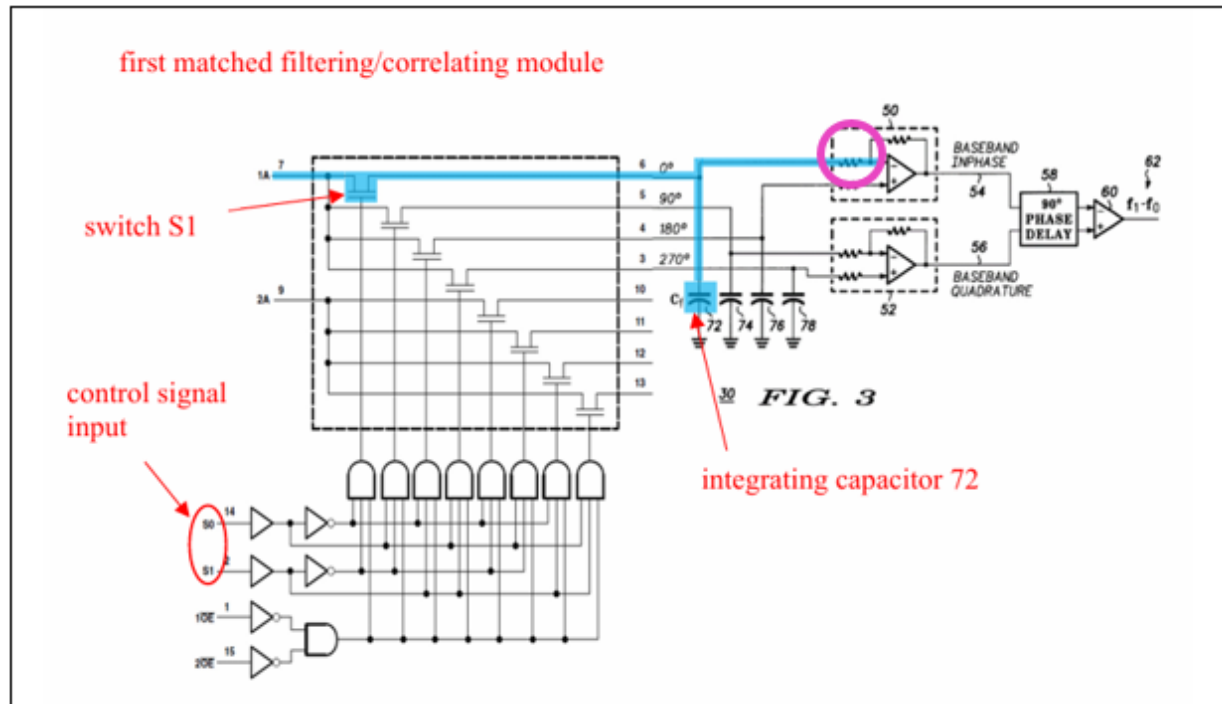
Petitioner does not dispute that a matched filtering/correlating module includes an integrator/capacitor that accumulates charge/energy. Indeed, Petitioner spends considerable time discussing this. Reply,26-29. And Petitioner concedes that, as disclosed with regard to matched filtering/correlating modules, “the result of accumulating charge is a down converted signal.” Reply,26.

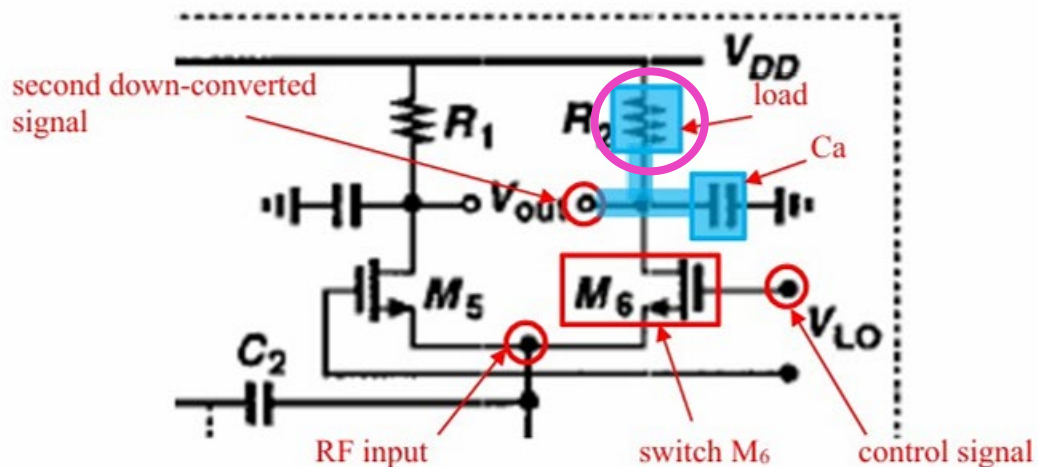
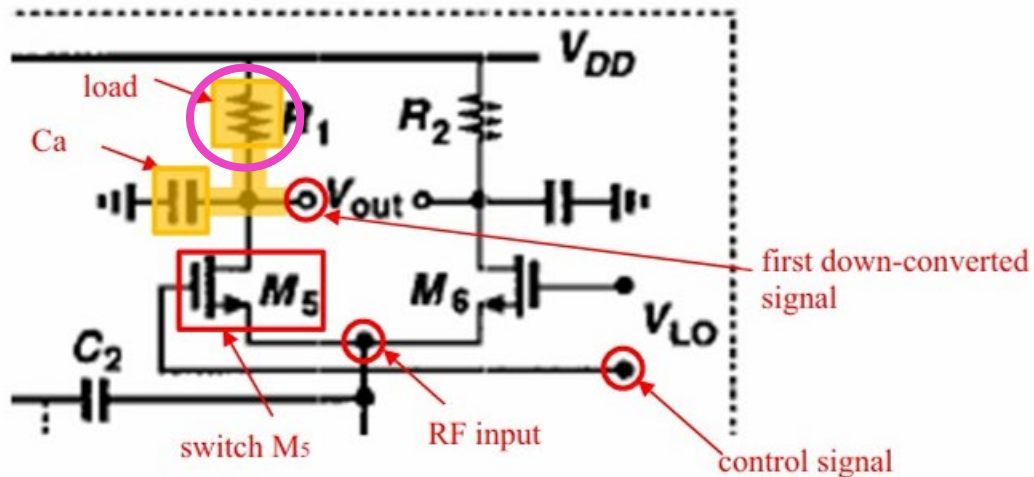
This begs the question – what is the relationship between accumulating charge and the down-converted signal? Consistent with PO's construction, the specification states that the accumulated charge in the integrator/capacitor is “*used to form*” the down-converted signal. Ex.-1001,130:28-31. Tellingly, Petitioner ignores this disclosure. In order to use charge to form the down-converted signal, the integrator/capacitor discharges the accumulated/integrated energy to a load. Ex.-2024,¶199 (citing Ex.-1001,147:35-42,148:17-24). And as Galton *admits*, charging and discharging indicates the presence of a load. Ex.-2040,12:10-22.

A. Petitioner Changes Positions.

Petitioner's assertion that a “matched filtering/correlating module” does not include a load is *inconsistent* with the Petition. In particular, as shown below, Petitioner/Galton themselves annotated portions of Tayloe/Razavi (blue/orange

highlights) to identify the alleged matched filtering/correlating modules. Those annotations include a load (pink circle, PO annotated).





Ex.-1003, ¶¶136,149,174,185.

Petitioner/Galton's original annotations are consistent with PO's proposed construction and the '177 disclosure (Ex.-1001,130:28-40; POR,64-66). Tellingly, the Reply ignores them.

Only now, after seeing PO's arguments in the POR, do Petitioner/Galton attempt to disavow a load. This is a clear shift in theory. Petitioner, however, cannot change positions simply because its original theory supports PO's construction and undermines its invalidity case.⁷ The Board should reject Petitioner's attempted walk-back.

B. The '177 Patent Requires A Load.

The claimed "matched filtering/correlating module" only works to down-convert if it includes a load. Without a load, energy cannot be transferred to form a down-converted signal. The '177 patent itself and Galton's own admissions confirm this.

Petitioner/Galton's contrary arguments require a POSITA to: (1) ignore their own knowledge, (2) ignore figure descriptions, and (3) isolate certain portions of the specification while ignoring others that contradict their position.

Petitioner/Galton also conveniently ignore how the '177 patent progressively builds on concepts—from high-level figures/discussions to increasingly detailed figures/discussions/implementations. Petitioner attempts to exploit the absence of

⁷ PO argues that Tayloe/Razavi do not invalidate because they do not transfer energy to a load to form a down-converted signal. POR,98-99,108-110.

an explicit load in certain higher-level figures to argue that no load is required. But in doing so, Petitioner omits key disclosures.

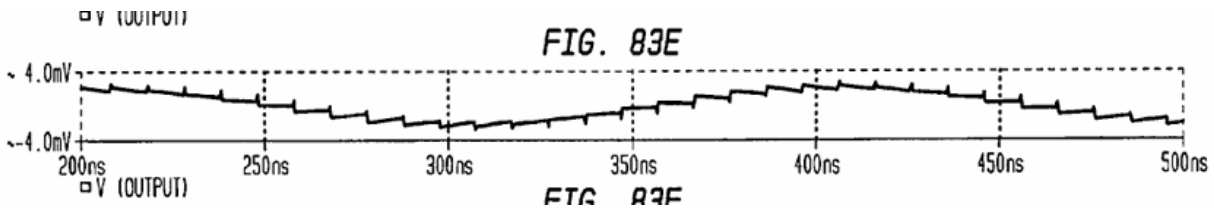
First, Petitioner cites figures showing an integrator (e.g., capacitor) charges and accumulates/integrates energy. But Petitioner conveniently ignores what happens next (i.e., discharge)—suggesting that “the result of accumulating is a down-converted signal.” Reply,26.

Yet Petitioner's own annotation to Figure 152 (Reply,27)—“*output of accumulation is a down-converted signal*”—undermines its argument. Petitioner implicitly concedes that it is not the accumulation itself that produces the down-converted signal, but rather the *output* of that accumulation. *Output* necessarily requires discharge.

The '177 patent confirms this, stating that the accumulated charge in the integrator/capacitor is “*used to form*” the down-converted signal. Ex.-1001,130:28-31. For this to occur, the integrator/capacitor discharges the accumulated/integrated energy to a load. Ex.-1001,147:35-149:19. Galton admits as much, testifying that charging and discharging indicates the presence of a load. Ex.-2040,12:10-22.

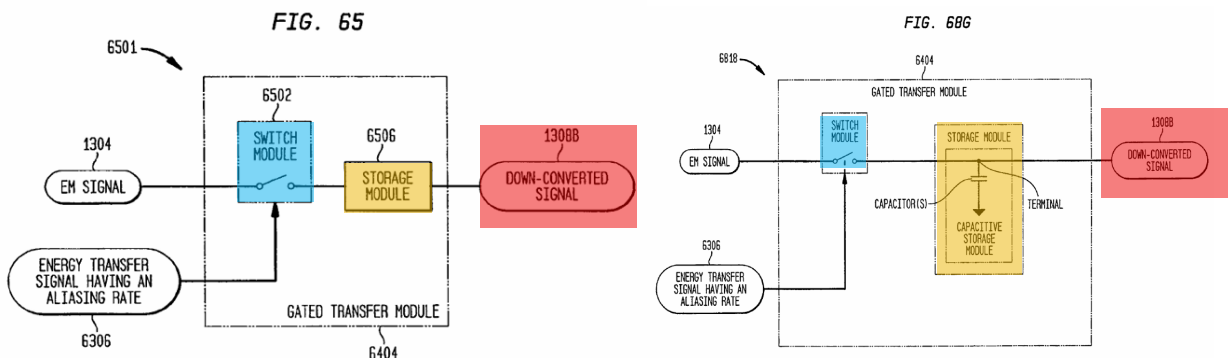
Second, Petitioner relies on Figures 65 and 68G to assert that “[t]he '177 patent provides embodiments of energy transfer that do not include transferring to a load.” Reply,30-31. But this does not mean one is not present/required.

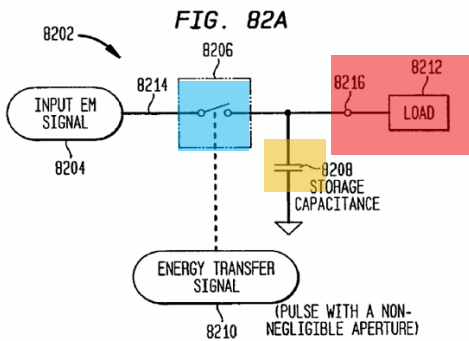
Again, Petitioner ignores that the patent explicitly states Figures 65/68G operate as shown in Figures 83A-F. Ex.-1001,104:41-45,107:1-4.



Notably, Figure 83E (above) shows the down-converted signal corresponding to Figures 65/68G. Galton admits Figure 83E depicts both charging and discharging of a capacitor, and that discharge indicates the presence of a load. Ex.-2040,12:10-22. Galton also admits that a matched filtering/correlating module integrates and “then output[s].” Ex.-2034, 26:16-27:16. Thus, the omission of a load from Figures 65/68G is immaterial. A POSITA understands that a load is used. Ricketts agrees. Ex.-2024, ¶¶186-188.

Petitioner also ignores that Figures 65/68G are directly tied to Figure 82A (shown below), which shows a load (all figures operate as shown in Figure 83E). Ex.-1001,74:20-21.





As shown above, the figures show the same thing with increasing detail—from higher-level (Figure 65/68G) to implementation-level (Figure 82A), which makes clear that the down-converted signal (13088) is formed at a load.

Third, Petitioner points to Figure 173 as showing a matched filtering/correlating module without a load. Reply,25-26. But again, Petitioner focuses solely on accumulation and ignores the subsequent/necessary discharge. A POSITA understands that the capacitor in Figure 173 accumulates/stores energy and *then discharges that energy*. Ex.-2024,¶¶186-188. As Galton admits, this happens with the presence of a load. Ex.-2040,12:10-22. That a load is not shown is irrelevant.

Petitioner then points to formulas used to calculate “charge accumulation” and signal-to-noise ratio (SNR) (for the accumulated charge) in Figure 173. Reply,28,30. This is a red herring. Those formulas describe only accumulation.

Petitioner's argument confuses what the formulas measure (accumulation) with what is required to form the down-converted signal (discharge to a load).

Fourth, Petitioner asserts that because Figure 175A shows load R_L , this demonstrates that a load is optional in other embodiments. Reply,29-30. Not so. As discussed above, a load is required for a matched filtering/correlating module to down-convert regardless of whether it is shown in the figures.

Contrary to Petitioner's assertion, Figure 175A is *not* an alternative embodiment of the matched/filtering correlating modules shown in earlier figures. Instead, Figure 175A simply introduces a discussion of how a load (here, R_L across capacitor C) affects discharging behavior of the capacitor. Ex.-1001,147:39-148:16. This specific load configuration is used so that the patent does not have to repeat "[t]he general forms of the differential equation and transfer function" described earlier in the patent (including Figure 173). Ex.-1001,147:35-39).

Fifth, similar to Petitioner's arguments regarding embodiments of the matched filtering/correlating module, Petitioner also incorrectly asserts that energy transfer embodiments do not include transferring energy to a load. Reply,31-33. Notably, Petitioner points only to portions of the specification that describe energy transfer occurring from the input signal (across a switch) to the capacitor. *Id.* Petitioner then asserts—without support—that this transfer alone is sufficient to

achieve down-conversion and, thus, no load is required. But Petitioner ignores that this is only one step in the down-converting process. The specification *repeatedly* explains that, in energy transfer, the down-converted signal is formed by discharging energy from a capacitor to a load. POR,18-22; *see also, e.g.*, Ex.-1001, Figs. 50E/51E/52E/83E; 80:62-81:5; 82:6-16; 83:47-57.

Finally, Petitioner asserts that driving a low impedance load is simply a benefit of an energy transfer system and, thus, *energy transfer* is achieved independent of a load. Reply,33-34. This is a red herring. It is irrelevant whether some sort of energy transfer can occur without a load. What matters is whether, in an energy transfer system, a *down-converted signal* can be achieved *without* a load. As discussed above, it cannot.

VI. Tayloe/TI-Datasheet Does Not Render Claim 14 Obvious.

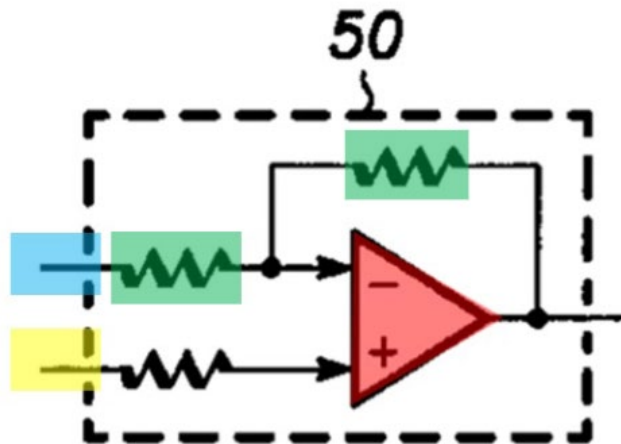
As explained in the POR, Tayloe does not transfer energy to a load (i.e., to Tayloe's differential amplifiers 50, 52) to form a down-converted signal.

In particular, Ricketts explains that Tayloe is a voltage sampling system and, as such, holds charge on the capacitors so that an accurate voltage can be read and a baseband signal can be derived therefrom. Ex.-2024,¶¶234,284-85. There is no discharge to a load (Tayloe's amplifiers 50,52). *Id.*,¶286. If discharge were to occur, the voltage could not be accurately read. *Id.*,¶284. And “without an accurate

reading of the voltage, the baseband signal cannot be accurately recreated (the system would not work).” *Id.*, ¶127.

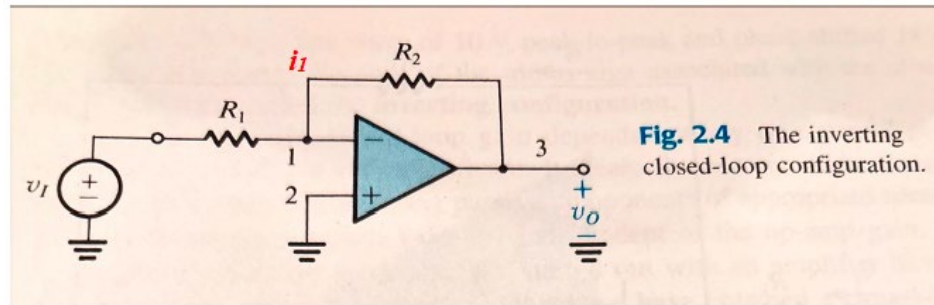
Tellingly, Petitioner does not dispute in its Reply that Tayloe is a voltage sampling system. Nor does it address the fundamental problem Ricketts raises: that discharging to Tayloe’s amplifiers 50 and 52 would corrupt the sampled voltage and circuit operation.

Ricketts explained that Tayloe’s amplifiers present high impedance loads, so the capacitors do not discharge to them. Ex.-2024, ¶¶226-234.

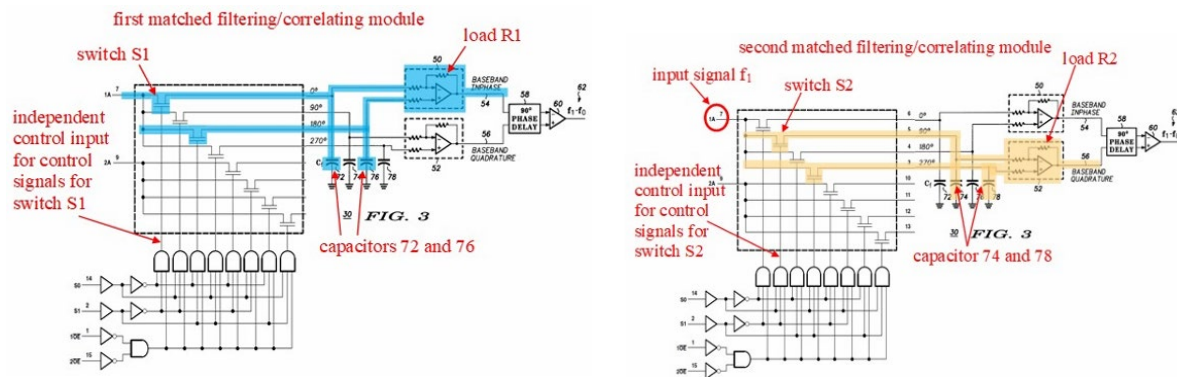


As shown above, there is no dispute that the yellow input has high resistance/impedance. Galton admits this. Ex.-2034, 72:14-73:6, 85:1. Ricketts further explained that the blue input must match the yellow input’s impedance/resistance—meaning it also must be high resistance/impedance or

problems would occur. Ex.-2024, ¶¶229-31. The Reply fails to address this argument.



Instead, without any way to discuss what is actually shown in Tayloe, the Reply shifts its discussion and tries to draw parallels between Tayloe's figures and the diagram (above) in a publication by Sedra. Reply,37-38. In Sedra's amplifier configuration, the "+" input is connected directly to ground. Ex.-2040,15:5-11.

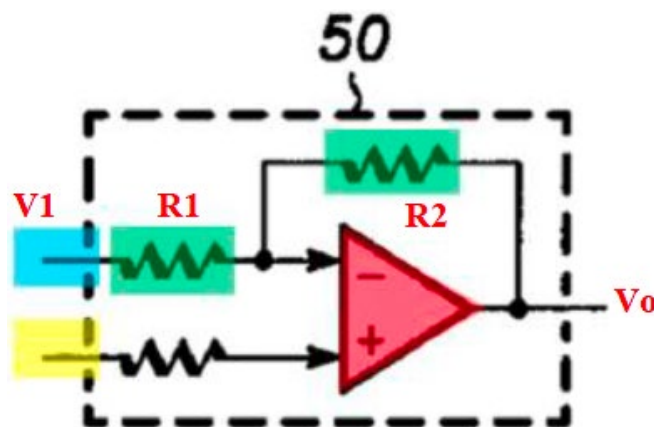


Pet., 26,43.

But, as shown above (Petitioner/Galton annotated), Tayloe has a completely different configuration. Unlike Sedra, the "+" input of Tayloe's amplifiers 50,52 are connected to a switch and capacitor, not to ground.

With regard to Sedra, Petitioner asserts that the “−” input (inverted input) exhibits low input impedance and, thus, current flows through R_1 and R_2 . Reply,38. Even assuming that is true in Sedra's configuration, Petitioner offers no evidence that the same behavior occurs in Tayloe's very different setup.

Instead, Petitioner asserts that when the switch connected to the “−” input in Tayloe is closed, the voltage on the “+” input is held constant which is equivalent to holding it to ground. *Id.*,38. But this reasoning ignores the fact that, as Ricketts explains, the blue and yellow amplifier inputs in Tayloe's circuit must already be impedance-matched (and high impedance) at the outset—before any signal is applied.



Reply,37 [Petitioner annotated].

The Reply does not rebut that the blue/yellow inputs must match and would be high impedance.

Finally, Petitioner asserts that it would be obvious to select a low resistance value for R_1/R_2 to optimize SNR. *Id.*,39. But this argument contradicts Petitioner's claim construction position, where it asserted that SNR can be optimized *without* considering the load resistor. *Id.*,30. Petitioner cannot have it both ways.

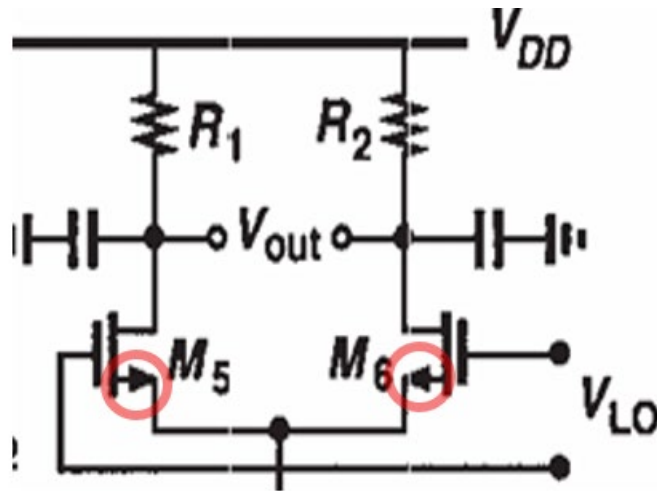
Nevertheless, citing a general advantage of low resistance does not overcome the need to match input impedances. Because there is no mechanism in Tayloe's amplifier to change the high impedance "+" input to low impedance, as Ricketts explains, the green resistors must be very high resistance/impedance. Ex.-2024,¶229.

VII. Razavi Does Not Render Claim 14 Obvious.

With regard to Razavi, Petitioner asserts that claim 14 does not require transferring to a load and, thus, directionality of current is not relevant. Reply,40. "Transferring to a load," however, is *not* the only argument PO makes. Directionality is relevant to PO's other argument—Razavi does not disclose sampling an input (RF) signal at an aliasing rate.

As Ricketts explains, when transistors M_5 and M_6 in Razavi's mixer are ON, energy is *not* transferred from the RF input upward through transistors M_5/M_6 towards capacitors C_p/C_m . POR,101-107 (citing Ex.-2024,¶¶306-22). Instead, as shown below, current only flows only downward from V_{DD} in the direction of the

transistor arrows (red). Because current does not flow upward from the RF input through transistors M5/M6, Razavi does not sample the input signal (reducing the RF input from a continuous-time signal to a discrete-time signal).



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.-2040,62:3-10, 63:8-20. Thus, Razavi does not meet this claim element.

Without any way of countering this, Petitioner/Galton *change* positions 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.

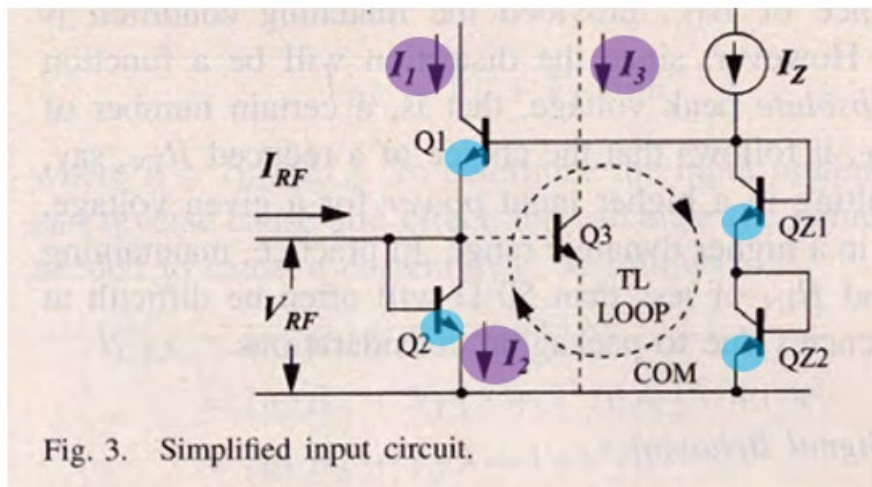
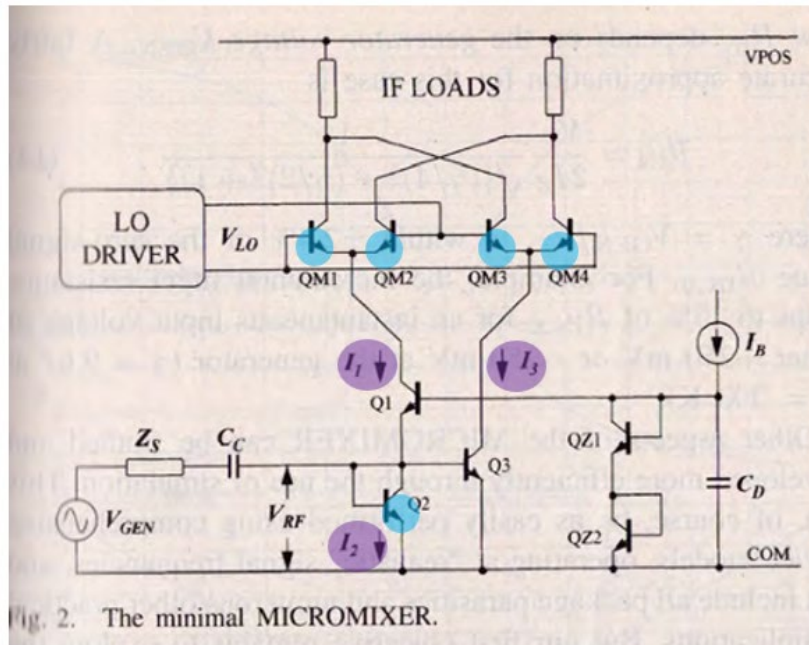
There are two ways to look at current flow – conventional current⁸ and the flow of electrons. The two are opposites. For conventional current, charge flows from a higher to lower potential (V_{DD} to ground). *Id.*,19:1-4. Electron flow is the opposite. Reply,40.

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.”) And Galton admits, the '177 patent is written from the perspective of conventional current, including its description of charging and discharging storage elements (capacitors). Ex.-2040,61:16-62:2. Indeed, the claims relate to transferring energy (which the Reply does not dispute). 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.-2040,21:19-24:5; *see also id.*,19:16-20:1 (admitting that “I”/“i” refers to conventional current). This should end the inquiry.

⁸ Conventional current is a well-known concept taught in engineering classes and discussed in the electronic industry. Ex.-2040,18:12-22.

Consistent with this (and Petitioner's own submitted literature), Ricketts analyzes the claims/prior art using conventional current—as would a POSITA. Petitioner, however, offers no evidence that a POSITA would rely on electron flow 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"/"i") and analyze current flow.



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.

Dated: July 31, 2025

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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 5,264 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).

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CERTIFICATE OF SERVICE

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