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DENTAL ANALGESIA PROCESSES AND DEVICES

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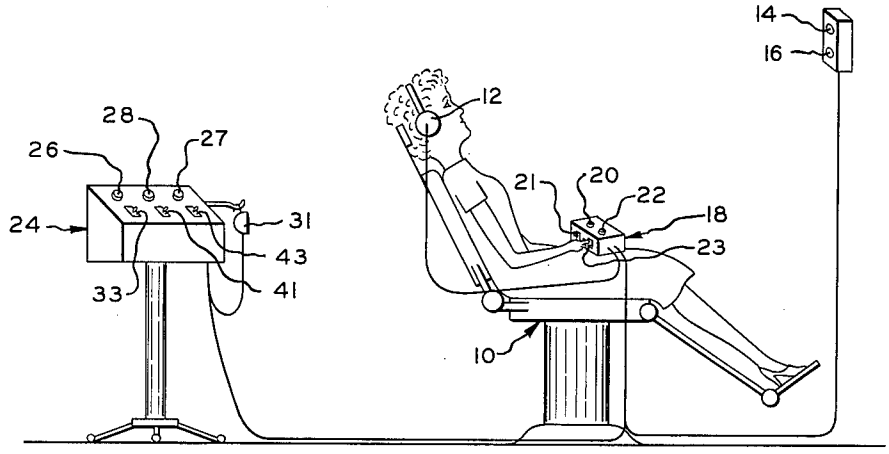


FIG. 1

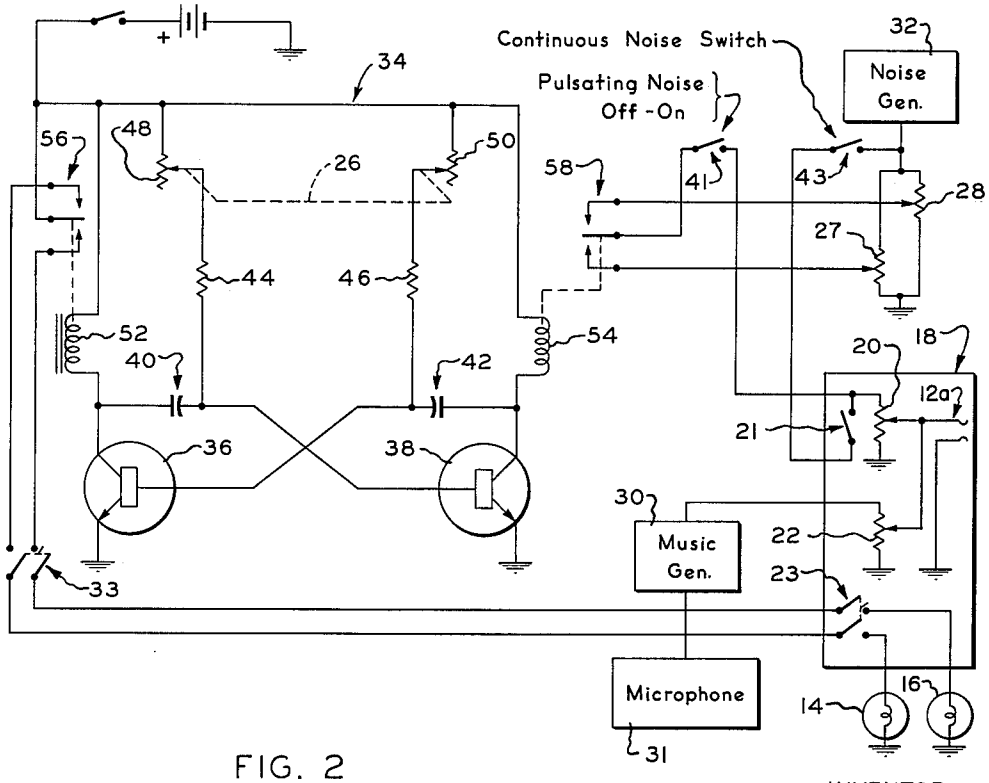


FIG. 2

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DENTAL ANALGESIA PROCESSES AND DEVICES

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The present invention relates to analgesic processes and devices and, more particularly, to the minimization or elimination of pain during a dental or other operation by stimulation of certain of the senses of the patent.

It has been proposed that pain be alleviated during a dental or other operation by subjecting the patient to sound in the form of music or noise. It is believed that the psychic effects of such sound are to mask the grinding noise made by the drill or other instrument on the teeth, to distract the patient's attention from the pain, to relieve anxiety in regard to the drill, to produce pleasant associations, to suggest lack of pain and to distract the patient's attention from the pain. The advantages of producing analgesia in the foregoing way include the immediacy of the foregoing effects, the avoidance of tension in the patient resulting from the application of a local anesthetic as by means of a hypodermic needle and the facility of producing the foregoing effects without the danger of introducing toxic agents that may have irreversible effects.

The primary object of the present invention is to intensify the analgesic effects of sensory stimulation, e.g. aural or visual or both, in order to lower the threshold of pain by the steps of periodically varying the intensity of the stimulation, synchronizing the periodic variation with the breathing cycle, i.e. the cycle of inspiration and expiration, of the patient and enabling the patient to control the intensity and quality of the stimulation. The basis of the foregoing is the fact that pulmonary respiration although usually automatic and not intruding into the conscious sphere, in contrast to other visceral functions can enter consciousness if the attention is directed towards it and can be modified at will. Two effects of the foregoing are particularly noteworthy. The first effect relates to alternations of the normal breathing (eupnea) pattern in any one of several forms resulting from the threat or experience in pain, particularly in the area of the air passages. Thus, there may be a reflex restriction in the form of holding of the breath (apnea), increase in the pulse rate (tachycardia), transient elevation of the blood pressure, etc. to such an extent that lack of oxygen (anoxia) and an accumulation of carbon dioxide (hypercapnia) in the tissues particularly of the nervous system, results. These anoxia in the tissues generates further tension which intensifies the original pain. The second effect relates to the philogenetic, i.e. autonomic, and autogenetic, i.e. voluntary, responses of the patient to pain inflicted in an operation. It is well ascertained that reactions to pain are manifested by defense reflexes and emotional protest. The pain threshold is constant in normal individuals in the absence of disturbing factors. On the other hand, psychic factors are of great importance in pain and extend considerable influence on the pain threshold. Thus, for example, autosuggestion and external suggestions may increase the threshold sufficiently to make painless the action of agents that destroy or traumatize the tissues, e.g. the dental drill. During a dental operation, the patient is required to sit still while undergoing pain and mental anguish. In consequence, his philogenic response is to perform a positive act to eliminate the pain as by fighting back or running away. Because of the requirement that he do neither of these, the resulting conflict intensifies the original pain. The philogenetic requirement may be partially satisfied by the patient's intentionally focusing on maintaining a normal breathing rate and/or by his intentionally controlling the intensity and quality of the stimulation to which he is subjected. In accordance with the present invention, maintainance of the normal breathing rate and control of the intensity and quality of the sound may be determined in the patient or the dentist or both. The dentist, by determining and maintaining the breathing rate, for example, is able to exercise control over the induction of general anesthesia in such a way that the absorption of an anesthetic agent takes place at a desired rapid rate.

Other objects of the present invention will in part be obvious and will in part appear hereinafter.

For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a patient being subjected to a process in accordance with the present invention; and

FIG. 2 is an electrical schematic diagram of a system of the type illustrated in FIG. 1.

Generally, the process illustrated herein involves subjecting the aural and/or visual senses of a dental patient to a stimulus or stimuli of an intensity which pulsates synchronously with the normal breathing pattern of the patient as interpreted by the dentist. The patient thereby is given a guide by which he intentionally can conform his respiration to its normal pattern notwithstanding his subjection to the volley of adverse physical and emotional factors to which he is subjected during a dental operation. The dentist controls the modulation, i.e. the rate and amplitude, of the pulsations. The patient controls the general level of volume of the resulting sound. Or a patient who does not respond properly to the pulsated noise, at his option, may eliminate the pulsations in order to permit continuous noise. This lack of proper response is due to the effect called habituation or adaptation, a condition developed in the hearing mechanism by prolonged stimulation of either pulsating (modulated) or continuous noise. Shifting from one to the other produces dehabituation. In practice, the normal breathing rate of the patient as ascertained by the dentist before the patient's arrival in the operating room merely by visual observation and comparison with elapsed time. Once seated in the operating chair, the patient is instructed to inhale and exhale in accordance with high and low sequential intensity sounds applied to both ears. Alternatively or additionally, the patient is instructed to inhale or exhale in accordance with upper and lower illuminating lamps located in front of his eyes. The frequency of human breathing varies from individual to individual at different times and under different conditions. Inasmuch as the normal patient's respiratory cycles occur from 5 to 25 times per minute, the pulsations of the stimulus in accordance with the present invention, range from 5 to 25 cycles per minute. The patient himself is able to select continuous noise, modulated noise, music or combinations thereof.

FIG. 1 illustrates an operating chair **10** in which is reclining a dental patient. Over both of the patient's ears are earphones, one of which is shown at **12**. In front of the patient's eyes are a pair of signal lights **14** and **16**. In the patient's lap is a remote control box **18** that is provided with a pair of potentiometer knobs **20** and **22** and a pair of switches **21** and **23**. Knobs **20** and **22** control the general levels of intensity of the noise and the music, respectively. Potentiometer knobs **20** and **22** serve as mixers to control the proportions of the music and either the continuous or modulated noise as well as their intensities. Switches **21** and **23** determine whether or not the pulsations and the lights respectively, are utilized.

A cabinet **24**, provided with control knobs **26, 27, 28**

and switches 33, 41, 43, supplies to earphones 12, sound in the form of music, pulsating or continuous noise or both music and pulsating or continuous noise, and supplies to lamps 14 and 16 intermittent power. The patient, by controlling knobs 20 and 22 is able to select, as he likes, music or noise or both and to determine their intensities. The dentist, by controlling knobs 26, 27, 28 and switches 33, 41, 43 is able to determine the timing of the pulsations of the sound, the amplitude of the pulsations of the sound and the intermittency of the lights, the pulsations of the sound and the intermittency of the lights being synchronized. The dentist also, by properly setting knobs 27 and 28 can synchronize or equalize the different decibel levels of the pulsating noise and thus provide a continuous noise. This procedure can be accomplished readily by rotating both knobs clockwise to the maximum output of their associated potentiometers. At this time, switches 41 and 43 should be closed.

A microphone 31 is provided to enable the dentist to talk to the patient while the earphones are being worn. It is to be understood that alternatively the pulsated noise can be generated by a phonograph record, a magnetic tape or wire recorder. The noise itself can be generated by a squelch noise type generator, a random noise generator, a signal generator of square or sine waves, etc.

The circuit of the cabinet of FIG. 1 is shown in FIG. 2 as comprising a music generator 30, a noise generator 32 and a pulsating system 34. System 34 is in the form of a multivibrator having a pair of transistors 36 and 38 cross-coupled to each other through a pair of condensers 40 and 42. Condensers 40 and 42 are charged through a pair of fixed resistors 44 and 46 from a pair of reversely ganged rheostats 48 and 50, which are controlled by knob 26. The outputs of the multivibrator are a pair of relays 52 and 54, which intermittently actuate a pair of switches 56 and 58, which are spring biased into their initial positions and magnetically drawn into their other positions by their associated coils. Switch 56 in its two positions alternately directs current to lamps 14 and 16. Switch 58 in its two positions alternately directs noise from generator 32 through potentiometers, which are controlled by knobs 27 and 28, in order to provide noise at different or similar decibel levels to earphones 12 through jack 12*a*. Switch 33 permits the dentist to actuate and deactuate lamps 14 and 16. Switch 41 allows the dentist, when switch 43 is open, to switch on pulsating noise. Switch 43 also allows the dentist, when switch 21 of patient's control box 18 is closed, to provide continuous noise or to interrupt it.

In practice, after the dentist visually ascertains the respiration rate of the patient, he is able to determine the frequency per minute of the multivibrator by adjusting knob 26. The dentist also may determine, by switch 33, whether lamps 14 and 16 are to be utilized by manipulating knobs 27 and 28 can control the amplitude of the pulsations. By properly setting these knobs, he can equalize (synchronize) the different sound levels of the pulsating noise and thus provide a continuous noise. The patient, by knobs 20 and 22, may select either music or noise or music and noise and their intensities and, by switches 21 and 23, may select pulsations of noise, alternations of lamps 14 and 16, either or both. It has been ascertained in clinical testing of the foregoing device that when the patient follows the breathing pattern established, unprecedented analgesic effects of the contemplated type are produced.

Since certain changes may be made in the above process and apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted in an illustrative and not in a limiting sense.

What is claimed is:

1. The process of producing an analgesic effect in a patient during a dental operation, said process comprising the steps of determining the normal breathing rate of the patient before said operation, said breathing rate constituting a number of breathing cycles per minute, each of said breathing cycles including one inhalation and one exhalation, subjecting the hearing sense of said patient during said operation for a first period of time to random noise, modulating the amplitude of said noise during said first period of time to provide a number of from 5 to 25 pulsations per minute, causing said number of pulsations per minute to correspond with said number of breathing cycles per minute during said first period of time, maintaining said number of pulsations constant during said first period of time, and thereafter subjecting the hearing sense of said patient during said operation for a second period of time to a steady random noise, said modulated random noise and said steady random noise being of sufficient intensity to produce analgesia and of sufficient distinctiveness to prevent habituation.

2. A system for producing analgesic effects in a dental patient, said system comprising, for use in cooperation with a dental chair, first generating means for producing random noise, earphone means for application to the ears of said patient when seated in said dental chair, first control means, a first housing for said first control means, second control means, a second housing for said second control means, said first housing being accessible to the hands of said patient when seated in said dental chair and being accessible to the hands of said dentist standing in proximity to said dental chair, second generating means for producing music, a modulating means including an electronic circuit for producing a signal characterized by pulsations of a number in the range of from 5 to 25 per minute, said modulating means having an operative connection with said first generating means in order to cause the amplitude of said noise to undergo pulsations of a number in the range of from 5 to 25 per minute, switch means for connecting and disconnecting said operative connection between said modulating means and said first generating means, said first generating means and said second generating means having an operative connection with said earphone means, said first control means including first manual means operatively connected to said first generating means, said second generating means and said switch means, said second control means including second manual means operatively connected to said first generating means, said modulating means and said switch means.

3. The system of claim 2 including a third generating means for producing modulating light observable by the patient and synchronized with said noise pulsation while said modulating means are operating.

References Cited by the Examiner

UNITED STATES PATENTS

2,466,054	4/49	Siebel	128—1
2,501,808	3/50	Brockway	128—1
2,527,656	10/50	Reinsdorf	179—146
2,934,060	4/60	Satter	128—1
2,986,140	5/61	Gardner	128—1

FOREIGN PATENTS

881,601	9/53	Germany.
15,665	1894	Great Britain.
670,789	4/52	Great Britain.

OTHER REFERENCES

"Electrical Engineering," by Erickson and Bryant, 2nd Edition, pages 592–598, TK 145, E 65, 1959, C. 46.

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