

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NXTGEN TOYS, LLC,
PETITIONER,

v.

ZIPSTRING, LLC,
PATENT OWNER.

Case IPR2024-01213
Patent 11,674,774

PETITIONER'S DEMONSTRATIVES

NxtGen Toys, LLC v. Zipstring, LLC

IPR2024-01213

Petitioner's Oral Hearing Demonstratives

U.S. Patent No. 11,674,774

December 4, 2025

Overview of Issues

- '774 Patent
 - disputed claim limitations
 - background of technology
- Grounds 3 and 4 – Wagner Combinations
 - issued claims 1-4, 12, 15-17
 - substitute claims 21-26, 28
- Ground 2 – Abello in view of Yeany
 - issued claims 1-3, 12 and 15
 - substitute claims 25, 26, 28
- Ground 1 – Yeany
 - issued claims 1-3, 12, 15-17

U.S. Patent No. 11,674,774 and Background of Technology

Claim 1 of '774 Patent

1. A string shooting device comprising:
a body;
a housing attached to the body;
a pair of wheels, wherein at least one of the pair of wheels
is a driven wheel; and
a string, wherein the string comprises a surface texture
configured to increase air friction in response to the
string being propelled through air by the pair of wheels,
wherein the string defines an axis along which the
string extends, and wherein the string comprises a
plurality of fibers extending away from the axis.

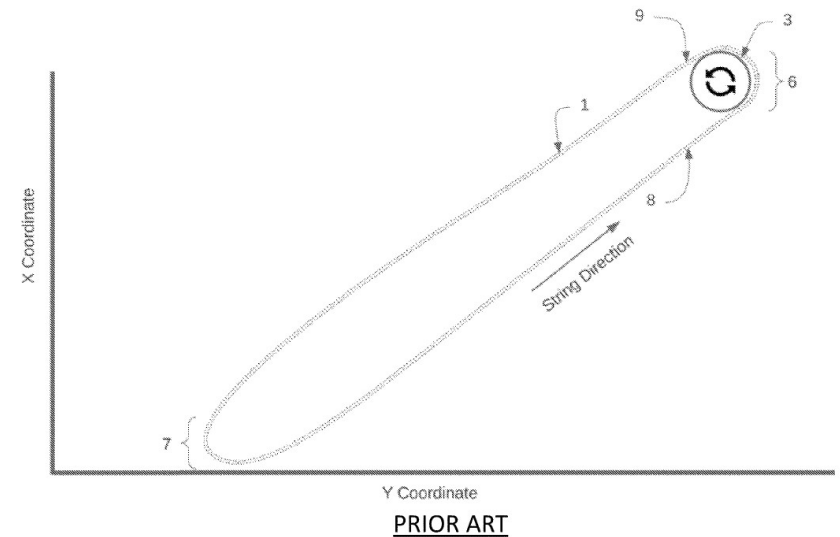
Ex. 1001 at 12:18-29

'774 Patent Specification

- Admitted prior art:

apparent if at all. FIG. 4 illustrates an example embodiment of a looped string 1 having a smooth profile as propelled by a drive wheel 3. As illustrated, the gravitational effects weigh down the distal end 7 since there is little-to-no lift on the string as it is propelled as outgoing string 9.

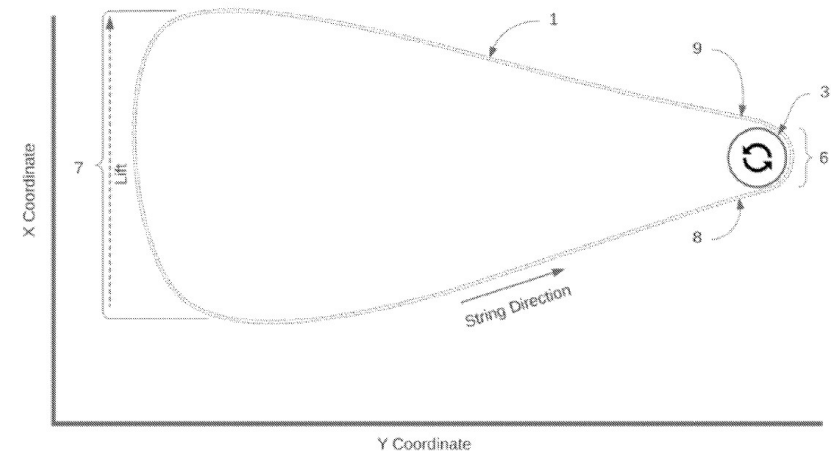
Ex. 1001 at Fig. 4 and 6:9-13



- Embodiment of '774 Patent:

gravity in a positive X-direction. The effect of the “fuzzy” surface of the string magnifies the air friction thereby magnifying the positive lift against gravity. With sufficient lift, the modified string overcome gravitational forces on the distal end 7 of the looped string 1 and give the appearance that the looped string 1 is weightless. The radiating threads

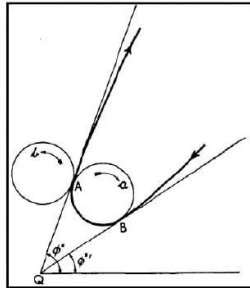
Ex. 1001 at Fig. 3 and 5:14-19



Prior Art String Shooter Devices

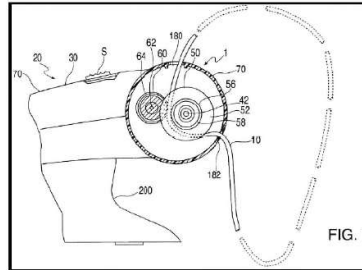
Despite the multitude of string shooter references existing in the prior art, the Patent Owner failed to submit any of them for consideration by the Examiner

1949



Ex. 1009

2001



Ex. 1008

2007



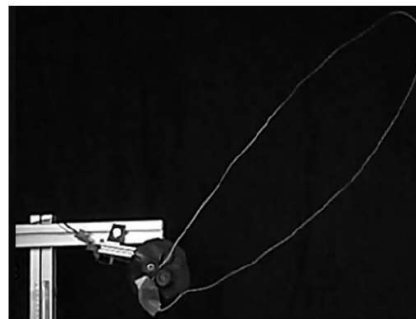
Ex. 1004

2014



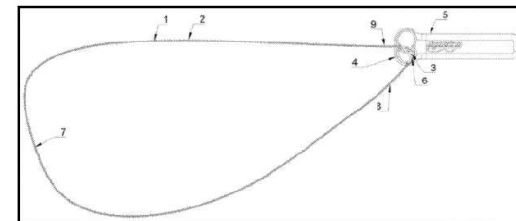
Ex. 1007

2020



Ex. 1005

2021 ('774 Patent)



Ex. 1001

Background Knowledge of POSITA

- Anderson (aerodynamics textbook):

Indeed, the presence of friction is the very reason why we have lift.

Ex. 1011 at 342

- Gregory:

An investigation is made of the dynamics of a flexible loop, driven by a small pulley at a constant speed, for the case when the speed is sufficient to cause the loop to become air-borne. It does this when the air-friction is greater than the weight of the loop. The shape and position of the loop may be calculated for values of the

Ex. 1009 at 1

- Abello:

When $v < v_{\text{takeoff}}$, it behaves like a simple string that dangles down from a pulley (hence the name *pulley state*). In this speed range, v is not sufficient to maintain the SSh “in flight”, as its weight dominates over air drag. However, as soon the SSh reaches the threshold speed v_{takeoff} , air drag dominates over the weight and begins to lift the SSh.

Ex. 1005 at 5

Ground 3 – Wagner in view of Yeany

Issued Claims 1-3, 12 and 15

Claim 1 – “a body” and “a housing attached to the body”

- Wagner:

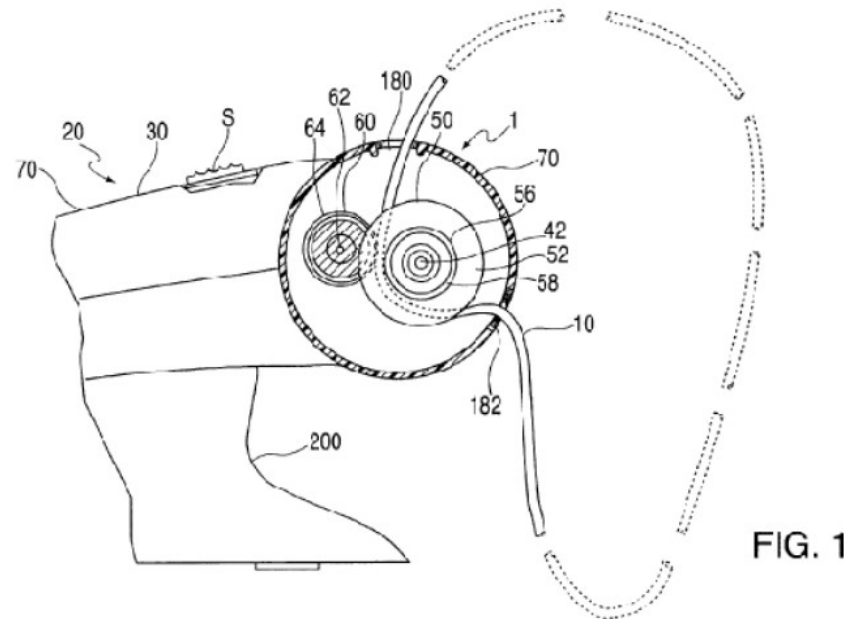


FIG. 1

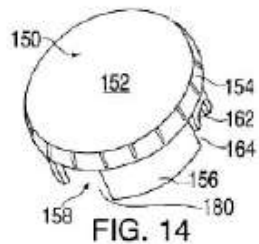


FIG. 14

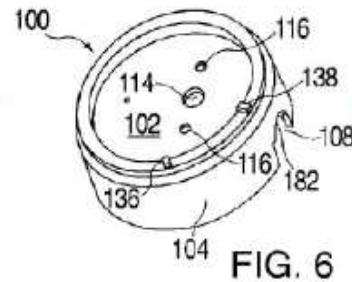


FIG. 6

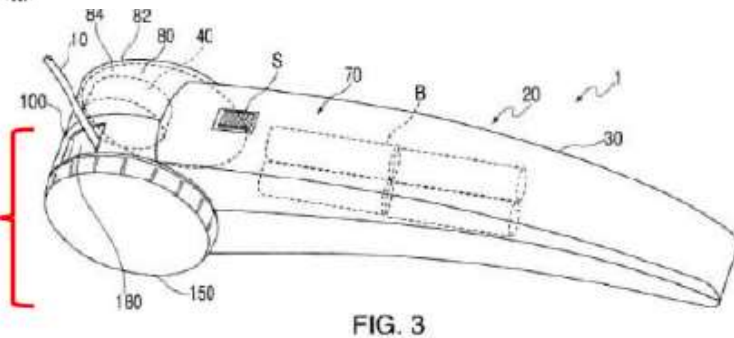


FIG. 3

a housing attached to a body

Ex. 1008 at Figs. 1, 3, 6 and 14;
Petition at 73-75;

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Motivation to use string configured to increase air friction:

Ex.1008, 5:12-15; Ex.1002, ¶157. By using a string with increased air friction, it would reduce the minimum speed necessary for Wagner’s device to overcome the density of the loop material as known from a POSITA’s background knowledge.

air by the pair of wheels, a POSITA would be motivated to use a string with a surface that increased air friction in order to reduce the takeoff velocity of the string which provides the benefits discussed above for improved operating with decreased cost and size. Ex.1002, ¶156. Indeed, Wagner notes that the speed of the loop at ejection

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Dr. Kudrowitz:

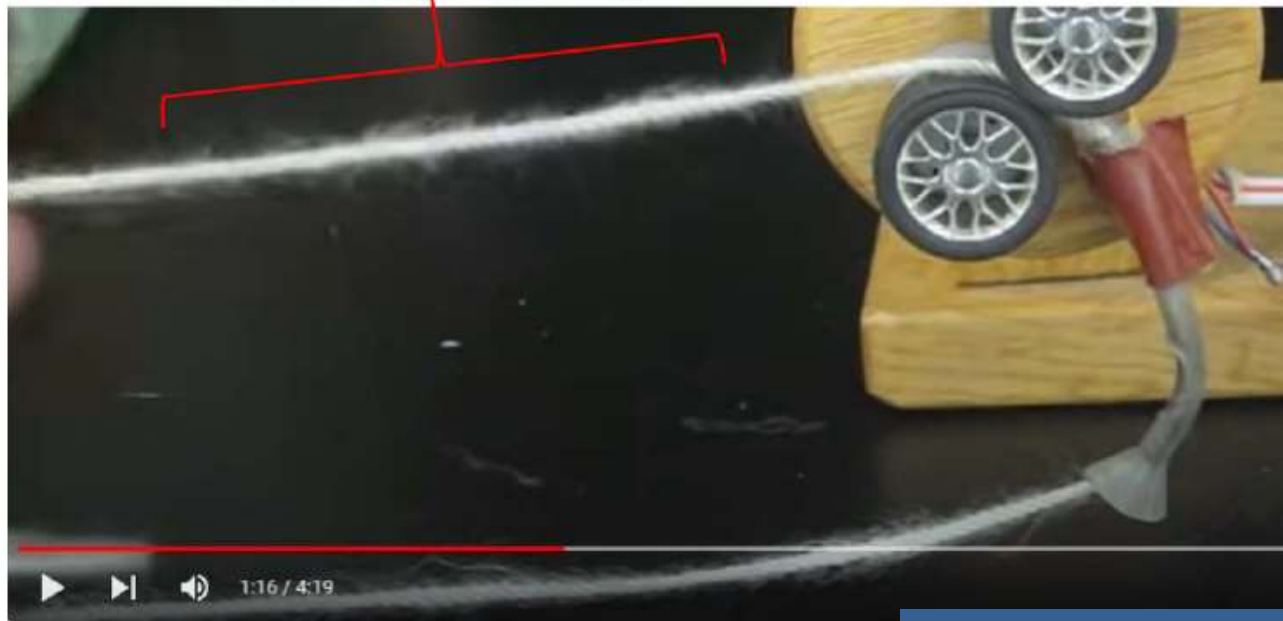
a number of benefits. For example, reducing the takeoff velocity would allow the string shooter to operate with slower spinning wheels reducing the amount of power consumed from the batteries leading to longer operation times and/or reducing the size and/or number of batteries needed. Additionally, reduced operating speeds reduces the wear on the string, wheels, and motors prolonging the useable life of these components. Furthermore, slower spinning wheels would reduce the noise created by the spinning wheels leading to a more pleasing operating environment to a user. Lastly, reduced takeoff speeds would be achieved by smaller motors. These

Ex. 1002 at ¶149;
Petition at 71

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

extending fibers that increased air friction. *Id.* Therefore, a POSITA looking to reduce string velocity needed for Wagner’s device would have been motivated to use a woven string like material with radiating extending fibers on the string surface as used in Yeany. *Id.* Doing so would have provided the benefits discussed above

surface texture configured
to increase air friction



Ex. 1004 (Part 1) at 1:16;
Ex. 1002 at ¶¶158-160; Petition at 36 and

Claim 1 – “a housing attached to the body”

- Patent Owner Response:

Because Yeany does not disclose the body, housing or surface texture of the string as recited in claim 1 and because Wagner does not cure the deficiencies found in Yeany for the reasons stated above, Wagner in view of Yeany does not render claim 1 or claims 2-3, which depend therefrom obvious.

PO Resp. at 14

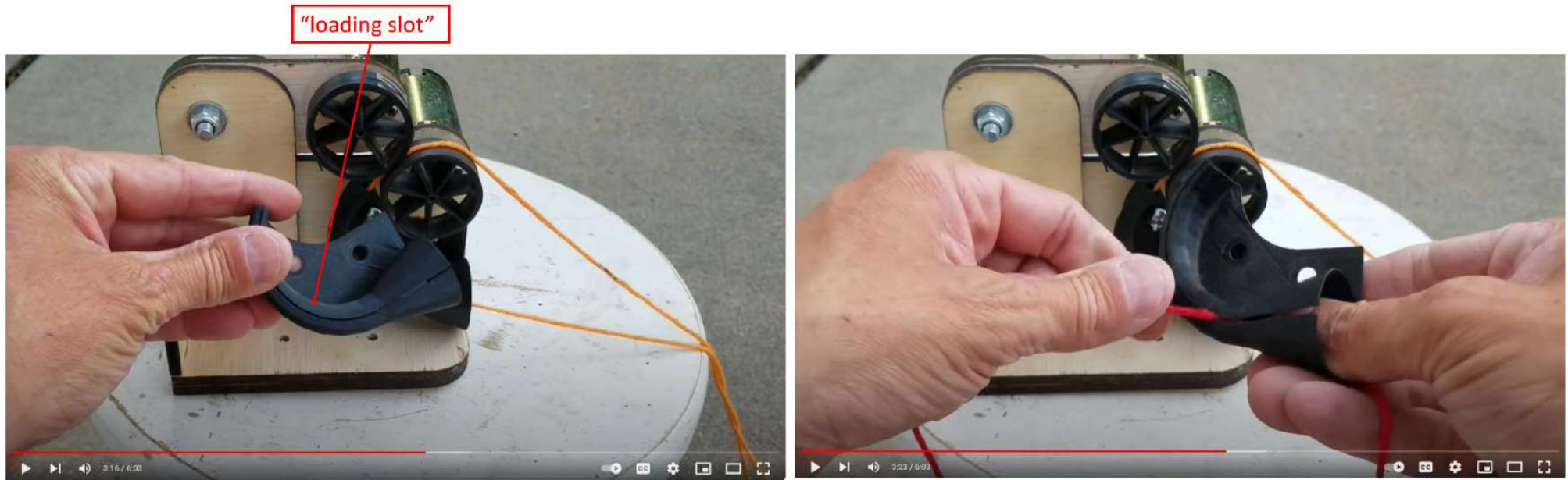
Ground 4 – Wagner in view of Yeany and Scorch

Issued Claims 4 and 16-17

Substitute Claims 21-26 and 28

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Scorch:



This loading slot allows one to “swap them [the strings] out really quick.”

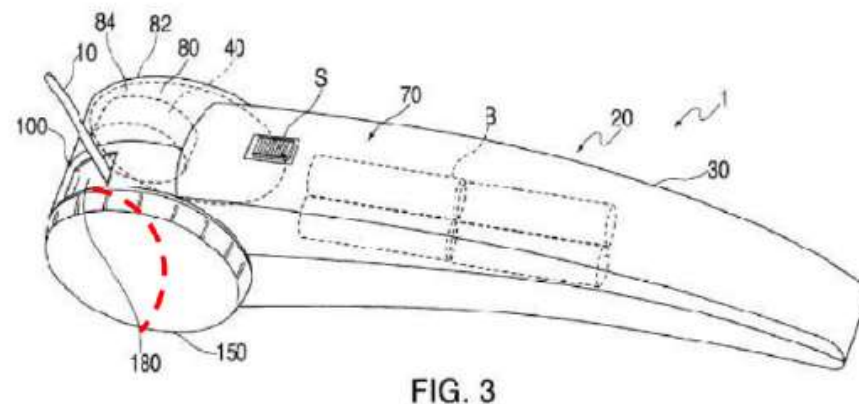
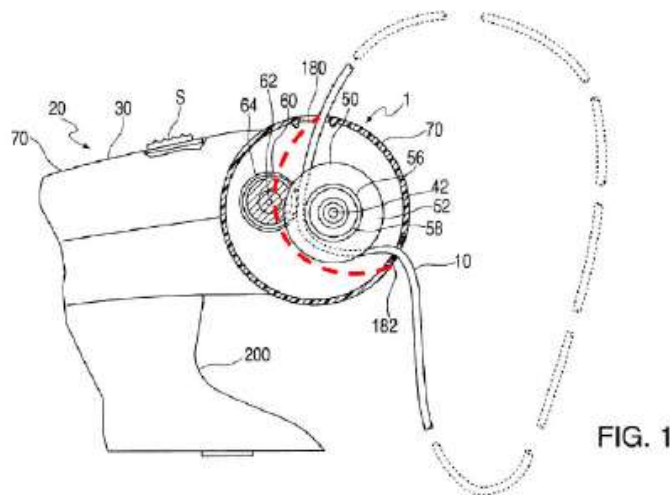
Ex.1007, 3:30-3:53; Ex.1002, ¶173. An example of how a loop of string is inserted

Ex. 1007 (Parts 3-4) at 3:00-3:53; Petition at 84-85

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Motivation to modify Wagner to use a loading slot:

A POSITA would apply the teaching of a side loading slot from Scorch to the Wagner device to improve the convenience of replacing a loop of string. Ex.1002, ¶174. Wagner already teaches that a loop of string may need to be “removed from the device 1 or reinstalled between the” wheels. Ex.1008, 3:58-62; Ex.1002, ¶174. However, Wagner teaches doing so by removing the cover and then reinstalling the cover after the loop of string has been replaced. Ex.1008, 3:46-4:45; Ex.1002, ¶174.



Ex. 1002 at ¶¶174-175; Petition at 85-85

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Patent Owner Response:

In contrast, Dr. Kudrowitz’s proposed combination of Wagner in view of Yeany and Scorch results in a housing design that is impractical, unsuitable for a kinetic device, unsafe and unnecessarily complicated to use, including string loop installation and removal. Dr. Kudrowitz’s modification of Wagner actually results in a worse design than if Wagner was left as-is. Regardless, the combinations

- Patent Owner’s Expert:

187. While I agree that removing Wagner’s cover and then reinstalling the cover after the loop of string has been replaced may be viewed as an inconvenient process, a POSITA would recognize that the cylindrical cover’s fit into a matching circular pocket represents a stable design that is suitable for kinetic devices. A

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Petitioner Reply:

Nonetheless, even assuming the modification to add a loading slot resulted in some drawbacks there is no dispute that a loading slot would still provide benefits to convenience in loading the string as testified to by both experts and stated expressly in Scorch. Ex. 1002 at ¶144; Ex. 2002 at ¶187; Ex.1007 at 3:30-3:53. This

- *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1075 (Fed. Cir. 2015) (motivation requires a POSITA to “recognize the potential benefits and pursue the variation.”)
- *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004) (obviousness does not require that the proposed combination “is the preferred, or most desirable, combination”)

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Patent Owner Response:

¶175] But neither Petitioner nor Dr. Kudrowitz provide support for the assumption that Wagner’s design allows the string to slide between top flange 54 and the top surface of wheel 60, especially since they are designed to “trap” the loop 10, a point that Dr. Kudrowitz acknowledges. [Kudrowitz, ¶176] Exhibit 2002, ¶188.

PO Resp. at 20

- Petitioner Reply:

Moreover, as Dr. Kudrowitz explained, a POSITA would use their knowledge to make the modifications of Wagner required to utilize a loading slot, including allowing the string to be loaded around the wheel flanges. Ex. 1002 at ¶174-176.

- KSR*: “person of ordinary skill is also a person of ordinary creativity, not an automaton”

Petitioner Reply at 21

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Patent Owner Response:

Wagner’s cover 152, for the reasons articulated above. If a POSITA was inclined to bring over Scorch’s slotted funnel tube, the POSITA may be more inclined to place Scorch’s slotted funnel tube on Wagner’s body, like Scorch’s current design.

PO Resp. at 21

- Petitioner Reply:

Instead, the Patent Owner argues against a completely different modification than what Petitioner proposed. Namely, Patent Owner argues against a modification

Moreover, Patent Owner’s proposal relies on a discredited approach that requires bodily incorporation of Scorch’s loading slot into Wagner’s device. *Allied*

Pet. Reply at 22-23

Claim 4 – “housing defines a loading slot through which the string is loaded or removed from between the pair of wheels”

- Patent Owner Response:

In addition to the foregoing, Scorch describes his slotted funnel as ineffective because the funnel still does not house the string and requires a separate piece to prevent the string from popping out of the slot. Thus, Scorch teaches away from using his slotted funnel by describing it as complicated, prone to entanglement and incomplete. Exhibit 2002, ¶¶204-205

PO Resp. at 22

- Petitioner Reply:

Resp. at 18. It is not clear what relevance Patent Owner places on this “extra piece” as it does not negate Scorch’s teaching of using loading slot, but in any event Scorch notes that this extra piece is merely optional. Ex.1007 at 4:00-4:30. Perhaps more

Pet. Reply at 23

Patent Owners Motion to Amend

Patent Owner proposes to substitute claims 1-4, 12 and 15-17 with claims 21-28, respectively. As shown in Appendix A, substitute claims 22-24, 26 and 28 are substantively identical to existing claims, but include amendments to the identification of the claim from which they depend. The proposed substitute claims

PO Mot. to Amend at 3

- Board Preliminary Guidance:

At this point in the proceeding, Petitioner has shown a reasonable likelihood that proposed substitute claims 21–26 and 28 would have been obvious in view of Wagner (Ex. 1008), Yeany (Ex. 1004), and Scorch (Ex. 1007).

Paper 16 at 6

Substitute Claim 21 – “housing defines a loading slot through which the string is loaded from between the pair of wheels”

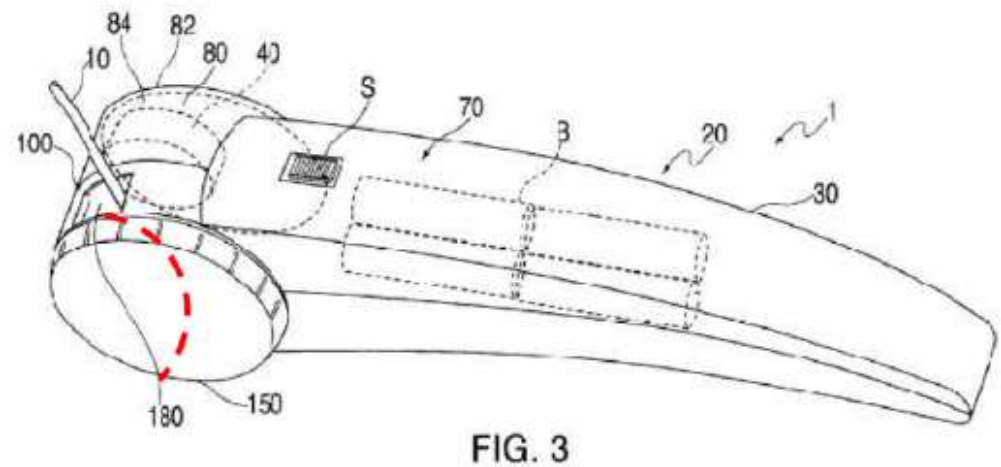
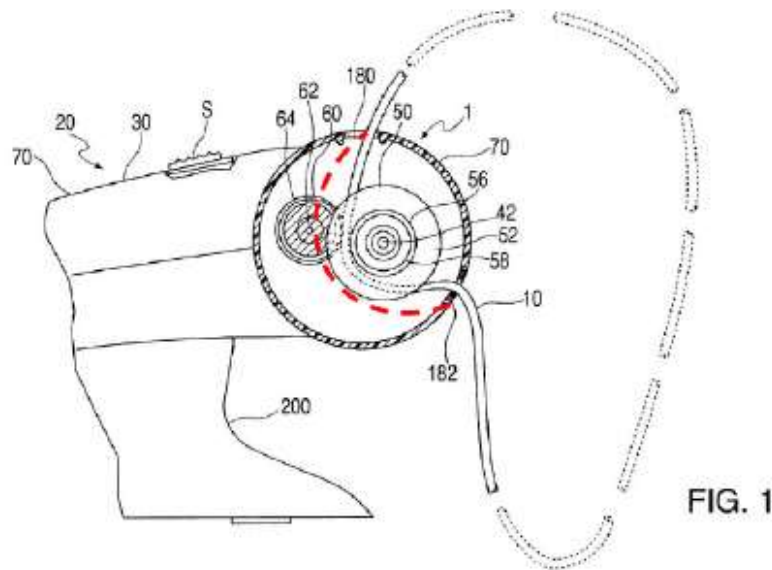
- Petitioner Opposition:

The proposed amendment for Substitute Claim 21, shown above, incorporates portions of issued claim 4 into issued claim 1.³ As such, Substitute Claim 21 is obvious over the combination of Wagner, Yeany and Scorch for the same reasons as discussed in the Petition and Petitioner’s Reply for claims 1 and 4, respectively discussed in Grounds 3 and 4. *See* Petition at 71-78 (motivation to combine Wagner

³ Substitute claim 21 does not incorporate all of the limitations of claim 4 as at least the word “removed” recited in claim 4 is not recited in substitute claim 21.

Petitioner Opposition at 2

Substitute Claim 24 – “the body is configured to be handheld and the loading slot is...”



Petitioner Opposition at 7-8

Substitute Claim 25 – “including a loading slot... wherein said loading slot provides a mechanism to load and unload said looped string”

- Petitioner Opposition:

While the full scope of the “mechanism” in Substitute Claim 25 is not clear, Patent Owner’s argument and the specification of the ’774 Patent seem to indicate that the loading slot itself is the mechanism. For instance, Patent Owner contends

the device quickly and easily”). Regardless of the “mechanism” being the loading slot itself or some feature of the loading slot to performs these functions, it is taught by the prior art.

Substitute Claim 25 – “including a loading slot... wherein said loading slot provides a mechanism to load and unload said looped string”

- Indefiniteness:

not inherently indefinite, to the extent the breadth of the claim has no objective boundaries then it is indefinite. *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (“The claims, when read in light of the specification and the prosecution history, must provide objective boundaries for those of skill in the art.”).

In more practical terms, the question is what loading slot would read on the limitation of a general “loading slot” but would not read on the claim language of “said loading slot provides a mechanism to load and unload said looped string,” as the general “loading slot” itself is a mechanism to load and unload string. There is

Substitute Claims 22-23, 26 and 28

Substitute Claims 22 and 23 are the same as issued claims 2 and 3, but change their dependency to Substitute Claim 21 instead of issued claim 1. PO Mot. to

Substitute Claims 26 is the same as issued claim 15, but changes dependency to Substitute Claim 25 instead of issued claim 12. PO Mot. to Amend at 9. Substitute

Substitute Claim 28 is the same as issued claim 17, but depends from Substitute Claim 25 instead of issued claim 16. PO Mot. to Amend at 9. Substitute

Petitioner Opposition at 7, 10 and 11

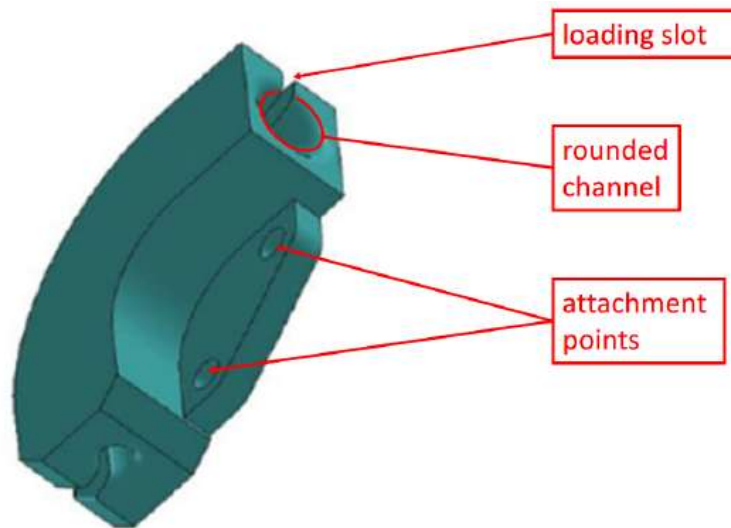
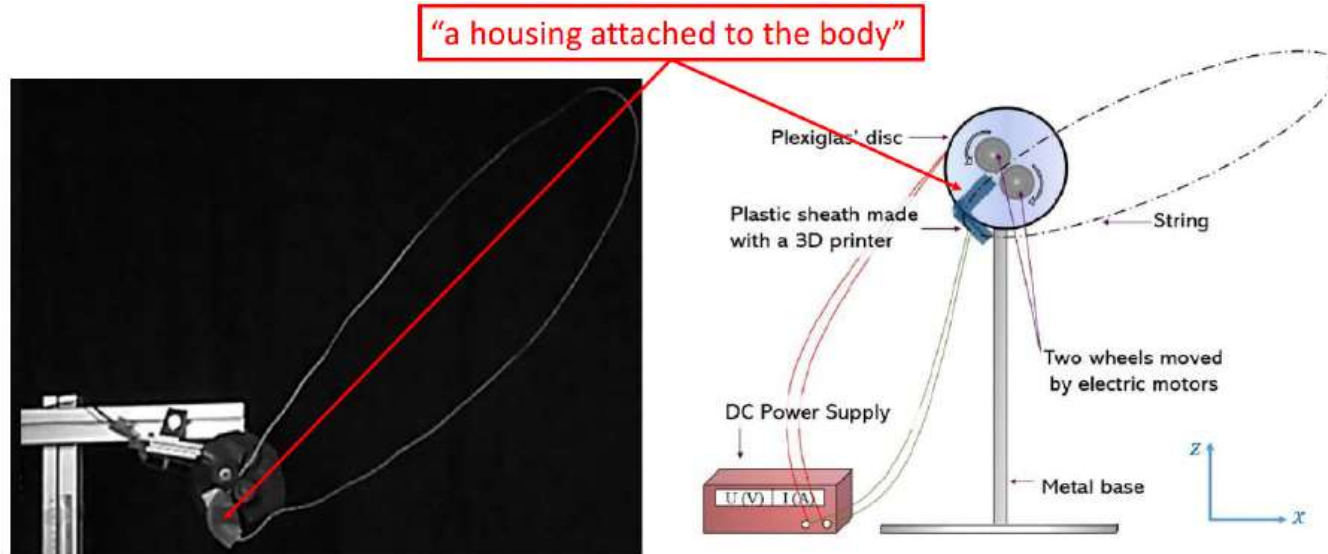
Ground 2 – Abello in view of Yeany

Issued Claims 1-3, 12 and 15-17

Substitute Claims 25, 26 and 28

Claim 1 – “a body” and “a housing attached to a body”

- Abello:



Claim 1 – “a body” and “a housing attached to a body”

- Patent Owner Response:

Abello also does not include a body configured to be held by a user, and as such, does not meet the limitation of claim 1 regarding a body. *See* Exhibit 2002 ¶ 119. Nor does Abello include a housing as disclosed in the ‘774 patent that is configured to receive wheels for propelling the looped string. [‘774 Patent Col. 9, lines 37-38]

PO Resp. at 12

Claim 1 – “a body” and “a housing attached to a body”

- 774 Patent at Col. 6, lines 14-17:

Embodiments of the present disclosure are configured to be **hand-held** devices, where a user holds the body **5** and turns on the motor **4** to drive the looped string **1** with the drive wheel **3**. The rotational force of the drive wheel **3**

- 774 Patent at 9:37-38 and 3:19-24:

FIGS. **6-9** illustrate the housing **100** that is configured to receive therein wheels for propelling a looped string. The

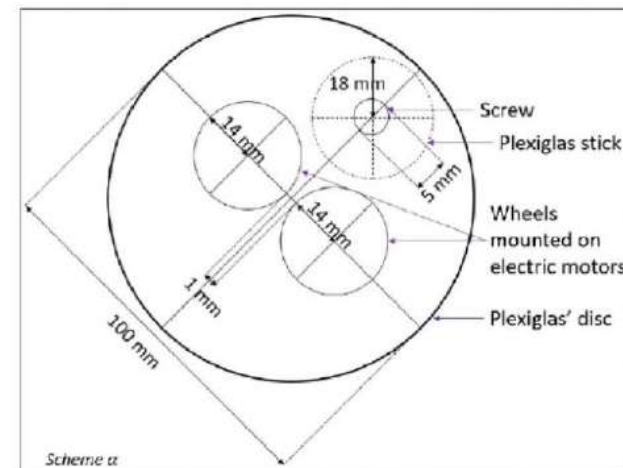
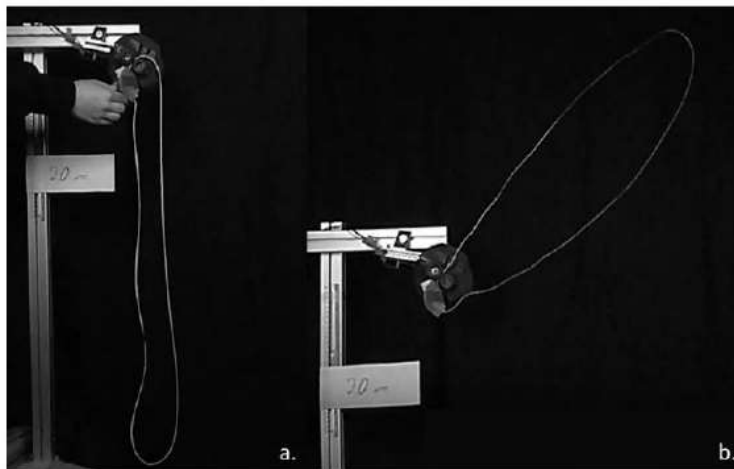
FIGS. **6** and **7** illustrate views of a housing for a string shooter including a loading feature and guide according to an **example embodiment** of the present disclosure;

Ex. 1001 at 3:19-24,
6:14-17 and 9:37-38

Claim 1 – “a body” and “a housing attached to a body”

- Petitioner Reply:

Yet, even if a hand-held device were required, Abello provides a picture with a user's hand holding a part of the device as well as providing express dimensions (e.g., 100mm plexiglass disc) further teaching a size and shape of a device that is configured to be held by a user's hand as shown below. Ex. 1005 at Fig. 1 and Fig.



Ex. 1001 at 6:14-17;
PO Resp. at 10

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Abello: solution. Physically, this means that the SSh should be able to remain in the air if and only if $R < 1$, i.e. if and only if the air drag prevails over weight.

Based on the results on Table 2, we noticed that the most dense strings as well as the smoothest strings were the ones to have the highest takeoff speeds v_{takeoff} .

gling itself in the wheels. The most severe issue however was wear, especially at higher speeds (our rubber wheels, or “tyres”, would considerably deform elastically at these speeds). Higher speeds meant more mechanical stress on every component of the SSh (string, wheels, sheath).

- Patent Owner misreads Abello:

¶ 132. As such, Abello teaches away from a fuzzy string because it indicates a preference for smooth strings and discloses that intentionally modifying the string would yield unknown results.

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Motivation to use string configured to increase air friction:

One such string with a non-smooth surface is disclosed in Yeany, which Abello specifically references as an inspiration for his paper. Ex.1005, 1, 8 (Yeany is listed as the first reference); Ex.1002, ¶125. A POSITA looking at Yeany would understand that the fibers extending from the surface of Yeany’s string would cause air friction that produces air drag to achieve Abello’s finding that air drag must dominate over weight to achieve an air-lifted state for the string. Ex.1002, ¶125. A

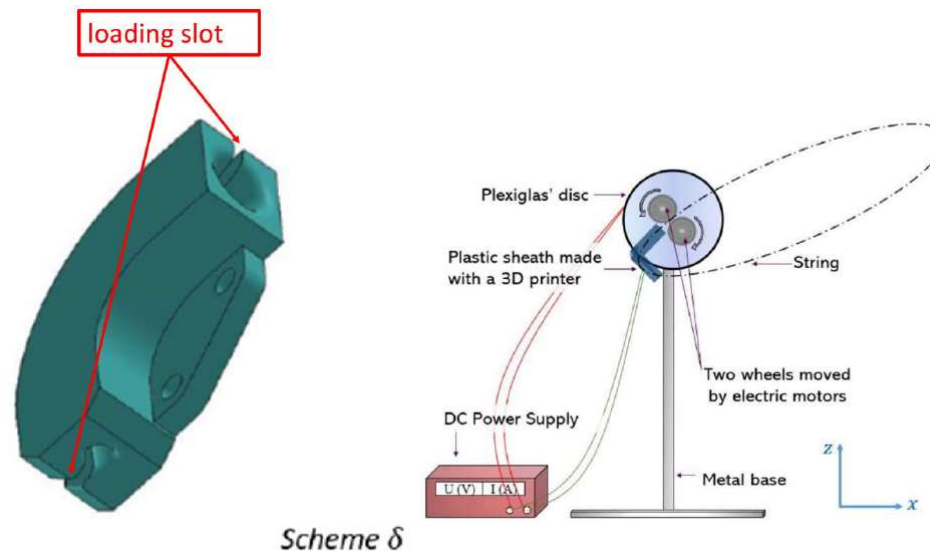
- Abello:

modifying the string itself by independently changing each of its characteristic parameters, such as linear density, roughness, fibre material, diameter,

Substitute Claim 25 – “including a loading slot... wherein said loading slot provides a mechanism to load and unload said looped string”

- Petitioner Opposition:

As explained by Dr. Kudrowitz, Abello teaches a looped string would be loaded into or unloaded via a loading slot of the sheath (e.g., the housing) into a rounded channel which “guides the returning string back in between the wheels” and thus guides the string into engagement with a drive wheel. Ex. 1002 at ¶¶117-119



Ex. 1005 at Fig. 2 and 3;
Petitioner Opposition at 12-13

Substitute Claims 26 and 28

Substitute Claims 26 is the same as issued claim 15, but changes dependency to Substitute Claim 25 instead of issued claim 12. PO Mot. to Amend at 9. Substitute

Substitute Claim 28 is the same as issued claim 17, but changed dependency to Substitute Claim 25 instead from issued claim 16. PO Mot. to Amend at 9.

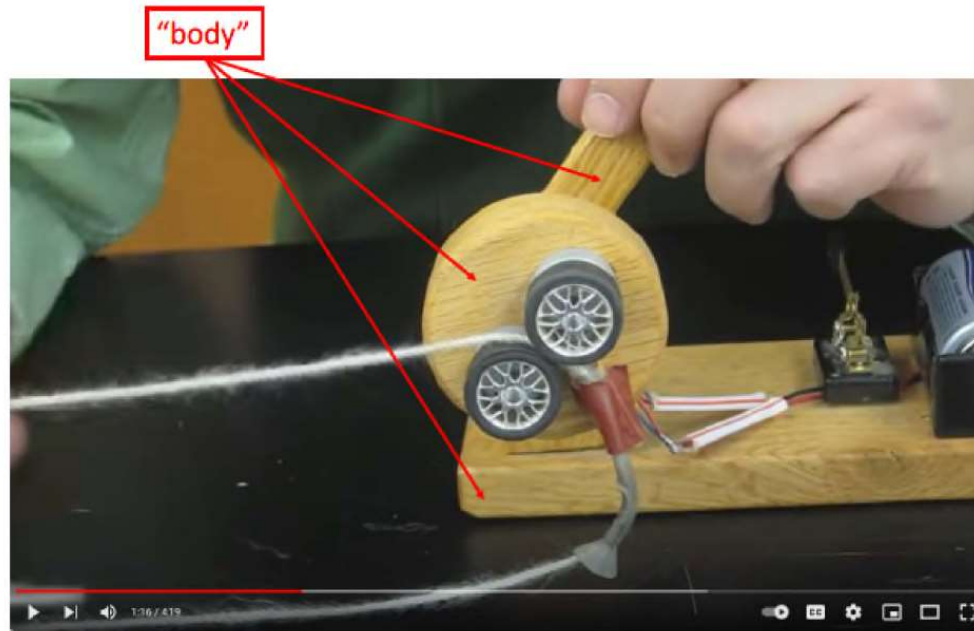
Petitioner Opposition at 13-14

Ground 1 – Yeany

Issued Claims 1-3, 12 and 15

Claim 1 – “a body”

- Yeany:



Ex. 1004 (Part 1-2) at 1:13-1:47 and (Part 2-3) 2:50-3:28;
Petition at 33;
Pet. Reply at 3-4

Claim 1 – “a body”

- Patent Owner Response:

As described above, Yeany is a table-top string shooting device. A POSITA would understand upon reading the ‘774 Patent that the body of the claimed device is configured to be held by a user [‘774 Patent Col. 6, lines 14-17] and that Yeany is not so configured. Exhibit 2002, ¶98.

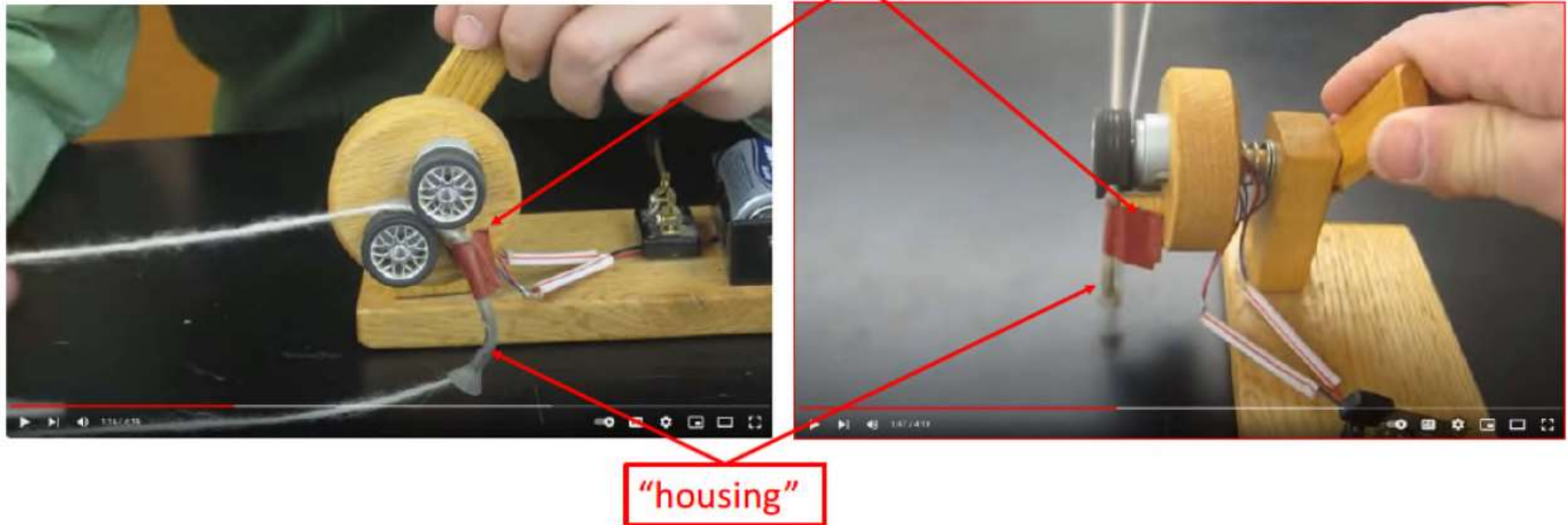
- 774 Patent at Col. 6, lines 14-17:

Embodiments of the present disclosure are configured to be hand-held devices, where a user holds the body 5 and turns on the motor 4 to drive the looped string 1 with the drive wheel 3. The rotational force of the drive wheel 3

Ex. 1001 at 6:14-17;
PO Resp. at 10

Claim 1 – “a housing attached to the body”

- Yeany:



¶80. The tubing is a housing since it is used to house the string and “guides it [the string] back into place in between the wheels.” Ex.1004, 1:13:1:47; Ex.1002, ¶80.

Ex. 1004 (Part 1-2) at 1:13-1:47;
Petition at 33-34;

Claim 1 – “a housing attached to the body”

- Patent Owner Response:

Yeany also does not disclose a housing as disclosed in the ‘774 patent that is configured to receive wheels for propelling the looped string. [‘774 Patent Col. 9, lines 37-38]

- 774 Patent at 9:37-38 and 3:19-24:

FIGS. 6-9 illustrate the housing 100 that is configured to receive therein wheels for propelling a looped string. The

FIGS. 6 and 7 illustrate views of a housing for a string shooter including a loading feature and guide according to an example embodiment of the present disclosure;

Ex. 1001 at 3:19-24 and 9:37-38;
PO Resp. at 10;
Pet. Reply at 5

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Yeany:



Ex. 1004 (Part 1) at 1:16; Ex. 1002 at ¶¶86-97; Petition at 36

- 774 Patent:

gravity in a positive X-direction. The effect of the “fuzzy” surface of the string magnifies the air friction thereby magnifying the positive lift against gravity. With sufficient lift, the modified string overcome gravitational forces on the distal end 7 of the looped string 1 and give the appearance that the looped string 1 is weightless. The radiating threads

Ex. 1001 at Fig. 3 and 5:14-19

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Yeany:



Ex. 1004 (Part 2) at 2:10; Ex. 1002 at ¶94; Petition at 42; Pet. Reply at 8

- Knowledge of POSITA:

Indeed, the presence of friction is the very reason why we have lift.

Ex. 1011 at 342; Petition at 16-17

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Patent Owner Response:

¶103. The fact that a close-up of the string after it has been shooting through the two rotating wheels shows a fuzzy surface texture does not indicate that the fuzziness is configured to increase the air friction as claimed. *Id.*

- Patent Owner Sur-Reply:

true here. For the prior art to anticipate claim 1, it must disclose that the string is "configured to" perform a function, therefore the Petitioner must demonstrate a purposeful design that achieves the specified function and not merely the capability to achieve the function. Petitioner has failed to do so. Since there is no disclosure by

Ex. 1001 at 3:19-24 and 9:37-38;
PO Resp. at 10;
Pet. Reply at 5

Claim 1 – “a string, wherein the string comprises a surface texture configured to increase air friction”

- Dr. Kudrowitz:

The extending fibers on the Yeany string must have some volume, mass, and surface area which would increase skin friction relative to a smooth string surface by increasing the string's resistance to movement when traveling through a fluid like air. As such, when the string is moving through air as shown in Yeany, a POSITA would know that the fibers extending from Yeany's string surface would necessarily increase the air friction between the string and the air relative to the same string surface without such extending fibers.

Ex. 1002 at ¶87;
Petition at 38-39

Conclusion

Conclusion

- Issued claims 1-4, 12 and 15-17 are unpatentable
 - Wagner in view of Yeany and Scorch
 - Abello in view of Yeany
 - Yeany
- Substitute claims 21-26 and 28 are unpatentable
 - Wagner in view of Yeany and Scorch
 - Abello in view of Yeany

CERTIFICATE OF SERVICE UNDER 37 CFR § 42.6(e)(4)

The undersigned hereby certifies that a copy of the Petitioner's Demonstratives were previously served via electronic mail on November 24, 2025 upon the following:

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