

IPR2023-00992
IPR2023-00993

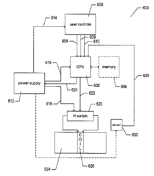
*Samsung Electronics Co., Ltd. v.
Resonant Systems, Inc.*

U.S. Patent No. 9,369,081
U.S. Patent No. 9,941,830

Patent Owner's Demonstratives

Challenged Claims

'081 Patent:

 US009369081B2	
(12) United States Patent Elena et al.	(10) Patent No.: US 9,369,081 B2 (45) Date of Patent: Jun. 14, 2016
(54) LINEAR VIBRATION MODULES AND LINEAR-RESONANT VIBRATION MODULES	(56) References Cited U.S. PATENT DOCUMENTS
(71) Applicant: Resonant Systems, Inc., Seattle, WA (US) (72) Inventors: Robin Elena, Seattle, WA (US); Brian Marc Pepin, Oakland, CA (US); Glen Tompkins, Woodinville, WA (US) (73) Assignee: Resonant Systems, Inc., Seattle, WA (US) (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.	1,120,414 A 12/1914 Schofield et al. 3,728,654 A 4/1973 Tada 4,540,535 A 10/1985 Wong 4,692,999 A 9/1987 Francis 5,017,819 A 5/1991 Pratt et al. 5,187,398 A 2/1993 Shurt et al. 5,251,356 A 7/1993 van Nanten 5,251,357 A 7/1993 van Nanten 5,424,592 A 6/1995 Blum et al. 5,806,076 A 4/1999 van Nanten 5,955,799 A 9/1999 Amaya et al. 5,973,422 A 10/1999 Chantre (Continued)
(21) Appl. No.: 14/469,210 (22) Filed: Aug. 26, 2014 (65) Prior Publication Data US 2014/0361714 A1 Dec. 11, 2014 Related U.S. Application Data (63) Continuation of application No. 13/345,607, filed on Jan. 6, 2012, now Pat. No. 8,860,337, which is a continuation-in-part of application No. 12/782,697, filed on May 18, 2010, now Pat. No. 8,093,767. (60) Provisional application No. 61/179,109, filed on May 18, 2009. (51) Int. Cl. H02K 33/00 (2006.01) H02P 25/02 (2016.01) H02K 33/16 (2006.01) (52) U.S. Cl. CPC H02P 25/027 (2013.01); H02K 33/16 (2013.01) (58) Field of Classification Search CPC H02P 25/027 ; F15D 2211/327 ; F15D 2211/85 ; F15D 2211/6346 See application file for complete search history.	FOREIGN PATENT DOCUMENTS EP 1 376 833 A1 1/2004 Primary Examiner — Karen Masih (74) Attorney, Agent, or Firm — Olympic Patent Works PLLC (57) ABSTRACT The current application is directed to various types of linear vibrational modules, including linear-resonant vibration modules, that can be incorporated in a wide variety of appliances, devices, and systems to provide vibrational forces. The vibrational forces are produced by linear oscillation of a weight or member, in turn produced by rapidly alternating the polarity of one or more driving electromagnets. Feedback control is used to maintain the vibrational frequency of linear-resonant vibration module at or near the resonant frequency for the linear-resonant vibration module. Both linear vibration modules and linear-resonant vibration modules can be designed to produce vibrational amplitude/frequency combinations throughout a large region of amplitude/frequency space.
18 Claims, 20 Drawing Sheets	
	

1. A linear vibration module comprising:
 - a housing;
 - a moveable component;
 - a power supply;
 - user-input features;
 - a driving component that drives the moveable component in each of two opposite directions within the housing; and
 - a control component that controls supply of power from the power supply to the driving component to cause the moveable component to oscillate at a frequency and an amplitude specified by user input received from the user-input features.

IPR2023-00992, Ex. 1001

Challenged Claims

'830 Patent:

 US009941830B2	
(12) United States Patent Elenga et al.	(10) Patent No.: US 9,941,830 B2 (45) Date of Patent: Apr. 10, 2018
(54) LINEAR VIBRATION MODULES AND LINEAR-RESONANT VIBRATION MODULES	(58) Field of Classification Search CPC H02P 25/032; H02K 7/1876; B06B 1/166 See application file for complete search history.
(71) Applicant: Resonant Systems, Inc. , Seattle, WA (US)	(56) References Cited
(72) Inventors: Robin Elenga , Seattle, WA (US); Brian Marc Pepin , Oakland, CA (US); Glen Tompkins , Woodinville, WA (US)	U.S. PATENT DOCUMENTS 1,120,414 A 12/1914 Schofield et al. 3,728,654 A 4/1973 Tada 4,540,535 A 10/1982 Wong 4,692,999 A 9/1987 Frandsen 5,017,819 A 5/1991 Pitt et al. 5,187,398 A 2/1993 Stuart et al. 5,231,336 A 7/1993 van Nuenen (Continued)
(73) Assignee: Resonant Systems, Inc. , Seattle, WA (US)	FOREIGN PATENT DOCUMENTS EP 1 376 833 A1 1/2004
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.	(74) Attorney, Agent, or Firm — Olympic Patent Works PLLC
(21) Appl. No.: 15/181,249	(57) ABSTRACT The current application is directed to various types of linear vibrational modules, including linear-resonant vibration modules that can be incorporated in a wide variety of appliances, devices, and systems to provide vibrational forces. The vibrational forces are produced by linear oscillation of a weight or member, in turn produced by rapidly alternating the polarity of one or more driving electromagnets. Feedback control is used to maintain the vibrational frequency of linear-resonant vibration module at or near the resonant frequency for the linear-resonant vibration module. Both linear vibration modules and linear-resonant vibration modules can be designed to produce vibrational amplitude/frequency combinations throughout a large region of amplitude/frequency space.
(22) Filed: Jun. 13, 2016	
(65) Prior Publication Data US 2016/0301346 A1 Oct. 13, 2016	
Related U.S. Application Data (63) Continuation of application No. 14/469,210, filed on Aug. 26, 2014, now Pat. No. 9,369,081, which is a continuation of application No. 13/245,607, filed on Jan. 6, 2012, now Pat. No. 8,860,337, which is a continuation-in-part of application No. 12/782,697, filed on May 18, 2010, now Pat. No. 8,093,767. (60) Provisional application No. 61/179,109, filed on May 18, 2009.	
(51) Int. Cl. H02K 33/00 (2006.01) H02P 25/032 (2016.01) H02K 33/16 (2006.01)	
(52) U.S. Cl. CPC H02P 25/032 (2016.02); H02K 33/16 (2013.01)	
20 Claims, 20 Drawing Sheets	

1. A vibration module comprising:
a housing;
a moveable component;
a power supply;
user-input features;
a driving component that drives the moveable component to oscillate within the housing; and
a control component that controls supply of power from the power supply to the driving component to cause the moveable component to oscillate at a frequency and an amplitude specified by one or more stored values.

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Claim Construction

“control component...” (independent claims)

Resonant Systems’ Construction	Samsung’s Construction
Means-Plus Function Corresponding structure: oscillator circuit; microcontroller with internal or external memory; processor; CPU; microprocessor; and equivalents thereof Where the corresponding structure is a processor, CPU, or microprocessor, the processor/CPU/microprocessor is programmed with an algorithm comprising the following steps: (a) set the mode and strength to [default values or] values representing selections made by user input to the user input features; and (b) provide a corresponding output to the power supply so that the power supply provides a corresponding output to the driving component. See, e.g., ’081 Patent at 7:10- 24, 8:10-20, Figs. 7A, 7C; ’830 Patent at 7:20-34, 8:20-30, Figs. 7A, 7C.	Means-Plus Function Corresponding structure: Processor and H Bridge Switch, where processor is programmed with an algorithm to perform the following steps: (1) set the mode and strength to [default values or] values represented by selections made by user input to the user input features, (2) provide a corresponding output to the power supply, and (3) provide a corresponding output to the H-bridge switch. EX1001, 7:20–34, 8:20–30, Fig. 7A, Fig. 7C.

IPR2023-00992, Pet. 7, POR 10

IPR2023-00993, Pet. 7–8, POR 10

“control component...” (independent claims)

Samsung District Court Construction

Means-Plus Function

Corresponding structure:

Processor programmed with an algorithm to perform the following steps: (1) set the mode and strength to [default values or] values represented by selections made by user input to the user input features, **(2) provide a corresponding output to the power supply**, and (3) provide a corresponding output to the driving component. '081 Patent at 6:32-35, 7:10-24, 8:10-20, Figs. 7A, 7C; '830 Patent at 6:40-44, 7:20-34, 8:20-30, Figs. 7A, 7C.

Samsung proposed District Court construction does not include H-bridge

IPR2023-00992, POR 10, Ex. 2012 at 32–33

IPR2023-00993, POR 10, Ex. 2012 at 32–33

“control component...” (independent claims)

Prior PTAB Construction for '830 Patent

Means-Plus Function

Corresponding structure:

In summary, the corresponding structure of the “control component” under a means plus function interpretation **that relies upon a microprocessor (and memory)** as corresponding structure further requires algorithmic structure at least for 1) computing an output value corresponding to a user-selected amplitude of oscillation and **outputting the value to the claimed power supply** so that the power supply outputs an appropriate current amplitude to a coil, and 2) operating a timer or its equivalent to flip the polarity of a control value periodically corresponding to a user-selected frequency and **input the control value to an H-bridge switch circuit** to change the direction of the current through the coil as supplied by the power supply.

IPR2023-00992, Ex. 1055 at 20, Ex. 1056 at 21

IPR2023-00993, Ex. 1055 at 20, Ex. 1056 at 21

“control component...” (independent claims)

District Court Construction in *Resonant v. Apple*

Means-Plus Function

Corresponding structure:

'830 patent claims 1 and 19:

a microcontroller, a processor, a microprocessor, or a CPU that performs the algorithm shown in Steps 706 through 716 in Figure 7A, with reference to all steps shown in Figure 7B other than Step 734 and all steps shown in Figure 7C, or the algorithm described in the corresponding text, See, e.g., 7:20–7:34, 7:42–7:52, 7:60–8:40, and equivalents thereof.

'830 patent claim 20:

a microcontroller, a processor, a microprocessor, or a CPU that performs the algorithm shown in Steps 706 through 716 in Figure 7A, with reference to the steps shown in Figures 7B and 7C, or the algorithm described in the corresponding text, See, e.g. 7:20–7:34, 7:42–8:40 and/or equivalents thereof

IPR2023-00992, Ex. 1053 at 37, 39

IPR2023-00993, Ex. 1053 at 37, 39

“control component...” (independent claims)

“all steps shown in Figure 7C”:

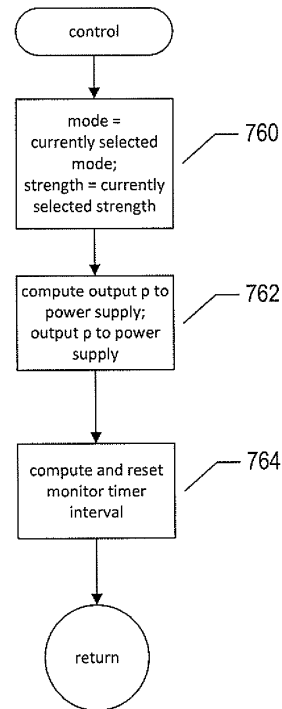


FIG. 7C

IPR2023-00993, Ex. 1001

“control component...” (independent claims)

“the algorithm described in the corresponding text, See, e.g., 7:20–7:34, 7:42– 7:52, 7:60–8:40”:

20 FIG. 7C provides a control-flow diagram for the routine “control,” called in step 716 in FIG. 7A. This routine is invoked when a change in the user controls has occurred. In step 760, the variables mode and strength are set to the currently selected mode and vibrational strength, represented by the current states of control features in the user interface. Next, in step 762, the routine “control” computes an output value *p* corresponding to the currently selected strength, stored in the variable strength, and outputs the value *p* to the power supply so that the power supply outputs an appropriate current to the coil. Finally, in step 764, the routine “control” computes a new monitor timer interval and resets the monitor timer accordingly.

IPR2023-00993, Ex. 1001 at 8:20–32

“control component...” (independent claims)

“the algorithm described in the corresponding text, See, e.g.,
7:20–7:34, 7:42– 7:52, 7:60–8:40”:

out tasks. When an event occurs, the control program begins 20
a series of tasks, the first of which is represented by the
conditional step **706**, to determine what event has occurred
and appropriately handle that event. When the frequency
timer has expired, as determined in step **706**, the value of the
output signal d is flipped, in step **708**, and output to the 25
H-bridge switch, with the frequency timer being reset to
trigger a next frequency-related event. The frequency-timer
interval is determined by the current value of the variable
freq. Otherwise, when the event is a monitor timer expira-
tion event, as determined in step **710**, then a routine “moni- 30
tor” is called in step **712**. Otherwise, when the event

IPR2023-00993, Ex. 1001 at 7:23–27

“control component...” (independent claims)

District Court Construction in *Resonant v. Sony*

Means-Plus Function

Corresponding structure:

an oscillator circuit, a microcontroller with internal or external memory, a processor, a CPU, or a microprocessor contained within the vibrating module where the microcontroller, processor, CPU, or microprocessor are programmed with an algorithm comprising the following steps: (a) set the mode and strength to [default values or] values representing selections made by user input to the user input features; and (b) provide a corresponding output to the power supply so that the power supply provides a corresponding output to the driving component and equivalents thereof.

IPR2023-00992, Ex. 1054 at 16

IPR2023-00993, Ex. 1054 at 16

“control component...” (independent claims)

Samsung’s construction improperly excludes oscillator and microcontroller embodiments:

Alternative, lower-cost linear-vibration modules can be designed and manufactured by replacing the processor or microcontroller (602 in FIG. 6) of the above-described linear-resonant vibration module with a simpler oscillator circuit with additional control circuitry. The H switch (620 in FIG. 6) can be controlled by an oscillating current input rather than digital outputs from a microprocessor. Replacing

IPR2023-00992, POR 10–12, Ex. 1001 at 11:43–49

IPR2023-00993, POR 10–12, Ex. 1001 at 11:57–63

“control component...” (independent claims)

Oscillator performs claimed function:

E.g., '081 patent claim 1:

a control component that controls supply of power from the power supply to the driving component to cause the moveable component to oscillate at a frequency and an amplitude specified by user input received from the user-input features.

Oscillator embodiment:

In one example implementation of an oscillator-controlled linear vibration module, a variable-frequency oscillator circuit can be controlled by user input to drive the H switch or other H-switch-like circuit to operate the linear vibration module at different frequencies. A user is provided an input feature that allows the user to directly adjust the frequency of the variable oscillator and thus the vibrational frequency produced by the linear vibration module. The user is additionally provided with an input feature to allow the user to control the current or duty cycle used to drive the linear vibration module and to thus increase and decrease the amplitude of vibration produced by the linear vibration module. Thus, a user can control both the frequency of vibration and the amplitude of vibration.

IPR2023-00992, POR 10–11, Ex. 1001 at 11:59–12:5

IPR2023-00993, POR 10–11, Ex. 1001 at 12:6–19

“control component...” (independent claims)

Oscillator expressly identified as possible control component in claim 2:

2. The linear vibration module of claim 1 wherein the control component is one of:
an variable oscillator circuit with additional control circuitry; and

IPR2023-00992, POR 10–11, Ex. 1001 at 15:49–52

IPR2023-00993, POR 10–11, Ex. 1001 at 16:1–4

“control component...” (independent claims)

Disclosed “control” routine does not output to H-bridge:

FIG. 7C provides a control-flow diagram for the routine “control,” called in step 716 in FIG. 7A. This routine is invoked when a change in the user controls has occurred. In step 760, the variables mode and strength are set to the currently selected mode and vibrational strength, represented by the current states of control features in the user interface. Next, in step 762, the routine “control” computes an output value p corresponding to the currently selected strength, stored in the variable strength, and outputs the value p to the power supply so that the power supply outputs an appropriate current to the coil. Finally, in step 764, the routine “control” computes a new monitor timer interval and resets the monitor timer accordingly.

IPR2023-00992, POR 15–16, Ex. 1001 at 8:16–22

IPR2023-00993, POR 15–16, Ex. 1001 at 8:26–32

“control component...” (claims 3 and 4)

Resonant Systems’ Construction	Samsung’s Construction
Means-Plus Function Corresponding structure: oscillator circuit; microcontroller with internal or external memory; processor; CPU; microprocessor; and equivalents thereof Where the corresponding structure is a processor, CPU, or microprocessor, the processor/CPU/microprocessor is programmed with an algorithm comprising the following steps: (a) receive the value of an output signal; (b) compare that value to a different value, which could be a previous value; and (c) adjust one or more operational control outputs based on that comparison	Means-Plus Function Corresponding structure: Claim 1 structure with the processor further programmed with an algorithm to perform the following steps: (1) convert the received output signal into an integer, (2) compare that integer to a specific value, (3) adjust one or more operational control outputs based on that comparison. ’081 Patent at 7:13-18, 7:32-8:9, Figs. 7A, 7B; ’830 Patent at 7:23-29, 7:42-8:19, Figs. 7A, 7B.

IPR2023-00992, Pet. 8, POR 16–17

IPR2023-00993, Pet. 8, POR 16–17

“driving component...”

Resonant Systems’ Construction	Samsung’s Construction
Means-Plus Function Corresponding structure: One or more coils or electromagnets. <i>E.g.</i>, Figs 4A-4G (coil 420); Fig. 5A (coil 514), Fig. 6 (coil 626), electromagnet of Fig. 10, electromagnet of Fig. 11, Fig. 12 (coil 1206), Fig. 13 (first coil 1302 and second coil 1304), Fig. 14 (coils 1412 and 1414), Figs. 15, 16 (coil 1510), stator coils of Figures 24A, 24B, and 25; and equivalents thereof.	Means-Plus Function Corresponding structure: One or more electromagnetic coils. <i>E.g.</i>, Figs. 4A-4G (coil 420); Fig. 6 (coil 626); Fig. 13 (first coil 1302 and second coil 1304).

Parties agree it is not necessary to construe this term

IPR2023-00992, Pet. 7, POR 8-9, Reply 3-4

IPR2023-00993, Pet. 7, POR 8-9, Reply 4-5

“driving component...”

Samsung’s construction omits embodiments with an “electromagnet” such as in Figure 10:

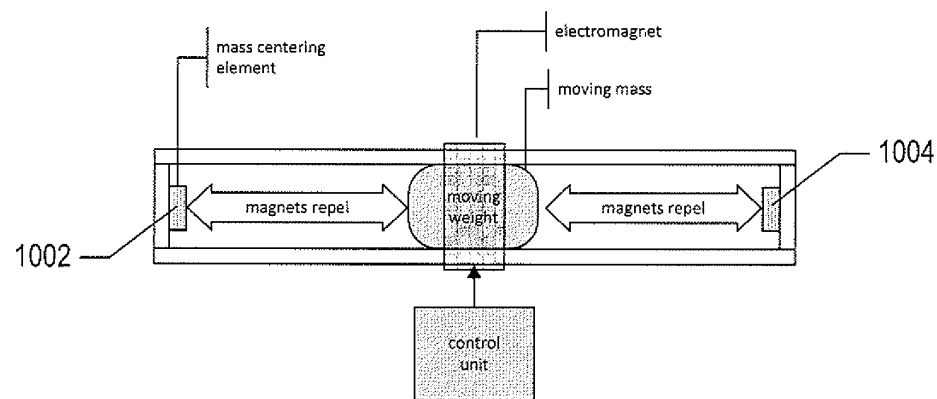


FIG. 10

IPR2023-00992, POR 8–9, Ex. 1001 Fig. 10

IPR2023-00993, POR 8–9, Ex. 1001 Fig. 10

“movable component...”

Resonant Systems’ Construction	Samsung’s Construction
Not Means-Plus-Function Plain and ordinary meaning	Means-Plus Function Corresponding structure: A moving weight. <i>E.g.</i> , Figs. 4A–4G (weight 404), Fig. 6 (oscillating mass 634).

No material difference between plain meaning and Samsung’s means-plus-function construction

Parties agree it is not necessary to construe this term

IPR2023-00992, Pet. 7, POR 7–8, Reply 7
IPR2023-00993, Pet. 7, POR 7–8, Reply 7

Dependency of claim 4

Resonant Systems' Construction

Claim 4 depends on claim 3
(recitation of “claim 1” is a typographical error)

Samsung's Construction

No construction required; “control component”
construction same for claims 3 and 4

Claim 3 provides antecedent bases for claim 4 limitations:

3. The [linear] vibration module of claim 1 wherein the control component receives output signals from **sensors** within the [linear] vibration module during operation of the [linear] vibration module and adjusts **one or more operational control outputs** of the control component according to the received output signals from the sensors.

4. The [linear] vibration module of **claim 1** wherein the control component adjusts **the one or more operational control outputs** of the control component according to the received output signals from **the sensors** in order that subsequent operation of the [linear] vibration module produces desired outputs from **the one or more sensors** corresponding to one or more operational control parameters.

IPR2023-00992, Pet. 8–9, POR 17–18

IPR2023-00993, Pet. 9, POR 17–18

Failure to Satisfy Element 1[f] and Related Elements (all grounds)

Failure to Show Output to Power Supply

- All proposed and adopted constructions for “control component” require a processor to be programmed to “provide a corresponding output to the power supply”
- Petition failed to identify “power supply” in Fukumoto or combinations that would have an input to accept such a corresponding output

IPR2023-00992, POR 20–25, Sur-Reply 7–11

IPR2023-00993, POR 20–25, Sur-Reply 7–11

Failure to Show Output to Power Supply

“In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable. See 35 U.S.C. § 312(a)(3) (requiring IPR petitions to identify ‘with particularity . . . the evidence that supports the grounds for the challenge to each claim’).”

Harmonic Inc. v. Avid Technology, Inc.,
815 F.3d 1356, 1363 (Fed. Cir. 2016)

“We see no error in the Board’s rejection of Ariosa’s reliance, in its Reply submissions, on previously unidentified portions of a prior-art reference to make a meaningfully distinct contention.”

Ariosa Diagnostics v. Verinata Health, Inc.,
805 F.3d 1359, 1367 (Fed. Cir. 2015)

IPR2023-00992, Sur-Reply 10–11

IPR2023-00993, Sur-Reply 10–11

Failure to Show Output to Power Supply

Samsung's replies attempt to re-write their petitions and what the petitions identified as the "power supply":

“In fact, the petition’s MPF analysis explains that Fukumoto’s power supply includes drive signal generation circuit 114. Pet., 22
(‘Fukumoto’s CPU provides a corresponding output to the power supply when it “instructs the drive signal generation circuit 114 to generate a drive signal”’)”

IPR2023-00992, Reply 21–22

IPR2023-00993, Reply 21–22

Failure to Show Output to Power Supply

What the Petitions actually identified as the “output to the power supply” is the drive signal *generated by circuit 114*:

“Additionally, Fukumoto’s CPU provides a corresponding output to the power supply when it ‘instructs the drive signal generation circuit 114 to generate a drive signal,’ and in response, ‘the drive signal generation circuit 114 generates a drive signal using the waveform data supplied from the CPU 113.’”

IPR2023-00992, Pet. 22, Sur-Reply 9

IPR2023-00993, Pet. 22, Sur-Reply 9

Failure to Show Output to Power Supply

Petitions do not identify circuit 114 as part of the “power supply” in element 1[c]:

“For oscillatory actuator 115 to vibrate at a resonant frequency, it requires ‘small drive power,’ which ‘reduce[s] the power consumption.’ *Id.*, 16:44–50. A POSITA would have understood and found it obvious that the ‘small power’ is supplied to the coil using a power supply. *Wolfe*, ¶165. Fukumoto discloses or suggests a ‘power supply.’”

IPR2023-00992, Pet. 15–16, Sur-Reply 8

IPR2023-00993, Pet. 15–16, Sur-Reply 8

Failure to Show Output to Power Supply

Petitions describe a “battery” as supplying power in Fukumoto:

“Fukumoto discloses or suggests a processor, circuitry to convert power supplied from, for example, the battery in the electronic device to the AC drive signal (equivalent to the '081 patent's disclosed H-bridge switch) . . .”

IPR2023-00992, Pet. 23, Sur-Reply 9–10

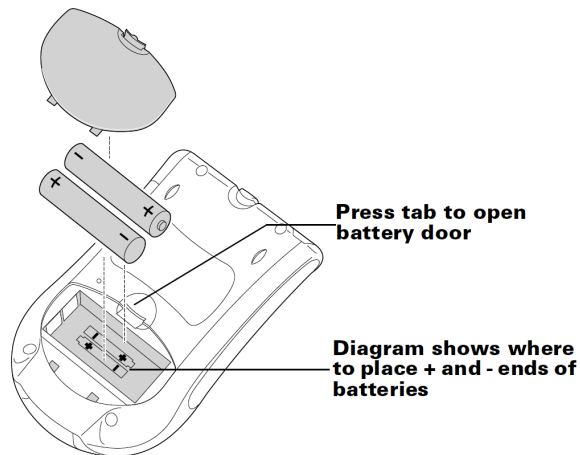
IPR2023-00993, Pet. 23, Sur-Reply 9–10

Failure to Show Output to Power Supply

No dispute that a battery used in devices of the kind described in Fukumoto and Ogusu would not have had an input necessary to accept an output from the claimed “control component”:

Installing batteries

1. Press the latch on the battery door and lift the battery door away from your handheld.

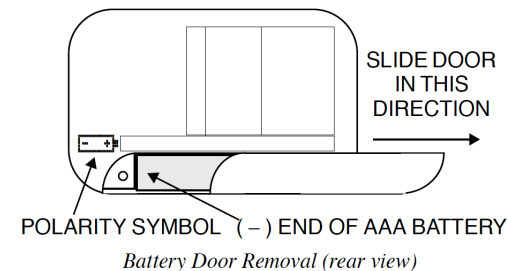


2. Install two AAA alkaline batteries into the battery compartment.
3. Insert the battery door back into place so that it is flush with the back of your handheld and “clicks” into position.

BATTERY INFORMATION

The ULTRA Express FLX pager operates with one AAA-size alkaline battery.

- ❶ To remove the old battery, hold the pager (back side facing up), and press down on the battery door.
- ❷ Slide the door to the side until its locking tabs release. Continue sliding the door until it is free of the housing.
- ❸ To install a new battery, align the battery so the positive (+) and negative (–) markings match the direction of the polarity markings shown on the back cover, and insert the battery.
- ❹ To replace the battery door, align the grooves on the battery door with the grooves on the front and back housing.
- ❺ Slide the battery door until it is fully closed and a “click” is heard. The battery door is self-locking.



IPR2023-00992, POR 22, 56–57, Ex. 2013 at ii, 2, Ex. 2014 at 11

IPR2023-00993, POR 22, 56–57, Ex. 2013 at ii, 2, Ex. 2014 at 11

Failure to Show Obviousness Under Samsung's Construction

- Samsung's construction of "control component" requires performing the step of "provide a corresponding output to the H-bridge switch"
- Samsung fails to show obviousness of this or its equivalent
- Specifically, Samsung does not even attempt to show that algorithm steps to produce outputs to oscillators or inverters would be equivalent to an algorithm step to provide output to the H-bridge switch

IPR2023-00992, POR 24–25, Reply 19, Sur-Reply 11

IPR2023-00993, POR 24–25, Reply 19, Sur-Reply 11

Failure to Establish Motivation to Combine Embodiments of Fukumoto (claim 8, grounds 1A-1C)

Samsung's theory of obviousness for claim 8 based upon Fukumoto relies upon combining elements of Figure 3 electromagnetic embodiment with Figure 83 electrostatic embodiment:

850

812b 814b 815b

CONSTANT POTENTIAL (+)

813

810

AMPLIFIER

DRIVE SIGNAL

CONSTANT POTENTIAL (-)

812a 814a 815a 811

IPR2023-00993, Pet. 29–30, Ex. 1005, Figs. 3, 83

Failure to Establish Motivation to Combine Fukumoto Embodiments

“This analysis unduly dissects prior art references into collections of individual elements, requiring a party showing obviousness to re-do the work already done in the prior art reference.”

General Electric Co. v. Raytheon Techs. Corp.,
983 F.3d 1334, 1352 (Fed. Cir. 2020)

“Whether a rejection is based on combining disclosures from multiple references, combining multiple embodiments from a single reference, or selecting from large lists of elements in a single reference, there must be a motivation to make the combination and a reasonable expectation that such a combination would be successful”

In re Stepan Co.,
868 F.3d 1342, 1346 n.1 (Fed. Cir. 2017)

IPR2023-00992, Sur-Reply 12
IPR2023-00993, Sur-Reply 12

Failure to Establish Motivation to Combine Fukumoto Embodiments



Prof. Keith Goossen
Patent Owner's Expert

92. In addition, Samsung fails to provide an adequate motivation to modify Fukumoto's Figure 3 embodiment based upon its Figure 83 embodiment. The petitions and Dr. Wolfe's declarations assert without evidence or explanation that using multiple springs would "dampen the vibration forces without damaging other components (e.g., the screen)." ³⁸ But Fukumoto Figure 3 already has structures between the weight 122 and the screen 103, including the spring 123, coil 121, and case 115a:

IPR2023-00992, POR 25–27, Ex. 2008, ¶ 92
IPR2023-00993, POR 25–27, Ex. 2008, ¶ 92

Failure to Establish Motivation to Combine Fukumoto Embodiments



Prof. Keith Goossen
Patent Owner's Expert

93. Samsung fails to explain how the weight could damage the screen or other components in spite of these structures keeping them separate, or how the addition of a second spring would make damage less likely.

IPR2023-00992, POR 25–27, Ex. 2008, ¶ 93

IPR2023-00993, POR 25–27, Ex. 2008, ¶ 93

Failure to Establish Motivation to Combine Fukumoto Embodiments



Prof. Keith Goossen
Patent Owner's Expert

94. Samsung also asserts a POSITA would have been motivated to add the second spring “to double the force of vibration created for greater effect while requiring less power.”³⁹ But neither the petitions nor Dr. Wolfe’s declarations provide any evidence or explanation for how increasing the force and effect of vibration would reduce the power required. It is a fact of introductory physics that the power required to move an object equals the force on the object times its speed. As a result, doubling the force on an object while keeping the distance and speed it moves the same is going to roughly double power consumption. While the actual power consumption will depend on the details of the design, there is no reason to expect that increasing forces will *decrease* power requirements.

IPR2023-00992, POR 25–27, Ex. 2008, ¶ 94

IPR2023-00993, POR 25–27, Ex. 2008, ¶ 94

Failure to Establish Motivation to Combine Fukumoto Embodiments



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95. As for the statement about the benefit of doubling the force and effect of vibration, Fukumoto correctly attributes that result to doubling the electrostatic force by doubling the number of electrodes.⁴⁰ Doubling the number of springs without changing the force that drives the oscillations is not likely to increase the vibrations. Samsung particularly fails to explain how Fukumoto's teaching that doubling the number of electrodes in an electrostatic embodiment increases vibrations would motivate changing the number of springs in an electromagnetic system such as Fukumoto Figure 3.

IPR2023-00992, POR 25–27, Ex. 2008, ¶ 95

IPR2023-00993, POR 25–27, Ex. 2008, ¶ 95

Failure to Establish Motivation to Combine Fukumoto Embodiments

15 Q. So, according to Hooke's law, the force exerted by
16 a spring is approximately a number --

17 (Clarification by the certified stenographer.)

18 BY ATTORNEY RUBIN:

19 Q. -- referred to as the spring constant times the
20 displacement of the spring; is that right?

21 A. According to Hooke's law, it's exactly the spring
22 constant times the displacement of the spring. In the real
23 world, there are other factors that come into play.

IPR2023-00992, Sur-Reply 13, Ex. 2010, ¶ 45:15–23

IPR2023-00993, Sur-Reply 13, Ex. 2010, ¶ 45:15–23

Failure to Establish Obviousness for “Integer” Construction Based on Ueda (claims 3-6, grounds 1A-1F, 2D-2F)

Samsung Fail to Show Obviousness of Claims 3–6 Under Its “Integer” Constructions

Samsung’s construction for “control component” requires steps of:

- “(1) convert the received output signal into an integer,
- “(2) compare that integer to a specific value”

Petitions rely upon Ueda as allegedly teaching this. (IPR2023-00992, Pet. 50–51; IPR2023-00993, Pet. 50–51).

But apart from recitations of Samsung’s proposed claim construction, integers are never mentioned—explicitly or otherwise—in any of:

- Ueda
- The Petitions
- Samsung’s expert declarations from Dr. Wolfe

IPR2023-00992, Pet. 50–51, Reply 61–62

IPR2023-00993, Pet. 50–51, Reply 61–62

Samsung Fail to Show Obviousness of Claims 3–6 Under Its “Integer” Constructions

Ueda never mentions or suggests digital signals or algorithms.

In contrast, Ueda’s specification contains the word “voltage” **369 times**.

Ueda consistently teaches an analog system with analog feedback control:

value of the driving voltage of the linear vibration motor so that a difference between the detected motor output and the determined target output becomes zero; and the motor driver adjusts the frequency and voltage value of the AC voltage supplied to the linear vibration motor so that the voltage value of the AC voltage becomes equal to the target voltage value determined by the driving voltage determining unit, and the frequency of the AC voltage becomes equal to the driving frequency determined by the driving frequency determining unit. Therefore, output control for the linear vibration motor becomes feedback control in which the voltage value of the driving voltage is adjusted with the motor output required of the linear vibration motor being the target output, whereby output control for the linear vibration motor can be carried out with high accuracy, stability, and responsivity, while keeping the stroke of the mover within an allowable range.

IPR2023-00992, Sur-Reply 15, Ex. 1008, ¶ [0028]

IPR2023-00993, Sur-Reply 15, Ex. 1008, ¶ [0028]

Samsung Fail to Show Obviousness of Claims 3–6 Under Its “Integer” Constructions

The Reply arguments about Ueda’s algorithm being implemented in a “general-purpose processor” are untimely new arguments.

Samsung’s assertions that such a “general-purpose processor” implementation are unsupported by anything beyond conclusory statements in their expert’s reply declaration.

IPR2023-00992, Sur-Reply 15–16, Ex. 1047, ¶ 17

IPR2023-00993, Sur-Reply 15–16, Ex. 1047, ¶ 17

Failure to Demonstrate Motivation to Combine with Erixon or Fuller (grounds 1G-1L, 2G-I)

Samsung Fails to Show Motivation to Combine Fukumoto or Ogusu with Erixon or Fuller

Samsung's theory of motivation of combine in the Petitions rests on "simple substitution" of Erixon or Fuller configurations in place of those in Fukumoto or Ogusu:

"A POSITA would have been motivated to use Erixon's coil configuration with Fukumoto because doing so would have amounted to **nothing more than simple substitution** of a known coil configuration for a linear vibration actuator."

"Further, a POSITA would have been motivated to use Fuller's configuration with Fukumoto because doing so would have amounted to **nothing more than simple substitution** of known components of a linear vibration actuator."

"A POSITA would have been motivated to combine Ogusu-Fukumoto, Ogusu-Fukumoto-Grant, and Ogusu-Fukumoto-Barton with Erixon for the **same reasons discussed in Section VII.E.**"

IPR2023-00992, Pet. 59–60, 66, 93

IPR2023-00993, Pet. 59–60, 66, 93

Samsung Fails to Show Motivation to Combine Fukumoto or Ogusu with Erixon or Fuller



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117. Furthermore, Fukumoto teaches that “The direction of the vibration is a direction perpendicular to the front surface of the touch panel **102** and matches with the direction by which the user presses the touch panel **102** or any one of the operation keys **104a** to **104c** and its opposite direction. Due to this, the touch panel **102** and the operation keys **104a** to **104c** vibrate in a direction perpendicular to the front surface of the touch panel **102** and vibration is transmitted to the fingertip of the user performing the operation input.” In other words, movement specifically in the direction perpendicular to the screen surface is essential to create the key-press haptic sensation desired in Fukumoto.

IPR2023-00992, POR 33–34, Ex. 2008, ¶ 117
IPR2023-00993, POR 33–34, Ex. 2008, ¶ 117

Samsung Fails to Show Motivation to Combine Fukumoto or Ogusu with Erixon or Fuller



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191. Ogusu teaches that “The vibration of the base part 1 vibrates the entire pager and can transmit the vibration to the user. Furthermore, the vibration is only in a direction perpendicular to the base part 1, which is a direction in which the vibration is easily felt by the user when used in a thin pager. Therefore, use of the vibration is efficient.”¹⁰⁸

192. Moreover, Ogusu teaches away from transmitting vibrations in other directions than perpendicular to the base and toward the human body, saying: “Furthermore, since vibration is generated by rotation, it also includes vibration in directions other than those the user is sensitive to (directions perpendicular to the surface of the human body). Therefore, although the efficiency of converting electricity into rotational motion is high, the effective acting force from among the generated vibration is weak and vibration transmission efficiency is low.”¹⁰⁹

IPR2023-00992, POR 64, Ex. 2008, ¶¶ 191–192

IPR2023-00993, POR 64, Ex. 2008, ¶¶ 191–192

Samsung Fails to Show Motivation to Combine Fukumoto or Ogusu with Erixon or Fuller



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118. In order to fit Erixon's tube-shaped vibrator into the Fukumoto Figure 3 PDA without substantially increasing the thickness of the device, the direction of vibration would be oriented parallel to the screen, not perpendicular, resulting in a haptic sensation very different from that of pressing a button:

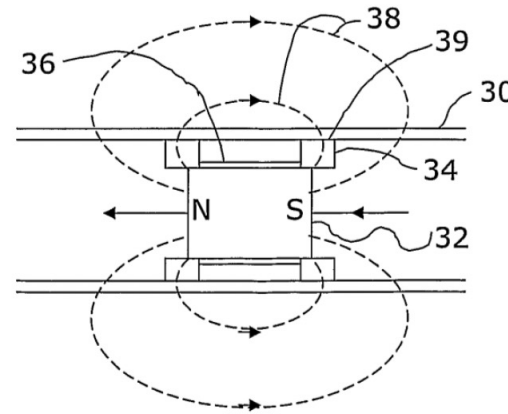


FIG. 3

IPR2023-00992, POR 34, Ex. 2008, ¶ 118

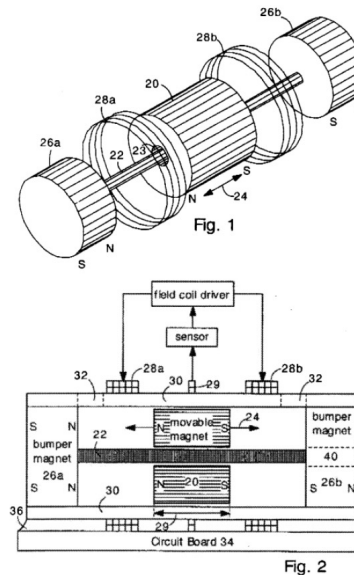
IPR2023-00993, POR 34, Ex. 2008, ¶ 118

Samsung Fails to Show Motivation to Combine Fukumoto or Ogusu with Erixon or Fuller



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129. In order to fit Fuller's tube-shaped electromagnetic vibrator into the Fukumoto Figure 3 PDA without substantially increasing the thickness of the device, the direction of vibration would be oriented parallel to the screen, not perpendicular, resulting in a haptic sensation very different from that of pressing a button:



IPR2023-00992, POR 38–39, Ex. 2008, ¶ 129

IPR2023-00993, POR 38–39, Ex. 2008, ¶ 129

Failure to Demonstrate Obviousness of Claim 14 Based Upon Dong (grounds 1M-1O)

Samsung Fails to Show Flux Paths Going Through Paramagnetic Material (i.e., Dong's Tungsten)

Claim 14 of each patent requires: “flux paths comprising a paramagnetic material that is shaped and positioned to reduce the reluctance of one or more magnetic circuits within the linear vibration module”

Petitions rely upon Dong as allegedly teaching this:

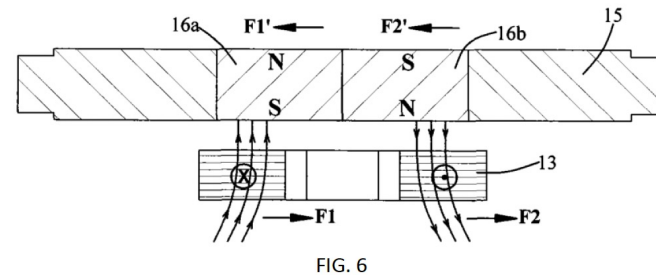


FIG. 6

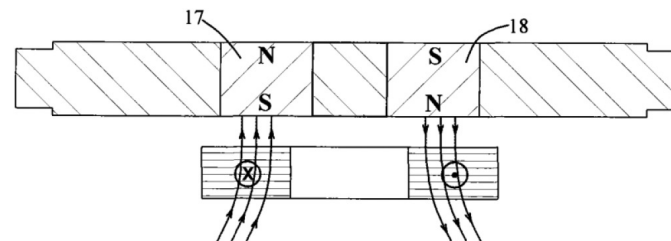


FIG. 7

IPR2023-00992, Pet. 67–70, Ex. 1011 at 10, POR 44, Ex. 2008, ¶ 140, Sur-Reply 18

IPR2023-00993, Pet. 67–70, Ex. 1011 at 10, POR 44, Ex. 2008, ¶ 140, Sur-Reply 18

Samsung Fails to Show Flux Paths Going Through Paramagnetic Material (i.e., Dong's Tungsten)



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the counterweight. Dong shows, in fact, that the counterweight is not even part of the magnetic circuit. Dong specifically illustrates the magnetic field lines going through the magnet 16a and 16b, and specifically not going through the counterweight that Wolfe identifies as “paramagnetic.” Wolfe’s

Samsung’s attorney argument in the replies fails to show Dong satisfies or otherwise renders obvious this limitation

IPR2023-00992, POR 44, Ex. 2008, ¶ 140, Sur-Reply 18

IPR2023-00993, POR 44, Ex. 2008, ¶ 140, Sur-Reply 18

Failure to Demonstrate Combinations of Fukumoto and Saiki Satisfy Claim 16 (grounds 1S-1U)

A POSITA Would Understand Addition of Frequencies Is Not “Modulation”

Claim 16 of each patent requires: “a primary oscillation frequency modulated by a modulating oscillation frequency”

To satisfy these modulation limitations, the petitions point to a teaching in Saiki of **adding** frequencies P1 and P2:

FIG. 17A illustrates the waveform of an electric signal which is obtained by adding together the eight point frequencies P1–P8, with the lowest frequency P1 being in reverse phase with the next frequency P2, P3 being in phase with P4, P5 being in reverse phase with P6, and P7 being in phase with P8. FIG. 17B illustrates the waveform of the output vibration characteristics obtained for the input electric signal. It can be seen in FIG. 17A that the period with which the peak value of the voltage level increases is reduced from that shown in FIG. 16A. Accordingly, the peak value of the output vibration waveform does not attenuate after the beginning of each period as in FIG. 16B, but a relatively large vibration output is continuously obtained.

IPR2023-00992, Pet. 73, Ex. 1013 at 15:24–37

IPR2023-00993, Pet. 73, Ex. 1013 at 15:24–37

A POSITA Would Understand Addition of Frequencies Is Not “Modulation”



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meaning in this context. As a POSITA would understand from their education, modulation refers to mixing or multiplying one signal with another, such as in the familiar amplitude modulation (AM), frequency modulation (FM), phase modulation (PM), and so forth. For example, the Elenga patents teach modulating a 25 Hz primary frequency with a 1Hz modulating frequency to produce “low-frequency pulses of high-frequency vibration.”⁶⁸ A POSITA would recognize that Saiki teaches adding P1 and P2, not modulating P1 with P2 as the '081 and '830 patents teach.⁶⁹ These have different effects; notably, modulat-

IPR2023-00992, POR 49, Ex. 2008, ¶ 158

IPR2023-00993, POR 49, Ex. 2008, ¶ 158

A POSITA Would Understand Addition of Frequencies Is Not “Modulation”

Samsung’s dictionary definitions confirm addition is not “modulation”:

modulation (1) (A) (data transmission) (*Carrier*). (i) The process by which some characteristic of a carrier is varied in accordance with a modulating wave. (ii) The variation of some characteristic of a carrier. *See also:* angle modulation; modulation index. **(B) (data transmission) (*Signal transmission system*).** (i) A process whereby certain characteristics of a wave, often called the carrier, are varied or selected in accordance with a modulating function. (ii) The result of such a process. *See also:* angle modulation; modulation index.

IPR2023-00992, Sur-Reply 20, Ex. 1049 at 4

IPR2023-00993, Sur-Reply 20, Ex. 1049 at 4

A POSITA Would Understand Addition of Frequencies Is Not “Modulation”

Samsung’s dictionary definitions confirm addition is not “modulation”:

modulate (möj’ə-lāt’) To vary the amplitude, frequency, or some other characteristic of a signal or power source. See also **amplitude modulation, frequency modulation.**

IPR2023-00992, Sur-Reply 20, Ex. 1050 at 4

IPR2023-00993, Sur-Reply 20, Ex. 1050 at 4

