CLINICAL NOTE

A STROBOSCOPE USING A GRID-CONTROLLED NEON TUBE THE " STROBOTRON "

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A STROBOSCOPE may be used simply to measure the frequency of motion o an object where that motion is cyclic, or, as in the case of the vocal cords it may be used to examine the object itself at any phase in the movement An instrument which is satisfactory for the first purpose may be quite unsuite for the second and the following are some of the requirements for a stroboscop suitable for the examination of cord movements.

(1) The period during which the cords are visible must be a small fractio of one complete cycle, otherwise only poor definition is possible.

If the movement is sinusoidal and the time of observation is one hundredt of the periodic time, the movement during observation is approximately on thirtieth of the total swing. This movement is sufficient to make the definitio poor and the observation of any harmonics almost impossible.

(2) The intensity of illumination during observation must be high t compensate for the viewing time being a small fraction of the total time.

(3) The frequency must be easily and accurately controlled over a 2. range.

(4) There should be no inertia forces to overcome, so that the respons to the frequency control is immediate.

It may be noted here that an instrument possessing characteristics (3) an (4) may have its frequency controlled automatically by the object unde observation.

(5) If required for portable use, the instrument must, of course, be small light, easily erected and adapted for use on a normal lighting circuit.

Stroboscopes in general are of two types. In the first (such as Powell' laryngo-stroboscope) the light is constant and the period of observation i controlled by some form of shutter placed between the source of light and th object, or between the object and the eye of the observer. In the secon type, the light itself is intermittent, so that the period of observation i controlled by the duration of the light flashes. Electric lamps of th incandescent filament type are unsuitable for the second type, as the time la in heating and cooling the filament makes high frequency flashes of shor duration impossible. The gaseous discharge type of lamp is free from thi defect and it is to this type that the " Strobotron " belongs.

The normal " neon " lamp is a familiar example of this type of lamp It has two electrodes in a bulb containing neon gas, the luminous discharg occurring when the voltage between anode and cathode exceeds a certai critical value.

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The "Strobotron" is a neon tube, but, in addition to the anode and cathode, it has two "grids", which give a further control of the discharge. With 400 volts between anode and cathode there is no discharge until a smaller control voltage is applied between one or both parts of the grids and the cathode.

The complete apparatus consists of three main parts.

The first is a standard type of D.C. supply unit, which is connected to an ordinary A.C. lighting, giving a D.C. output of about 50 milliamps at 400 volts.

The second unit is the frequency control circuit, by which the strobotron can be made to flash at frequencies of 200 to 400 per second. For hand control only one of the two grids of the strobotron is used and the voltages are supplied to both plate and grid from a condenser. This condenser is charged from the D.C. supply unit through a resistance, the time to charge up being controlled by varying the resistance. This resistance gives control of the range of frequencies but does not need adjustment for variations over a 2.1 range. The fine control of frequency is obtained by connecting the grid of the strobotron to a variable point on a potential divider across the main supply circuit. Adjustment of this potential divider by one knob gives smooth control of the light frequency from, say, 200 to 400 cycles.

The duration of each flash with the circuit used was less than one hundred-thousandth of a second.

A telephone earpiece, connected to the second grid of the strobotron, which is not necessary for hand control of the frequency, gives a note of the same frequency as that of the light flashes.

As there are no moving parts in this frequency control arrangement, a change of frequency needs practically no power in the control circuit and the response is instantaneous. Automatic frequency control may easily be added to the apparatus. This is done by connecting a microphone through an amplifier to the second grid of the strobotron instead of the monitoring telephone used with the manual control described above. The amplifier is not elaborate, as linear amplification was found to be unnecessary. If any note is produced within the frequency range for which the stroboscope is set and picked up by the microphone, the light flashes are immediately synchronized with the frequency of the sound. The vibrating body (the vocal cord) producing the note then appears stationary when viewed by the light from the stroboscope.

The apparatus was devised before the war and the ripple movement at the edge of the vocal cord was seen. This movement has been observed also by cinematographic methods but this method of examination is not one for the consulting room.

The strobotron apparatus has its uses in the functional disorders of the cords, in the detection of impaired mobility of the cords in infiltrations by growth or infection.

It had been hoped to improve the intensity of illumination but war conditions have not allowed improvements to the machine.

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