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(54) **RAPID FEED PAINTBALL LOADER WITH PIVOTABLE DEFLECTOR**

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See application file for complete search history.

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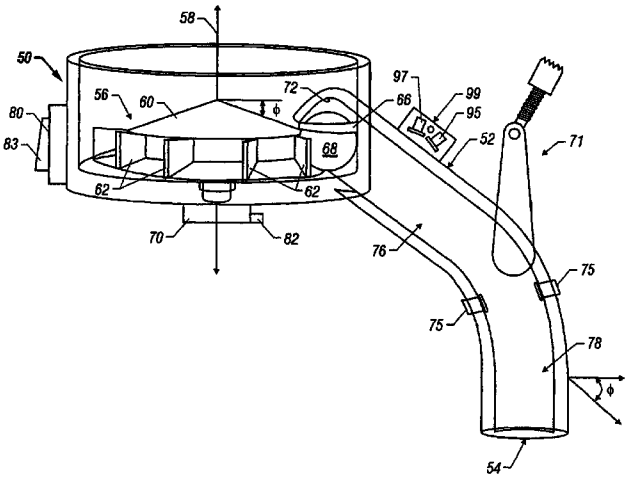
(57) **ABSTRACT**

A rapid feed paintball loader for use upon a conventional paintball gun. The rapid feed paintball loader includes a container for holding a plurality of paintballs. At a bottom portion of the container is a rotatable drive cone having a plurality of vertical fins. Each fin forms a gap with an adjacent fin large enough to accommodate a paintball. At the bottom of the container is an exit tube which exits from the bottom portion of the container and leads to an inlet tube of the paintball gun. A tube extension is mounted on an interior surface of the container adjacent to the sloped exit portion of the exit tube. The tube extension is mounted at a height which is above the top feed surface of the fins, and which is approximately equal to the radius of a paintball. A pivotable deflector is also mounted on an interior surface of the container adjacent the tube extension to prevent paintball jams from occurring within the interior of the container. The deflector is positioned above the top feed surface of the fins and below the height of the tube extension. The paintball loader also includes a microprocessor to variably control the rotational speed of the drive cone.

REEXAMINATION RESULTS

The questions raised in reexamination proceeding No. 90/009,715, filed Jun. 3, 2010, have been considered, and the results thereof are reflected in this reissue patent which constitutes the reexamination certificate required by 35 U.S.C. 307 as provided in 37 CFR 1.570(e) for *ex parte* reexaminations, or the reexamination certificate required by 35 U.S.C. 316 as provided in 37 CFR 1.997(e) for *inter partes* reexaminations.

108 Claims, 5 Drawing Sheets



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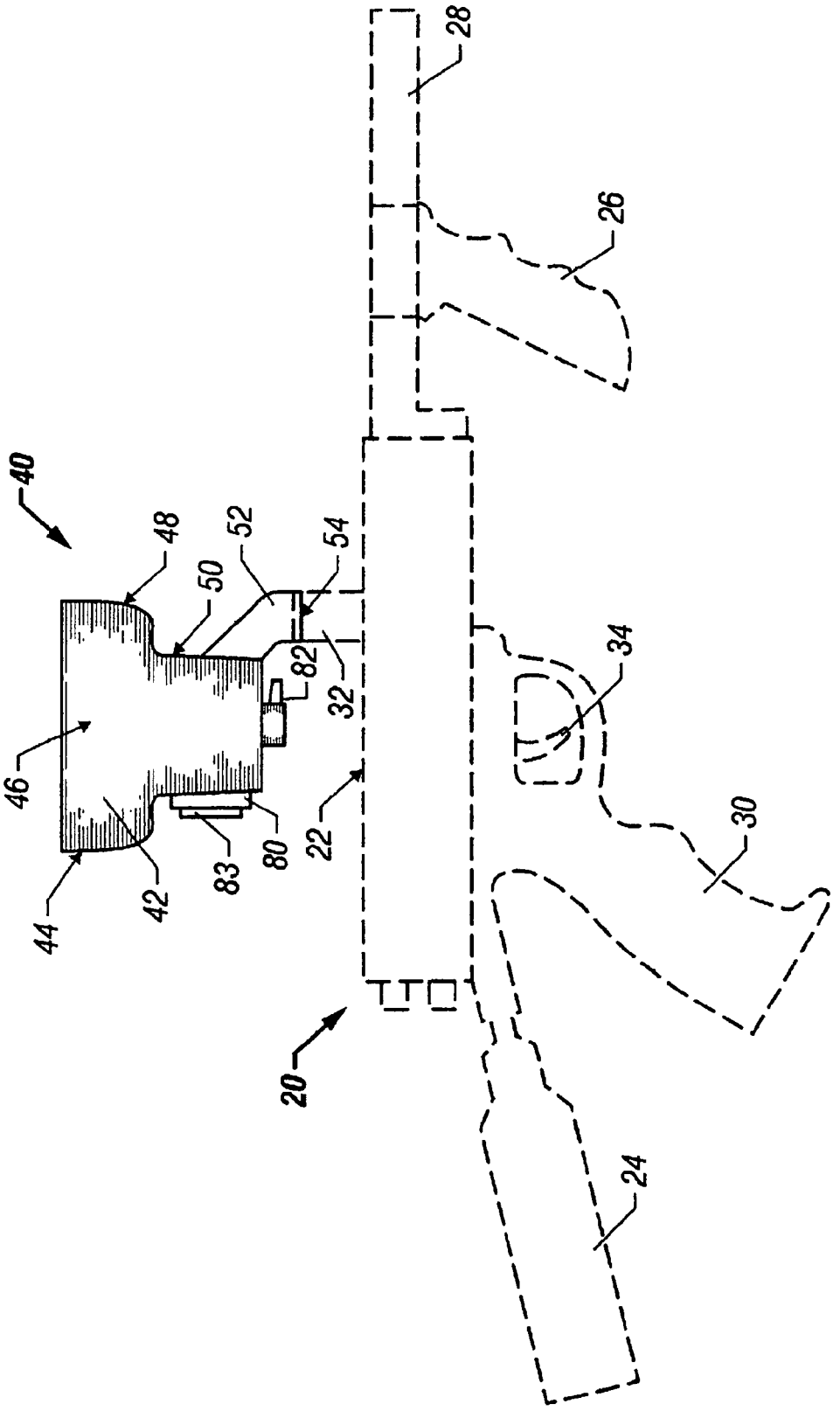

FIG. 1

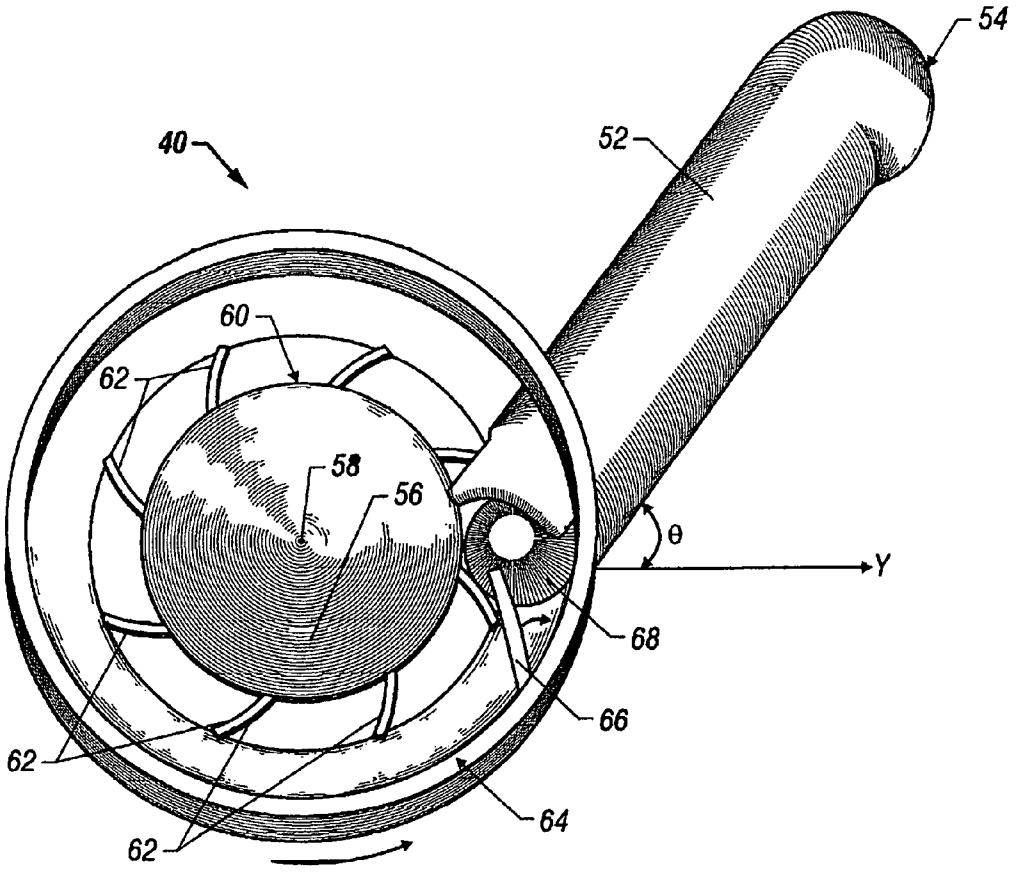

FIG. 2

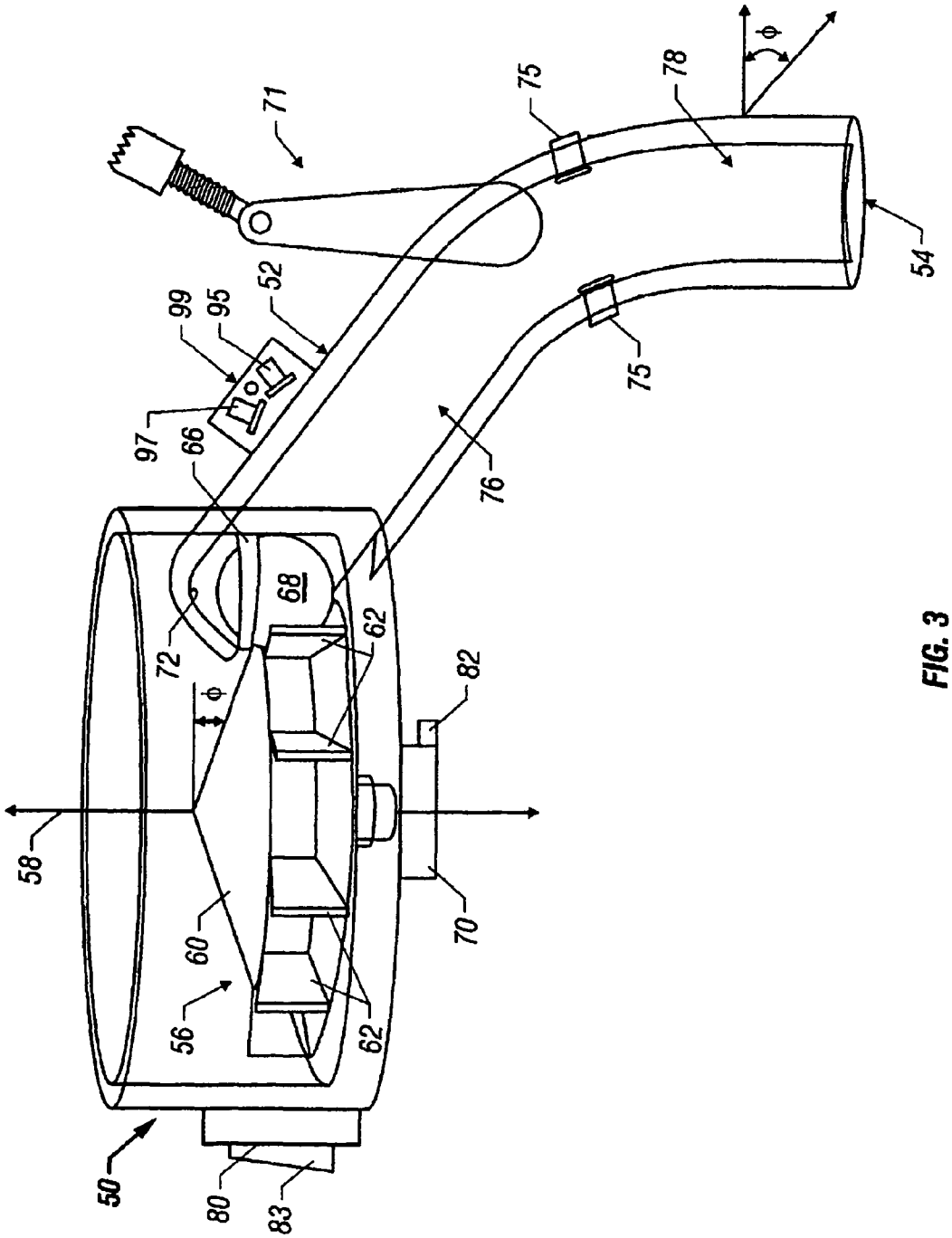

FIG. 3

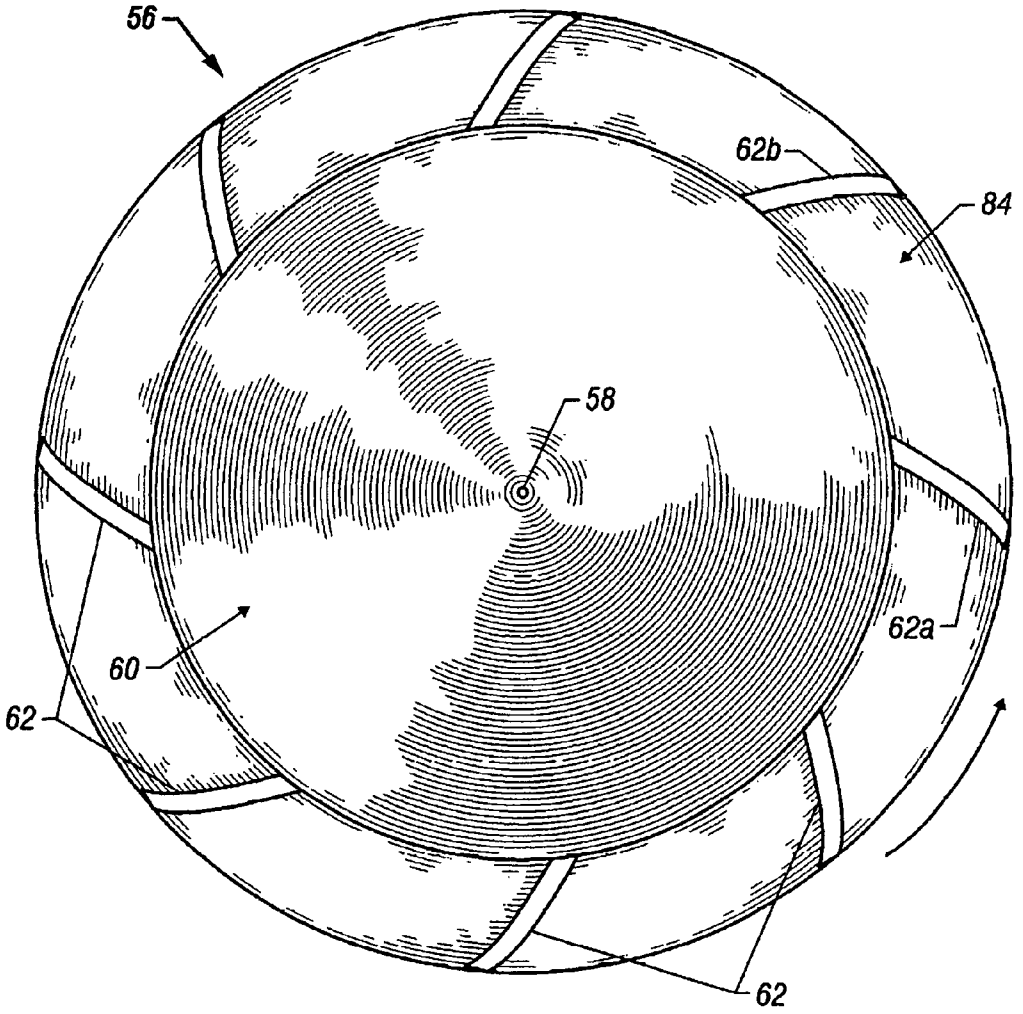

FIG. 4

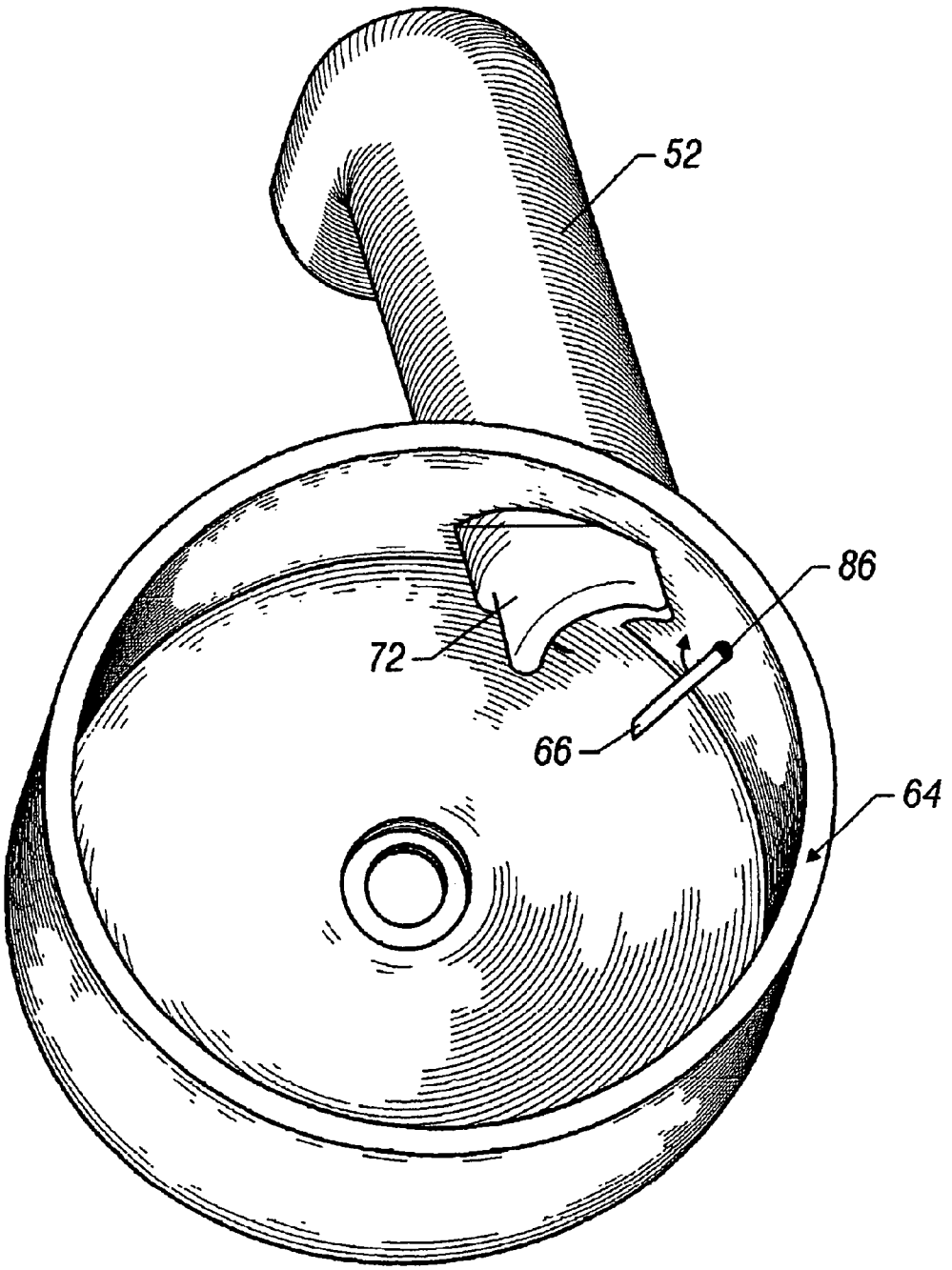

FIG. 5

RAPID FEED PAINTBALL LOADER WITH PIVOTABLE DEFLECTOR

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

RELATED APPLICATIONS

This application is a continuation-in-part of a co-pending U.S. patent application (Ser. No. 09/465,440, entitled "Rapid Feed Paintball Loader", filed Dec. 16, 1999 in the names of James T. Christopher and Albert G. Schilling.

BACKGROUND OF THE INVENTION

1. Technical Field of the Invention

This invention relates to paintball loaders, and more particularly, to a paintball loader which forcibly and rapidly feeds paintballs into a paintball gun.

2. Description of Related Art

Operators of paintball guns are constantly seeking increased performance from paintball guns. Operators use these paintball guns in a war game having two teams of players trying to capture one another's flag. The war game is played on a large field with opposing home bases at each end. Each team's flag is located at the player's home base. In addition, all of the players have a paintball gun that shoots paintballs. These paintballs are gelatin-covered spherical capsules filled with paint. During play of the game, the players on each team advance towards the opposing team's base in hopes of stealing the opposing team's flag, without being eliminated from the war game. A player is eliminated from the game when the player is hit by a paintball fired from an opposing player's gun. When the paintball hits a player, "splat" of paint is left on the player.

Typically, an existing paintball loader includes a housing which is placed on an upper portion of a paintball gun. The housing is shaped to hold a large quantity of paintballs. At the bottom of the housing is an outlet tube through which the paintballs drop by the force of gravity. The outlet tube leads to an inlet tube located on the upper portion of the gun.

During the operation of existing paintball loaders, paintballs sequentially drop by gravity through the outlet tube into the inlet tube of the gun. The inlet tube directs each paintball into the firing chamber of the gun, where the paintball is propelled outwardly from the gun by compressed air.

Co-pending U.S. patent application Ser. No. 09/465,440 describes a paintball feed system providing enhanced performance over existing paintball feed systems by utilizing a drive cone to forcibly feed paintballs into the gun. However, jams may still occur when rapidly feeding paintballs to the gun. Additionally, an operator cannot control the speed at which the paintballs are fed to the gun. A motor which drives the drive cone, has only two speeds at which it operates, zero and full speed. The two speed operation of the motor inefficiently feeds paintballs to the paintball gun. Therefore, to increase the performance of a paintball gun, a paintball loader is needed which reliably and forcibly delivers paintballs to a paintball gun at a rapid, selectable rate, while actively preventing paintball jams.

Thus, it would be a distinct advantage to have an apparatus which feeds the paintballs at a selectable and rapid rate into the paintball gun, while simultaneously actively preventing jams from occurring during the operation of the paintball gun and loader. It is an object of the present invention to provide such an apparatus.

SUMMARY OF THE INVENTION

In one aspect, the present invention is a rapid feed paintball loader for use on a paintball gun. The paintball loader includes a container for holding a plurality of paintballs, a paintball agitating device mounted on a bottom portion of the container, and an exit tube exiting from a side wall near the bottom portion of the container and leading to an inlet tube of the paintball gun. The paintball loader also includes a tube extension mounted on an interior surface of the container adjacent to the exit tube, a motor that rotates the paintball agitating device and a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension. The deflector is pivotably attached to the interior surface of the container adjacent to the tube extension and is mounted at a height above the top feed surface of the agitating device and below a bottom portion of the tube extension. In addition, the paintball loader includes a means for actuating the motor upon demand.

In another aspect the present invention is a rapid feed paintball loader for use on a paintball gun. The paintball loader includes a plurality of fins located at a bottom portion of the container. Each fin has a top surface and with an adjacent fin forms a gap large enough to accommodate a paintball. The paintball loader also includes means for rotating the plurality of fins about an axis running perpendicularly through the bottom portion of the container.

In still another aspect, the present invention is a rapid feed paintball loader which includes a detector for detecting a presence of paintballs at a selected position within the exit tube and a microprocessor which variably controls the speed of the motor. The microprocessor decreases the speed of the motor when receiving a signal from the detector that the presence of paintballs is detected in the exit tube and increases the speed of the motor when receiving a signal from the detector that paintballs are not present in the exit tube.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and its numerous objects and advantages will become more apparent to those skilled in the art by reference to the following drawings, in conjunction with the accompanying specification, in which:

FIG. **1** is a side elevational view of a rapid feed paintball loader constructed in accordance with the teachings of the present invention and operatively attached to a representative paintball gun illustrated in phantom;

FIG. **2** is a top view of the lower portion of the rapid feed paintball loader of FIG. **1** showing a drive cone;

FIG. **3** is a side interior cut-away view of the paintball loader of FIG. **2** illustrating the drive cone, the exit tube, the loaded paintball, a motor, and the paintball tube extension;

FIG. **4** is a top view of the drive cone of FIG. **2** showing the plurality of fins; and

FIG. **5** is a top perspective view of the lower portion of the paintball container with the drive cone removed illustrating the paintball tube extension, pivotable deflector, and exit tube.

DETAILED DESCRIPTION OF EMBODIMENTS

A paintball loader for rapidly delivering paintballs at a selectable speed to a paintball gun while actively preventing jams is disclosed.

FIG. **1** is a side elevational view of a rapid feed paintball loader **40** constructed in accordance with the teachings of the present invention and operatively attached to a representative paintball gun **20** illustrated in phantom. The paintball gun **20** includes a main body **22**, a compressed gas cylinder **24**, a front handgrip **26**, a barrel **28**, and a rear handgrip **30**. The paintball gun also includes an inlet tube **32** leading to a firing chamber (not shown) in the interior of the main body and a trigger **34**. The front handgrip projects downwardly from the barrel and provides an area for gripping by an operator of the paintball gun. The compressed gas cylinder is typically secured to a rear portion of the paintball gun. The compressed gas cylinder normally contains CO_2, although any compressible gas may be used.

In operating the paintball gun **20**, the trigger **34** is squeezed, thereby actuating the compressed gas cylinder to release bursts of compressed gas. The bursts of gas are used to eject paintballs outwardly through the barrel **28**. The paintballs are continually fed by the paintball loader **40** through the inlet tube to the firing chamber. Although FIG. **1** depicts an automatic paintball gun, the paintball gun **20** may also be a semi-automatic gun.

The rapid feed paintball loader **40** includes a paintball container **42** having a container wall **44** forming an interior area **46**. The container is divided into an upper portion **48** and a lower portion **50**. An exit tube **52** leads from the bottom portion of the container to an outlet opening **54**. The exit tube is positioned on top of the inlet tube **32** of the paintball gun **20**.

FIG. **2** is a top view of the lower portion **50** of the rapid feed paintball loader of FIG. **1** showing a drive cone **56**. Mounted along a vertical center axis **58**, located in the approximate center of the interior area, is the drive cone having a conically-shaped interior surface area **60** with a plurality of fins **62** projecting upwardly from the top surface of the drive cone and spiraling outwardly from an outer circumference of the interior area. The drive cone is rotatably attached to a bottom portion of the paintball container, allowing rotation about the center axis. The exit tube **52** projects outwardly from a rim **64** of the lower portion **50** of the container wall **44** at an approximately 45 degree angle from the Y-axis. In addition, an upper part of the exit tube extends towards the interior area to form a paintball tube extension **72**. A pivotable deflector **66** extends inwardly towards the vertical center axis from the rim **64**. A paintball **68** is illustrated between two fins.

FIG. **3** is a side interior cut-away view of the paintball loader illustrating the drive cone **56**, the exit tube **52**, the loaded paintball **68**, a drive motor **70**, and the paintball tube extension **72**. In the preferred embodiment of the present invention, the container wall **44** is curved and extends upwards to form the upper portion **48** (not shown in FIG. **3**). The interior area **46** formed by the container wall stores a plurality of paintballs prior to being used by the paintball gun **20**. Although a circular shape is illustrated in the top view of FIG. **2**, the container may be any size and shape which permits the paintballs to drop towards the drive cone **50**.

The top feed surface of the drive cone, which is the feed surface between the fins **62** where the paintball **68** rests, is sloped downwardly at an angle of Φ (approximately 45 degrees in the preferred embodiment). The surface may slope at any angle which matches the slope of the exit tube and allows paintballs to feed into the exit tube **52**. The exit tube is a circular tube with an inside diameter slightly larger than a conventional paintball. The exit tube leads from an entry opening **74** to the outlet opening **54** which engages with the inlet tube **32** of the paintball gun. The exit tube includes a sloped exit portion **76** and a vertical outlet portion **78**. In the preferred embodiment of the present invention, the sloped exit portion of the exit tube is sloped downwardly at an angle of approximately Φ, which is the same slope as the top feed surface of the drive cone. The pivotable deflector **66** is positioned above the top portion of the fins **62** and below the tube extension **72**.

The tube extension **72** is located at the entry opening **74**. The tube extension is an extension of the exit tube **52**. The tube extension extends towards the center axis **58**, while maintaining a clearance above the fins **52**. The paintball tube extension is formed as a scoop which has an interior radius of curvature approximately equal to the curvature of a paintball. The top of the scoop is positioned so that it partially covers a paintball that is pushed into position by the fins at the entry opening **74** of the exit tube. In this manner, the sloped surface of the drive cone, the radially curved fins, the angled orientation (approximately 45 degrees) of the exit tube, and the tube extension all equate to forcibly drive the paintball into the exit tube.

The drive cone **56** is rotated around the center axis **58** by the drive motor **70**. The motor **70** may be a conventional dc electric motor powered by a power supply **80**, such as a 9-volt battery. The power supply is illustrated as being located on the outer surface of the container **42**, however, the power source may be located in any position which allows the power source to supply power to the motor. The paintball loader **40** may also includes an electro-mechanical motor-actuator switch **71** located in an interior portion of the exit tube **52**.

In the preferred embodiment of the present invention, the paintball loader **40** may also include a microprocessor **82** to enhance the performance of the loader as well as providing useful information to a paintball gun operator. In alternate embodiments, the microprocessor may provide information for the operator on a display **83**. The display **83** may be mounted anywhere on the gun or loader which provides an easily visible display to the operator. As illustrated in FIG. **3**, the display is located on an outer surface of the container **42**. The display may include a backlit background or any device allowing viewing of the display in the dark.

FIG. **4** is a top view of the drive cone **56** of FIG. **2** showing the plurality of fins **62**. As discussed above, the plurality of fins originate at the outer circumference of the conically-shaped interior area **60** and spiral outwardly towards the rim **64** of the container wall **44** (not shown in FIG. **4**). Each fin forms a gap **84** with an adjacent fin which, at the container wall, is sized slightly larger than a conventional paintball. For example, fins **62**a and **62**b form the gap to accommodate a conventional paintball. Additionally, each fin curves to the rear as it radiates outwardly from the center axis so that paintballs are pushed outward as well as forward as the drive cone rotates in the forward direction (counterclockwise when viewed from above).

FIG. **5** is a top perspective view of the lower portion **50** of the paintball container **42** without the drive cone **56** illustrating the paintball tube extension **72**, pivotable deflector **66**, and exit tube **52**. In the preferred embodiment, the tube extension is concavely shaped to accommodate the paintball **68** by contacting the paintball on its upper half, and guide it into the exit tube. The pivotable deflector is attached to the rim **64** at pivot point **86**, allowing the deflector to rotatably move as indicated in FIG. **5**.

Referring to FIGS. **1-5**, the operation of the rapid feed paintball loader **40** will now be explained. The rapid feed paintball loader is positioned on the top of the paintball gun **20**. The loader **40** is connected to the gun by attaching the exit tube **52**, at the outlet opening **54**, to the inlet tube **32** with an attaching device such as a clamp (not shown).

When an operator of the paintball gun **20** wishes to shoot paintballs, the trigger **34** is squeezed, which actuates the compressed gas cylinder **24**. The compressed gas cylinder releases bursts of compressed gas which are used to eject paintballs through the barrel **28**. A plurality of paintballs are stored in the paintball container **42** and pass down the exit tube for use by the paintball gun when demanded by the operator.

The plurality of paintballs located in the container **42** rest on top of the drive cone **56**. The bottom-most paintballs drop into the plurality of gaps **84**. The drive cone is rotated by the drive motor **70**, forcing the paintballs outward and downward from the center axis **58** and forward toward the tube extension **72**. The pivotable deflector **66** helps prevent jams by causing paintballs to either fall into one of the gaps between the fins or to rise above the tube extension. The paintball **68** is forced into the entry opening **74** of the exit tube **52** by the tube extension. In addition, since the drive cone is downwardly sloped toward the exit tube, the paintball falls downwardly, with the assistance of gravity, and outwardly towards the rim **64**.

In the preferred embodiment of the present invention, the tube extension grasps the paintball at an upper portion of the paintball. In addition, in the preferred embodiment, the exit tube extends outwardly from the container **42** at an angle θ of approximately 45 degrees from the Y axis. This 45 degree position provides the optimum orientation to feed paintballs into the exit tube. After the paintball enters the entry opening, the next paintball located in an adjacent gap **84** is sequentially grasped by the tube extension and driven into the entry opening behind the first paintball. Additional paintballs located in the container **42**, are drawn downwardly and outwardly by gravity and fill the vacated gaps. Positioning the fins on the outer circumference of the interior dome-shaped area prevents paintballs from being lodged in the upper portions of the gaps.

Once the paintball **68** enters the entry opening **74**, it passes through the sloped exit portion **76** to the vertical outlet portion **78** of the exit tube. The sloped exit portion of the exit tube is sloped at approximately the same angle as the top feed surface of the drive cone **56**, allowing the paintball to enter the exit tube more easily. As the paintball passes through the exit tube, the paintball may actuate an optional electro-mechanical motor actuator switch (not shown). The motor actuator switch may be utilized to detect the paintball passing through the exit tube. When the paintball enters the exit tube, the motor actuator detects the paintball in the exit tube and shuts off the motor. Thus, when the exit tube fills up with paintballs, the motor is automatically turned off. Then as paintballs vacate the exit tube, the motor actuator does not detect a paintball and engages the motor and rotates the drive cone **56**. In this way, the exit tube is always kept full of paintballs, ready for use when demanded by the paintball gun.

Although an electro-mechanical switch has been described to detect the presence of paintballs in the exit tube, it should be understood that other devices may also be utilized to detect the paintballs (e.g., infrared senors, contact pads, optical sensors, etc.), without departing from the scope of the present invention. In the preferred embodiment, a reflective infrared (IR) optical sensor **99** may be utilized. The sensor **99** detects the presence of a paintball in the exit tube by emitting a limited range light from an emitter **95**. The range of the light is considerably less than the diameter of the exit tube, however of a sufficient length to strike a paintball located in the exit tube. If a paintball is located within the exit tube, the light emitted from the emitter bounces off the paintball and reflects back to the sensor **99**. A detector **97** detects the reflected light, thus detecting the presence of a paintball. However, if a paintball is not located within the exit tube, the light emitted from the emitted does not reflect off any solid object. Due to the limited range of the emitted light, the light does not strike the opposite side of the exit tube.

There are several advantages in utilizing a reflective light sensor such as sensor **99**, as compared to existing sensors. First, the sensor is located in one single integrated device. Other existing devices utilize two sensors located in different places. In addition, the sensor **99** does not require as much power as existing sensor systems, since a limited range light beam is utilized. Existing sensors require transmitting a beam across the entire diameter of the exit tube. In existing sensors, a beam of light is constantly projected across an opening. The existing sensors detect when a paintball is not located in the exit tube, rather than when the paintball is located in the exit tube. Specifically, the beam of light in an existing sensor is detected when the paintball is not in the exit tube. The lack of the beam of light being detected by the existing sensor's detector is the indication that the paintball is present in the exit tube. Although the sensor **99** is the preferred embodiment, other types of sensors may be utilized. For example, a plurality of sensors **75** may be used to detect the paintballs as illustrated in FIG. **3**.

To remove jams, the drive cone **56** may be reversed by the motor **70**. The curvature of the fins tends to push the paintballs upward and inward toward the top of the cone when the cone is rotated in reverse.

In the preferred embodiment, the microprocessor **82** may also be used to monitor jams within the paintball loader. *The microprocessor may momentarily reverse the direction of rotation of the motor 70 in response to a jam. A jam may be detected, for example, when a specified increase in torque output from the motor occurs.* If paintballs jam within the paintball loader, the drive motor experiences additional resistance in rotating the drive cone. This produces increased torque on the motor and a rise in electrical current. This rise is detected by a motor controller which may be, for example, the microprocessor **82**. Upon detection of the rise in electrical current, the microprocessor immediately stops the motor to prevent jamming of a paintball within the exit tube. The microprocessor automatically commands the motor to start up after the jam clears. The microprocessor may be attached to the motor **82** or in any position which allows communication with the motor. When the electro-mechanical switch, or other any other type of sensor, detects the presence of a paintball at the top of the exit tube, the sensor sends a signal to the microprocessor. In turn, the microprocessor sends a signal to disengage the motor. When the motor actuator switch does not detect any paintballs within the exit tube, the sensor signals the microprocessor that the exit tube is not full. The microprocessor can then signal the motor to engage and rotate the drive cone, providing additional paintballs to the paintball gun.

The microprocessor may also perform the function of variably controlling the speed of the motor and the rotational speed of the drive cone. In conjunction with a sensor (electro-mechanical actuator switch, infrared sensor, etc.) within the exit tube **52**, the microprocessor varies the speed of the motor to support the demand for paintballs. For example, if the exit tube is not full, more paintballs need to be supplied for entry into the paintball gun. The microprocessor then sends a command to the motor to increase the RPM, thus increasing the supply of paintballs to the gun. If the exit tube is full, as detected by the sensor, the motor is stopped by the microprocessor. As the demand for paintballs increases, the microprocessor commands the incremental increase in power to the

motor, resulting in an increase in RPM of the drive cone. In existing devices, there are only two speeds associated with the motor, full speed or zero speed. With the use of the microprocessor, the motor can be variably controlled to supply paintballs according to the demand of the gun operator. The use of the microprocessor to variably control the speed of the motor may be utilized on any paintball gun loader requiring the use of a motor to feed paintballs to the paintball gun.

In the preferred embodiment of the present invention, the microprocessor changes the speed of the motor by varying the duty cycle available to the motor **82**, rather than changing the voltage delivered to the motor. The duty cycle available to the motor is varied by pulse width modulation, which is a technique well known in the art of electronics. For example, the duty cycle is increased to increase the speed of the motor. Likewise, the duty cycle is decreased by the microprocessor to decrease the speed of the motor. The power utilization of the motor is more efficient by utilizing pulse width modulation to vary the speed of the motor. With low power remaining in a battery, which may be sensed by the microprocessor, the duty cycle may be decreased. This decrease in duty cycle available to the motor allows a battery to provide power to the motor for a longer period of time. Additionally, by utilizing pulse width modulation, any dc electrically powered motor may be used. Thus, an expensive variable speed motor is not necessary to operate the paintball loader **40**.

The microprocessor **82** may also be used in conjunction with a display such as an LED or LCD display to present relevant data to the operator of the paintball gun **20**. The microprocessor may be used to count the amount of shots fired or shots per second fired by the paintball gun by receiving data from the sensor located within the exit tube **52** (e.g., the number of paintballs passing through the exit tube detected by the sensor). Additionally, the microprocessor may be connected to the power supply **80**, displaying the power remaining in the power supply. For example, the microprocessor may monitor the remaining life of a battery, if a battery is used as the power supply. The microprocessor can then present this data to the operator through the display **83**, which may be affixed on top of the rapid feed paintball loader, for easy viewing by the operator. As discussed above, the microprocessor may also vary the duty cycle of the electric power in response to the remaining power available from the battery.

A timer (not shown) may also be incorporated into the paintball loader **40**. The timer may provide the running time of the game as well as an audio, visual, or vibratory warning to the operator when a predetermined amount of time remains in the game. The timer may be a separate display located on the paintball loader or may be controlled by the microprocessor **82** on the central display **83**.

The pivotable deflector **66** provides an active device to prevent the jamming of paintballs within the paintball loader. In existing paintball loaders, a paintball may be lodged between the tube extension or entry opening of the exit tube and one of the fins or "agitators" driving the paintball towards the exit tube, causing the loader to jam and stopping the rotation of the drive cone. To prevent the paintball from lodging between the tube extension (or extension of the exit tube in existing loaders) and a fin (or agitator in existing loaders), the pivotable deflector forces the paintball to either fall into one of the gaps between the fins or to rise upwardly away from the tube extension. In addition, the deflector pivots away from the paintball, thus preventing the paintball from lodging between the fin and the deflector. The deflector, although depicted with the paintball loader **40** illustrated in FIGS. **1-5**, may be utilized on any active feed paintball loader to prevent the inadvertent lodging of paintballs between a fin (or other agitating device) and the entry of the exit tube.

The paintball loader **40** provides many advantages over existing paintball loaders. Existing paintball loaders suffer from the disadvantage of numerous jams within the paintball container because of a paintball unintentionally being lodged between an agitating device and the entry way to the exit tube. The paintball loader prevents the jamming of the paintball between the agitating device and the entry way by providing a pivotable deflector to deflect paintballs from lodging in undesirable locations. Thus, the pivotable deflector actively prevents the jamming of paintballs within the paintball loader.

The paintball loader **40** also provides the advantage of variably controlling the feed rate of the paintballs to the paintball gun. In existing paintball loaders, the motor driving the agitating device has only two speeds, full speed and zero speed. The paintball loader **40** provides a full range of speeds of the motor to change the speed at which the paintballs are delivered to the paintball gun. A sensor or plurality of sensors within the exit tube provide the microprocessor information when the demand. increases for paintballs, as indicated by an empty or half full exit tube. The microprocessor and sensor located within the exit tube may be used in any paintball loader, thus providing variable feed rates to the paintball gun.

The paintball loader **40** also enhances the feed rate of the paintballs to the paintball gun by orientating the exit tube at approximately a 45 degree angle from the Y axis of the paintball loader. This orientation provides the optimum position to feed paintballs into the exit tube, thus increasing the delivery rate to the paintball gun.

It is thus believed that the operation and construction of the present invention will be apparent from the foregoing description. While the apparatus shown and described has been characterized as being preferred, it will be readily apparent that various changes and modifications could be made therein without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs *having an interior space*;

a paintball agitating device mounted on a bottom portion of the container, *said paintball agitating device including a plurality of fins, said fins forming gaps therebetween;*

wherein the paintball agitating device includes a drive cone rotatably mounted on a bottom portion of the container, said drive cone having a top feed surface that slopes downward from a center axis of said drive cone; and

the plurality of fins affixed to the top feed surface of the drive cone, each fin having a top feed surface and forming a gap with an adjacent fin large enough to accommodate a paintball;

a motor that rotates the paintball agitating device;

an exit tube *having an entry way* exiting from the bottom portion of the container **[**and leading to**]** *and configured to lead to lead to* an inlet tube of **[**the**]** *a* paintball gun, *the exit tube including a sloped exit portion*;

a tube extension mounted on an interior surface of the container adjacent to the exit tube, *the tube extension mounted at a height which is above the top feed surface of the fins and having a radius of curvature that is approximately equal to the radius of a paintball*;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube exten-

sion, said deflector *having a first end* pivotably attached to the interior surface of the container *separately from* and adjacent to the tube extension,

said deflector having a free end that extends away from the first end into the interior space of the container and pivots away from a paintball driven toward the entry way by the paintball agitating device,

said deflector being mounted at a height above a top surface of the agitating device [and below a bottom portion of the tube extension]; and

means for actuating the motor upon demand;

wherein the means for actuating the motor upon demand includes a detector for detecting a presence of paintballs at a selected position within the exit tube;

wherein said means for actuating the motor upon demand includes a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the detector that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the detector that paintballs are not present in the exit tube.

[2. The rapid feed paintball loader of claim **1** wherein:

the paintball agitating device includes:

a drive cone rotatably mounted on a bottom portion of the container, said drive cone having a top feed surface that slopes downward from a center axis of said drive cone; and

a plurality of fins affixed to the top fee d surface of the drive cone, each fin having a top feed surface and forming a gap with an adjacent fin large enough to accommodate a paintball;

the exit tube includes a sloped exit portion; and

the tube extension is mounted at a height which is above the top feed surface of the fins and having a radius of curvature that is approximately equal to the radius of a paintball.]

3. The rapid feed paintball loader of claim [2] *1*, wherein the motor is a DC electric motor.

[4. The rapid feed paintball loader of claim **2**, the means for actuating the motor upon demand includes a detector for detecting a presence of paintballs at a selected position within the exit tube.]

[5. The rapid feed paintball loader of claim **4**, wherein said means for actuating the motor upon demand includes a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the detector that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the detector that paintballs are not present in the exit tube.]

6. The rapid feed paintball loader of claim [4] *1*, wherein said detector is a reflective infrared optical sensor.

7. The rapid feed paintball loader of claim [4] *1*, wherein said detector is an optical sensor.

8. The rapid feed paintball loader of claim [4] *1*, wherein said detector is an electromechanical switch.

9. [The rapid feed paintball loader of claim **4**,] *A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:*

a container for holding a plurality of paintballs having an interior space;

a paintball agitating device mounted on a bottom portion of the container, said paintball agitating device including fins, said fins forming gaps therebetween;

wherein the paintball agitating device includes a drive cone rotatably mounted on a bottom portion of the container, said drive cone having a top feed surface that slopes downward from a center axis of said drive cone; and

a plurality of fins affixed to the top feed surface of the drive cone, each fin having a top feed surface and forming a gap with an adjacent fin large enough to accommodate a paintball;

a motor that rotates the paintball agitating device;

an exit tube having an entry way exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun, wherein the exit tube includes a sloped exit portion;

a tube extension mounted on an interior surface of the container adjacent to the exit tube, the tube extension mounted at a height which is above the top feed surface of the fins and having a radius of curvature that is approximately equal to the radius of a paintball;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension; and

means for actuating the motor upon demand;

wherein the means for actuating the motor upon demand includes a detector for detecting a presence of paintballs at a selected position within the exit tube;

further comprising a microprocessor communicating with the detector and the motor.

10. The rapid feed paintball loader of claim **9** wherein said microprocessor momentarily stops the motor when said microprocessor detects a specified increase in torque output from the motor.

11. The rapid feed paintball loader of claim **10**, further comprising a display positioned on the container and wherein said microprocessor displays relevant data to an operator of [the] *a* paintball gun on the display.

12. The rapid feed paintball loader of claim **11**, wherein said display includes a timer.

13. The rapid feed paintball loader of claim **12** wherein said timer emits an audio warning after a preselected time has elapsed.

14. The rapid feed paintball loader of claim **12** wherein said timer displays a visual warning after a preselected time has elapsed.

15. The rapid feed paintball loader of claim **12** wherein said time provides a vibratory alert after a preselected time has elapsed.

16. [The rapid feed paintball loader of claim **4**,] *A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:*

a container for holding a plurality of paintballs having an interior space;

a paintball agitating device mounted on a bottom portion of the container, said paintball agitating device including fins, said fins forming gaps therebetween;

wherein the paintball agitating device includes a drive cone rotatably mounted on a bottom portion of the container, said drive cone having a top feed surface that slopes downward from a center axis of said drive cone; and

a plurality of fins affixed to the top feed surface of the drive cone, each fin having a top feed surface and forming a gap with an adjacent fin large enough to accommodate a paintball;

a motor that rotates the paintball agitating device;

an exit tube having an entry way exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun, wherein the exit tube includes a sloped exit portion;

a tube extension mounted on an interior surface of the container adjacent to the exit tube, the tube extension mounted at a height which is above the top feed surface of the fins and having a radius of curvature that is approximately equal to the radius of a paintball;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension; and

means for actuating the motor upon demand;

wherein the means for actuating the motor upon demand includes a detector for detecting a presence of paintballs at a selected position within the exit tube;

wherein said means for actuating the motor upon demand includes a microprocessor which disengages the motor when receiving a signal from the detector that the presence of paintballs is detected in the exit tube.

17. The rapid feed paintball loader of claim **16** wherein said microprocessor momentarily reverses a rotational direction of the motor when said microprocessor detects a specified increase in torque output from the motor.

18. The rapid feed paintball loader of claim **[2]** *9* wherein the sloped exit portion has a slope approximately equivalent to the slope of the top feed surface of the drive cone.

19. The rapid feed paintball loader of claim **[2]** *9* wherein the exit tube is horizontally orientated approximately 45 degrees from a horizontal axis running through a mid-position of the paintball loader.

20. The rapid feed paintball loader of claim **[2]** *9* wherein the plurality of fins spiral outwardly from an interior dome-shaped area located within the center of the drive cone.

21. The rapid feed paintball loader of claim **[2]** *9* wherein said plurality of fins spiraling outwardly from an interior area of the drive cone.

22. **[**The rapid feed paintball loader of claim **1** further comprising:**]** *A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:*

a container for holding a plurality of paintballs having an interior space;

a paintball agitating device mounted on a bottom portion of the container, said paintball agitating device including fins, said fins forming gaps therebetween;

a motor that rotates the paintball agitating device;

an exit tube having an entry way exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun;

a tube extension mounted on an interior surface of the container adjacent to the exit tube;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension;

means for actuating the motor upon demand;

a detector for detecting a presence of paintballs at a selected position within the exit tube; and

a microprocessor communicating with the detector and the motor.

23. The rapid feed paintball loader of claim **22** further comprising a display positioned on the container and wherein said microprocessor displays relevant data to an operator of **[**the**]** *a* paintball gun on the display.

24. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs;

a plurality of fins located at a bottom portion of the container, each fin **[**having a top feed surface and**]** forming a gap with an adjacent fin large enough to accommodate a paintball;

means for rotating the plurality of fins about an axis running perpendicularly through the bottom portion of the container;

an exit tube exiting from the bottom portion of the container **[**and leading to**]** *and configured to lead to* an inlet tube of **[**the**]** *a* paintball gun, said exit tube having a sloped exit portion;

a tube extension mounted on an interior surface of the container adjacent to the sloped exit portion of the exit tube, said tube extension being mounted at a height which is above the top feed surface of the fins and having a radius of curvature that is approximately equal to the radius of a paintball;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably mounted on the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height which is above the top feed surface of the fins and which is below a bottom portion of the tube extension;

a motor that rotates the drive cone; **[**and**]**

means for actuating the motor upon demand*;*

a detector for detecting a presence of paintballs at a selected position within the exit tube; and

a microprocessor communicating with the detector and the motor.

25. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs;

a paintball agitating device mounted on a bottom portion of the container;

an exit tube exiting from the bottom portion of the container **[**and leading to**]** *and configured to lead to* an inlet tube of **[**the**]** *a* paintball gun;

a motor that rotates the paintball agitating device; and

means for actuating the motor upon demand, said means for actuating the motor upon demand including:

a detector for detecting a presence of paintballs at a selected position within the exit tube; and

a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the detector that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the detector that paintballs are not present in the exit tube.

26. The rapid feed paintball loader of claim 27, wherein the motor is a DC electric motor.

27. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs;

a paintball agitating device mounted on a bottom portion of the container, and having a plurality of fins, and a plurality of gaps between the fins;

a motor that rotates the paintball agitating device;

an exit tube having an entry way exiting from the bottom portion of the container, the exit tube including a sloped exit portion;

a tube extension mounted on an interior surface of the container adjacent to the exit tube, at least a portion of the tube extension is mounted at a height which is above at least a portion of the paintball agitating device;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension;

means for actuating the motor;

wherein the means for actuating the motor includes a sensor for detecting a presence of paintballs at a selected position within the exit tube;

further comprising a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the sensor that there is a lesser demand for paintballs detected and increasing the speed of the motor when receiving a signal from the sensor that paintballs are in higher demand.

28. The rapid feed paintball loader of claim 27, wherein said sensor is a reflective infrared optical sensor.

29. The rapid feed paintball loader of claim 27, wherein said sensor is an optical sensor.

30. The rapid feed paintball loader of claim 27, wherein said sensor is an electromechanical switch.

31. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs;

a paintball agitating device mounted on a bottom portion of the container, and having a plurality of fins, and a plurality of gaps between the fins;

a motor that rotates the paintball agitating device;

an exit tube having an entry way exiting from the bottom portion of the container, the exit tube including a sloped exit portion;

a tube extension mounted on an interior surface of the container adjacent to the exit tube, at least a portion of the tube extension is mounted at a height which is above at least a portion of the paintball agitating device;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension;

means for actuating the motor;

wherein the means for actuating the motor includes a sensor for detecting a presence of paintballs at a selected position within the exit tube;

further comprising a microprocessor communicating with the sensor and the motor.

32. The rapid feed paintball loader of claim 31 wherein said microprocessor momentarily stops the motor when said microprocessor detects a specified increase in torque output from the motor.

33. The rapid feed paintball loader of claim 32, further comprising a display positioned on the container and wherein said microprocessor displays relevant data to an operator of a paintball gun on the display.

34. The rapid feed paintball loader of claim 33, wherein said display includes a timer.

35. The rapid feed paintball loader of claim 34 wherein said timer emits an audio warning after a preselected time has elapsed.

36. The rapid feed paintball loader of claim 34 wherein said timer displays a visual warning after a preselected time has elapsed.

37. The rapid feed paintball loader of claim 34 wherein said time provides a vibratory alert after a preselected time has elapsed.

38. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs having an interior space;

a paintball agitating device mounted on a bottom portion of the container, said paintball agitating device including fins, said fins forming gaps therebetween;

a motor that rotates the paintball agitating device;

an exit tube having an entry way exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun;

a tube extension mounted on an interior surface of the container adjacent to the exit tube;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension; and

means for actuating the motor upon demand,

wherein said means for actuating the motor upon demand includes a microprocessor which disengages the motor when receiving a signal from a detector that the presence of paintballs is detected in the exit tube.

39. The rapid feed paintball loader of claim 38 wherein said microprocessor momentarily reverses a rotational direction of the motor when said microprocessor detects a specified increase in torque output from the motor.

40. The rapid feed paintball loader of claim 27 wherein the sloped exit portion has a slope approximately equivalent to the slope of the top feed surface of the drive cone.

41. The rapid feed paintball loader of claim 27 wherein the exit tube is horizontally orientated approximately 45 degrees from a horizontal axis running through a mid-position of the paintball loader.

42. The rapid feed paintball loader of claim 27 wherein the paintball agitating device comprises a drive cone rotatably mounted on a bottom portion of the container, said drive cone having a top surface at least a portion of which slopes downward from a center axis of said drive cone; and a plurality of fins affixed to the top surface of the drive cone, each fin forming a gap with an adjacent fin large enough to accommodate a paintball; and wherein the plurality of fins project outwardly from an interior dome-shaped area located within the center of the drive cone.

43. The rapid feed paintball loader of claim 27 wherein the paintball agitating device includes: a drive cone rotatably mounted on a bottom portion of the container, said drive cone having a top surface that slopes downward from a center axis of said drive cone; and a plurality of fins affixed to the top surface of the drive cone, each fin forming a gap with an adjacent fin large enough to accommodate a paintball; the exit tube includes a sloped exit portion; and the tube extension is mounted at a height which is above the top surface of the fins.

44. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:
a container for holding a plurality of paintballs;
a paintball agitating device mounted on a bottom portion of the container, and having a plurality of fins, and a plurality of gaps between the fins;
a motor that rotates the paintball agitating device;
an exit tube having an entry way exiting from the bottom portion of the container;
a tube extension mounted on an interior surface of the container adjacent to the exit tube;
a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension;
means for actuating the motor;
a detector for detecting a presence of paintballs at a selected position within the exit tube; and
a microprocessor communicating with the detector and the motor.

45. The rapid feed paintball loader of claim 31 further comprising a display positioned on the container and wherein said microprocessor displays relevant data to an operator of a paintball gun on the display.

46. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:
a container for holding a plurality of paintballs, the container having an interior space;
a plurality of fins located at a bottom portion of the container, each fin forming a gap with an adjacent fin large enough to accommodate a paintball;
a motor for rotating the plurality of fins about an axis running perpendicularly through the bottom portion of the container;
an exit tube having an entry way exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun, said exit tube having a sloped exit portion;
a tube extension mounted on an interior surface of the container adjacent to the sloped exit portion of the exit tube, and;
a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension; and
means for actuating the motor;
further comprising a microprocessor in communication with a sensor and the motor, the microprocessor controlling operation of the motor in response to a signal from the sensor.

47. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:
a container for holding a plurality of paintballs having an interior space;
a drive cone that includes a plurality of fins rotatably mounted on the bottom portion of the container, each of the fins forming a gap with an adjacent fin large enough to accommodate a paintball;
a motor for operating the paintball agitating device;
an exit tube having an entry way;
a tube extension mounted on an interior surface of the container adjacent to the exit tube; and,
a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector having a first end pivotably attached to the interior surface of the container separately from and adjacent to the tube extension,
said deflector having a moveable free end that extends away from the first end into the interior space of the container and moves away from a paintball driven toward the entry way by the paintball agitating device,
said deflector being mounted at a height above a top surface of the paintball agitating device;
a detector for detecting paintballs; and,
a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the detector that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the detector that paintballs are not present in the exit tube.

48. The rapid feed paintball loader of claim 46, wherein the sensor is adapted to send a signal to the microprocessor when the exit tube has a number of paintballs, and the microprocessor is adapted to stop the motor in response to the signal.

49. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:
a container for holding a plurality of paintballs;
a paintball agitating device mounted on a bottom portion of the container;
an exit tube exiting from the bottom portion of the container;
a motor for operating the paintball agitating device;
a sensor for detecting at least one paintball at a selected position within the exit tube; and,
a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube.

50. The rapid feed paintball loader of claim 49, wherein the sensor is adapted to detect a presence of the at least one paintball at a selected position within the exit tube.

51. The rapid feed paintball loader of claim 49, wherein the sensor is adapted to send a signal to the microprocessor when the exit tube has a number of paintballs therein, wherein the microprocessor is adapted to stop the motor in response to the signal.

52. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:
a container for holding a plurality of paintballs;
a paintball agitating device mounted on a bottom portion of the container;
a motor for operating the paintball agitating device;
an exit tube exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun, the exit tube having an exit opening;
a tube extension adjacent the exit opening;
a sensor for detecting at least one paintball at a selected position within the exit tube; and,
and a microprocessor which variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and

increasing the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube.

53. The rapid feed paintball loader of claim 52, wherein the sensor is adapted to send a signal to the microprocessor when the exit tube has a number of paintballs therein, wherein the microprocessor is adapted to stop the motor in response to the signal.

54. The rapid feed paintball loader of claim 52, further comprising a deflector pivotably attached to the interior surface of the container adjacent to the tube extension.

55. The rapid feed paintball loader of claim 54, wherein the paintball agitating device is a drive cone rotatably mounted on the bottom portion of the container having a plurality of fins, each of the fins forming a gap with an adjacent one of the fins large enough to accommodate a paintball, and wherein the deflector is positioned to deflect paintballs downward into the gaps between the fins or upward to pass over the tube extension.

56. The rapid feed paintball loader of claim 52, wherein the sensor is adapted to detect a presence of a paintball at a selected position within the exit tube.

57. The rapid feed paintball loader of claim 52, wherein said sensor is a reflective infrared optical sensor.

58. The rapid feed paintball loader of claim 52, wherein said sensor is an optical sensor.

59. The rapid feed paintball loader of claim 52, wherein said sensor is an electromechanical switch.

60. The rapid feed paintball loader of claim 52, wherein said microprocessor is adapted to momentarily stop the motor upon detection of a specified increase in torque output from the motor.

61. The rapid feed paintball loader of claim 52, wherein the microprocessor is adapted to record relevant data relating to use of the paintball loader, further comprising a display in communication with the microprocessor positioned on the container.

62. The rapid feed paintball loader of claim 61, wherein said display includes a timer.

63. The rapid feed paintball loader of claim 62, wherein said timer is adapted to emit an audio warning after a preselected time has elapsed.

64. The rapid feed paintball loader of claim 62, wherein said timer is adapted to display a visual warning after a preselected time has elapsed.

65. The rapid feed paintball loader of claim 62, wherein said timer is adapted to provide a vibratory alert after a preselected time has elapsed.

66. The rapid feed paintball loader of claim 61, wherein the display is adapted to show information relating to the power remaining in the power supply.

67. The rapid feed paintball loader of claim 52, wherein the paintball agitating device is a drive cone.

68. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs having an interior area;

a tube extension projecting into the interior area and positioned adjacent to the exit tube;

a paintball agitating device mounted on a bottom portion of the container;

a motor that rotates the paintball agitating device;

an exit tube exiting from the bottom portion of the container and configured to lead to an inlet tube of a paintball gun, the exit tube having an exit opening;

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension; and means for actuating the motor upon demand;

a sensor for detecting at least one paintball at a selected position within the exit tube; and

a microprocessor communicating with the sensor and the motor, the microprocessor controlling the motor's speed when the motor is actively operating the paintball agitating device, and automatically increasing an existing rate of speed of the motor in response to a signal from the sensor indicating an increased demand for paintballs.

69. The rapid feed paintball loader of claim 68, wherein the sensor is adapted to send a signal to the microprocessor when the exit tube has a number of paintballs, and the microprocessor is adapted to stop the motor in response to the signal.

70. The rapid feed paintball loader of claim 68, wherein the sensor detects a presence of paintballs at a selected position within the exit tube.

71. The rapid feed paintball loader of claim 68, wherein the microprocessor is adapted to variably control a speed of the motor, said microprocessor adapted to decrease the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and adapted to increase the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube.

72. The rapid feed paintball loader of claim 68, wherein said sensor is a reflective infrared optical sensor.

73. The rapid feed paintball loader of claim 68, wherein said sensor is an optical sensor.

74. The rapid feed paintball loader of claim 68, wherein said sensor is an electromechanical switch.

75. The rapid feed paintball loader of claim 68, wherein said microprocessor is adapted to momentarily stop the motor upon detection of an increase in torque output from the motor.

76. The rapid feed paintball loader of claim 68, wherein the microprocessor is adapted to record relevant data relating to use of the paintball loader, the loader further comprising a display in communication with the microprocessor positioned on the container.

77. The rapid feed paintball loader of claim 76, wherein said display includes a timer.

78. The rapid feed paintball loader of claim 77, wherein said timer is adapted to emit an audio warning after a preselected time has elapsed.

79. The rapid feed paintball loader of claim 77, wherein said display is adapted to display a visual warning after a preselected time has elapsed as measured by the timer.

80. The rapid feed paintball loader of claim 77, wherein said display is adapted to provide a vibratory alert after a preselected time has elapsed as measured by the timer.

81. The rapid feed paintball loader of claim 76, wherein the timer is adapted to display shows information relating to the power remaining in the power supply.

82. The rapid feed paintball loader of claim 67, wherein the paintball agitating device is a drive cone.

83. A paintball loader, comprising:

a container for holding a plurality of paintballs;

a paintball agitating device mounted in the container;

an exit tube exiting from the container;

a motor for operating the paintball agitating device; and

a sensor for detecting a presence of a paintball at a selected position within the exit tube; and

a microprocessor in communication with the sensor and motor,

the microprocessor which variably controls a speed of the motor, the microprocessor decreasing the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube.

84. The paintball loader of claim 83, wherein the motor is a reversible DC electric motor.

85. The paintball loader of claim 83, wherein the sensor comprises a reflective infrared optical sensor.

86. The rapid feed paintball loader of claim 83, wherein said sensor comprises a combination of optical sensors or infrared sensors.

87. The rapid feed paintball loader of claim 83, wherein said sensor comprises an electromechanical device.

88. The paintball loader of claim 83, wherein the microprocessor is adapted to detect an increase in torque output from the motor, and the microprocessor is adapted to momentarily stop or reverse a rotational direction of the motor upon detection of the increase in torque.

89. The paintball loader of claim 83, further comprising a display positioned on the container, and wherein the microprocessor is adapted to display data to an operator of a paintball gun via the display.

90. The paintball loader of claim 89, wherein the display includes a timer.

91. A method for operating a paintball loader, the method comprising the steps of:

(a) providing a container for holding paintballs;

(b) providing an exit tube exiting from the container;

(c) providing a paintball agitating device mounted in the container;

(d) providing a motor for operating the paintball agitating device;

(e) providing a sensor adapted to detect a paintball; and,

(f) providing a microprocessor in communication with the sensor and motor, the microprocessor variably controlling a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube.

92. The method for operating a paintball loader of claim 91, further comprising the step of reversing a direction of the motor.

93. The method for operating a paintball loader of claim 91, wherein the sensor is adapted to detect paintballs passing through the exit tube.

94. The method for operating a paintball loader of claim 91, wherein the sensor is adapted to detect a demand for paintballs.

95. A method for operating a paintball loader, the method comprising the steps of:

(a) providing a container for holding paintballs;

(b) providing an exit tube exiting from the container;

(c) providing a tube extension mounted on an interior surface of the container adjacent to the exit tube;

(d) providing a paintball agitating device mounted in the container, said paintball agitating device including a plurality of fins, said fins forming gaps therebetween

(e) providing a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension;

(f) providing a motor for rotating the paintball agitating device;

(g) providing a microprocessor in communication with the motor and a sensor, the microprocessor configured to automatically control the direction of rotation of the motor, the microprocessor processing a signal generated in response to the detection of a paintball;

(h) reversing a direction of the motor in response to the signal; and,

(i) automatically operating the motor in its original direction after the paintball jam has cleared.

96. A method for operating a paintball loader, the method comprising the steps of:

(a) providing a container for holding paintballs;

(b) providing a paintball agitating device within the container adapted to move in either a first direction or in a second opposite direction;

(c) moving the paintballs using the paintball agitating device in the first direction toward an exit opening formed within the paintball loader, the paintball agitating device operated by a microprocessor-controlled motor, the microprocessor in communication with a sensor, the microprocessor variably controlling a speed of the motor, the microprocessor decreasing the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube;

(d) detecting a paintball jam within the paintball loader with the sensor;

(e) sending a signal to the microprocessor indicating the paintball jam;

(f) stopping the motor in response to the signal received by the microprocessor indicating the paintball jam; and,

(f) automatically starting the motor after the paintball jam has cleared.

97. A paintball loader, comprising:

a container for holding a plurality of paintballs;

an exit tube exiting from the container;

a tube extension adjacent the exit tube;

a paintball agitating device mounted in the container, said paintball agitating device including a plurality of fins, said fins forming gaps therebetween

a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension; and,

a reversible motor that rotates the paintball agitating device in either a first direction or in a second direction opposite the first direction, the operation of the motor controlled by a microprocessor in communication with a sensor, the microprocessor configured to change the motor's rotational direction from a first direction to a second direction in response to the sensor detecting a paintball jam, the microprocessor configured to automatically command the motor to rotate in the first direction after the paintball jam clears.

98. A method for operating a paintball loader, comprising the steps of:

(a) providing a container for holding a plurality of paintballs, the container including an exit tube exiting from the container, and a tube extension mounted on an interior surface of the container adjacent to the exit tube;

(b) providing a paintball agitating device including mounted in the container, said paintball agitating device including a plurality of fins, said fins forming gaps therebetween, said paintball agitating device further including a deflector for deflecting paintballs downward into the gaps between the fins or upward to pass over the tube extension, said deflector pivotably attached to the interior surface of the container adjacent to the tube extension, said deflector being mounted at a height above a top surface of the agitating device and below a bottom portion of the tube extension;

(c) providing a motor for operating the paintball agitating device, the operation of the motor controlled by a microprocessor in communication with a sensor, the microprocessor controlling the motor's speed when the motor is actively operating the paintball agitating device, and automatically increasing an existing rate of speed of the motor in response to a signal from the sensor indicating an increased demand for paintballs; and,

(d) operating the motor in a first direction to forcibly drive paintballs within the container into the exit tube; and,

(e) automatically operating the motor in a second direction in response to a paintball jam.

99. The method for operating a paintball loader according to claim 97, further comprising the step of providing a sensor for detecting paintballs within the exit tube.

100. The method for operating a paintball loader according to claim 99, further comprising the step of providing a microprocessor in communication with the sensor and motor.

101. The method for operating a paintball loader according to claim 100, further comprising the step of controlling operation of the motor in response to signals transmitted from the sensor to the microprocessor.

102. The method for operating a paintball loader according to claim 101, further comprising the step of reversing a direction of the paintball agitating device.

103. A rapid feed paintball loader for use on a paintball gun for force feeding paintballs, the paintball loader comprising:

a container for holding a plurality of paintballs;

a paintball agitator rotatably mounted on a bottom portion of said container;

at least one fin extending from the agitator, said fin forming a gap large enough to accommodate a paintball;

a motor that rotates said drive cone;

an exit tube exiting from the bottom portion of said container and configured to lead to an inlet tube of a paintball gun;

and microprocessor for controlling said motor in communication with the motor and a sensor;

whereby said agitator is adapted to receive paintballs from the container and forcibly drive the paintballs from the gap into the exit tube;

the operation of the motor controlled by the microprocessor, the microprocessor configured to stop the motor in response to the sensor detecting a paintball jam, the microprocessor variably controlling a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from the sensor that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from the sensor that paintballs are not present in the exit tube.

104. The rapid feed paintball loader of claim 103, wherein the sensor is configured to detect a paintball.

105. The rapid feed paintball loader of claim 104, wherein the sensor is an electro-mechanical switch.

106. The rapid feed paintball loader of claim 104, wherein the sensor is a reflective infrared sensor.

107. The rapid feed paintball loader of claim 103, wherein the paintball agitating device is a drive cone, and wherein the fin separates the top feed surface of the drive cone into at least one gap large enough to accommodate a paintball.

108. The rapid feed paintball loader of claim 107, wherein the drive cone includes a dome-shaped area located proximate its center; and the at least one fin projects outwardly from the dome-shaped area.

109. A rapid feed paintball loader for use on a paintball gun, the paintball loader comprising:

a container for holding a plurality of paintballs;

a paintball agitating device mounted on a bottom portion of the container;

an exit tube exiting from the bottom portion of the container;

a motor for operating the paintball agitating device;

a plurality of sensors for detecting a demand for paintballs; and

a microprocessor in communication with the sensors and motor, the microprocessor adapted to control the motor when receiving a signal from at least one of the sensors, the microprocessor variably controlling a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from at least one of the sensors that the presence of paintballs is detected in the exit tube and increasing the speed of the motor when receiving a signal from at least one of the sensors that paintballs are not present in the exit tube.

110. The paintball loader of claim 109, wherein the microprocessor is adapted to detect an increase in torque output from the motor, and the microprocessor is adapted to momentarily stop or reverse a rotational direction of the motor upon detection of the increase in torque.

111. The paintball loader of claim 109, wherein the microprocessor variably controls a speed of the motor, said microprocessor decreasing the speed of the motor when receiving a signal from a sensor that there is a lesser demand for paintballs detected and increasing the speed of the motor when receiving a signal from the sensor that paintballs are in higher demand.

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