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(54) Flame effect apparatus

(57) Flame effect apparatus is disclosed, e.g. for use in an electric fire to provide a simulated flame effect. Such a fire may include a frame chassis (7) with an illumination source (1), utilizing either lamps or LEDs, a horizontal axis motor (5) affixed to the frame chassis (7), and, securely affixed to the horizontal axis motor (5) a driven element (8). The opposite end of the driven element (8) is secured in a bearing housing (11), which is affixed to the frame chassis (7) on the opposing side but lying on the horizontal axis of the motor (5). Swivel joints, loose fitting rings, or similar devices (9) attach a sheet or strips of reflective material (2) suspended from the driven element (8). The light source (1) illuminates the reflective material (2) and the horizontal axis motor (5) rotates the driven element (8) in a circular, vertical plane motion. This provides the illusion of a flame effect when viewed through a glass or plastic panel (4).

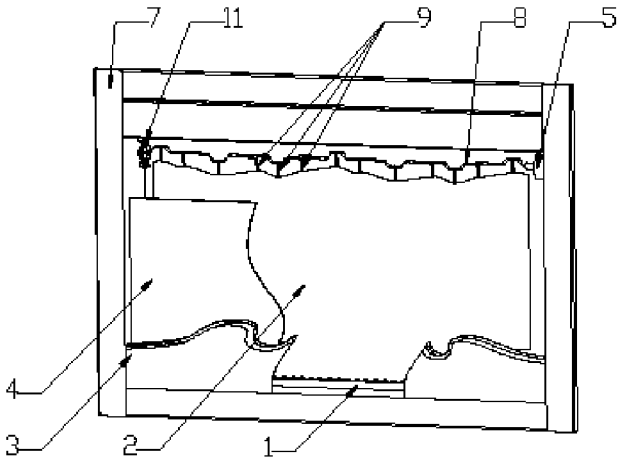

figure 1A

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Description

[0001] This invention relates to flame effect apparatus, for example for use in electric fires having a flame effect.

[0002] GB-A- 2385413 discloses a flame effect for an electric fire having a suspended fabric sheet visible behind a glass panel. The base of the fabric is oscillated by an electric motor via a crank drive.

[0003] EP-A-1223385 discloses apparatus for simulating a fire and for installation in a fireplace to give the impression of an actual fire burning in the fireplace. Flame and fire simulated patterns are projected on to a window at the front of the apparatus. The apparatus includes a foil suspended from near the top of a housing and means for moving the foil by impact on its base or at a point below its suspension.

[0004] US-B-6691440 discloses a fire construction for use in an open hearth and having a fuel bed, a set of reflective sheets above the bed and, above the sheets, a circulating drum or belt with short reflective strips on it. The strips are illuminated as the drum or belt rotates and their reflection from the plates gives the illusion of flames coming from the fuel bed.

[0005] I have now found that a much more realistic effect may be achieved by the use of a reflective sheet or strips (ribbons) suspended behind a window through which they may be viewed, and wherein the suspension itself is moved in rotary fashion by an electric motor. Preferably the reflective sheet or strips are mounted via swivel joints or loose-fitting rings on a shaft which is moved in a circular motion about a horizontal axis parallel to the shaft itself. This may be easily achieved by suspending the sheet or strips on one or more shaft sections offset from its axis of rotation. Each section essentially rotates in a vertical plane.

[0006] The illumination source is placed so that it reflects off the reflective material which is moved by the motor to provide a realistic 3D flame effect looking like a real fire. By using the approach according to the present invention, an electric fire apparatus mounted in a thin or full depth electric fire body may be provided with the appearance of a real fire.

[0007] In a typical embodiment, the apparatus has, located near to top of a housing, a fixed horizontal-axis motor which rotates a driven element on which is suspended, via one or more sections of the shaft offset from its axis of rotation, a reflective material, either a full sheet or individual strips, using swivel joints or loose fitting rings. The circular, vertical plane rotation of each offset part of the driven element, offset provides a 4-direction movement of the reflective material - upward, downward, forward, and rearward. The reflective material is placed behind a glass or plastic panel of a choice of various colours, dependent on the desired flame colour or colours, and illuminated by either single or multiple colour LEDs or by various colour lamps.

[0008] By suitably choosing the materials, and the speed at which rotation is effected, the appearance of the simulated flame is that of a vertically upward rolling flame action along with a concurrent flame depth action, both at the base and at the tip of the flame. Variations in the design configuration of the driven element and variations in the methods of attachment of the reflective material to this driven element can be used to create different flame patterns.

[0009] The invention is illustrated by way of example with reference to the accompanying drawings, in which:

Figures 1A and 1B show respectively a part broken away front view and a vertical section through an electric fire with flame simulation according to the present invention, and

Figures 2A to 2D show the movement of the driven shaft and its associated ribbons on an enlarged scale.

[0010] Referring to the drawings, an electric fire is comprised of a frame chassis 7, an illumination source 1 located in its base, a horizontal axis motor 5 affixed to the frame chassis 7 near the top, and a driven element 8, which can be of various designs to create different 3D flame effect patterns, attached at one end to the drive shaft of motor 5. The other end of the driven element 8 is secured in a bearing housing 11, which is affixed to the frame chassis 7 on the opposite side. Bearing housing 11 lies on the horizontal axis of rotation of the drive shaft of the motor 5. A sheet of reflective material 2 is attached via swivel joints, loose fitting rings, or similar devices 9 to the driven element 8. The reflective material 2 is located behind a glass or plastic panel 4, which is affixed to the frame chassis 7 behind an artificial fuel bed 3.

[0011] When the motor and light source are switched on, the light source 1 illuminates the reflective material 2 from the front underside and the horizontal axis motor 5 rotates the driven element 8 in a circular, vertical plane motion, thus moving the reflective material 2 in the following pattern: up/forward, up/rearward, down/rearward, and down/forward, as shown in Figures 2A to 2D. The movement of the reflective material 2 in this pattern provides the desired upward rolling and 3D flame appearance.

[0012] As shown in Figures 2A to 2D - the central axis of rotation of the driven element 8 is denoted 10 and corresponds to the horizontal axis of the motor 5 (not shown in Figures 2A to 2D). The offset portions of the driven element 8 are connected to a swivel joint, loose fitting ring, or similar device 9 which is attached to the reflective material 2. The horizontal axis motor 5 rotates the offsets of the driven element 8 in a clockwise direction as seen in the Figures. Fig 2A depicts the up/forward movement of the reflective material 2 when the offset portion 8 of the driven element is in around the 225 degrees from the vertical position. As the horizontal axis motor 5 continues to rotate the offset of the driven element 8 in a clockwise direction, the reflective material 2

passes the 270 degree from vertical position, at which the reflective material 2 is in its most forward position, to around 315 degrees from vertical, as shown in Fig 2B, depicting the up/rearward movement of the reflective material 2. As the horizontal axis motor 5 continues to rotate the offset of the driven element 8 in a clockwise direction, carrying the reflective material 2, it passes the vertical position, at which the reflective material 2 is in its highest position, towards the 45 degrees from vertical position shown in Fig 2C, corresponding to a down/rearward movement of the reflective material 2. As the horizontal axis motor 5 continues to rotate the offset of the driven element 8 in a clockwise direction, the reflective material 2 passes the 90 degree from vertical position, at which the reflective material 2 is in its most rearward position, towards the 135 degree from vertical position as shown in Fig 2D, depicting the down/forward movement of the reflective material 2. As the horizontal axis motor 5 continues to rotate the offset of the driven element 8 in a clockwise direction, the reflective material 2 passes the 180 degree from vertical position, at which the reflective material 2 is in its lowest position, and continuing back to the originating position as shown in Fig 2B. The movement of the reflective material 2 from its lowest to highest positions provides the desired flame growth and flame tip action. The movement of the reflective material 2 from its most forward to most rearward positions provides the flame depth, or 3D appearance.

[0013] As shown, the horizontal axis motor 5 is located such that its direction of rotation imparts an upward movement of the reflective material 2 when this material is at its closest position to the glass or plastic panel 4. The continued rotation of the driven element 8 lifts the reflective material 2 to its highest position, thus simulating flame growth and flame tip movement. Further rotation of the driven element 8 translates the reflective material 2 to its most rearward position, thus simulating flame depth. Variations in the driven element 8 design can be used to create different flame effect patterns. The colours of the glass or plastic panel 4 and of the light source 1 may be adjusted to produce the desired flame colours. By using variable colour LEDs and suitable control circuitry, further variation over time may be easily achieved.

[0014] The electric fire may be provided with electrically powered heating elements of known type, and with likewise known means to blow hot air from the unit if desired.

Claims

1. Apparatus for simulating a flame effect comprising a viewing window(4), a sheet or strips of reflective material (2) suspended behind the window(4), and means for illuminating (1) and imparting motion to (5) the reflective material (2) to provide a simulated flame effect, **characterized in that** the means for imparting motion to the reflective material comprises a motor (5) adapted to rotate a driven element (8) on which the reflective material (2) is suspended.

2. An apparatus according to claim 1 wherein the motor (5) and driven element (8) are mounted such that the driven element (8) rotates in a vertical circular plane motion, moving the reflective material (2) in flame like ways.

3. Apparatus according to claim 1 or 2 wherein the the driven element (8) on which the reflective material (2) is suspended is a shaft configured with at least one offset on which the reflective material (2) is suspended.

4. Apparatus according to any one of claims 1 to 3 wherein the reflective material is suspended from the driven member via swivel joints or loose-fitting rings (9).

5. Electric fire apparatus incorporating a flame effect simulation apparatus according to any one of the preceding claims.

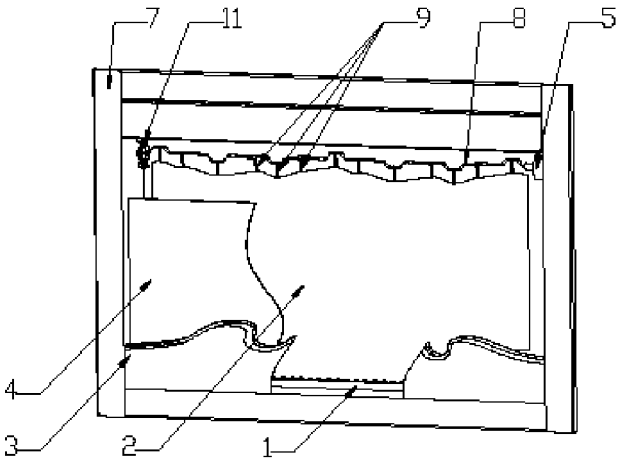

figure 1A

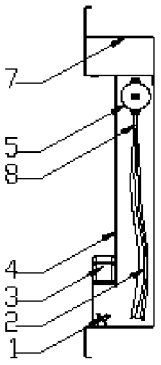

figure 1B

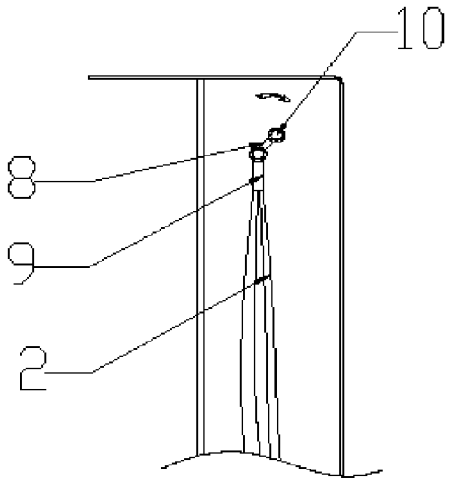

figure 2A

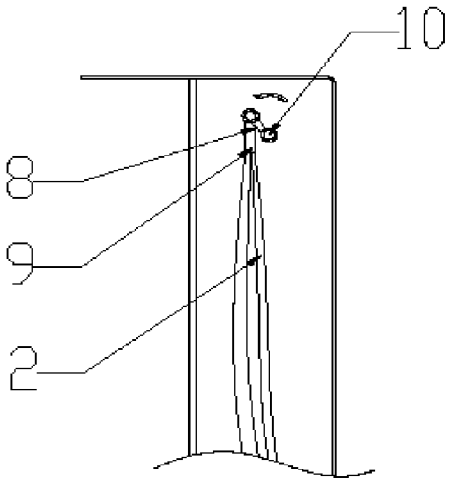

figure 2B

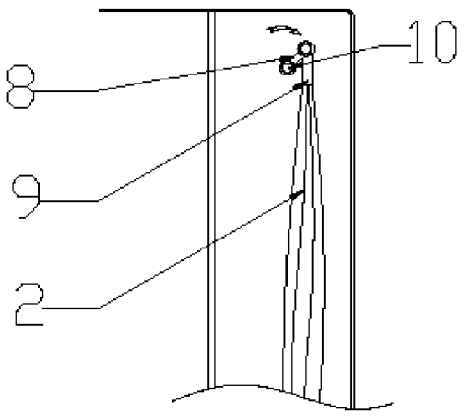

figure 2C

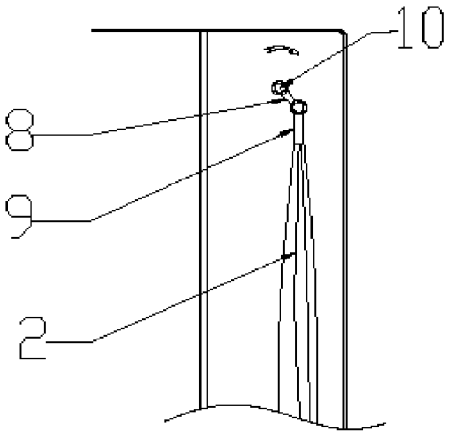

figure 2D

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EUROPEAN SEARCH REPORT

Application Number
EP 10 19 3035

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GB 2 404 730 A (CREATIVE FIRES UK LTD [GB]) 9 February 2005 (2005-02-09) * the whole document *	1-5	INV. F24C7/00 F21S10/04
Y	US 2003/156828 A1 (JAMIESON DONALD R [CA] ET AL) 21 August 2003 (2003-08-21) * paragraphs [0016], [0018], [0021]; figure 2 *	1-3,5	
Y,D	GB 2 385 413 A (STOCKWELL ROBERT JOHN [GB]) 20 August 2003 (2003-08-20) * page 1; figure 4 *	4	
A	GB 2 372 806 A (STOCKWELL ROBERT JOHN [GB]) 4 September 2002 (2002-09-04) * abstract; figures *	1-5	
A	NL 1 024 166 C2 (A & L INTERNAT B V [NL]) 1 March 2005 (2005-03-01) * figures *	1-5	
A	US 2004/264949 A1 (DENG DAVID [US]) 30 December 2004 (2004-12-30) * paragraph [0014]; figures 2,3 *	1	TECHNICAL FIELDS SEARCHED (IPC) F24C F21S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 June 2011	Verdoodt, Luk

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- GB 2385413 A **[0002]**
- EP 1223385 A **[0003]**
- US 6691440 B **[0004]**