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FABRICATION OF CHAIN LINK WIRE MESH MAKING MACHINE

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ABSTRACT
The aim of our project is to develop a model of a chain-link fence. The fence features wires running vertically, bent into a zigzag pattern. Each "zig" hooks with the adjacent wire on one side, while each "zag" hooks with the wire on the other side, creating a diamond pattern. This design not only enhances the fence's structural integrity but also maintains the traditional appearance characteristic of chain-link fences. Our model will focus on accurately replicating this pattern to ensure durability and functionality, making it a reliable and effective fencing solution.

INTRODUCTION
A fence is a structure that encircles an area, typically outdoors, made from posts connected by panels, wire, railings, or mesh. Unlike walls, fences do not have a solid foundation along their entire length. Chain-link fences are usually made from galvanized steel wire, and their production is known as weaving. The process involves pulling galvanized wire through a rotating blade to create a flattened spiral. This spiral hooks through the previous one, forming the fence. The wire is cut, pressed flat, and the ends are twisted to secure the links.

When powered, an AC motor rotates a rectangular rod inside a hollow tube with a spiral-shaped cutout. The wire from a bobbin hooks onto the rod through the tube slot. As the motor runs, the wire spirals around the rod, creating a zigzag shape. This efficient system produces zigzag wires for chain link or mesh making.

A chain-link fence is woven from galvanized steel wire into a mesh pattern, forming interlocking squares referred to as the "fabric" of the fence. It is secured to steel posts embedded in the ground and used to enclose areas such as schoolyards, parking lots, industrial properties, and residential yards. It also serves for dog runs, kennels, animal pens, and as temporary fencing at construction sites.

Understanding wire quality in fence manufacturing is essential to avoid breakage and field erection issues. Tests for wire quality include tensile strength, ductility, three-point bending, impact energy, linear tensional conductivity, and micro-hardness. These tests ensure the wire meets required standards, with linear tensional conductivity being the most reliable quality indicator.

Chain link fence manufacturing involves running two wires through a machine, wrapping them around a metal rod, pulling out the rod, and hooking the wire ends together to form the mesh. This process is

repeated, building the chain-link fence incrementally.

WIRE BENDING ASSEMBLY

The chain link fence is first attached to one terminal post (or one end if the fence is installed in a straight line) and then stretched to be attached to the next terminal post (or the other end of a straight fence). Excess wire is cut and removed, with the ends wrapped around the posts. The fence is secured to the line posts using aluminum wire ties. Movements below the fence between posts can cause damage, so a tension wire, also known as a coil wire, is often stretched along the bottom from one terminal post to another for added security.

This tension wire is usually installed and secured to the line posts before the wire-mesh fence is attached and is typically secured to the tension wire using hog rings. For enhanced durability and stability, especially in security fencing, bottom horizontal rails may be used instead of tension wires. Tension wires or rails can also be installed on top of the wire-mesh fence, with top rails being common. For fences taller than three meters, intermediate or middle rails are generally installed to ensure greater stability.

LITERATURE SURVEY

1. **D. Pons, G. Bayley, R. Laurenson, M. Hunt, C. Tyree, D. Aitchison**. (Year). Wire Fencing: Determinants of Wire Quality. This study investigated knotted wire fences fabricated on specialized machines using galvanized steel wire. They identified wire strand breakages during fabrication and subsequent field erection.
2. **Dirk J. Pons, Gareth Bayley, Christopher Tyree, Matthew Hunt, Reuben Laurenson Aitchison**. (Year). Material Properties of Wire for the Fabrication of Knotted Fences. This research focused on the material properties of galvanized fencing wire, examining tensile strength, ductility, Young's modulus, three-point bending, and bending span.
3. **Sebastian Balos, Vencislav Grabulov, Leposava Sidjanin, Mladen Pantic**. (Year). Wire Fence as Appliqué Armoring. This study explored the behavior of wire fences made from commercial high-strength patented wire, supported by mild steel L-profile frames.
4. **Arshpreet Singh, Anupam Agrawal**. (Year). Comparison of Deforming Forces, Residual Stresses, and Geometrical Accuracy of Deformation Machining with Conventional Bending and Forming. This research compared deformation machining, which combines thin structure machining and single point incremental forming/bending, with conventional methods.
5. **Nurudeen A. Raji, Oluleke O. Oluwole**. (Year). Influence of Degree of Cold-Drawing on the Mechanical Properties of Low Carbon Steel. This study examined the effects of different degrees of cold drawing (20%, 25%, 40%, and 50%) on the mechanical properties of low carbon steel using tensile, impact, and hardness tests.
6. **Junichiro Tokutomia, Kenichi Hanazaki, Nobuhiro Tsuji, Jun Yanagimoto**. (Year). Change in Mechanical Properties of Fine Copper Wire Manufactured by Continuous Rotary Draw Bending Process. This research investigated the mechanical behaviors of Cu–Sn alloy wire processed by rotary draw bending, noting changes in Vickers hardness and the promotion of softening induced by plastic deformation.

These references provide a comprehensive understanding of wire fencing, from material properties and manufacturing techniques to specific applications and mechanical behavior studies.

OBJECTIVES

- To understand the basic principal of our project
- Describe the construction and working of various parts of our project
- Development of the working model of our project
- To reduce time spent on this activity

METHODOLOGY

CHAIN LINK FENCE FOR PRIVACY PURPOSE

One common misconception about chain-link fences is their perceived lack of privacy due to the open holes in the mesh. However, there are several effective ways to add privacy to these fences:

1. **Privacy Fence Screens**: Designed to withstand various weather elements, these screens can be easily attached to the fence, providing immediate privacy.
2. **Inserting Slats**: Privacy slats can be woven through the wire mesh either horizontally or vertically, significantly reducing visibility.
3. **Growing Vines**: Planting vines along the fence can offer a natural and aesthetic privacy solution. Depending on the plant species, the coverage can be partial or complete.
4. **Greenery Panels**: These garden decor panels offer an eco-friendly, low-maintenance privacy option that can be easily controlled and adjusted.

INSTALLATION OF THE CHAIN LINK FENCE

To install chain-link security fencing around a property, follow these steps:

1. **Install Posts**: Use concrete, steel tubing, or timber posts planted into the ground for stability. Terminal posts, such as gate and corner posts, should be anchored or set in concrete footings to prevent leaning or falling under the tension of the stretched wire fence. Line posts, placed between terminal posts, should be spaced no more than three meters apart.
2. **Wire Bending**: Figure 1 demonstrates the wire bending process.

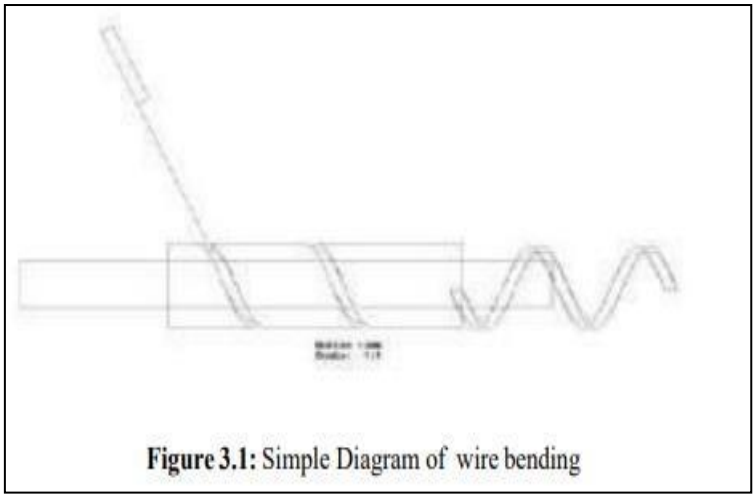

Figure 1: Wire Bending Diagram

3. **Chain-Link Machine Operation**: Modern chain-link machines adopt automatic threading, saving manpower and providing stable mechanical performance. A servo motor and touch screen operating system ensure precise control. By setting the speed and thread values on the

touch screen, accurate grid width and smooth mesh surfaces are achieved, reducing material waste and increasing efficiency by 1.8-4 times. The machine features automatic locking in Knuckled and Twisted forms, allowing for mechanized and automated production.

4. **Wire Mesh Fabrication**: Wire mesh is created by intertwining, weaving, or welding wires of various thicknesses to form equal parallel rows and intersecting columns. Wire mesh, also known as wire fabric or hardware mesh, is produced on industrial looms. Welded wire mesh is made using an electric welder to join longitudinal wires at their intersections.
5. **Galvanized Wire Mesh**: Made from plain or carbon steel wire, galvanized wire mesh involves applying a zinc coating to protect against rust and corrosion. It can be welded or woven using galvanized wire or plain steel wire galvanized post-production. Galvanized wire mesh is cost-effective and ideal for fencing in agriculture, gardening, greenhouses, architecture, construction, security, window guards, and infill panels.

This setup ensures a durable and efficient chain-link fence, suitable for various applications and providing enhanced security.

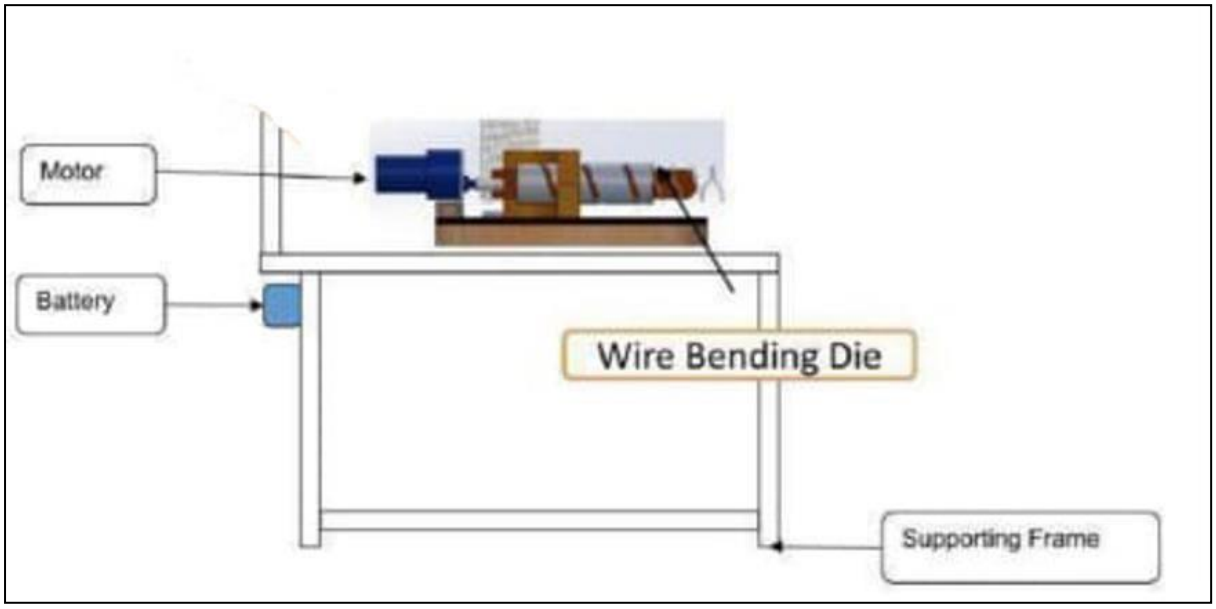

Figure 2: Block Diagram of the project

HOW DIAMOND MESH CHAIN LINK FENCING IS MADE.

1. **Wire Preparation**:
   - The wire is retrieved from the payoff stand and moved through dies, creating a zigzag wire pattern.
   - The cutting machine, equipped with sensors for 100% accuracy, cuts the wire to the correct length.
2. **Weaving**:
   - Two zigzag wires are woven together to form the diamond mesh chain link pattern.
3. **Locking**:
   - The woven diamond mesh is locked at both ends using the locking mechanism.

4. **Rolling**:
    - The completed diamond mesh chain link fence is rolled using the roller part of the machine.

Applications:

- Suitable for both residential and commercial properties, chain link fencing is versatile, cost-effective, and practical.
- Widely used in commercial markets where solid walls are impractical or unnecessary.
- Common in Western countries like Europe and the United States due to its functionality and cost-effectiveness.

Advantages:

- Chain link fencing is made from galvanized or PVC-coated wire, which is shaped into a zigzag pattern.
- These wires interlock to form a strong, diamond-shaped mesh.
- This type of fencing provides a transparent barrier, ideal for maintaining visibility while ensuring security.
- Available in various materials, including galvanized wire, cast iron, and SUS wire, allowing for customization based on requirements.

Manufacturing Process

1. **Wire Formation**:
    - The wire runs through a machine that bends it into a zigzag pattern, forming the characteristic diamond shape.
    - This wire is then cut to the required length and locked into place.

2. **Fencing Machine**:
    - Modern chain link fencing machines automate the threading, weaving, locking, and rolling processes.
    - These machines can produce fences of various widths, typically between 2 to 6 meters.
    - They also allow for different re-coiling options based on production needs.

Usage

- **Sports Fields**: Provides a secure and visible boundary.
- **River Banks**: Prevents erosion and unauthorized access.
- **Construction Sites**: Ensures safety and demarcation.
- **Residential Areas**: Offers security while maintaining visibility.
- **Animal Fencing**: Contains animals securely without obstructing the view.

Features

- The fence is highly durable, with a heavy galvanized coating ensuring a long lifespan.
- Suitable for enclosing lawns, roads, and other areas where a secure yet visible barrier is needed.

Figure 3: Wire Differences in Chain-Link Fences

When considering chain link fencing, several types of wires can be used, each with its unique properties and applications. The most popular types are heavy galvanized wires, vinyl-coated wires, green PVC wires, and black PVC wires.

Galvanized Wires

Process:

- Galvanized wires are steel wires coated with zinc through a hot-dipping process at temperatures around 450°C.
- This galvanization process protects the wire from rust and corrosion.

Uses:

- Ideal for environments that require heavy-duty material to withstand extreme elements.
- Commonly used in most chain link fences:
  - Regular hot-dip galvanized wires (2.5mm diameter) for general use.
  - Heavy galvanized wires (3.15mm diameter) for commercial fencing.

Vinyl-Coated Wires

Process:

- Wires are coated with polyvinyl chloride (PVC) or vinyl.
- This additional coating enhances the wire's resistance to rust and corrosion.

Uses:

- Suitable for coastal areas where salty air can accelerate the breakdown of zinc coating in galvanized wires.
- Provides extended durability and longevity to the fence.

Green PVC Wires

Characteristics:

- Vinyl-coated in green to blend seamlessly into natural environments.
- Preferred for aesthetic reasons, especially in gardens and grass lawns.

Uses:

- Ideal for areas where the fence should blend into the background rather than stand out.

Black PVC Wires

Characteristics:

- Coated in black PVC for a bold, distinct look.
- When used with black metal rails and posts, it can mimic the appearance of wrought iron structures from a distance.

Uses:

- Popular for creating a striking profile against natural landscapes.
- Can also be used to create a "transparent" fence effect, depending on the background and landscape.

Summary

- **Galvanized Wires**: Best for durability in extreme environments, with regular and heavy-duty options.
- **Vinyl-Coated Wires**: Enhanced rust protection, ideal for coastal areas.
- **Green PVC Wires**: Blend into natural settings, perfect for gardens and lawns.
- **Black PVC Wires**: Offer a bold, high-end appeal or a transparent look depending on the setting.

Choosing the right type of wire for your chain link fence depends on the specific needs of your environment and your aesthetic preferences. Each type offers unique benefits that can help ensure your fence is both functional and visually appealing.

IMPLEMENTED MODEL

Figure 4 :- Working model

COST ANALYSIS

The total cost analysis of both object detection and authentication devices is shown here. Here, the estimated price and the buying price of the components are shown

Table .1 :- Cost of component

Sr. No	Name of component	Unit price	Quantity	Total price
1	DC Motor	1950	1	1950
2	Spocket	280	2	560
3	Chain	140	1	140
4	Bearing	140	2	280
5	12V lead acid battery	1400	1	1400
6	3 pin male female connector	45	2	90
7	Switch	25	2	50
8	Shaft	60	1	60
9	Frame	550	1	550
10	Welding work	200	-	200
11	Labor Cost	600	-	600
			Total	**5880**

CONCLUSION

The chain link wire mesh making machine we designed and fabricated represents a significant step forward in mechanical construction machinery. It combines efficiency, precision, and durability to produce high-quality chain link fencing. The project enhanced our skills and knowledge in mechanical design, material selection, and machining processes, making maximum use of the available facilities and our abilities.

The successful completion of this project demonstrates the potential for further advancements in automated machinery for construction and other industrial applications.

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ADVANTAGES OF THE PROJECT

- **Easy Installation** — Wire mesh is flexible and pliable to easily insert or connect to a wall, railing, or flat surface.
- **Electronics Storage** — Computers, monitors, and other electronics have to be placed in well-ventilated storage areas. Wire mesh makes it possible for delicate and sensitive electronics to be held securely with limited access.
- **Convenienc**e — Wire mesh can be used as partitions to separate work positions but afford easy accessibility. It can be easily removed or rearranged to meet the needs of changing organizational dynamics.
- **Visibility** — In warehousing, wire mesh can be used to separate items but make them easily detectable and visible for retrieval. The use of wire mesh removes time- consuming searches and inventory checks.
- **Customer Area Partitions** — Wire mesh can be used to allow customer interaction while preventing them from entering the work area.

- **Strengthening and Support** — In the construction industry, wire mesh is added to a building to provide extra support and backing for walls and ceilings.
- **Cost-Effective** — Wire mesh is a cost-effective way to replace panels, shelves, and supports. It is easy to man ever and place. The superior strength of wire mesh makes it a positive Alternative to other forms of filtering and support materials.

DISADVANTAGES OF THE PROJECT:

- This type machine various sizes wire mesh, various sizes wire bending die is required due to initial costing higher.

APPLICATION OF THE PROJECT:

- Open lands and plots
- Characterizing Boundaries
- Providing Security
- Sports Fields
- High-Security Facilities
- Modern Buildings and Factories
- Schools and campus
- Farms
- Highways and motor ways

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