

Study and Application of Cable Modeling Tools

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Abstract. With the rapid development of modern science and technology and the continuous advancement of industrial technology, more and more CNC bending machines have been applied in modern production and the development has become more mature. This paper introduces briefly a cable bending tool with the following features: it consists of a left and a right support plate hinged together under which handles are fixed; on the left support plate are two parallel vertical plates and under the lower plate a adjusting screw is equipped, which then pierce through the lower plate and against the upper plate; on the point where the upper plate and the adjusting screw meet a curved upper jaw and a lower jaw are set against the buckle; on the upper left corner of the right support plate a pressure roller is set.

Introduction

During the construction process of cable installing, cables need to be bent due to environment constraints. Currently, the common cable bending method is that operators stand on the bending part of cables and then bend the cable by hand. The absence of professional tools makes it difficult to bend cables and dissatisfying wiring technics can easily damage the cable sheath and cores, bringing safety risks.

This paper focuses on a new cable bending tool that consists of a left and a right support plate hinged together under which handles are fixed; on the left support plate are two parallel vertical plates and under the lower plate a adjusting screw is equipped, which then pierce through the lower plate and against the upper plate; on the point where the upper plate and the adjusting screw meet a curved upper jaw and a lower jaw are set against the buckle; on the upper left corner of the right support plate a pressure roller is set.

With the rapid development of modern science and technology and the continuous advancement of industrial technology, more and more CNC bending machines have been applied in modern production and the development has become more mature. as the second largest industry to automotive industry in China, product variety and domestic market share of wire and cable industry are both more than 90%. In the world market, total output value of China's wire and cable has surpassed that of United States and China has become the world's largest wire and cable producing country. Along with the rapid development of China's wire and cable industry, number of new enterprises continues to rise and overall technical level of the industry has been greatly improved.

Technological Process

Wire and cable manufacturing is completely different with production of most electromechanical products. For the general production of the latter, parts are assembled into a component and then a plurality of components are assembled into a single product, which is measured by number of units or number of pieces. Wire and cable are measured by length. All wire and cable are processed from conductors with layers of insulation, shielding, cabling and sheathing in the outside. The more complicated the structure of the product is, the more superimposed layers are.

Technological Features

Combined production mode of large length and superimposition has overall and controlling influence on the production of wire and cable, which involves

(1) Production process and equipment layout

All equipment in the production plant must be arranged reasonably according to the required technological process of products so as to make semi-finished products at various stages flow in sequence. Equipment layout should take into consideration the balance between production efficiency and production capacity, as some equipment may have to be two or more pieces to balance the manufacturing capacity of the production line. Therefore, reasonable match-making combination and arrangement of production site have to be considered from the perspective of balance between products and production capacity.

(2) Production and organization management

Production and organization management must be scientific and rational, careful and accurate, strict and meticulous; the operator must meticulously execute according to process requirements, or any problem in the production stages will affect the smoothness of production process and thus affect the product quality and delivering. Especially for multicore cable, insufficient length of a line couple or basic unit or any problem in quality can lead to the wasting of the whole cable. Vice versa, if a unit is too long, it must be sawn and abandoned.

(3) Quality management

Production method of superimposing continuously cables of great length makes it easily to affect quality of the whole cable by a trivial and instantaneous problem in any production stages. The more inner layer the quality defects are in, the more losses will be resulted in due to failure in stopping production in time. Different with production of assembled products, wire and cable cannot be reassembled or replaced with new parts; any quality problem of any parts or production process of wire and cable can lead to almost irreversible and irreparable outcomes for the cable. Post-processing is very negative, including sawing shorter, down grading or abandoning the entire cable, as it cannot be reassembled.

Quality management of wire and cable must run through the entire production process. Quality management and inspection department should tour check the entire production process; operators should check on their own operations; mutual inspection between the upper and lower production stages. These are important means to ensure product quality and improve economic efficiency of enterprises.

Production technology categories and large material flow

Wire and cable manufacturing process involves a wide range of technology categories, from the non-ferrous metal smelting and pressure processing to chemical technologies like plastics, rubber and painting, etc.; from textile techniques like lapping and weaving of fiber materials to processing technologies like lapping of metal materials, longitudinally covering of metal strips and welding and shaping of metal materials, etc..

Wire and cable manufacturing involves many kinds of materials, with many categories, varieties, specifications and a large quantity. Therefore, the using amount, spare amount, batch cycle and batches of all kinds of materials must be audited and checked. Meanwhile, decomposition of waste treatment, recycling, reuse and waste disposal should be taken as an important part of management; do good material quota management and pay attention to conservation work.

In wire and cable production, from the input and output and storage of raw materials and various auxiliary materials, transferring of semi-finished products to storage and distribution of products, material flow is too much and must be distributed rationally and managed dynamically.

Construction Statuses

During the construction process of cable installing, cables need to be bent due to environment constraints. Currently, the common cable bending method is that operators stand on the bending part of cables and then bend the cable by hand. The absence of professional tools makes it difficult

to bend cables and dissatisfying wiring technics can easily damage the cable sheath and cores, bringing safety risks. The new cable bending tool proposed in this paper is designed to solve the above problems as the tool can make it easy to bend wires and reduce cable damages. The tool is unique in that: it consists of a left and a right support plate hinged together under which handles are fixed; on the left support plate are two parallel vertical plates and under the lower plate a adjusting screw is equipped, which then pierce through the lower plate and against the upper plate; on the point where the upper plate and the adjusting screw meet a curved upper jaw and a lower jaw are set against the buckle; on the upper left corner of the right support plate a pressure roller is set. On the bottom of the lower jaw groove pinches are set, through which the adjusting screw penetrates and then at the penetrated end a ring is fixed. There are corresponding connecting tendons secured between the upper and lower plates and the left upright support plate. By turning the adjusting screw, one can fix the left side of a cable between the upper and lower plates, preventing it from bulk movement. Place the right side of a cable under the pressure roller and bend the cable into certain angle by pulling the two opposing handles. It is simple in structure and easy to operate with less effort, and also can bend cables flexibly by the pressure roller and prevent cables from damages caused by concentrated pressures. As shown in Fig 1

Brief Description

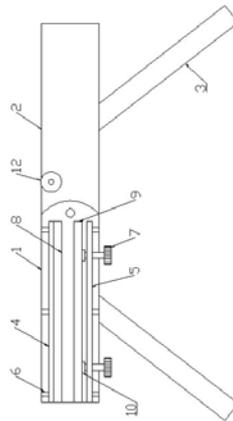


Figure 1 : Equipment structure

1 - left support plate, 2- right support plate, 3- handles, 4- upper vertical plate, 5-lower vertical plate, 6- connecting bars, 7- adjusting screw, 8- upper jaw, 9-lower jaw, 10- gusset, 11- ring, 12- pressure roller.

Conclusion

The proposed cable bending tool consists of a upper support plate 1 and a lower support plate 2 hinged together under which handles 3 are fixed; on the left support plate 1 two parallel vertical plates 4 and 5 are fixed by connecting bars 6. Under the lower vertical plate 5 an adjusting screw 7 is equipped, which then pierce through the lower vertical plate 5 and against the upper vertical plate 4; on the point where the upper vertical plate 4 and the adjusting screw 7 meet a curved upper jaw 8 and a lower jaw 9 are set against the buckle; On the bottom of the lower jaw 9 a groove pinch 10 is set, through which the adjusting screw penetrates and then at the penetrated end a ring 11 is fixed. Inside the groove pinch 10 corresponded with ring 11, a pressure roller 12 is equipped on the upper left corner of the right support plate

In operation, first fix one side of the cable between upper jaw 8 and lower jaw 9. By turning the adjusting screw 7, one can fix the cable and press the penetrated end of the cable under the pressure roller 12. By turning the opposite handles 3, the cable can be easily bended with less effort. It is simple in structure and also can bend cables flexibly by the pressure roller and prevent cables from damages caused by concentrated pressures.

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