in the structure with the possibility of reducing damage to the structure.

The present invention provides a method for detecting and identifying inorganic or biologic structures using resonant acoustic and/or acousto-EM energy. The method includes determining the acoustic signature of a structure by irradiating the structure with a range of frequencies to determine the specific frequency and/or frequencies that induce acoustic resonance therein to provide an acoustic signature of the structure. The acoustic signature can be compared with reference signatures to detect and/or identify the structure.

Furthermore, the identification and/or detection of a structure can also be achieved by detecting an acousto-EM signature of a targeted structure, the method comprising the steps of:

a) inducing acoustic resonance in the targeted structure; and

b) detecting an electromagnetic energy pattern from the targeted structure in acoustic resonance which represents an acousto-EM signature of the structure.

The acousto-EM signature can be compared to reference signatures to detect and/or identify the structure.

The targeted structure can be induced into acoustic resonance by introducing acoustic energy including at least one resonant acoustic frequency, electromagnetic energy equivalent to the resonant acoustic frequency, and/or an electromagnetic energy pattern equivalent to the acousto-EM signature.

The electromagnetic energy pattern manifested as electromagnetic properties and fields may be determined by detection means well known to those skilled in the art such as those disclosed in *Introduction to Electromagnetic Fields and Waves*, by Erik V. Bohn Addison-Wesley Publishing Co., 1968, the contents of which are incorporated by reference herein.

In another embodiment of the present invention, a structure may be induced into acoustic resonance by applying to the structure part or all of the acousto-EM signature of the structure to induce the structure into acoustic resonance. If the structure is induced into acoustic resonance, this fact may be used to detect and/or identify the structure. This represents another method of the present invention that may used for identification or detection of a specific structure, because each structure will not only have its own unique acoustic signature but also will have a unique acousto-EM signature to which it responds by

resonating acoustically. Also, depending on the power intensity of the electromagnetic properties and/or fields and the type of targeted structure that is induced into acoustic resonance, the structure may have its functions affected, such as disruption and/or augmentation.

In all the above embodiments the introduction of acoustic and/or electromagnetic energy including a resonant acoustic frequency can be applied in either continuous and/or periodic form depending on the desired effect.

The acoustic and/or EM fields may be applied individually or in combination. Likewise the acoustic and/or EM fields may be detected individually or in combination.

Many biochemical compounds and biologic structures are naturally occurring crystals and especially susceptible in that regard to the effects of resonant acoustic energy. Many biologic substances are piezoelectric materials. For instance, bone is a piezoelectric material and the piezoelectric properties of bone play a vital role in its biological functions. As such, it is further envisioned by the inventors that biologic structures having a piezoelectric nature may be affected by applying a sufficient amount of acoustic energy and/or electromagnetic energy to induce the structure into resonance thereby affecting the functions of the biologic structure either positively or negatively. Thus understood, biologic structures that act as living piezoelectric transducers may be induced into acoustic resonance by introducing electromagnetic energy equivalent to a resonant acoustic frequency of the biologic structure which is converted to mechanical energy by the living transducer thereby inducing acoustic resonance in the structure.

Another aspect of the invention is a system for detecting a biologic or inorganic structure by determining the resonant acoustic and/or acousto-EM signature of the structure comprising:

a) means for inducing acoustic resonance in the biologic or inorganic structure;

b) means for detecting the acoustic signature of the biologic or inorganic structure; and

c) means for comparing the acoustic signature of the biologic or inorganic structure with a reference acoustic signature of the structure.

Also, the above system may also or instead comprise means for detecting a resonant acousto-EM energy signature of the structure in acoustic resonance which produces an

electromagnetic energy pattern such as described above. The acousto-EM signature can be compared with a previously determined reference signature by providing means for comparing in a detection or identification system. The electromagnetic energy pattern is manifested as electromagnetic properties and/or fields that include but are not limited to energy in the form of direct and alternating current, electric and magnetic fields, and electromagnetic radiation. The targeted structure can be induced into acoustic resonance by introducing acoustic energy including at least one resonant acoustic frequency, electromagnetic energy equivalent to the resonant acoustic frequency, and/or an electromagnetic energy pattern equivalent to the acousto-EM signature.

In another embodiment of the present invention a system for augmenting and/or disrupting a targeted biologic structure comprises means for applying acoustic energy including a previously determined resonant acoustic frequency to induce acoustic resonance in the biologic structure, the acoustic energy being applied at a sufficient power input to affect functions of the biologic structure. Alternatively, the targeted structure may be induced into acoustic resonance by providing electromagnetic energy equivalent to the resonant acoustic frequency or the acousto-EM signature that was previously determined, such as direct and alternating current, electric and magnetic fields, and electromagnetic energy.

In yet another embodiment a system is provided to introduce acoustic energies having acoustic frequencies at or near the resonant acoustic frequencies of the targeted structure and also electromagnetic energy to augment the resonant acoustic frequencies comprising:

means for introducing a frequency at or near the resonant acoustic frequency of the targeted structure ; and

means for introducing electromagnetic energy equivalent to the electromagnetic energy pattern previously determined as an acousto-EM signature of the structure, such as direct and alternating current, electric and magnetic fields, and/or electromagnetic radiation and the like.

The acoustic energy and EM energy equivalent to the acousto-EM signature may be applied and/or detected by a single means that can apply both types of energy.

Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in

the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and many of the advantages of the invention will be better understood upon a reading of the following detailed description when considered in connection with the accompanying drawings wherein:

Figure 1 is a block schematic of a basic Acoustic Energy Generating System.

Figure 2 is a block schematic of a basic Acoustic Energy Detection System.

Figure 3 is a block schematic of a stationary magnetic field applied to a biologic structure.

Figure 4 is a block schematic of an oscillating magnetic field applied to a biologic structure.

Figure 5 is a block schematic of a direct or alternating current applied to a biologic structure.

Figure 6 is a block schematic of a static charge applied to a biologic structure.

Figure 7 is a block schematic of delivery of electromagnetic radiation to a biologic structure.

Figure 8 is a block schematic of detection of a stationary or oscillating magnetic field in a biologic structure.

Figure 9 is a block schematic of detection of a static charge in a biologic structure.

Figure 10 is a block schematic of detection of electromagnetic radiation emitted from a biologic structure.

Figure 11 is a block schematic of detection of direct and alternating current in a biologic structure.

Figure 12 is a block schematic showing a method for determining resonant acoustic frequencies of viruses.

Figure 13 is a block schematic showing a method for assessing the effects of resonant acoustic fields on viruses.

Figure 14 is a block schematic showing a method for disrupting viruses extra corporeally with resonant acoustic fields.

Figure 15 is a block schematic showing a method for disrupting viruses *in vivo* intravascularly with resonant acoustic fields.

Figure 16 is a block schematic showing a method for disrupting viruses *in vivo* in multicellular organism with resonant acoustic fields.

Figure 17 is a block schematic showing a method for disrupting viruses in a portion of a multicellular organism with a resonant acoustic field probe.

Figure 18 is a block schematic showing a method for disrupting viruses in a portion of a multicellular organism with a resonant acoustic field sheet.

Figures 19 A & B are block schematics showing a method for determining resonant acoustic and/or acousto-EM frequencies of viruses.

Figure 20 is a block schematic showing a method for assessing effects of resonant acoustic and/or acousto-EM fields on viruses.

Figure 21 is a block schematic showing a method for disrupting viruses extracorporeally with resonant acoustic and/or acousto-EM fields.

Figure 22 is a block schematic showing a method for disrupting viruses *in vivo* intravascularly with resonant acoustic and/or acousto-EM fields.

Figure 23 is a block schematic showing a method for disrupting virus in a portion of a multicellular organism with resonant acoustic and/or acousto-EM field probe.

Figures 24 A & B are block schematics showing a method for determining resonant acoustic and/or acousto-EM frequencies of microorganisms.

Figure 25 is a block schematic showing a method for augmenting microorganisms with resonant acoustic and/or acousto-EM fields.

Figure 26 is a block schematic showing a method for disrupting microorganisms with resonant acoustic and/or acousto-EM fields.

Figure 27 is a block schematic showing a method for determining resonant acoustic and/or acousto-EM frequencies of arthropods.

Figure 28 is a block schematic showing a method for disrupting arthropods using resonant acoustic and/or acousto-EM energy.

Figure 29 is a block schematic showing a method for augmenting and maintaining