COMPACT, ECONOMICAL AND REUSABLE NEW ELEMENT TO FACILITATE THE HORIZONTAL REINFORCEMENT OF REINFORCED CONCRETE ELEMENTS

PATENTED TECHNOLOGY

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ABSTRACT

The research group "Materials and Construction Systems for Buildings", from the Building and Urbanism Department at the University of Alicante, has developed a new system that significantly facilitates the placement of the horizontal bars in constructive elements of reinforced concrete due to its reduced size and weight.

The invention is characterized by being reusable, easy to place in any type of work and it can be handled by a single operator. Moreover, it is a simple, inexpensive system to manufacture and its use implies a considerable reduction in time and execution costs on site. The research group is looking for companies interested in commercial exploitation.

INTRODUCTION

Nowadays, to undertake the construction of a reinforced concrete element, usually it comes first placing vertical reinforcement; then the horizontal reinforcement is placed. All this is done on a structural basis previously constructed (foundation, forged, etc.) in which standby reinforcements are foreseen in order to give continuity to the vertical arms in the element to be concreted and to allow construction phases.

Specifically, the current work system for **placement of horizontal bars in reinforced concrete elements** involves numerous drawbacks in its different steps, leading to increase run time and its corresponding impact on the final cost.

The main drawbacks of the current system work are:

- The necessary **separation between horizontal bars has to be chalked** on vertical bars. This marking is not exact, being able to produce accumulative human errors.
- The **minimum work of two operators**. Working horizontally with long bars and considerable weight require at least two people in order to prevent buckling of the bars during placement.
- A **resistant tied of armours** (double tied or welding) **is needed** on those points that support the weight of the armour.
- The use of **scaffolding or auxiliary means is required** for heights greater than 1.5 meters (it reduces the operator safety and increases the need of more security measures).
- The **storage of armours** on scaffolding or auxiliary means involves losses of time and the need for a larger area, as well as implies a higher risk.
- The **provisional vertical shoring** of armours is necessary to maintain verticality and stability in the assembly.

- **Repeat all the steps** mentioned above to assemble the different areas, increasing labour needed and time spent.

Considering the shortcomings exposed, it becomes necessary to develop new systems that meet the placement of horizontal reinforcement bars in concrete construction elements; today this process is still performed in a manual way.

TECHNICAL DESCRIPTION

The research group "Materials and Construction Systems for Buildings" has developed a **new system that significantly facilitates the placement of the horizontal bars in constructive elements of reinforced concrete. The system has great potential to be used in any type of work as it is reusable, easy to install and can be managed by a single operator**. The system greatly facilitates the placement of horizontal reinforced bars by having a **reduced size and weight**.

This is a system of linear geometry and variable height (adjusted to the dimension of the construction element to be armed) comprising at least a main part which has or contains comb elements (fixed or removable) with slits or periodic projections (in a variable separation) where armours can rest depending on the specific needs of each project.

The system consists of more than one main piece with different shapes and dimensions that can be movable and incorporate a displacer which allows the folding and / or extension of the system for lifting up the horizontal reinforcement bars to the top area of the construction element.

Also, the system is designed so that it can be held to the structural basis providing stability as well as an easy removal once the horizontal bars are placed and tied.

For each section of the construction element to be armed it is only necessary to use two of these elements, longitudinally placed one on each side. The separation between elements should be appropriate to prevent bending between bars.

TECHNOLOGY ADVANTAGES AND INNOVATIVE ASPECTS

The advantages of the proposed element are:

- **Avoid hand chalked**. The slots allow modulated and precise placement of the horizontal bars without the possibility of deviations.
- **Reduces labour** allowing its installation and operation by a single worker. The armours rest horizontally on the proposed system and the size and weight of the system are reduced.
- **Avoid resistant tying of armours**. It enables stable support of the horizontal reinforcements, preventing the initial tying to bear the weight of the bars.
- **Reduce the use of scaffoldings and increase workers' safety**. The operators can always work at ground level.
- **Avoid problems of space and security** derived from horizontal gathering of armours in the scaffolding.
- **Avoid the use of auxiliary means**, with a considerable saving of time and economic resources.
- **Avoid provisional shoring of armours** to allow a stable support of each bar on two points.
- **Easy and low cost production**. The system consists of parts of simple geometry and easily manufactured by companies in different sectors.
- It is **reusable**, thus reducing the total cost of the product required on site.
- Can be made with different size and shape which gives **great versatility**. It can be used in any type of work and for construction elements with different heights.
- **Easy transportation**. It is an easily stackable system with a reduced weight and size.
- **Quick and easy placing**. It decreases installation time without using additional machinery such as cranes.
- **Easy to use in welded armours**, preventing movements of the bars and facilitating the execution of welding.
- Gets a **plumb armed** with exact distances between armours.
- **Can be removed without causing harm or damage** to the basic structural element.

CURRENT STATE OF DEVELOPMENT

Nowadays, different solutions of the proposed system have been studied using three-dimensional modelling software. In addition, one of the prototypes has been placed on-site by a practical application test of horizontal placement of armour on a concrete wall.

MARKET APPLICATIONS

Construction and Building Products.

COLLABORATION SOUGHT

Companies interested in acquiring this technology for **commercial exploitation** by:

- Patent license agreements.
- Technical cooperation agreements.
- R&D agreements.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by a patent application.

- Title of patent: "System for placement of horizontal armours".
- Application number: 201431775
- Application date: 28/11/2014

MARKET APPLICATION (1)

Construction and Architecture