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(54) **GUIDED LAUNCHING DEVICE FOR FIREWORK CASINGS**

(57) This invention comprises a launching device (1) for firework casings (13), the tubes (2) are guided by means of a computerized system.

This system allows for precision guiding of the ballistic path in 3D of the discharged casings through a CNC system (computer numerical controlled) to achieve the positioning of said casings over specific spatial coordinates (X1 Y, Z) in a predetermined time in order to trace words and/or drawings (12) in space through properly synchronized fireworks.

The operator (11) controlling the launch (1) is able to program any desired word, or draw the outline of any object on the monitor screen (9.1).

When the discharged device is activated, the same words or drawings from the monitor are seen in the sky, creating a fireworks show never before seen in pyrotechnics.

There are no risks when using this device, not even for the operator or the public watching the show.

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Description

OBJECT OF INVENTION

[0001] This invention belongs to the industrial sector of pyrotechnics.

[0002] With the aim to create an absolutely revolutionary firework show, we pretend to develop an electromechanical shuttle for three-dimensional shooting of fireworks, that is programmable and adjustable by a guidance system for computers type CNC (computer numerical controlled).

[0003] This device allows the mobility of the casing tubes of pyrotechnic shuttles during the show, so that it's possible to draw figures or even whole words in space,

INVENTION BACKGROUND

[0004] From a technological point of view, the large sector of firework technology assumes a certain slowdown of technological advances due to the scarcity of qualified technicians.

[0005] Regarding to the firing of ball casings, these were traditionally placed in a tube and were driven by a preload elevation. When reaching a certain altitude, they explode and produce fireworks in different ways and colors.

[0006] This tube has a closed base and by ignition of a quantity of powder located at the bottom and the effect of the generated gases, it pushes the casing towards the direction where it points the tube at the same time when it turns on the fuse. A few seconds later, the content will explode and will create the pyrotechnic effect.

[0007] The casings are filled with balls of powder and are usually made of two plastic semispheres which are connected by a snap. One part has a cylinder called "fuse" that controls the time it takes to reach the inside of the casing to explode. This fuse is usually loaded with pressed powder in order to slow down the ignition, so that there is enough time for the artifice to reach the desired height before exploding.

[0008] The mentioned tubes are usually placed at a fixed point of the controlled pyrotechnic area and in an upright position, although they may have some predetermined inclination.

[0009] The author of this new invention, in order to develop the stagnation of the pyrotechnic industry, has developed an electromechanical shuttle to shoot three-dimensional fireworks that are both, programmable and adjustable by a guidance system that is assisted by a computer type GNC, as described below.

DESCRIPTION OF THE INVENTION

[0010] This invention consists in a launching device of fireworks or casings whose pipes are positioned by a computer-assisted guidance. This system allows an accurate control of the ballistic tract of the devices that are

fired by a computerized system type CNC (computer numerical controlled), to follow and ballistical trace of certain three-dimensional (3D) trajectories from the whole launch tube. So it's possible to trace letters and drawings in space. To do so, we calculate on the one hand the powder charges that allows to position each casing on its spatial coordinates (X, Y, Z), and on the other hand the delay times which are required for it's synchronized explosion.

[0011] The operator controls the shuttle with the screen of his monitor screen and can also set the outline of a desired figure or word to draw in space. By turning on the device shot into space it will display the same words or drawings of the monitor screen, creating a show that was never seen before in the pyrotechnic history.

[0012] The activity of the shots of the firework is associated to a number of inherent risks due to the handling of potencial dangerous explosives, that affects both, staff and audience or visitors. Therefore, it is very important to maintain a high level of product quality as well as a high technical precision to assure a low level of error.

[0013] One of the beauties of this project is that it provides a high level of accuracy and security to the show that is impossible to achieve with the current trigger systems. The development of this invention and its improvement will involve the integration of information technology, advanced mechanical and electronic shooting systems. The international pirotechnic sector currently fails in such a system.

[0014] Technology of Computer Numerical Control (CNC) is well known in other sectors, and allows certain tools to draw complex figures in two or three dimensions (2D and 3D), all this with a high precision of thousandth of millimeter, but it has never been applied to a control of tube launchers (or mortar) of fireworks whose technology is also well known, but static on the orientation of these mortars, whose mobility under CNC control would provide an absolutely revolutionary and fascinating show for the visitors. Furthermore, it will open an excellent market for any company that desires to impact their customers using this system, used as an advertising medium.

[0015] Its application to the firework industry in all its activities (manufacturing or design shows) will constitute a high-impact for the technological revolution worldwide.

[0016] The development of this new technology will give an extraordinary impulse to this industry, especially for companies that are involved in the firework area, because of their national and international significance.

[0017] From initial market research since today, the application of such techniques type CNC to the firing of projectiles has been used exclusively in the military sector, with completely different problems and aims (to track moving targets or moving cannons). With the development of the electromechanical shuttle we pretend to create a new dimension in the world of fireworks, exclusively for the civilian area and for recreational application: CNC-assisted shooting fireworks.

DESCRIPTION OF THE DRAWINGS

[0018] To complete the description of this invention and with the aim to help understand the features, below we attach a number of figures con an illustrative and not limiting caracter. We will show some drawings below whose main components are:

- (1) launching device
- (2) Tubes.
- (3) Oscillating body.
- (4) Turnable base.
- (5) Tread.
- (6) Fixed base.
- (7) Motorized horizontal axis.
- (8) Motorized vertical axis.
- (9) Numerical control equipment.

(9.1) Monitor/Screen,

- (10) Cable,
- (11) Operator.
- (12) Drawing, word.
- (13) firework casings

Figure 1A: a front elevation view of the shuttle.

Figure 1B: a side elevational view.

Figure 1C: a top plan view.

Figure 2: a perspective view.

Figure 3: an exploded perspective view with its main components.

Figure 4: a perspective view of a firework display, which shows the operator (11) controlling the computer numerical control (9), once programmed with the word or picture (12) it can be projected in space. We will also have a look on the casing (13) driven by the shuttle (1), tracing the word "Valencia".

PREFERRED PERFORMANCE OF THE INVENTION

[0019] Among the different types of shuttles (1) of pyrotechnic casing that can be produced by this invention, the preferred performance is described below:

Based on the design and calculation of all components of the shuttle (1), first of all you have to build a fixed base (6) on which you have to install the motorized vertical axis (8) that allows you to rotate the shuttle (1) on the vertical axis. Then place the treat (5) that relies on the turning base (4). This turning base (4) is installed along the motorized horizontal axis (7) which produces the rotation drive of the shuttle on this axis.

[0020] Furthermore you have to put the oscillating body (3) on fixing tube assembly (2),

[0021] The operation of both motors that are controlled by the computer numerical controlled system (CNC), al-

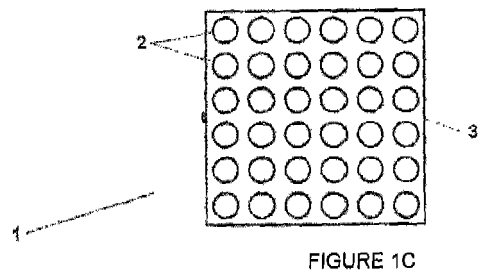
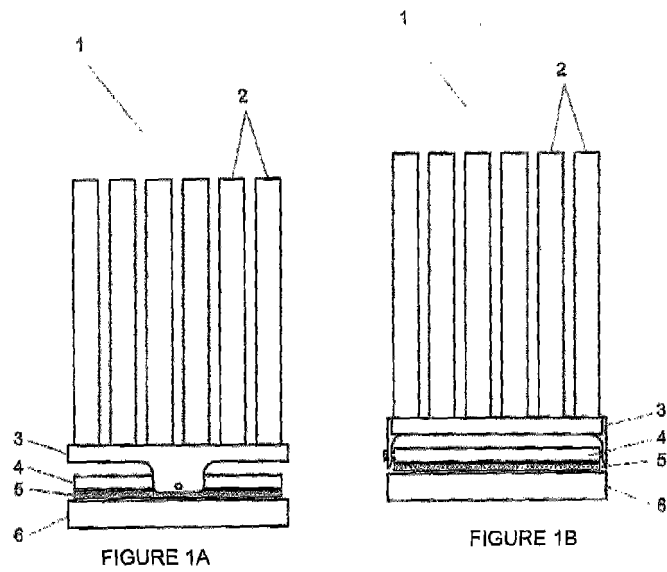
lows the orientation of the shuttle in a way that the the projected casing (13) can be pushed in space, tracing a pre-programmed ballistic trajectory as their coordinates indicate (weight, load, time of delay, etc.) so that they can draw geometric figures and/or predefined letters.

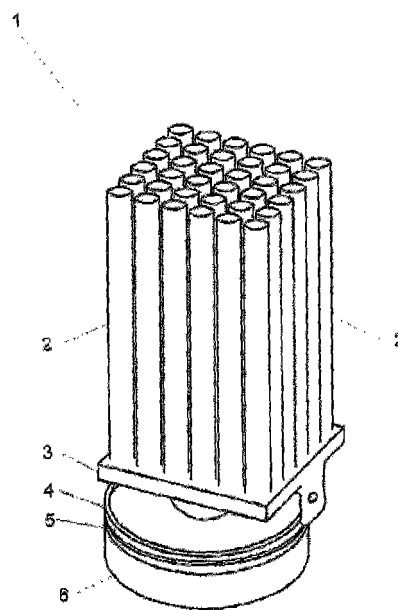
[0022] The installation is completed with elements known as Computerized Numerical Control equipment (9), monitor/screen (9.1), cable (10), specific software etc.

[0023] Once having sufficiently described the nature of this invention and its practical application, it's important to add that both, its shape and the materials and manufacturing process are susceptible to change, and just if they do not substantially affect the characteristics which are claimed below.

Claims

1. Adjustable shuttle of pirotechnic casing is peculiar because it is composed by a cluster of tubes (2) arranged on a oscillating body (3), hinged on a turnable base (4), which is supported on a treat (5), supported by the fixed base (6), and their movements are directed by motors from a computer numerical control that allows individually programmed ballistic trajectories for each of the casings fired to achieve their spatial position in 3D (according to coordinates X, Y, Z) according to a pre-programmed explosion time, that allows you to synchronize their flashes to draw pictures and/or letters in space.
2. Adjustable shuttle of pirotechnic casing according to the first claim, is peculiar because the swing frame (3) provides in his bottom part a horizontal shaft motor (7) which can rotate about a given zenith angle.
3. Adjustable shuttle of pirotechnic casing according to the first claim is peculiar because the turntable (4) has a motorized vertical shaft (8) which can rotate about an angle between 0 ° and 360 °.
4. Adjustable shuttle of pirotechnic casing according to previous claims is peculiar because the positioning of the shuttle through the motorized shaft (7) and (8) is produced by a computer numerical controlled system (CNC) with their polar coordinates.
5. Adjustable shuttle of pirotechnic casing according to previous claims is peculiar because is has a computer program that allows the operator (11) to set a picture or word (12) on the display monitor screen (9.1), which plays the shuttle in space while shooting the casing of the fireworks (13).





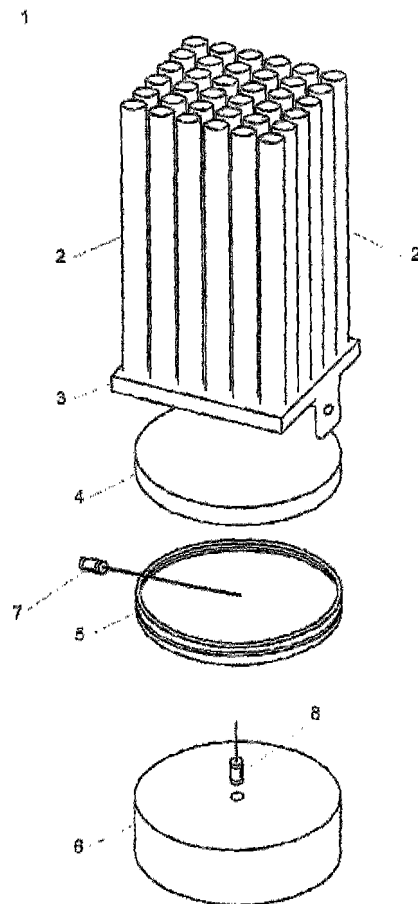


FIGURE 3

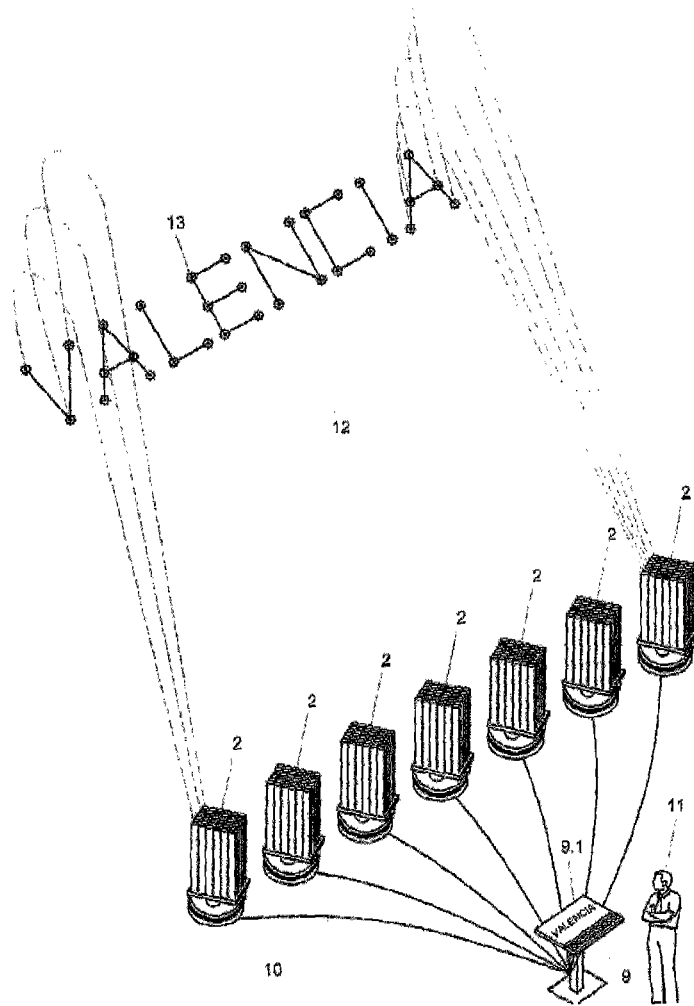


FIGURE 4