

Concept 1

Spin Mechanism: Three-wheel system for imparting spin. Each wheel's speed can be adjusted to create topspin, backspin, or sidespin.

Speed Mechanism: Uses the same three-wheel system to regulate ball speed.

Pitch Angle Control: Gear mechanism (Gear 1) adjusts the pitch angle, allowing limited but precise adjustments.

Yaw Angle Control: Gear 1 for directional control, offering basic yaw angle adjustments by rotating the launching mechanism partially.

User Interaction: Integrated controller for inputting parameters like trajectory and frequency, with a potentiometer for numerical data input.

Control Mechanisms: BLDC motors for spin and speed, and servo motors for controlling pitch and yaw.

Device Positioning: Securely mounted using clamps.

Ball Feed & Frequency: Stepper motors for feeding and launching balls with an adjustable frequency.

The balls are stored in a box-like reservoir and transferred to the launching mechanism using a stepper-motor-driven Maltese wheel system. This system rotates incrementally to drop one ball at a time into the launching chamber. From there, the three spinning wheels grip the ball. The relative speeds of the wheels dictate the spin and speed of the ball. The wheels propel the ball forward while simultaneously imparting spin, thanks to differential wheel velocities. The system ensures smooth ball transfer and prevents jamming through precise timing of the stepper motor.

Concept 2

Spin Mechanism: Four-wheel system for better control and stability over the spin. Individual wheel speeds enable refined spin adjustments.

Speed Mechanism: Same four-wheel configuration to deliver high-speed and precise control.

Pitch Angle Control: Four-bar linkage provides a range of adjustable angles for the launching mechanism.

Yaw Angle Control: Four-bar linkage allows smooth pivoting for directional adjustments.

User Interaction: Integrated controller for receiving trajectory and frequency settings, potentiometer for manual input.

Control Mechanisms: BLDC motors for spin and speed, servo motors for pitch and yaw adjustments.

Device Positioning: Clamps for secure attachment.

Ball Feed & Frequency: Stepper motors regulate ball storage, feeding, and frequency.

In this concept, the balls are held in a storage unit designed as a gravity-fed funnel, where they naturally flow downward to the transfer mechanism. A rotating pusher powered by a stepper motor ensures that only one ball is fed at a time into the launching chamber. The four-wheel system in the launcher grips the ball with high stability, allowing precise control over both spin and speed. This mechanism is particularly effective for delivering consistent shots with complex spins, as the four wheels provide balanced pressure during the launch.

Concept 3

Spin Mechanism: Two-wheel spinning head, providing basic spin functionalities by adjusting wheel speeds.

Speed Mechanism: Two-wheel system also controls ball velocity.

Pitch Angle Control: Four-bar linkage ensures flexibility in pitch angle adjustments.

Yaw Angle Control: Bevel gear for smooth horizontal angle adjustments.

User Interaction: Integrated controller for input with trajectory details, supported by a potentiometer for numerical settings.

Control Mechanisms: BLDC motors for spin and speed, servo motors for pitch and yaw adjustments.

Device Positioning: Positioning via clamps.

Ball Feed & Frequency: Stepper motors manage feeding and launching.

Balls are transferred from a tunnel-like storage unit using a slider-crank mechanism powered by a stepper motor. The slider pushes the ball into the launching system, ensuring smooth and consistent feeding. Once in the launcher, the two wheels grip the ball, accelerating it to the desired speed. By varying the relative speed of the two wheels, the system can also impart spin to the ball. The simple two-wheel setup makes this concept highly efficient for rapid and frequent launches.

Concept 4

Spin Mechanism: Three-wheel setup similar to Concept 1, providing a balance of complexity and control.

Speed Mechanism: Three-wheel system for adjustable ball speeds.

Pitch Angle Control: Bevel gear mechanism ensures stable, precise vertical adjustments.

Yaw Angle Control: Bevel gear configuration for smooth horizontal orientation.

User Interaction: Integrated controller and potentiometer interface.

Control Mechanisms: BLDC motors for spin and speed, servo motors for pitch and yaw control.

Device Positioning: Manual clamping system.

Ball Feed & Frequency: Stepper motors for controlling feeding and frequency.

The storage in this concept consists of a box reservoir that feeds balls into a rotating Maltese wheel system. The Maltese wheel, driven by a stepper motor, transfers one ball at a time to the launching system. The three spinning wheels in the launcher handle the propulsion and spin generation. Their configuration allows for precise adjustments to both the ball's speed and spin. This setup is well-suited for replicating diverse shot styles with high accuracy.

Concept 5

Spin Mechanism: Four-wheel design for highly accurate spin generation.

Speed Mechanism: Four-wheel system offers advanced control over speed variations.

Pitch Angle Control: Bevel gear ensures angular adjustments for high precision.

Yaw Angle Control: Gear 2 allows broader control by rotating the entire tower base.

User Interaction: Integrated controller and potentiometer for manual input.

Control Mechanisms: Uses a DC motor for speed and spin, servo motors for yaw and pitch adjustments.

Device Positioning: Clamps for secure and stable placement.

Ball Feed & Frequency: Stepper motor-based control for consistent ball delivery.

A rotating pusher mechanism, controlled by a stepper motor, transfers balls from a gravity-fed funnel into the launcher. This mechanism ensures no jams during the transfer process. The launcher uses a four-wheel system to grip the ball securely. By carefully controlling the rotation speeds of each wheel, the system can produce intricate spin combinations, such as topspin, backspin, or sidespin, while also adjusting the ball's velocity. The inclusion of four wheels provides excellent stability during the launch, making this concept ideal for advanced training setups.

Concept 6

Spin Mechanism: Three-wheel system offering a good mix of control and cost-efficiency.

Speed Mechanism: Same three-wheel setup ensures speed control.

Pitch Angle Control: Four-bar linkage mechanism to handle vertical angle adjustments.

Yaw Angle Control: Bevel gear for accurate adjustments to the horizontal angle.

User Interaction: Integrated controller for settings and potentiometer for fine-tuning.

Control Mechanisms: BLDC motors for spin and speed, servo motors for trajectory adjustments.

Device Positioning: Clamps used for positioning.

Ball Feed & Frequency: Stepper motors regulate ball frequency and storage.

In this concept, balls are stored in a gravity-fed reservoir and moved to the launching chamber by a slider-crank mechanism driven by a stepper motor. The slider ensures precise timing for transferring balls without any overlap or jamming. The three-wheel setup in the launcher grips the ball securely, using differential wheel speeds to control spin. The system is efficient and reliable, making it a balanced option for creating a variety of shot types while maintaining simplicity in design.

Concept 7

Spin Mechanism: Two-wheel system for simple and effective spin creation.

Speed Mechanism: Same two-wheel system for managing ball velocity.

Pitch Angle Control: Bevel gear ensures consistent angular control.

Yaw Angle Control: Gear 2 for broader tower-base rotation.

User Interaction: Integrated interface with potentiometer input for frequency and trajectory.

Control Mechanisms: BLDC motors for spin and speed control, servo for pitch and yaw.

Device Positioning: Clamp-based secure mounting system.

Ball Feed & Frequency: Stepper-driven feeding and launch mechanism.

The storage mechanism in this concept is a tunnel with a spiral lift. A stepper motor powers the lift, which gradually elevates balls to the launching chamber. This eliminates the risk of clogging or uneven feeding. Once in the launcher, the two wheels grip the ball and accelerate it to the desired speed. Adjusting the speeds of the wheels creates different spin types, making this concept efficient for training scenarios that emphasize rapid and dynamic ball delivery.

Concept 8

Spin Mechanism: Four-wheel mechanism for precise and stable spin.

Speed Mechanism: Utilizes the four-wheel design for refined speed adjustments.

Pitch Angle Control: Four-bar linkage system for vertical angle flexibility.

Yaw Angle Control: Gear 1 for basic horizontal adjustments.

User Interaction: Integrated interface for trajectory inputs, potentiometer for detailed settings.

Control Mechanisms: BLDC motors for spin and speed, servo motors for controlling pitch and yaw.

Device Positioning: Clamps for securing the system.

Ball Feed & Frequency: Stepper motors for steady feeding and ball launching.

Balls are transferred from a gravity-fed reservoir using a Maltese wheel system, driven by a stepper motor for precise control. This system ensures one ball at a time enters the launcher.

The four-wheel mechanism grips the ball and provides balanced propulsion, adjusting the wheel speeds to generate the required spin and speed. This concept excels in delivering highly consistent shots with fine-tuned control, thanks to the stability and precision offered by the four-wheel configuration.