

APPARATUS FOR STIMULATING RESPIRATORY CONDITIONS ESPECIALLY PATHOLOGICAL RESPIRATORY CONDITIONS

BACKGROUND OF THE INVENTION

1. Field of the invention

The invention concerns apparatus for simulating pathological and other respiratory conditions for teaching respiratory auscultation semiology to medical personnel.

2. Description of the prior art

Simulation devices for teaching medical personnel are known, especially devices for teaching anaesthesia and devices for teaching circulatory auscultation semiology. These devices are usually complex, heavy, bulky and therefore difficult to transport and costly. Also, there is no simple way of adapting them to collective use.

SUMMARY OF THE INVENTION

The invention consists in an apparatus for simulating pathological and other respiratory conditions comprising a manikin reproducing the external appearance of approximately the upper half of the body of a patient, a stethoscope simulator having at least one earpiece and a head connected to a device for receiving radiation conveying a signal, and at least one control device connected electrically to said manikin, in which apparatus said manikin has a flexible and elastical material envelope simulating the skin of the patient, at least one drive device for animating the manikin by moving at least one area of the flexible material envelope, and sensors disposed under said envelope to detect the proximity of said head, said head comprises at least one unit adapted to cooperate with said sensors so that at least said sensor nearest said head initiates transmission of a proximity signal to said control device, and said earpiece is an electroacoustic transducer connected electrically to said receiver device, said control device includes a control unit, at least one memory unit in which are stored groups of sound data each associated with a respiratory condition connected electrically to said control unit to supply to it, on the basis of instructions received, a corresponding group of sound data, and a transmitter of said signal-carrying radiation also connected electrically to said control unit to receive therefrom a sound data signal produced by it from the sound data group received by it, and said control unit is connected to said manikin to receive said proximity signal from it and, depending on its source, to generate the sound data signal sent to said transmitter and to deliver to said manikin a control signal for said drive device derived from said sound data.

The invention thus simulates the external physique of a patient by means of a manikin and simulates the behavior of the manikin by means of a control device comprising an electronic control system and peripheral devices controlled by this system, to be more precise simulation of the pulmonary areas by arrays of sensors, simulation of respiratory sounds by means of a stethoscope simulator and mechanical simulation of respiration by raising and lowering part of the manikin by means of a drive device.

Other objects, advantages and features of the invention will emerge from the following description of one embodiment of the apparatus in accordance with the

invention given by way of non-limiting example with reference to the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram showing the external appearance of apparatus in accordance with the invention.

FIG. 2 shows a block diagram of the electronics of the apparatus in accordance with the invention.

FIG. 3 is a diagram showing the interconnection of the component parts of the apparatus from FIG. 1.

FIGS. 4A and 4B are diagrams showing the distribution of the pulmonary lobes of a patient and of the manikin of the apparatus from FIG. 1.

FIG. 5 shows the control device of the apparatus in accordance with the invention open.

FIG. 6 shows the control panel of the device from FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

The apparatus shown in FIG. 1 includes a manikin 1 part of which reproduces the exterior of approximately the upper half of a human body, supposedly that of a patient consulting a practitioner for the purposes of a pulmonary examination, a stethoscope simulator 2 and a control device 3. The control device is housed in a carrying case which is shown closed, i.e. in the non-functioning position; it is connected to the manikin by an electric cable 4 incorporating five conductors and is connected to the mains electrical power supply by a single power supply cord 5.

The manikin 1 includes a rigid structure to support (in the manner of the bones and muscles) an envelope 11 of a flexible and elastic material imitating the texture of the human skin (flesh-colored silicone reinforced, except at certain locations, by a layer of laminated resin); the realism is augmented by the use of silicone paint to simulate the eyes, the mouth, the nails, etc. and part of the hair (hair on the head, eyebrows) is simulated by means of false hair. Inside the torso of the manikin are one or more drive devices 12 for moving parts of the flexible material envelope which are rendered mobile by discontinuities in the reinforcing structure so that animation of these parts simulates movements due to respiration; here the drive devices 12 comprise a variable speed DC motor articulated to a pivoted link; the motor is coupled to a linkage including a link which it rotates and which is guided in its rotation on one of the laminated resin reinforcing shells of the manikin; the resulting oscillatory movement of the motor drives a ventral shell; the movement simulating the respiratory rhythm by means of oscillatory up and down movements of the abdomen of the manikin is synchronized with the sounds supposedly emitted by the supposedly auscultated pulmonary area in order to simulate the respiratory rhythm, without disturbing the diagnosis based on the respiratory sounds; to this end the motor is controlled by a control device incorporating two loops respectively responsive to a tachogenerator 121 rotating with the shaft of the motor and a position sensor 122. In the immediate vicinity of the inside surface of the flexible material envelope are removable plates of proximity sensors 13, for example flexible blade electro-magnetic switches usually called reed relays. This part of the apparatus approximately representing the upper half of a human body is mounted on a base 14 fitted with at least one electrical connector 15 whose pins are connected to respective drive devices 12 to supply them