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[54] SIMULATED FIRE APPARATUS

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[52] **U.S. Cl.** **431/18,** 431/125, 272/14, 272/15, 40/106.51

[51] **Int. Cl.**.....**F23n**

[58] **Field of Search** 272/14, 15; 431/18, 125; 40/106.51, 106.52

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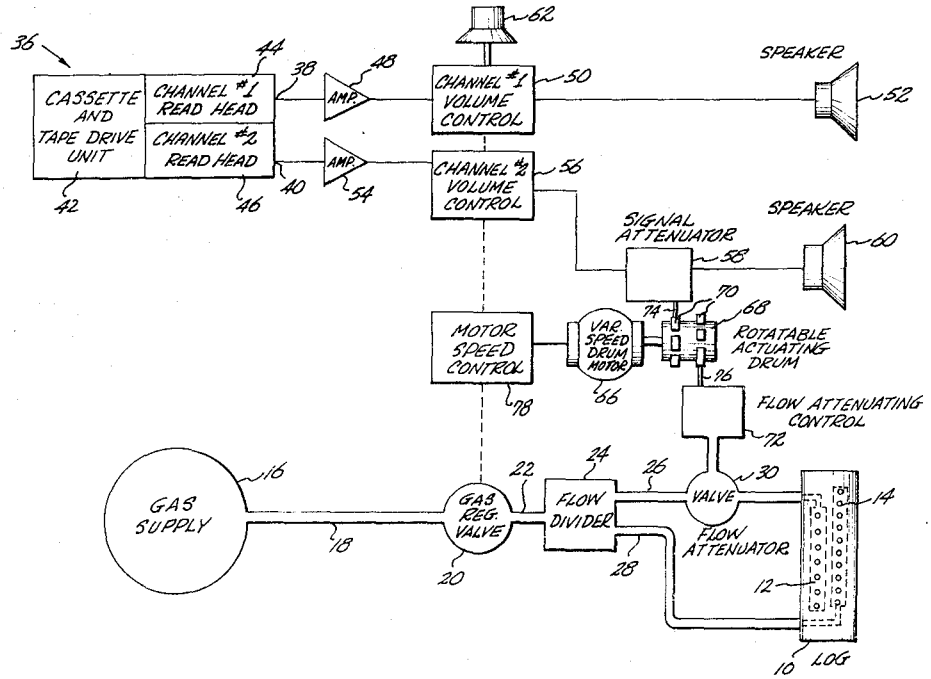
[57] **ABSTRACT**

Simulated fire apparatus wherein a gas or electrically operated flame portrayer is adjusted to vary the type of flame portrayed. Such adjustments are coordinated with adjustments in sound effects produced by a speaker.

10 Claims, 4 Drawing Figures



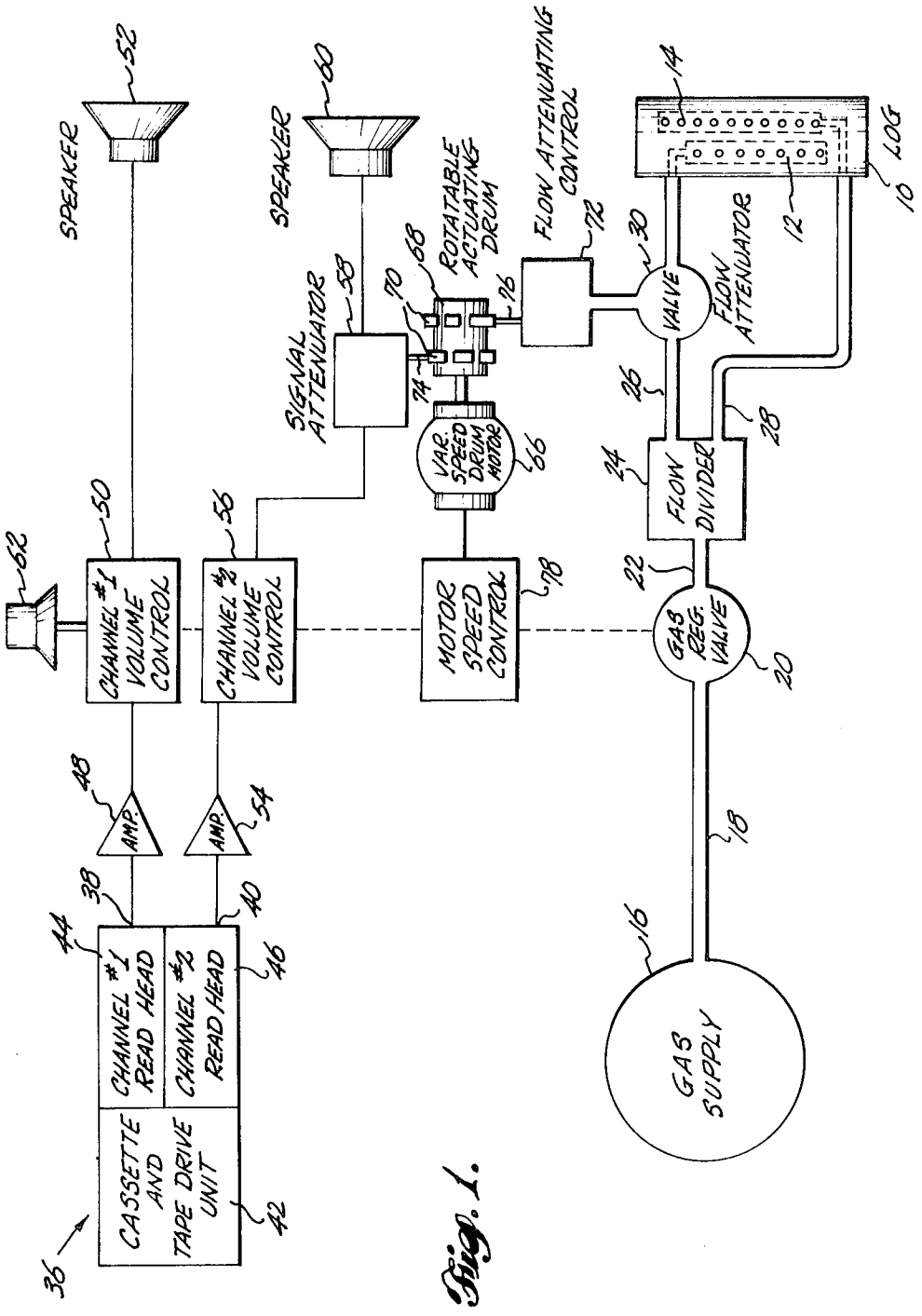

SPEAKER
52
SPEAKER
60
FLOW ATTENUATING CONTROL
72
14
LOG
10
ROTATABLE ACTUATING DRUM
68
70
76
SIGNAL ATTENUATOR
58
74
VAR. SPEED DRUM MOTOR
66
VALVE
30
FLOW ATTENUATOR
12
26
28
24
FLOW DIVIDER
62
50
56
CHANNEL #1 VOLUME CONTROL
CHANNEL #2 VOLUME CONTROL
MOTOR SPEED CONTROL
78
22
GAS REG. VALVE
20
48
AMP.
54
AMP.
38
40
44
46
CHANNEL #1 READ HEAD
CHANNEL #2 READ HEAD
18
16
GAS SUPPLY
CASSETTE AND TAPE DRIVE UNIT
42
36

Fig. 1.

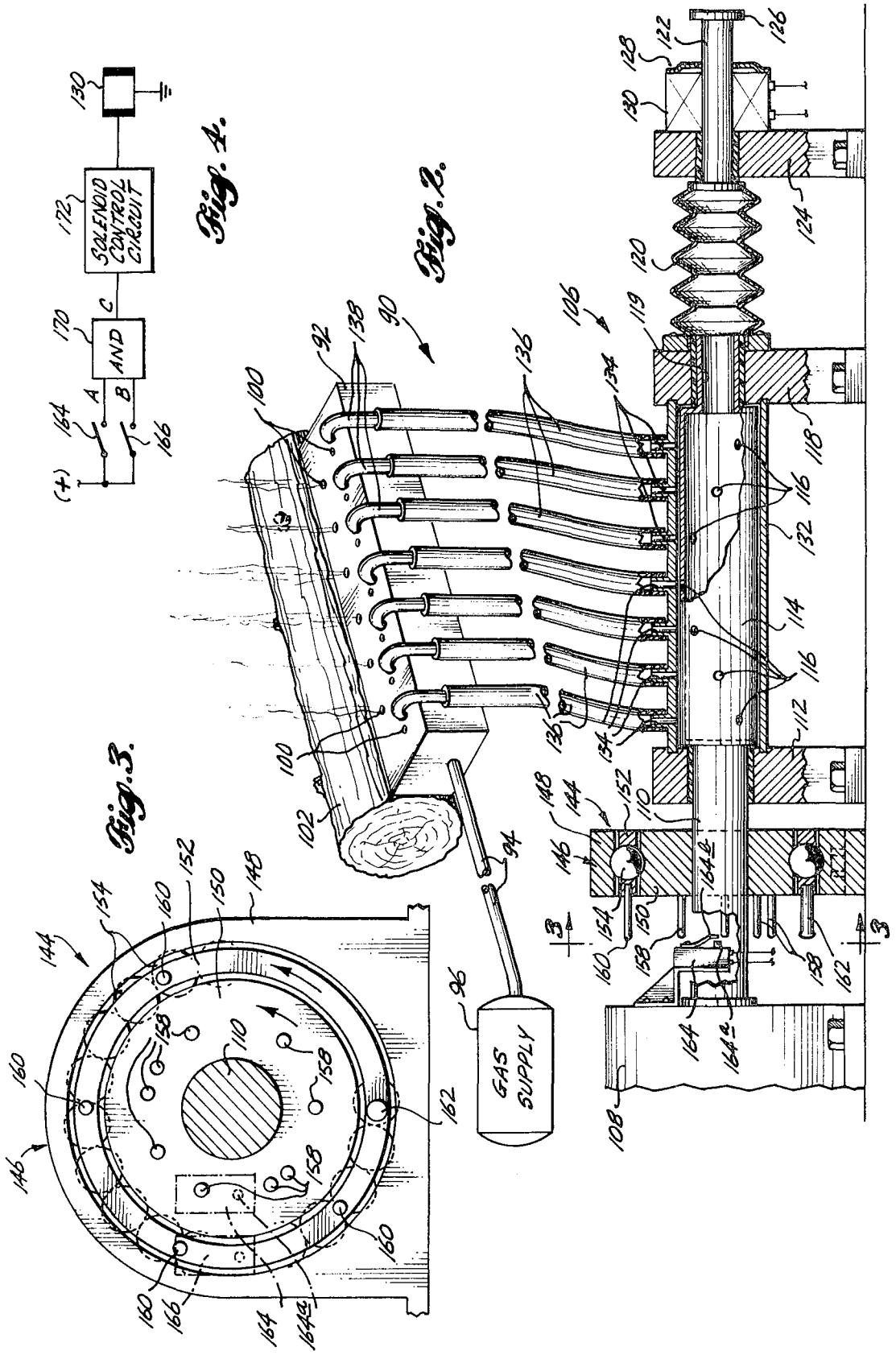


Fig. 4.
130
172
SOLENOID CONTROL CIRCUIT
170
AND
A
B
C
164
166
(+)
Fig. 2.
90
92
138
100
136
106
134
119
120
122
126
128
130
124
118
116
132
114
112
102
94
148
144
152
110
146
154
150
158
160
162
164
164a
96
GAS SUPPLY
108
Fig. 3.
144
154
160
152
150
148
146
110
158
162
166

SIMULATED FIRE APPARATUS

This invention relates to apparatus for producing a simulated fire, and more particularly to such apparatus which includes means for visually portraying a fire, which may be gas or electrically operated, as well as means for producing fire sound effects.

The apparatus produces varied sound effects, and such are coordinated with changes made in the type of flame portrayed, to produce a very realistic simulation of an authenic fire.

One object of the invention, therefore, is to provide novel apparatus for simulating a fire which includes means for coordinating changes in fire sound effects with changes in the type of flame simulated by the apparatus.

Another object is to provide such apparatus wherein fire sounds are produced electrically.

Yet another object of the invention is to provide apparatus as described which includes manually controlled means for controlling the intensity of sound produced, and means responsive to this manual control producing a change in the manner that the flame is portrayed.

These and other objects and advantages will become more fully apparent from the following description, when such is read in conjunction with the accompanying drawings wherein:

FIG. **1** is a schematic illustration of apparatus according to one embodiment of the invention;

FIG. **2** is a view of a modified version of apparatus according to the invention with a portion of the apparatus illustrated in cross section;

FIG. **3** is an enlarged view, taken generally along the line **3—3** in FIG. **2**; and

FIG. **4** is a simplified schematic diagram of an electrical circuit in the invention as illustrated in FIG. **2**.

The apparatus illustrated in FIG. **1** is one in which gas fuel is relied upon to produce the flame. As indicated earlier, the invention contemplated herein is also usable in conjunction with electrically operated means for simulating a flame, with such flame simulating means being well known in the art. With an electric system, some modification of the apparatus would be required, as will be hereinafter described.

Considering now in more particular the details of the invention as illustrated in the figure, a simulated log is shown at **10** of the type that might be placed in a fire. The log, as would be conventional, is made of nonflamable material. Associated with the log, and indicated schematically at **12** and **14**, are a pair of gas burners, such having conventional burner jets through which gas is ejected to be ignited on leaving the jets.

The log and the burner jets are referred to herein broadly as a visual flame portrayer, such being actuated by gas fed to the log, such gas or fuel being referred to broadly as an operating medium fed to the portrayer. In the case of an electrical system, the operating medium comprises electrical current fed to the flame portrayer.

Indicated generally at **16** is a gas supply. Gas is fed to the log from the gas supply through a conduit **18**, what is referred to as a gas regulating valve **20**, which is adjustable to vary the rate of gas flow downstream of the valve, a conduit **22**, a flow divider **24**, and conduits **26**, **28**.

Conduit **28** extends directly from the flow divider to burner jet **14**. Thus, for a given setting of the valve **20** the flame produced in jet **14** remains of substantially uniform size and intensity. Conduit **26** connects with burner jet **12** through a valve **30**, also referred to herein as a flow attenuator, since on adjustment of the valve to close it the valve cuts down the flow to the burner jet. As will become more fully apparent, adjustment of the valve **30** is relied upon to produce periodically a change in the size and intensity of the flame emanating from burner jet **12**.

As discussed briefly, with the apparatus of the instant invention sound effects are produced which accompany the visual effect of the burning log.

Considering now in more detail the means provided for providing sound effects, shown generally at **36** is what I have referred to broadly as a player unit, which in the particular embodiment illustrated includes two output channels **38** and **40**. Unit **36** is effective to produce in each an electrical signal which is electrically representative of a sound effect characterizing a burning fire, so as to produce such a sound when fed to an amplifier and speaker which converts the same to audio sound. By providing two channels, it is possible to produce in one a signal representative of a continuous roaring sound, such as characterizes a fire, and in the other a signal representative of a snapping or popping sound, also characterizing a log fire.

The player unit may take any of a number of forms, as for instance the usual tape cassette, with the tape having two tracks thereon. The cassette which houses the continuous tape as well as the drive unit therefore is indicated at **42**. Also part of the player unit are the two read heads for the two tracks on the tape, indicated at **44** and **46**, respectively, producing in channels **38** and **40** the two types of signals representing electrically two types of fire burning sounds.

Considering specifically output channel **38**, shown at **48** is an amplifier serving to amplify the signal. Such is fed through a volume control **50** to a speaker shown at **52**.

Output channel **40** is electrically connected to amplifier **54** which amplifies the signal in this channel. The signal then is fed through a volume control **56** adjustable to change the volume of the signal, and thence through what is referred to as a signal attenuator **58** to a speaker **60**.

Volume control **50** and volume control **56** are ganged to a control knob **62**, also referred to as a manually adjusted control. On turning of the knob, therefore, both are adjusted simultaneously to produce an increase or decrease in the volume of the signal being handled. In the case of the signal in output channel **38**, for a given setting of the knob the volume of the signal feed to the speaker **52** remains constant. In connection with channel **40**, the signal fed to speaker **60** is additionally effected by adjustments made in signal attenuator **58**.

Shown at **66** is a variable speed motor driving a drum or actuator **68**. In the particular form of the invention illustrated, such may have cams or other means **70** on the periphery thereof moved in circular courses on rotation of the drum. The motor and drum constitute means in the organization for producing periodically adjustments in signal attenuator **58** as well as in a flow

attenuating control **72**. Such may be done as through sensors or fingers, such as are shown at **74**, **76**, which are arranged to be in the path of the cams disposed on such drum thereby to be shifted into position on moving over a cam to effect an adjustment in the signal attenuator and flow attenuating control, respectively.

Signal attenuator **58** may be merely a switch which is opened and closed with movement of the sensor **74** periodically to cut off and then restore the signal to speaker **60**. Alternatively, the attenuator may be of a construction wherein the signal is not completely cut off, but instead periodically sharply reduced in volume on the sensor riding over one of such cams.

With flow attenuator or valve **30** being a solenoid operated valve, flow attenuating control **72** may take the form of a switching device actuatable periodically to open and close the valve in response to cam movement relative to sensor **76**.

Also illustrated in the figure is a motor speed control **78**. This is connected to the variable speed motor whereby adjustments in the speed control produce a change in the speed at which the motor runs. The motor speed control is also ganged to control knob **62**. The connection is such that with the knob turned to increase the volume in controls **56** and **50**, motor speed increases to increase the activity of the signal attenuator **58** and flow attenuating control **72**.

Also to be noted in the drawing is that the gas regulating valve **20** may be ganged to the knob so that with adjustment of the knob to increase the volume the valve is opened up a greater extent. This is reflected in a more brilliant flame in burner jet **12** and burner jet **14**.

From the above it will be seen that signal attenuating means, in the form of the actuating drum and attenuator **58** and attenuating control **72**, is connected between the circuit supplying the speaker **60** with the signal and the means, more specifically conduit **28**, supplying the gas or operating medium to the log **10**. It should also be apparent that with the apparatus of the invention, attenuation in the flow of fuel to the log is coordinated with attenuation of the signal supplied to speaker **60**.

In an installation where an electrically operated means is provided for simulating the flame, means such as a rheostat would be substituted for the valve **30**, for the purpose of varying the current supplied to the electrically operated device from a source of electric current. Suitable electronic components would be substituted for the flow divider and flow attenuator, to obtain the desired control in the flow of electric power to the log simulator.

Referring now specifically to FIG. **2**, at **90** is indicated generally a modified version of simulated fire apparatus according to the invention. Apparatus **90** includes a gas burner **92** which is connected, through a pipe **94**, to a gas supply indicated generally at **96**. Gas fed to the burner is ejected through holes **100** disposed in a pair of rows on top the burner. Ignition of such gas produces a visually observable flame above the burner which may be seen above, and may appear to be burning from, an artificial log **102** adjacent the burner, when viewed from the opposite side of the log.

At **106** is indicated generally apparatus operable to produce a random popping noise, such as occurs in natural wood fires, and for varying the visually observable effect of the flame at the burner with such coordinated with the random popping sounds.

Apparatus **106** includes a motor **108** having an output shaft rotatable about a substantially horizontal axis. The right end of shaft **110** as viewed in FIG. **2**, is mounted for rotation in a stationary support **112**.

A hollow cylindrical manifold **114** is secured to the end of the shaft for rotation therewith. A plurality of holes **116** disposed in a spiral pattern open through the sides of the manifold. The right end of manifold **114** is journaled for rotation in a stationary support **118**.

A port **119** opens through the right end of manifold **114** and communicates with the interior of an expandible-compressible bellows **120**. The left end of bellows **120**, as viewed in FIG. **2**, is secured against movement on support **118**. The right end of the bellows is closed off and secured to the left end of an elongated plunger **122**. Plunger **122** is mounted for sliding movement in the direction of its longitudinal axis, (to the left and right as seen in FIG. **2**) in a stationary support member **124**.

Plunger **122** projects to the right from support **124** and through the coil of a solenoid **130**. When the coil is deenergized, plunger **122** is in the position shown in FIG. **2**, which is a position shifted to the right, with bellows **120** expanded. Energizing of the solenoid drives the plunger to the left with head **126** of the plunger striking a sounding member **128** and producing a popping sound. As the plunger is driven to the left by the solenoid, bellows **120** is compressed, forcing compressed air into manifold **114**.

An elongated, hollow, cylindrical tube **132**, having an internal diameter slightly greater than the outer diameter of manifold **114** surrounds manifold **114** and is secured at its ends in supports **112**, **118**. A series of openings **134** are disposed in-line along the top of the tube. Openings **134** communicate with the interior of tube **132** and each has an end of an elongated conduit **136** connected thereto. Each of conduits **136**, in turn, has an inverted J-shaped nozzle **138** connected to its other end. Each of nozzles **138** is secured in a position whereby it may direct a flow of air form its associated conduit **136** onto one of holes **100** in burner **92**, as will be described in greater detail below.

Holes **116** distributed in a spiral pattern about manifold **114** are so positioned that as the manifold is turned by motor **108** each of holes **116** will successively register with an associated one of holes **134** in tube **132**.

Air forced into manifold **114** by the compression of bellows **120** escapes through the hole **116** in manifold **114** which is then adjacent one of holes **134** and is routed through the conduit **136** associated with such hole, whereby it is blown against the flame emanating from one of holes **100** in burner **92**. This air blowing against the flame from one of holes **100** either momentarily extinguishes such flame, or diverts it substantially whereby it alters the visual effect of the flame from the burner. This occurs in coordinated relationship with the popping sound produced by the head **126** of the plunger striking sounding member **128**.

The operation of solenoid **130** is controlled by a random timing device indicated generally at **144** (see FIGS. **2** and **3**). Device **144** includes a roller bearing as-

sembly **146** which has a stationary outer ring **148**, a rotatable inner ring **150**, and a retainer ring **152** between rings **148**, **150**. Inner ring **148** is secured to shaft **110** for rotation therewith. Retainer ring **152** is rotatable also and maintains a plurality of ball bearings **154** aligned in the races provided in inner and outer rings **148**, **150**, respectively.

A plurality of pins **158** are secured to one side of inner ring **150** and project outwardly therefrom in a direction paralleling shaft **110**. Pins **158** are all equidistant from the longitudinal center line of shaft **110** (as best seen in FIG. 3) and are randomly spaced thereabout. A plurality of pins **160** and **162** are secured to and project outwardly from retainer ring **152** in a direction paralleling pins **158**. Pins **160**, **162** are equidistant from the center line of shaft **110** and are randomly spaced thereabout on the retainer ring. Pin **162** has a head which is considerably larger than the heads of pins **160**. Ring **150** and its associated pins are referred to herein as an operator, and ring **152** and its associated pins are referred to as another operator.

As shaft **110** is rotated in a counterclockwise direction as viewed in FIG. 3, inner ring **150** and retainer ring **152** are rotated in a counterclockwise direction at different rotational speeds. Ring **150**, being secured to shaft **110**, will rotate at the speed of the shaft. The rotational speed of retainer ring **152** is governed by the rotational speed of bearings **154** in the races and any slippage which may occur between the bearings and rings.

Referring again to FIG. 2, a switch **164**, also referred to herein as an actuator, is suspended adjacent bearing assembly **146**. Switch **164** has a stationary contact **164***a* and another contact **164***b* which is shiftable toward and away from contact **164***a* and is spring biased to a normally spaced position, as shown in FIG. 2. Contacts **164***a*, **164***b* are spaced from the longitudinal axis of shaft **110** the same distance as pins **158**. As a pin **158** is rotated into a position adjacent switch **164** it will momentarily close contacts **164***a*, **164***b*, and after it passes, it allows the contacts to open. When the contacts are closed, the switch may be considered to be in an actuating state and when they are opened the switch may be considered to be in a non-actuating state.

A similar switch **166**, shown in broken outline in FIG. 3, and also referred to herein as an actuator, is suspended adjacent switch **164** and is in a position whereby its contacts are closed momentarily as one of pins **160** or **162** pass thereby with rotation of retainer ring **152**. It should be noted that since pin **162** has a larger head than pins **158**, **160**, it will close the contacts of switch **166** for a longer period of time.

Switches **164**, **166** are connected to solenoid **130** through an electrical circuit, shown diagramatically in FIG. 4. As is seen in FIG. 4, the left sides of switches **164**, **166** are connected to a suitable source of positive voltage. The right sides of the switches are connected through separate conductors to the upper and lower input terminals A and B, respectively, of a conventional AND circuit **170**. AND circuit **170** is so constructed that when a signal is present at both of its input terminals a signal will be produced at its output terminal C. Should the signal cease at either one or both of its input terminals, the signal at output terminal C ceases.

The output of AND circuit **170** is connected to the input terminal of a solenoid control circuit **172**. A signal presented at the input terminal of control circuit **172** energizes solenoid **130**. When a signal ceases to be presented at the input of control circuit **172**, solenoid **130** is deenergized.

Explaining the operation of timing device **144**, rotation of shaft **110** causes inner ring **150** and retainer ring **152** of the roller bearing assembly **146** to rotate at different speeds. As the rings rotate, pins **158**, **160**, **162** periodically close switches **164**, **166**. At random intervals switches **164**, **166** will be closed simultaneously producing simultaneous signals at input terminals A, B of AND circuit **170** which operates, through solenoid control circuit **172**, to energize solenoid **130**. As has been explained previously, when solenoid **130** is energized plunger **122** is driven to the left. Head **126** strikes sounding member **128** to produce a popping noise and bellows **120** is compressed forcing a stream of pressurized air through one of conduits **136** and against one of holes **100** in burner **92** to deflect the flame emanating therefrom.

It will be noted that at least one pair of pins **158** are closely spaced (that pair immediately below switch **164** as seen in FIG. 3). Should pin **162**, having an enlarged head, and such closely spaced pins **158** reach their respective switches **166**, **164** at the same time, a double popping noise and jet of flame-varying air will be produced. Explaining further, the enlarged head of pin **162** is capable of holding switch **166** closed a sufficient time for such pair of closely spaced pins **158** to produce successive closing, opening, and then reclosing of switch **164**.

The apparatus described thus is operable to vary the visually observable effect of a flame produced by the burner and at the same time produce a popping noise which simulates the sound of a natural wood fire. Through this apparatus the means for varying the flame and for producing the popping flame are interconnected whereby the visual and audible effects are coordinated.

It should be obvious that changes and variations are possible without departing from the spirit of the instant invention.

It is claimed and desired to secure by Letters Patent:

1. Simulated fire apparatus comprising

a fuel burner,

a supply of fuel and means for feeding fuel from the supply to the burner for producing a visually observable flame at the burner,

varying means for varying the visually observable effect of a flame produced at the burner,

sound producing means for simulating the sound of another type of fire burning, and

connecting means interconnecting the varying means and the sound producing means for coordinating the relationship there-between.

2. The apparatus of claim **1**, which further comprises timing means operable to produce substantially simultaneous operation of said varying means and sound producing means at random time intervals.

3. The apparatus of claim **2**, wherein said timing means comprises a pair of actuating means, each of which has an actuating and a nonactuating state, means operatively connecting said actuating means to said

varying and sound producing means whereby said varying and sound producing means are actuated only when both of said actuating means are in their actuating states simultaneously, a first operator associated with one of said actuating means operable intermittently to shift said one actuating means from its nonactuating to its actuating state, and a second operator associated with the other of said actuating means operable intermittently to shift said other actuating means from its nonactuating to its actuating state.

4. The apparatus of claim 1, wherein said varying means comprises means for directing a stream of pressurized fluid against a portion of a flame produced at such burner.

5. The apparatus of claim 1, wherein said varying means comprises a plurality of nozzles, each adapted to direct a stream of pressurized fluid against a different portion of a flame produced at said burner, and supply means for intermittently supplying such a stream of fluid to certain of said nozzles at random time intervals.

6. Simulated fire apparatus comprising a visually observable flame portrayer actuated by the supply of an operating medium thereto,

a supply of such operating medium and means for feeding such to the flame portrayer,

recording player means including at least two output channels and means for introducing a different signal on each channel, with one signal being electrically representative of one type of fire burning sound and the other signal being electrically representative of another fire burning sound,

speaker means for said channels and electrical circuit means for each channel connecting the channel to the speaker means for delivering the signal of the channel to the speaker means, and

attenuator means connected between the electrical circuit means for at least one of said channels and the means for supplying operating medium to the flame portrayer producing attenuation in the sound produced by the speaker means coordinated with attenuation in the supply of operating medium to the flame portrayer.

7. The apparatus of claim 6 which further comprises manually adjusted control means for regulating the amplitude of the signal in said one channel delivered to said speaker means, and wherein said attenuator means includes means responsive to an adjustment of said control means for changing the attenuation produced by the attenuator means.

8. The apparatus of claim 6, wherein said attenuator means comprises a signal attenuator producing changes in the signal delivered to said speaker means, a supply attenuator for changing the supply of operating medium fed to the flame producer, and a power-operated actuator for the two attenuators for actuating the two in a coordinated manner.

9. Simulated fire apparatus comprising

a gas burner operable to produce a gas flame,

a supply of such gas and means for feeding gas from the supply to the burner,

recording player means including an output channel and means for introducing a signal on such channel with such signal being electrically representative of a type of fire burning sound,

a speaker and electrical circuit means connecting said channel to the speaker, and

attenuator means connected between the electrical circuit means and the means for feeding gas to the burner producing attenuation in the sound produced by the speaker coordinated with attenuation of the gas supplied to the burner.

10. The apparatus of claim 9, wherein said attenuator means comprises a signal attenuator producing changes in the signal delivered to the speaker, a valve for changing the supply of gas fed to the burner, and a power-operated actuator for the signal attenuator and valve constructed to actuate the two in a coordinated manner.

* * * * *