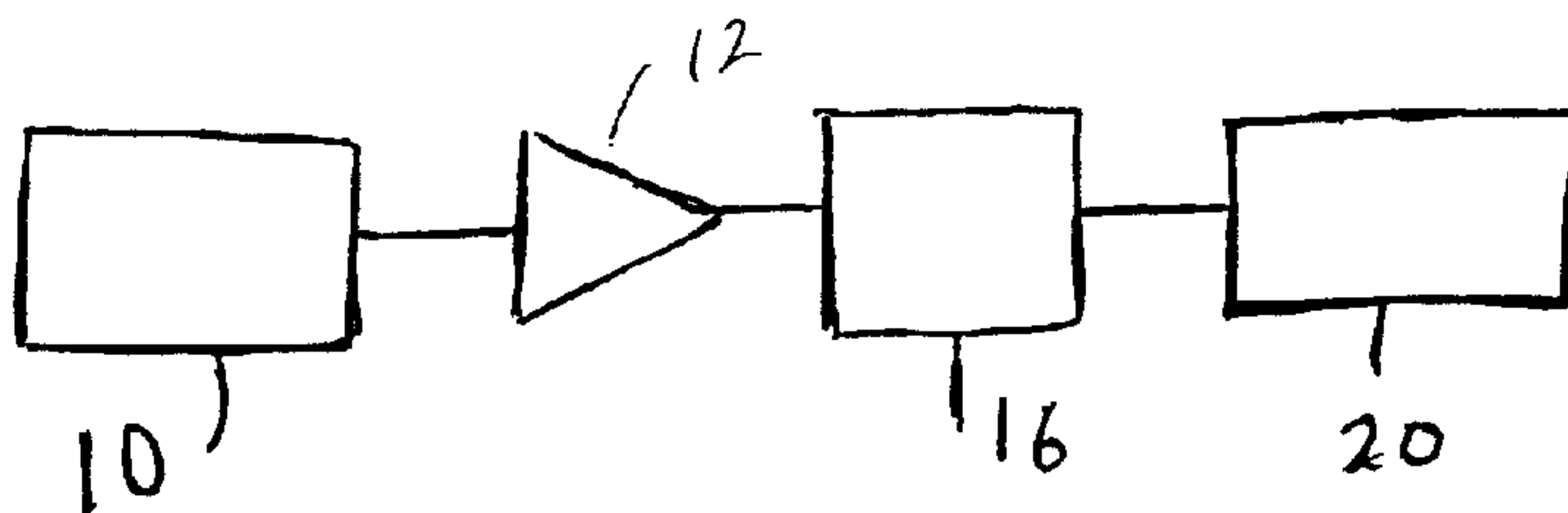




(72) DUVE, JEFF, US  
(71) REGENT LIGHTING CORPORATION, US  
(51) Int.Cl.<sup>7</sup> G01P 13/00, H05B 37/02  
(30) 1999/05/19 (09/314,746) US  
(54) **DISPOSITIF INFRAROUGE PASSIF**  
(54) **PIR DEVICE**



(57) An outdoor light using a motion sensor that activates the light when motion is sensed by changes in the infrared signal detected. The device uses a passive infrared detector network to sense infrared and to produce an analog signal in response to said infrared detected which is then passed through an amplifier to a signal controlled oscillator. The signal is converted into a digital signal which is used to detect motion by a logic device.

PIR DEVICE

Attorney Docket No. 2740

Abstract

An outdoor light using a motion sensor that activates the light when motion is sensed by changes in the infrared signal detected. The device uses a passive infrared detector network to sense infrared and to produce an analog signal in response to said infrared detected which is then passed through an amplifier to a signal controlled oscillator. The signal is converted into a digital signal which is used to detect motion by a logic device.

PIR DEVICE

Attorney Docket No. 2740

Background of the Invention

The invention is directed to a control circuit and method for converting an analog signal from a passive infrared ("PIR") detector into a digital signal. More specifically, the device converts infrared detected by a passive infrared detector into a digital signal through the use of an oscillator.

Summary of the Invention

The present invention is directed at a novel control circuit that may be used in lighting devices that use a PIR to sense "motion" in order to activate the lighting element of the unit. The present invention solves the problems associated with the control circuitry currently used in such devices by eliminating the use of PIRs in combination with comparators to detect "motion". The present invention does this by coupling a PIR to a signal controlled oscillator that converts the analog signal generated by the PIR into a digital output that may be used by a microprocessor or other similar logic device. In current designs, PIRs are typically coupled to a number of comparators which are used to detect the presence of motion through changes in the infrared detected. However, there are several drawbacks to this type of design.

## Attorney Docket No. 2740

First, the use of comparators requires the use of additional components which increase the cost of the unit. Moreover, the use of comparators limits the unit's ability to supply useful and accurate information to a microprocessor or similar logic device. In addition, the comparators are affected by changes in environmental conditions such as changes in temperature, humidity and the like, which, in turn, create false readings. For example, at sub-zero temperatures, most prior art devices using comparators will cease functioning. In addition, if the environmental temperature exceeds that of the comparator's threshold level, the device will incorrectly sense motion and remain active until the environmental temperature falls within the preset thresholds.

The present invention solves the above mentioned shortcomings of the prior art designs by coupling PIR to an oscillator which produces a digital frequency that is inputted to a logic device. The logic device may employ variable threshold logic to sense changes in temperature as a function of time in order to detect motion. This differs significantly from prior art designs which use fixed thresholds to detect changes in temperature to detect "motion". Consequently, eliminating the use of a fixed threshold improves the accuracy of the device since it eliminates inaccurate triggering or failure to trigger situations.

**Description of the Drawings**

Figure 1 is a block diagram showing a circuit of one embodiment of the present invention;

Figure 2 is a graphical representation of how the prior art employs fixed thresholds to detect motion; and

Figure 3 is a graphical representation showing the variable thresholds created by the present invention.

**Description of a Preferred Embodiment**

Referring to Figure 1, a PIR 10 of a design known to those of skill in the art is used to detect changes in infrared and to produce a corresponding analog signal. The analog signal produced by PIR 10 is then supplied to an amplifier 12 which, in turn, sends the amplified signal to an oscillator 16 which may either be a voltage control oscillator or a current control oscillator. In a preferred embodiment, a single operational amplifier voltage control oscillator ("single Op-Amp VCO") may be used. The oscillator 16 then converts the analog signal produced by PIR 10 into a digital signal that may then be further transmitted to a microprocessor 20 or some other type of logic device. If a single Op-Amp VCO is used, it may be of a design disclosed in Applicant's co-pending application. In addition, either the current or voltage

## Attorney Docket No. 2740

controlled oscillators may be of other designs currently known to the those of skill in the art.

Once the analog signal generated by PIR 10 is converted into a digital signal, it may then be used in a number of ways by microprocessor 20. One novel way in which to use the digital signal is to eliminate the use of comparators and fixed thresholds to detect motion. As discussed above, this will solve a number of design-defects, including without limitation, false triggering by the light unit. To do this, the microprocessor simply needs to be adapted to sense a change in frequency over a discrete period of time. As shown in Figure 3, variable thresholds 50-56 are created in which the device is programmed to detect changes in frequency over a constant period of time. For thresholds 50, 51, 54, and 55, no motion is detected since the frequency change was not great enough in the given time period. However, motion is detected in thresholds 52 and 53 due to the sharp change in frequency.

It should be understood that various changes and modifications to the preferred embodiment described would be apparent to those skilled in the art. Changes and modifications can be made without departing from the spirit and scope of the present invention and without diminishing its intended advantages. It is, therefore, intended that such changes and modifications be covered by the following claims.

**What is Claimed is:**

1. A motion detector comprising:
  - a passive infrared detector network adapted to sense infrared and to produce an analog signal in response to said infrared detected;
  - an oscillator adapted to receive said analog signal and to convert said analog signal into a digital signal which is used to detect motion.
2. The device of claim 1 further including a logic device which receives said digital signal and uses said digital signal to detect motion.
3. The device of claim 2 wherein said logic device senses motion as a function of change in temperature over a predetermined period of time.
4. The device of claim 1 wherein said oscillator is a voltage controlled oscillator.
5. The device of claim 4 wherein said voltage controlled oscillator is a single operational amplifier voltage control oscillator.
6. The device of claim 1 wherein said oscillator is a current controlled oscillator.
7. The device of claim 1 further including an amplifier for receiving said analog signal and amplifying said signal.
8. A motion detector comprising:
  - a passive infrared detector network adapted to sense

## Attorney Docket No. 2740

infrared and to produce an analog signal in response to said infrared detected;

an amplifier for receiving said analog signal, and amplifying said signal; and

an oscillator adapted to receive said analog signal and to convert said analog signal into a digital signal which is used to detect motion.

9. The device of claim 8 further including a logic device which receives said digital signal and uses said digital signal to detect motion.
10. The device of claim 8 wherein said logic device senses motion as a function of change in temperature over a predetermined period of time.
11. The device of claim 1 wherein said oscillator is a voltage controlled oscillator.
12. The device of claim 11 wherein said voltage controlled oscillator is a single operational amplifier voltage controlled oscillator.
13. The device of claim 1 wherein said oscillator is a current controlled oscillator.
14. A motion activated light comprising:

a light fixture containing a light source, passive infrared detector, a signal voltage controlled oscillator and a logic device;

said passive infrared detector adapted to generate an

Attorney Docket No. 2740

analog signal in response to detected infrared;

an amplifier adapted to receive said analog signal from said passive infrared detector and amplify said analog signal;

a signal controlled oscillator adapted to receive said amplified analog signal and convert said signal into a digital frequency; and

a logic device adapted to receive said digital frequency, said logic device adapted to activate said light when said digital frequency increases over a predetermined period of time.

15. The circuit of claim 14 further including an amplifier for receiving said analog and amplifying said signal.



FIG. 1

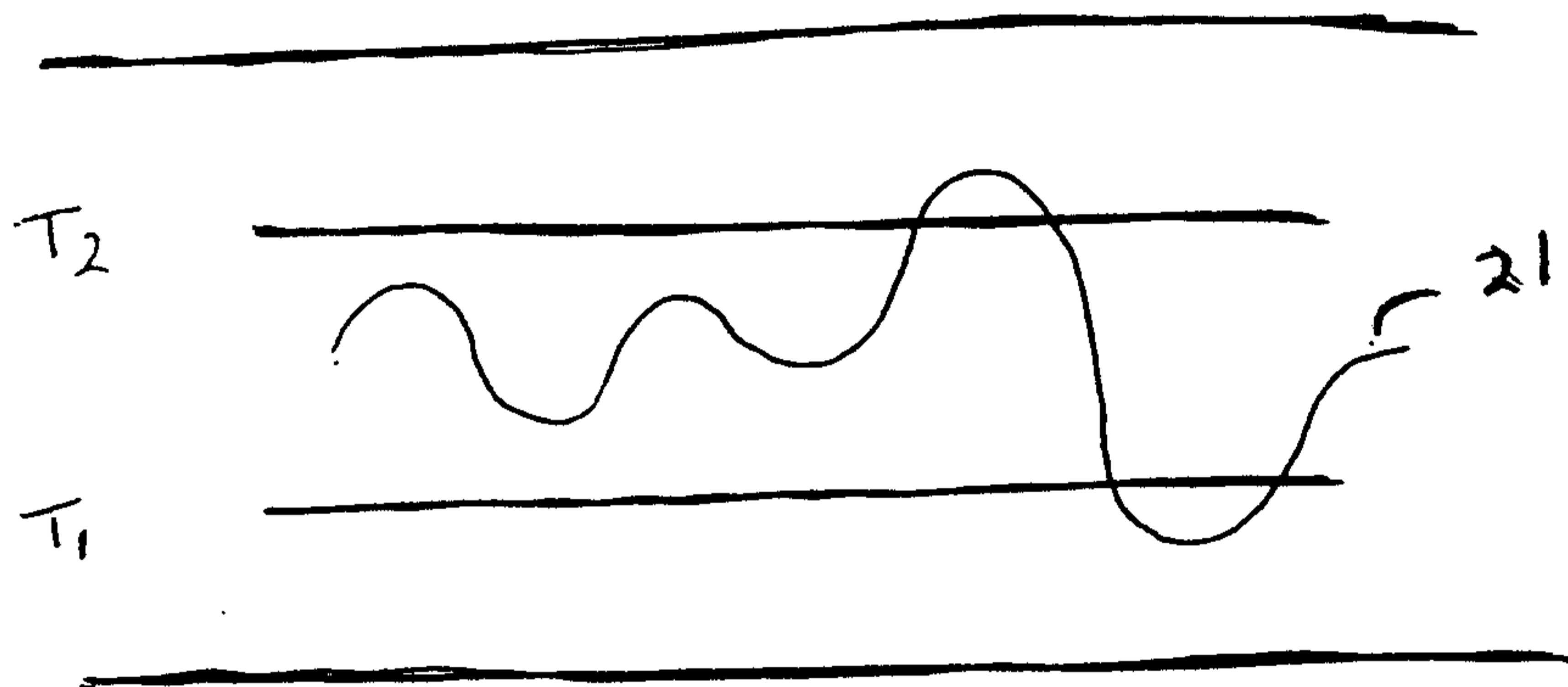


FIG. 2

*Fenlayson & Senglehurst*

PATENT AGENTS

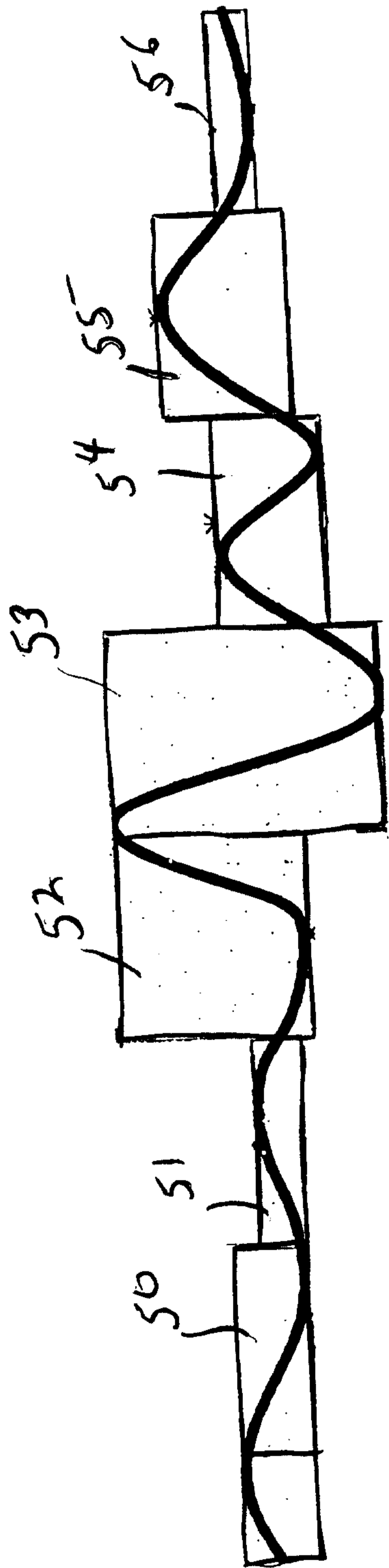


FIG 3

*Kenley & Langlois*  
PATENT AGENTS

