US Patent & Trademark Office
Patent Public Search | Text View

United States Patent	12385715
Kind Code	B2
Date of Patent	August 12, 2025
Inventor(s)	Spicer; Louis et al.

Compressed gas projectile launching devices

Abstract

Various projectile launching devices are disclosed herein. In one aspect, the projectile launching device includes a gas-powered projectile agitator, an anti-jam assembly, and a compressed gas canister frame positioned below a body of the device. In another embodiment, the projectile launching device includes a rear-loading hopper and a projectile agitator which is actuated by mechanical power via a linkage with a pump handle.

Inventors: **Spicer; Louis (Sewell, NJ), Pearce; Mark (Lindenwold, NJ), Ambrose; Robert W. (Marlton, NJ), Rice; John Ronald (Stoke-on-Trent, GB)**

Applicant: **KORE OUTDOOR (US), INC.** (Fort Wayne, IN)

Family ID: **1000008749417**

Assignee: **KORE OUTDOOR (US), INC. (Fort Wayne, IN)**

Appl. No.: **18/029564**

Filed (or PCT Filed): **September 29, 2021**

PCT No.: **PCT/US2021/052575**

PCT Pub. No.: **WO2022/072443**

PCT Pub. Date: April 07, 2022

Prior Publication Data

Document Identifier	Publication Date
US 20230332861 A1	Oct. 19, 2023

Related U.S. Application Data

us-provisional-application US 63085750 20200930

Publication Classification

Int. Cl.: **F41B11/52** (20130101); **F41B11/62** (20130101)

U.S. Cl.:

CPC **F41B11/52** (20130101); **F41B11/62** (20130101);

Field of Classification Search

CPC: F41B (11/52); F41B (11/53); F41B (11/62)

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
452882	12/1890	Giffard	251/74	F41B 11/72
1332992	12/1919	Moore et al.	N/A	N/A
1332993	12/1919	Moore et al.	N/A	N/A
1403689	12/1921	Hyndman	N/A	N/A
1403719	12/1921	Szepe	N/A	N/A
1404689	12/1921	Fairweather	N/A	N/A
1743576	12/1929	Smith	N/A	N/A
1867513	12/1931	Lahti	N/A	N/A
1954093	12/1933	Nelson	N/A	N/A
2064888	12/1935	Dickinson	N/A	N/A
2307015	12/1942	Boynton	N/A	N/A
2338984	12/1943	Van et al.	N/A	N/A
2357951	12/1943	Hale	N/A	N/A
2398263	12/1945	Trimbach	N/A	N/A
RE23951	12/1948	Graham	N/A	N/A
2526969	12/1949	Powers	N/A	N/A
2612888	12/1951	Wells	124/53	F41A 9/62
2639904	12/1952	McMaster et al.	N/A	N/A
2641412	12/1952	Byberg	N/A	N/A
2676633	12/1953	Lohre et al.	N/A	N/A
2716973	12/1954	Desi	N/A	N/A
3089476	12/1962	Wolverton	N/A	N/A
3119384	12/1963	Merz	124/51.1	F41B 11/62
3134301	12/1963	Even	N/A	N/A
3227148	12/1965	Spack	124/76	F41B 11/62
3233125	12/1965	Buie	N/A	N/A
3248008	12/1965	Meierjohan	N/A	N/A
3384354	12/1967	Migule et al.	N/A	N/A
3410453	12/1967	Lawrence	N/A	N/A
3467073	12/1968	Rhodes	N/A	N/A

3610223	12/1970	Green	N/A	N/A
3695246	12/1971	Fillippi et al.	N/A	N/A
3724437	12/1972	Halstead	N/A	N/A
3745687	12/1972	Koon, Jr.	N/A	N/A
3766901	12/1972	Cleary et al.	N/A	N/A
3777732	12/1972	Holloway et al.	N/A	N/A
3788298	12/1973	Hale	N/A	N/A
3789891	12/1973	Bosch	N/A	N/A
3814283	12/1973	Cioth	N/A	N/A
3844267	12/1973	Mohr	N/A	N/A
3855988	12/1973	Sweeton	N/A	N/A
3867921	12/1974	Politzer	N/A	N/A
3930486	12/1975	Kahelin	N/A	N/A
3978841	12/1975	Yarur et al.	N/A	N/A
3996916	12/1975	Koehn et al.	N/A	N/A
4021036	12/1976	Nelson et al.	N/A	N/A
4027646	12/1976	Sweeton	N/A	N/A
4034644	12/1976	Hupp et al.	N/A	N/A
4073280	12/1977	Koehn et al.	N/A	N/A
4083349	12/1977	Clifford	124/53.5	F41B 11/52
4185824	12/1979	Natwick	N/A	N/A
4207857	12/1979	Balka, Jr.	N/A	N/A
4280697	12/1980	Yuasa	N/A	N/A
4299383	12/1980	Yuasa	N/A	N/A
4332097	12/1981	Taylor, Jr.	N/A	N/A
4481862	12/1983	Wiethoff et al.	N/A	N/A
4487103	12/1983	Atchisson	N/A	N/A
4563999	12/1985	Miehlich	N/A	N/A
4646709	12/1986	Kholin	N/A	N/A
4676137	12/1986	Stockton et al.	N/A	N/A
4759435	12/1987	Cedrone	N/A	N/A
4819609	12/1988	Tippmann	N/A	N/A
4834060	12/1988	Greene	N/A	N/A
4850330	12/1988	Nagayoshi	N/A	N/A
4896648	12/1989	Boller	N/A	N/A
4923066	12/1989	Ophir et al.	N/A	N/A
4926742	12/1989	Ma et al.	N/A	N/A
4930400	12/1989	Brandl et al.	N/A	N/A
4936282	12/1989	Dobbins et al.	N/A	N/A
4951548	12/1989	Wixon et al.	N/A	N/A
4951644	12/1989	Bon	N/A	N/A
4956951	12/1989	Kannankeril	N/A	N/A
4986251	12/1990	Lilley	N/A	N/A
4993400	12/1990	Fitzwater	N/A	N/A
5063905	12/1990	Farrell	N/A	N/A
5097816	12/1991	Miller	N/A	N/A
5097985	12/1991	Jones	N/A	N/A
5166457	12/1991	Lorenzetti	N/A	N/A
5251906	12/1992	Heller et al.	N/A	N/A
5282454	12/1993	Bell et al.	N/A	N/A

5335579	12/1993	David	N/A	N/A
5353712	12/1993	Olson	N/A	N/A
5361746	12/1993	Szente	N/A	N/A
5383442	12/1994	Tippmann	N/A	N/A
5456153	12/1994	Bentley et al.	N/A	N/A
5464208	12/1994	Pierce	N/A	N/A
5490493	12/1995	Salansky	N/A	N/A
5497758	12/1995	Dobbins et al.	N/A	N/A
5502455	12/1995	Ferrin et al.	N/A	N/A
5505188	12/1995	Williams	N/A	N/A
5507271	12/1995	Actor	N/A	N/A
5511333	12/1995	Farrell	N/A	N/A
5520171	12/1995	David	N/A	N/A
5542570	12/1995	Nottingham et al.	N/A	N/A
5555662	12/1995	Teetzel	N/A	N/A
5561258	12/1995	Bentley et al.	N/A	N/A
5600083	12/1996	Bentley et al.	N/A	N/A
5673679	12/1996	Walters	N/A	N/A
5675110	12/1996	Gyer et al.	N/A	N/A
5722383	12/1997	Tippmann, Sr. et al.	N/A	N/A
5727538	12/1997	Ellis	N/A	N/A
5736720	12/1997	Bell et al.	N/A	N/A
5749797	12/1997	Sunseri et al.	N/A	N/A
5755056	12/1997	Danner et al.	N/A	N/A
5762058	12/1997	Cheng	124/83	F41A 21/32
5771875	12/1997	Sullivan	N/A	N/A
5784985	12/1997	Lodico et al.	N/A	N/A
5791325	12/1997	Anderson	N/A	N/A
5794606	12/1997	Deak	N/A	N/A
5809983	12/1997	Stoneking	N/A	N/A
5816232	12/1997	Bell	N/A	N/A
5819715	12/1997	Haneda et al.	N/A	N/A
5839422	12/1997	Ferris	N/A	N/A
5881962	12/1998	Schmidt et al.	N/A	N/A
5887578	12/1998	Bakeris et al.	N/A	N/A
5947100	12/1998	Anderson	N/A	N/A
5950611	12/1998	Lopez et al.	N/A	N/A
5954042	12/1998	Harvey	N/A	N/A
6032395	12/1999	Bentley et al.	N/A	N/A
6055975	12/1999	Gallagher et al.	N/A	N/A
6062208	12/1999	Seefeldt et al.	N/A	N/A
6109252	12/1999	Stevens	N/A	N/A
6176230	12/2000	Thompson	N/A	N/A
6206562	12/2000	Eyraud et al.	N/A	N/A
6213110	12/2000	Christopher et al.	N/A	N/A
6220237	12/2000	Johnson et al.	N/A	N/A
6305367	12/2000	Kotsiopoulos et al.	N/A	N/A
6311682	12/2000	Rice et al.	N/A	N/A
6325233	12/2000	Harris	N/A	N/A
6327953	12/2000	Andresen	N/A	N/A

6347621	12/2001	Guthrie	N/A	N/A
6374819	12/2001	Ming-Hsien	N/A	N/A
6408836	12/2001	Ming-Hsien	N/A	N/A
D459767	12/2001	Rushton	N/A	N/A
6415781	12/2001	Perrone	N/A	N/A
6418919	12/2001	Perrone	N/A	N/A
6425781	12/2001	Bernstein et al.	N/A	N/A
6460530	12/2001	Backeris et al.	N/A	N/A
6467473	12/2001	Kostiopoulos	N/A	N/A
6468879	12/2001	Lamure et al.	N/A	N/A
6481432	12/2001	Rushton et al.	N/A	N/A
6488019	12/2001	Kotsiopoulos	N/A	N/A
6502567	12/2002	Christopher et al.	N/A	N/A
6526955	12/2002	Juan	N/A	N/A
6588412	12/2002	Ferrara et al.	N/A	N/A
6591824	12/2002	Hatcher	N/A	N/A
6609511	12/2002	Kotsiopoulos et al.	N/A	N/A
6615814	12/2002	Rice et al.	N/A	N/A
6644293	12/2002	Jong	N/A	N/A
6666203	12/2002	Maeda et al.	N/A	N/A
6684873	12/2003	Anderson et al.	N/A	N/A
6701907	12/2003	Christopher et al.	N/A	N/A
6708685	12/2003	Masse	N/A	N/A
6722355	12/2003	Andrews, Jr.	N/A	N/A
6725852	12/2003	Yokota et al.	N/A	N/A
6729321	12/2003	Ho	N/A	N/A
6729497	12/2003	Rice et al.	N/A	N/A
6739322	12/2003	Rice et al.	N/A	N/A
6739323	12/2003	Tippmann, Jr.	N/A	N/A
6742512	12/2003	Ho et al.	N/A	N/A
6752137	12/2003	Brunette et al.	N/A	N/A
6792933	12/2003	Christopher et al.	N/A	N/A
6802306	12/2003	Rice	N/A	N/A
6860285	12/2004	Ehrman et al.	N/A	N/A
6889680	12/2004	Christopher et al.	N/A	N/A
6915792	12/2004	Sheng	N/A	N/A
6978776	12/2004	Hamilton	N/A	N/A
6981493	12/2005	Poteracke	N/A	N/A
7000603	12/2005	Steenbeke	N/A	N/A
7017569	12/2005	Jong	N/A	N/A
7021302	12/2005	Neumaster et al.	N/A	N/A
7040505	12/2005	Hashimoto et al.	N/A	N/A
7077118	12/2005	Lewis	N/A	N/A
7107981	12/2005	Dunn	N/A	N/A
D535339	12/2006	Broersma	N/A	N/A
7159585	12/2006	Quinn et al.	N/A	N/A
7216641	12/2006	Friesen et al.	N/A	N/A
7222617	12/2006	Andresen	N/A	N/A
D544047	12/2006	Bell et al.	N/A	N/A
7234456	12/2006	Andresen	N/A	N/A

7270120	12/2006	Broersma et al.	N/A	N/A
7270121	12/2006	Lubben	N/A	N/A
7322347	12/2007	Broersma	N/A	N/A
7322348	12/2007	Chen	N/A	N/A
7343909	12/2007	Christopher et al.	N/A	N/A
D567302	12/2007	Choi	N/A	N/A
D567303	12/2007	Neumaster	N/A	N/A
7357129	12/2007	Neumaster et al.	N/A	N/A
7357130	12/2007	Broersma	N/A	N/A
D572318	12/2007	Broersma	N/A	N/A
7428899	12/2007	Andresen	N/A	N/A
7445002	12/2007	Christopher et al.	N/A	N/A
D584776	12/2008	Stevens	N/A	N/A
7617814	12/2008	Leppert	N/A	N/A
7617817	12/2008	Kulp	N/A	N/A
7975683	12/2010	Williams et al.	N/A	N/A
8047191	12/2010	Christopher et al.	N/A	N/A
8118016	12/2011	Italia et al.	N/A	N/A
8235030	12/2011	Kaakkola et al.	N/A	N/A
8381710	12/2012	Nguyen	N/A	N/A
8387607	12/2012	Christopher et al.	N/A	N/A
8408837	12/2012	Helfer et al.	N/A	N/A
8415781	12/2012	Kariya et al.	N/A	N/A
8430086	12/2012	Tippmann, Jr. et al.	N/A	N/A
8726895	12/2013	Tippmann, Jr. et al.	N/A	N/A
8746225	12/2013	Christopher et al.	N/A	N/A
8857658	12/2013	Lin	N/A	N/A
8985378	12/2014	Wan et al.	N/A	N/A
RE45490	12/2014	Italia et al.	N/A	N/A
9500435	12/2015	Tseng	N/A	N/A
9733042	12/2016	Yuen et al.	N/A	N/A
9857140	12/2017	Italia	N/A	N/A
9857141	12/2017	Spurlock	N/A	N/A
10520520	12/2018	Kaeppeli et al.	N/A	N/A
11796280	12/2022	Pearce	N/A	N/A
2002/0014230	12/2001	Christopher et al.	N/A	N/A
2002/0020402	12/2001	Kotsiopoulos	N/A	N/A
2002/0059927	12/2001	Woods, Sr.	N/A	N/A
2002/0117159	12/2001	Kotsiopoulos et al.	N/A	N/A
2003/0017173	12/2002	Markham et al.	N/A	N/A
2003/0079731	12/2002	Dobbins	N/A	N/A
2003/0127084	12/2002	Tippmann, Jr.	N/A	N/A
2003/0127085	12/2002	Brunette	N/A	N/A
2004/0074487	12/2003	Christopher et al.	N/A	N/A
2004/0074489	12/2003	Neumaster et al.	N/A	N/A
2004/0112356	12/2003	Hatcher	N/A	N/A
2004/0134475	12/2003	Jong	N/A	N/A
2004/0194772	12/2003	Hamilton	N/A	N/A
2004/0211402	12/2003	Christopher et al.	N/A	N/A
2004/0245276	12/2003	Hashimoto et al.	N/A	N/A

2005/0028801	12/2004	Lewis	N/A	N/A
2005/0121015	12/2004	Postorivo, Jr.	N/A	N/A
2005/0188974	12/2004	Pedicini et al.	N/A	N/A
2005/0217653	12/2004	Christopher et al.	N/A	N/A
2005/0241628	12/2004	Hatcher	N/A	N/A
2005/0274370	12/2004	Lubben	N/A	N/A
2005/0274371	12/2004	Lubben	N/A	N/A
2005/0284456	12/2004	Chipley	N/A	N/A
2005/0284457	12/2004	Hatcher	N/A	N/A
2006/0005823	12/2005	Quinn et al.	N/A	N/A
2006/0032488	12/2005	Telford	N/A	N/A
2006/0037597	12/2005	Wood	N/A	N/A
2006/0054151	12/2005	Christopher et al.	N/A	N/A
2006/0086347	12/2005	Hedberg	N/A	N/A
2006/0124118	12/2005	Dobbins	N/A	N/A
2006/0130821	12/2005	Hamilton	N/A	N/A
2006/0157041	12/2005	Friesen	N/A	N/A
2006/0196489	12/2005	Campo	N/A	N/A
2006/0249131	12/2005	Broersma	N/A	N/A
2006/0254572	12/2005	Hall	N/A	N/A
2007/0012303	12/2006	Christopher et al.	N/A	N/A
2007/0012304	12/2006	van Dorsser et al.	N/A	N/A
2007/0017494	12/2006	Andresen	N/A	N/A
2007/0017495	12/2006	Andresen	N/A	N/A
2007/0028908	12/2006	Deak	124/73	F41B 11/52
2007/0056573	12/2006	Campo	N/A	N/A
2007/0062506	12/2006	Bell	N/A	N/A
2007/0081233	12/2006	Hattori	N/A	N/A
2007/0101981	12/2006	Chen	N/A	N/A
2007/0113834	12/2006	Spicer	N/A	N/A
2007/0137631	12/2006	Christopher	N/A	N/A
2007/0175463	12/2006	Higgins et al.	N/A	N/A
2007/0181117	12/2006	Tippmann, Jr. et al.	N/A	N/A
2007/0246479	12/2006	Andresen	N/A	N/A
2007/0256676	12/2006	Orvis et al.	N/A	N/A
2008/0017178	12/2007	Marques et al.	N/A	N/A
2008/0047535	12/2007	Handel	N/A	N/A
2008/0047536	12/2007	Chen	N/A	N/A
2008/0047537	12/2007	Kulp et al.	N/A	N/A
2008/0087264	12/2007	Postorivo	N/A	N/A
2009/0000608	12/2008	Christopher et al.	N/A	N/A
2009/0025700	12/2008	Andresen	N/A	N/A
2009/0120420	12/2008	Tippmann, Jr.	206/234	F41A 35/00
2009/0133680	12/2008	Christopher et al.	N/A	N/A
2011/0011386	12/2010	Tran	124/51.1	F41B 11/57
2011/0073092	12/2010	Yeh	N/A	N/A
2012/0103316	12/2011	Kaakkola et al.	N/A	N/A
2013/0015098	12/2012	Chen	N/A	N/A
2013/0167821	12/2012	Nguyen	N/A	N/A
2013/0220293	12/2012	Kaakkola	N/A	N/A

2018/0066913	12/2017	Stevens	N/A	N/A
2019/0323794	12/2018	Wood	N/A	N/A
2021/0381797	12/2020	Buys	N/A	N/A

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
876370	12/1952	DE	N/A
2035097	12/1971	DE	N/A
3721527	12/1989	DE	N/A
4343870	12/1993	DE	N/A
19922589	12/2000	DE	N/A
0075970	12/1982	EP	N/A
1054228	12/1999	EP	N/A
01653189	12/2005	EP	N/A
921527	12/1946	FR	N/A
1216612	12/1959	FR	N/A
470201	12/1936	GB	N/A
551077	12/1942	GB	N/A
2322438	12/1997	GB	N/A
9813660	12/1997	WO	N/A
0144745	12/2000	WO	N/A
0242708	12/2001	WO	N/A
03087698	12/2002	WO	N/A
2007033309	12/2006	WO	N/A
2007035601	12/2006	WO	N/A
2007044546	12/2006	WO	N/A
2007044822	12/2006	WO	N/A
2008104061	12/2007	WO	N/A

OTHER PUBLICATIONS

Valken V-Max Manual, Available at: https://paintball.skiep.pl/public/assets/images/instrukcje/Valken%20V-max%20manual.pdf (2011). cited by applicant
Valken V-Max Plus Paintball Loader Owners Manual (2014). cited by applicant
Virtue Spire III Paintball Loader Manual, Available at: https://www.manualslib.com/manual/1709739/Virtue-Spire-III.html (2012). cited by applicant
Virtue Spire Paintball Loader Manual, Available at: https://pbmanuals.com/downloads/775_Virtue_Virtue_Spire_Hopper_Manual_ENG.pdf (2013). cited by applicant

---

Primary Examiner: Hayes; Bret

Attorney, Agent or Firm: Volpe Koenig

Background/Summary

INCORPORATION BY REFERENCE (1) This application is a § 371 application of International Application No. PCT/US2021/052575, filed Sep. 29, 2021, which claims the benefit of U.S.

Provisional Application No. 63/085,750, filed on Sep. 30, 2020, which is incorporated herein by reference as if fully set forth.

FIELD OF INVENTION

(1) The present disclosure relates to the field of projectile launchers.

BACKGROUND

(2) Various types of projectile launching devices are well known. Such projectile launching devices are shown and described, for example, in U.S. Pat. Nos. 10,704,859, 7,975,683, 9,658,027, and 8,950,387, the entire contents of all of which are incorporated by reference herein. Projectile launching devices can be configured to shoot paintballs, foam balls, pellets, or other types of projectiles. The energy required to fire projectiles in these devices can be supplied in a variety of ways. For example, some projectile launching devices rely on compressed gas to fire the projectiles. Other devices require manual pumping of a handle or mechanism to build up air pressure and load a firing spring.

(3) One persistent issue with these devices includes jamming of projectiles in the hopper. This can result in the device malfunctioning or misfiring. Another common issue for these devices involves the safety of the user and any bystanders, particularly during loading and reloading of the projectiles.

(4) It would be desirable to provide a projectile launching device that reliably fires, does not jam, and also includes safety features. It would further be desirable to provide a projectile launching device that is easy to load with projectiles. It would further be desirable to provide a projectile launching device that accommodates soft projectiles and does not cause such projectiles to jam on firing.

SUMMARY

(5) A projectile launching device is disclosed herein. The projectile launching device includes a body, a grip assembly, and a hopper.

(6) In one aspect, the body includes a projectile agitator assembly configured to selectively protrude into the hopper. The projectile agitator assembly can be gas actuated.

(7) In one aspect, the body includes an anti-jam assembly. The anti-jam assembly can include a linkage and an anti-jam spring configured to allow the linkage to move rearward if a bolt of the device engages a jammed projectile.

(8) In one aspect, the grip assembly includes a handle and trigger assembly arranged below a rear portion of the body, and a frame arranged below a front portion of the body. The frame is dimensioned to hold a compressed gas canister. Specifically, the frame includes an opening dimensioned to receive the compressed gas canister. In one aspect, the opening has a longitudinal axis (X1) extending parallel to a longitudinal axis (X2) of the body. The opening of the frame can be positioned below the hopper. The frame can be positioned below the trigger assembly. The frame can be positioned longitudinally inward from a projectile launching opening defined on the body. Preferably, an opening of the frame is circular and configured to be shaped so as to snugly hold a compressed gas canister of appropriate size.

(9) In one aspect, the hopper includes a housing defining a container for projectiles, a lid attached to the housing, and a fill volume limiting wall arranged within the housing.

(10) In one aspect, luminescent projectiles are also provided that are configured to be fired or launched by the projectile launching device.

(11) In another embodiment, a grip for a compressed gas projectile launcher is provided. The grip includes a handle including a trigger assembly, and a frame attached to the handle. The frame defines a sleeve dimensioned to receive a compressed gas canister.

(12) Another projectile launching device is disclosed that includes a body, a grip assembly, and a hopper. A lid is attached to a rear surface of the hopper. This device also includes a projectile agitator configured to: (i) extend at least partially inside of the hopper, and (ii) move relative to an

interior chamber defined by the hopper.
(13) Additional embodiments are disclosed herein.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The foregoing Summary and the following Detailed Description will be better understood when read in conjunction with the appended drawings, which illustrate a preferred embodiment of the disclosure. In the drawings:
(2) FIG. **1**A is a side cross-sectional view of a projectile launching device in a non-firing state or ready-to-fire or rearward state.
(3) FIG. **1**B is a side cross-sectional view of the device of FIG. **1**A in a firing state or forward state.
(4) FIG. **2**A is a side view of a hopper for the device of FIGS. **1**A and **1**B with a lid in an opening state.
(5) FIG. **2**B is a side view of the hopper for the device of FIGS. **1**A and **1**B with a lid in an open state.
(6) FIG. **3**A is a side view of the hopper with the lid in a closed position.
(7) FIG. **3**B is a side view of the hopper with the lid in a partially open position.
(8) FIG. **3**C is a side view of the hopper with the lid in a fully open position.
(9) FIG. **3**D is an additional side view of the hopper with the lid in an opening position.
(10) FIG. **4** is a side view of a projectile launching device according to another embodiment.
(11) FIG. **5**A is a side view of a projectile launching device according to another embodiment.
(12) FIG. **5**B is a side cross-sectional view of the projectile launching device according to FIG. **5**A.
(13) FIG. **6**A is a side cross-sectional view of a projectile launching device according to another embodiment.
(14) FIG. **6**B is a side view of the projectile launching device according to FIG. **6**A.
(15) FIG. **6**C is a side cross-sectional view of the projectile launching device according to FIGS. **6**A-**6**B.
(16) FIG. **6**D is a rear top perspective view of the projectile launching device according to FIGS. **6**A-**6**C.
(17) FIG. **7** illustrates a projectile configured to be launched by any of the projectile launching devices illustrated herein.
(18) FIG. **8**A is a side cross-sectional view of a projectile launching device according to another embodiment.
(19) FIG. **8**B is a side cross-sectional view of the projectile launching device of FIG. **8**A with the triggering mechanism or assembly being engaged.
(20) FIG. **8**C is a side cross-sectional view of the projectile launching device of FIGS. **8**A and **8**B in a non-firing state, ready to fire, or rearward state.
(21) FIG. **8**D is an exploded view of the projectile launching device of FIGS. **8**A-**8**C.
(22) FIG. **8**E is a front perspective view of the projectile launching device of FIGS. **8**A-**8**D.
(23) FIG. **8**F is a side view of the projectile launching device of FIGS. **8**A-**8**E.
(24) FIG. **8**G is a rear perspective view of the projectile launching device of FIGS. **8**A-**8**F.
(25) FIG. **9**A is a side cross-sectional view of a projectile launching device according to another embodiment.
(26) FIG. **9**B is a front perspective view of the projectile launching device of FIG. **9**A.
(27) FIG. **9**C is a rear perspective view of the projectile launching device of FIGS. **9**A-**9**B.
(28) FIG. **10**A is a side cross-sectional view of a projectile launching device including an agitator.
(29) FIG. **10**B is a side view of a hopper of the device of FIG. **10**A.
(30) FIG. **10**C is a side cross-sectional view of the hopper of FIGS. **10**A and **10**B.

(31) FIG. **10**D is a rear perspective view of the hopper of FIGS. **10**A-**10**C.
(32) FIG. **10**E is a front view of the hopper of FIGS. **10**A-**10**D.
(33) FIG. **11**A is a side view of a projectile launching device including a cannister or tank locking feature.
(34) FIG. **11**B is a magnified view of the cannister or tank locking feature of FIG. **11**A.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS
(35) Certain terminology is used in the following description for convenience only and is not limiting. “Axially” refers to a direction along an axis (X) of an assembly. “Radially” refers to a direction inward and outward from the axis (X) of the assembly. “Circumferentially” refers to a direction extending along a curve or circumference of a respective element relative to the axis (X) of the assembly. The words “right,” “left,” “top,” and “bottom” designate directions in the drawings to which reference is made. The words “a” and “one,” as used in the claims and in the corresponding portions of the specification, are defined as including one or more of the referenced item unless specifically stated otherwise. This terminology includes the words above specifically mentioned, derivatives thereof, and words of similar import. The phrase “at least one” followed by a list of two or more items, such as “A, B, or C,” means any individual one of A, B or C as well as any combination thereof.
(36) A reference to a list of items that are cited as “at least one of a, b, or c” (where a, b, and c represent the items being listed) means any single one of the items a, b, or c, or combinations thereof. The terminology includes the words specifically noted above, derivatives thereof and words of similar import.
(37) Referring to FIGS. **1**A and **1**B, an exemplary projectile launching device **10** is illustrated, which includes a body **20**, a grip assembly **40**, and a hopper **60**. The body **20** includes front portion **28** defining projectile launching opening **29** (which may be referred to or comprise a barrel or barrel assembly) and a rear portion **27**. The grip assembly **40** includes a handle **42** and trigger assembly **44** arranged below a rear portion **27** of the body **20**, and a frame **48** arranged below a front portion **28** of the body **20**. The frame **48** is dimensioned to hold a compressed gas canister **50**. The hopper **60** includes a housing **62** defining a receptacle or container for projectiles, and a lid **64** attached to the housing **62**.
(38) The body **20** includes a generally cylindrical interior passage or space (which may also be known as a breech area or comprise a breech area) for housing at least some of the firing components (such as the hammer and valve components) of the device **10**.
(39) A hammer **23** (also known as a ram, striker, or bolt) is disposed within the body **20** adjacent the rear portion **27**. The hammer **23** has a forward end facing a valve assembly **30** and the forward end of the hammer **23** is configured to contact a valve pin of the valve assembly **30**. As shown in FIGS. **1**A and **1**B, the hammer **23** can include a seat **23***a*. In one aspect, the seat **23***a* is defined as a radially extending flange or shoulder. The hammer **23** is retained in a cocked or ready position by a sear **32** that pivots to engage a portion of the hammer **23**. Actuation of the trigger assembly **44** (such as by pulling the trigger) disengages the sear **32** from the hammer **23**, allowing the hammer **23** to drive forward.
(40) As shown in FIG. **1**B, a firing assembly **31** including a central post or guide **31***a* and a firing spring **31***b* is provided to drive the hammer **23** forward when the trigger assembly **44** is actuated. In one aspect, the central post **31***a* is dimensioned to extend within central openings or channel of the hammer **23** and firing spring **31***b* to align the hammer **23** and the firing spring **31***b*.
(41) A bolt **33** is disposed within the body **20**. A firing tube **34** is partially disposed within the bolt **33**, such that the bolt **33** coaxially surrounds the firing tube **34**. Forward movement of the bolt **33** causes forward movement and loading of a projectile **70**.
(42) The valve assembly **30** is disposed within the body **20** between the hammer **23** and the bolt **33**. The valve assembly **30** includes a valve pin **35** extending rearward toward the hammer **23**. The valve pin **35** includes a contact end configured to engage with the hammer **23**.

(43) The body **20** can include an anti-jam assembly **24**. In one aspect, the anti-jam assembly **24** generally includes a linkage **25** and an anti-jam spring **26**, which are described in more detail herein.

(44) The anti-jam spring **26** is disposed within the body **20**. The anti-jam spring **26** can be positioned between a rear end cap **21** of the body **20** and a region of the hammer **23**. In one aspect, a first end **26***a* of the anti-jam spring **26** engages in a region of the hammer **23**, and a second end **26***b* of the anti-jam spring **26** engages against the rear end cap **21**. It is appreciated that the anti-jam spring **26** can contact or press against any extension in the interior of the body to stop its rearward movement.

(45) As shown in FIG. **1**A, the linkage or connecting rod **25** connects the hammer **23** (at a first end **25***a* of the linkage **25**) and the bolt **33** (at a second end **25***b* of the linkage **25**) for synchronized movement of the hammer **23** and the bolt **33**. In one aspect, the second end **25***b* of the linkage **25** is curved and engages against the seat **23***a* of the hammer **23**. The first end **25***a* of the linkage **25** can similarly be curved but the first end **25***a* engages with the bolt **33**.

(46) The anti-jam spring **26** can engage directly against the second end **25***b* of the linkage **25**, or can be engaged against the hammer **23**, either directly or indirectly. In one aspect, the anti-jam spring **26** generally provides a biasing force (either directly or indirectly) against the seat **23***a* of the hammer **23**. The anti-jam spring **26** is generally configured to provide a damping force, shock absorption, or cushion that prevents the bolt **33** (via the linkage **25** connected to the hammer **23**) from inadvertently crushing or overly compressing a stationary, jammed or misaligned projectile **70**. In one aspect, the anti-jam spring **26** and the linkage **25** can be secured against the hammer **23** without the need for any additional attachment or fastening means other than the biasing force provided by the anti-jam spring **26** against the linkage **25**, which engages against the seat **23***a* of the hammer **23**. If the bolt **33** presses against a projectile, the linkage **25** can move rearward and compress the anti-jam spring **26**. The linkage **25** will move rearwardly away from the hammer, and therefore, cease to provide, or provide less of, a forward force on the hammer, thus lessening the pressure or force on a projectile.

(47) The valve assembly **30** includes a valve housing **36** and a valve body **37** disposed within the valve housing **36**. The valve body **37** includes an inlet port **38** for receiving gas under pressure from a gas line **39**. The valve body **37** also includes an outlet port for communicating gas under pressure from within the valve body **37** when the valve assembly **30** is actuated or open. A valve poppet or valve stem, including a sealing member such as a cup seal, is also disposed within the valve body **37**.

(48) In one aspect, the body **20** includes a projectile agitator assembly **22** configured to selectively protrude into the hopper **60**. In one aspect, the projectile agitator assembly **22** is gas actuated, and may act as a gas-actuated piston. In one aspect, pressurized gas is supplied by the canister **50** to the projectile agitator assembly **22**, such that a post or piston **22***c* is driven vertically upward into an interior of the hopper **60**. The device **10** can include a poppet or other valve components in order to drive a post or piston into the interior of the hopper **60**. In one aspect, the projectile agitator assembly **22**, and more specifically the post or piston **22***c*, is configured to engage with a secondary element **22***a*, such as an agitating surface, floor panel, or other type of engagement element that is connected to an interior surface of the hopper and configured to selectively project inwards.

(49) In one aspect, the supply of compressed gas to operate the projectile agitator assembly **22**, such as the piston **22***c*, may be supplied from different ports, and may be supplied directly from a valve, an exhaust port, or upstream or downstream (following the flow of compressed gas from a rearward portion of the body to a forward portion of the body) from a valve (i.e. the valve assembly **30**). In one aspect, the gas supplied to the projectile agitator assembly **22** is fed as exhaust or firing gas relative to the gas supplied for firing the projectiles. In a preferred embodiment, upon actuation of the valve, such as by the hammer hitting the valve stem, the released firing gas is channeled through a channel, passage or port to actuate the agitator assembly **22**. In this manner, the gas used

to actuate the agitator assembly **22** may be considered upstream from the bolt **33** and firing tube **34**. One or more passages or channels can be supplied or positioned adjacent the valve assembly **30**, such that, upon actuation of the valve assembly **30**, gas used to actuate the agitator assembly **22** is channeled through a passage upstream of the bolt **33** and firing tube **34**. It is appreciated that those of skill in the art can adjust the placement or location of the passages used to feed gas to the agitator assembly **22**.

(50) In one aspect, the grip assembly **40** includes a handle **42** and trigger assembly **44** arranged below a rear portion **27** of the body **20**, and a frame **48** arranged below a front portion **28** of the body **20**. The frame **48** includes an opening **49** dimensioned to receive and hold a compressed gas canister **50**. The frame **48** can include secondary features, such as a locking assembly as shown in FIGS. **11**A and **11**B. The compressed gas canister **50** generally includes threading around a neck portion of the compressed gas canister **50** that is configured to matingly engage with threading on a tank interface **48***a* of the frame **48**. The connection between the tank interface **48***a* and the compressed gas canister **50** can generally include screwing the compressed gas canister **50** relative to a threaded opening defined by the tank interface **48***a*, as is known in the art.

(51) In one aspect, the opening **49** has a longitudinal axis (X1) extending parallel to a longitudinal axis (X2) of the body **20**. The opening **49** of the frame **48** can be positioned below the hopper **60**. The frame **48** is positioned below the trigger assembly **44**. In one aspect, the frame **48** is positioned longitudinally inward from a projectile launching opening **29** defined on the body **20**. The frame **48** preferably includes a circular or oblong opening **49** sized and shaped to receive the outer wall of a compressed gas canister **50** of appropriate size. The compressed gas canister **50** slides into the opening **49** to be position as in, for example, FIG. **1**A. Preferably, a front portion of the compressed gas canister **50** does not extend farther than a front of the device, or may be generally aligned with the projectile launching opening **29**. In this manner, the arrangement allows for the positioning of a compressed gas canister that is out of the way and does not obstruct a user while using the device.

(52) As shown in FIGS. **2**A and **2**B, a fill volume limiting wall **266** can be arranged within a housing **262** of the hopper **260**. A linkage can be provided between the wall **266** and the lid **264** such that the wall **266** moves inside an interior chamber of the housing **262** when the lid **264** is opened, decreasing the volume of space within the housing. The wall **266** ensures that the hopper **260** cannot be overfilled or overloaded such that the projectiles **70** become jammed. For example, densely packing foam projectiles into the hopper, such foam projectiles being pliable, could cause lack of movement and a jam. Decreasing the available volume for filling the housing prevents such overfilling. In this manner, interior chamber of the housing has a first volume, and a decreased second volume as set by the fill volume limiting wall **266** when the lid is opened and the fill volume limiting wall **266** is moved to its decreased volume position.

(53) FIGS. **3**A-**3**D illustrate another embodiment of a fill volume limiting wall **366** which is also connected to a lid **364**. As shown in FIGS. **3**A-**3**D, a linkage **368** is provided between the lid **364** and the wall **366**. The linkage **368** generally translates movement such that when the lid **364** is opened, then the wall **366** moves within the interior of the hopper **360**. The wall **366** can generally be positioned in an upper area of an interior of the hopper **360** while the lid **364** is closed, and then is generally shifted downward into a generally middle portion of the hopper **360** as the lid **364** is opened, showing a decreased interior chamber volume for receiving projectiles. One of ordinary skill in the art would understand that the wall **366** can be moved in a variety of ways based on opening of the lid **364**. Alternatively, the wall **366** can be moved or adjusted without relying on a position of the lid **364**.

(54) FIGS. **2**A-**3**D generally illustrate the concept of linking an external feature of the hopper **260**, **360** to an internal feature, such as a volume limiting wall **266**, **366**, partition, or other type of boundary. As a user engages the external feature of the hopper **260**, **360**, such as the hopper lid **264**, **364**, then the internal feature (i.e. wall **266**, **366**) is moved or displaced. This configuration ensures that the volume of the hopper **260**, **360** changes when the lid **264**, **364** of the hopper **260**, **360** is

moved between an opened and closed position and helps prevent overloading of the hopper **260**, **360** by changing the volume of the hopper **260**, **360** via a partition, boundary, or volume limiting wall **266**, **366**.

(55) FIG. **4** illustrates another embodiment of a projectile launching device **410**. In FIG. **4**, the device includes a hopper **460** having an oval-shaped or egg-shaped profile. All other aspects of the device are otherwise identical to the device **10** of FIGS. **1**A and **1**B.

(56) FIGS. **5**A and **5**B illustrate another embodiment of a projectile launching device **510**, which is similar to the embodiment of FIGS. **1**A and **1**B except a frame **541** extending between the hopper **560** and the body **520** is modified. Specifically, the frame **541** connecting the hopper **560** and the body **520** extends straight upward instead of at an angle.

(57) FIGS. **6**A-**6**D illustrate another embodiment for a projectile launching device **710** that is similar to the embodiment of FIGS. **1**A and **1**B. The projectile launching device **710** of FIGS. **6**A-**6**D does not include an anti-jam assembly.

(58) FIG. **7** illustrates a projectile **870** that is configured to be launched by the projectile launching device **10** or any other projectile launching device from the other figures. In one aspect, the projectile **870** is luminescent or fluorescent. The projectile **870** can include a luminescent or fluorescent coating. Components of the projectile launching devices, such as a loader, feed neck, breech, barrel, hopper or container, etc., can include a black light charger unit which is configured to emit ultraviolet light which is absorbed and re-emitting by the luminescent or fluorescent projectiles.

(59) FIG. **8**A-**8**G illustrate a different embodiment for a projectile launching device **910**. In this embodiment, the hopper **960** is a “rear-loading” configuration and includes a loading opening positioned on a rear side of the hopper **960**. A lid **916** for the hopper **960** is connected to the rear side of the hopper **960**, and the opening of the hopper **960** faces rearwardly when the device is oriented for use. The lid **916** is oriented generally vertically when the device is positioned for use and may be generally perpendicular to a longitudinal axis of the device body. Based on this arrangement, a user can load projectiles into the hopper **960** while the projectile launching device **910** is oriented with its muzzle directed towards the ground. Accordingly, a user can safely load projectiles into the hopper **960** without any risk of inadvertently firing projectiles at oneself or bystanders since the muzzle **929** is directed towards the ground during loading.

(60) FIG. **8**D illustrates additional elements for the projectile launching device **910**. The projectile launching device **910** includes an engine assembly **901**, a slide stop assembly **902**, a left shell portion **903**, a right shell portion **904**, a left window panel **905**, a right window panel **906**, a left body portion **907**, a right body portion **908**, a rod cocking assembly with inserts **909**, a trigger **911**, a pump handle **912**, a plug stock **913**, a barrel with seal overmolded **914**, a spring torsion lid **915**, the lid with rip clip **916**, a dowel pin **917**, a sear **918**, a lock safety single cocking **919**, a spring single cocking safety lock **920**, a safety push button **921**, a spring sear **922**, two O-rings **925**, **926**, assembly screws **923**, **927**, **928**, and a ball latch or cradle **930**. The window panels **905**, **906** allow users to visually inspect and determine the quantity of projectiles remaining in the hopper **960**.

(61) A projectile agitator **950** extends at least partially inside of the hopper **960** and is configured to move projectiles within the hopper **960**. As shown in FIGS. **8**A and **8**C, as the pump handle **912** is moved forward and backwards, the projectile agitator **950** likewise is moved forward and backwards within an interior area of the hopper **960**. One of ordinary skill in the art would understand that the projectile agitator **950** can be linked to various components of the projectile launching device **910**, such as the pump handle **912** or other components linked to the pump handle **912**. In one aspect, the projectile agitator **950** is configured to be driven forward and backward to agitate projectiles within the hopper **960**. The projectile agitator **950** may be shaped with a rounded outer surface so that it will not catch or snap projectiles or rupture projectiles. One of ordinary skill in the art would understand that any other type of motion, such as up and down motion or lateral motion, can be imparted on the projectile agitator **950**.

(62) The ball cradle or detent **930** is configured to hold the projectiles **970** after loading and before firing. A user generally drives the pump handle **912** forward and backwards to generate a compressed air that is then used to fire the projectiles **970** down the barrel. Atmospheric air enters the engine assembly **901** when the pump handle **912** is driven backwards. This motion also compresses a spring within the engine assembly **901**.
(63) The engine or firing assembly **901** generally includes the following features. A piston within the engine assembly **901** can include an abutment surface or seat configured to engage a compression spring when the piston is driven backwards (i.e. via pumping of the handle **912**). The compression spring is then compressed between the piston and an end cap or abutment. Force on the spring is then supplied by the user pulling the pump handle **912**, which is connected to an air concentration tube. The air concentration tube is connected to an impact ring, which is inside of the engine assembly **901**. The compression spring is compressed and the piston is pulled backwards until a front of a spring seat moves behind the sear **918**. The front of the spring seat engages the sear **918** and the compression spring is held in a compressed state until the projectile is fired. The pump handle **912** is then moved forward to load the projectile into the breach and seal off an input port. Atmospheric air pressure then enters the area in front of the piston. When the trigger is engaged, the sear **918** releases the energy of the compression spring, and the piston moves forward past side slots of the air focus tube to seal off a front portion of the air focus tube. Continued forward movement compresses the air and this compressed air travels through the impact ring and the breach to launch the projectile out of the barrel.
(64) FIGS. **9**A-**9**C illustrate another embodiment for a projectile launching device **1010** that is substantially similar to the projectile launching device **910**, but has a modified pump handle **1012** that is angled away from the barrel assembly.
(65) As shown in FIGS. **10**A-**10**E, a projectile launching device **1110** is disclosed that includes an agitator assembly **1122**, which may be provided generally as a moving surface or floor. In one aspect, the agitator assembly **1122** is arranged in the interior area of the hopper **1160**. The agitator assembly **1122** can generally include an agitating surface **1122***a*. In one aspect, the agitating surface **1122***a* partially forms a movable or displaceable floor panel of the hopper **1160**. One of ordinary skill in the art would understand that the agitating surface **1122***a* could be provided in any location of the hopper **1160**. The agitating surface **1122***a* is configured to be agitated or move relative to an inner chamber or interior area defined by the hopper **1160**. Movement of the agitating surface **1122***a* ensures that projectiles within the hopper **1160** do not jam or are not bunched together with each other. Various driving means can be provided to move the agitating surface **1122***a*. As shown in FIG. **10**A, a compressed air supply line **1122***b*, having an upper and lower portion, can be provided to selectively provide pressurized or compressed air to move the agitating surface **1122***a*, such as each time the poppet valve is actuated. The air supply line **1122***b* is configured to be supplied by the same compressed gas cannister that generally provides the projectile firing power for the device **1110**.
(66) In one aspect, a piston **1122***c* is in fluid connection with the compressed gas supplied to the compressed air supply line **1122***b* and is configured to abut the agitating surface **1122***a* and drive the agitating surface **1122***a*, such as in an upward direction. In one aspect, each time that the trigger is pulled or actuated, and the poppet valve associated with the piston **1122***c* is actuated, a portion of the compressed gas can be supplied or bled to the upper portion of the compressed air supply line **1122***b*, which actuates the piston **1122***c* and drives the agitating surface **1122***a* such as in an upward motion.
(67) The agitating surface **1122***a* can be driven in a linear manner or in a rotational or pivoting manner, depending on how the agitating surface **1122***a* is connected to the hopper **1160**. As shown in FIG. **10**C, a pivot connection **1122***d* or hinge can connect the agitating surface **1122***a* to the hopper **1160**. A return spring **1122***e* can also be provided to bias the agitating surface **1122***a* to a lower or non-actuated position. The piston **1122***c* acts in an opposite direction from the return

spring **1122***e*. During operation, the piston **1122***c* is driven upward when compressed air is fed to it, and then the return spring **1122***e* quickly pulls the agitating surface **1122***a* back downwards when compressed air is no longer fed to the piston **1122***c*.

(68) As shown in FIG. **10**C, the agitating surface **1122***a* can have a length (L) that is at least half of a total length of the hopper **1160**. This relatively large surface area of the agitating surface **1122***a* provides a reliable way to dislodge projectiles. Preferably, the agitating surface **1122***a* does not cover the opening at the bottom of the hopper, or selectively partially covers a portion of the opening. As shown in FIG. **10**D, the rear face of the hopper can include a window **1161** so that the contents are visible to a user, and the level of projectiles in the hopper can be monitored.

(69) In one aspect, the supply of compressed gas to operate the projectile agitator assembly **1122**, such as the piston **1122***c*, may be supplied from different ports, and may be supplied directly from a valve, an exhaust port, or upstream or downstream (following the flow of compressed gas from a rearward portion of the body to a forward portion of the body) from a valve (i.e. the valve assembly). In one aspect, the gas supplied to the projectile agitator assembly **1122** is fed as exhaust or firing gas relative to the gas supplied for firing the projectiles. In a preferred embodiment, upon actuation of the valve, such as by the hammer hitting the valve stem, the released firing gas is channeled through a channel, passage or port to actuate the agitator assembly **1122**. In this manner, the gas used to actuate the agitator assembly **1122** may be considered upstream from the bolt and firing tube. One or more passages or channels can be supplied or positioned adjacent the valve assembly, such that, upon actuation of the valve assembly, gas used to actuate the agitator assembly **1122** is channeled through a passage upstream of the bolt and firing tube. It is appreciated that those of skill in the art can adjust the placement or location of the passages used to feed gas to the agitator assembly **1122**.

(70) FIGS. **11**A and **11**B illustrate another aspect of a projectile launching device. As shown in FIGS. **11**A and **11**B, the frame **48** of the projectile launching device includes an opening **29** dimensioned to receive the cannister or tank **50** of compressed air. A locking assembly **51** is provided on the frame **48** for further securing the tank **50**. The locking assembly **51** may be configured to engage a medial region of the tank **50**, in one aspect, but it is appreciated that the locking assembly **51** can be positioned to engage the tank **50** at other locations. The locking assembly **51** is generally configured to prevent unintentional rotation of the tank **50** when the tank **50** is screwed onto the projectile launching device at a tank interface or gas coupling **48***a* (which provides the compressed air to the firing mechanism and the agitating assembly). In this manner, when a user grips the tank as, for example, a foregrip during use, the tank will not rotate and disengage from the tank interface or gas coupling **48***a*, thus causing the projectile launching device not to fire. The locking assembly **51** can include a clamping ring in one aspect. In another aspect, the locking assembly **51** can have a clam shell type locking interface with the tank **50**. The locking assembly **51** can include a locking ring **51***a* and a securing element **51***b* configured to attach the locking assembly **51** to the frame **48**. The locking ring **51***a* is configured to engage around a circumference of tanks of varying sizes and can be adjusted via a user based on a size of the tanks. In one aspect, the locking assembly **51** can be partially concealed within the opening **49** of the frame **48**.

(71) Having thus described the present disclosure in detail, it is to be appreciated and will be apparent to those skilled in the art that many physical changes, only a few of which are exemplified in the detailed description of the invention, could be made without altering the inventive concepts and principles embodied therein.

(72) It is also to be appreciated that numerous embodiments incorporating only part of the preferred embodiment are possible which do not alter, with respect to those parts, the inventive concepts and principles embodied therein.

(73) The present embodiment and optional configurations are therefore to be considered in all respects as exemplary and/or illustrative and not restrictive, the scope of the embodiments being

indicated by the appended claims rather than by the foregoing description, and all alternate embodiments and changes to this embodiment which come within the meaning and range of equivalency of said claims are therefore to be embraced therein.

Claims

1. A projectile launching device comprising: a hopper configured to retain projectiles; a body including a projectile agitator assembly comprising a piston configured to selectively move within an interior of the hopper; the projectile agitator assembly comprising an agitating panel separate from and unattached to the piston and configured to be moveable in response to a selective movement of the piston with respect to the agitating panel, the agitating panel comprising a generally concave upper surface curving away from an upper wall of the body and having a medial portion that extends toward an outlet opening of the body; a grip assembly including a handle and a trigger assembly arranged below a rear portion of the body; and a frame positioned below a barrel of the projectile launching device, the frame comprising an opening dimensioned to receive and support a compressed gas canister by surrounding a part of a compressed gas cannister other than a threaded portion of the compressed gas cannister such that at least a portion of the compressed gas canister is positioned below the barrel.
2. The projectile launching device according to claim 1, wherein the piston is gas actuated.
3. The projectile launching device according to claim 1, wherein the body includes an anti-jam assembly.
4. The projectile launching device according to claim 3, wherein the anti-jam assembly includes a linkage and an anti-jam spring.
5. The projectile launching device according to claim 1, wherein the frame comprises a sleeve defining the opening dimensioned to receive and support the compressed gas canister.
6. The projectile launching device according to claim 5, wherein the opening has a longitudinal axis (X1) extending parallel to a longitudinal axis (X2) of the body.
7. The projectile launching device according to claim 5, wherein the opening of the frame is positioned below the hopper.
8. The projectile launching device according to claim 1, wherein at least a portion of the frame is positioned below the trigger assembly.
9. The projectile launching device according to claim 1, wherein the frame is positioned longitudinally inward from a projectile launching opening defined on the body.
10. The projectile launching device according to claim 1, wherein the hopper includes a housing defining an interior chamber configured to retain the projectiles, a lid attached to the housing, and a fill volume limiting wall arranged within the housing that blocks a portion of the interior chamber.
11. The projectile launching device according to claim 1, further comprising luminescent projectiles that are configured to be launched by the projectile launching device.
12. The projectile launching device according to claim 1, wherein the agitating panel has at least one raised end as compared to the medial portion.
13. The projectile launching device according to claim 12, wherein a compressed gas configured for a firing operation of the launching device is diverted to operate the piston.
14. The projectile launching device according to claim 13, wherein a compressed air supply line is in communication with the piston, and the compressed air supply line is configured to provide a predetermined amount of a compressed air to the piston each time a trigger of the trigger assembly is actuated.
15. The projectile launching device according to claim 12, wherein the agitating panel is connected to an interior wall of the hopper via a pivot connection, and a return spring is provided to bias the agitating panel to a non-actuated position.
16. The projectile launching device according to claim 12, wherein the agitating panel has a length

(L) that is at least half of a total length of the hopper.

17. The projectile launching device according to claim 1, wherein the hopper further comprises a fill volume limiting wall arranged within an interior of the hopper and connected to a lid, wherein a linkage is provided between the lid and the fill volume limiting wall such that the fill volume limiting wall is displaced when the lid is opened.

18. The projectile launching device according to claim 1, wherein at least portion of a housing of the hopper is transparent such that an interior chamber of the hopper is visible.