TREADMILL WITH A VARIABLE ANGLE OF INCLINATION OF THE RUNNING BAND FOR EXPERIMENTS ON SMALL ANIMALS

Yu. F. Frolov

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An apparatus is described by means of which the running conditions (i.e., the speed and angle of inclination of the running band) can be varied.

The general appearance of the treadmill used by the author in his experiments on rabbits is shown in Fig. 1. By means of a movable partition (16) the animal can be compelled to run with steps of a certain length.

Since the treadmill is driven by a motor without a commutator, and since the design of the working space of the treadmill gives it good screening properties, electrophysiological investigations on the moving animal can be carried out with the use of stationary electrophysiological apparatus.

The treadmill consists of a stand (1) to which the running band and electric motor (6) with a six-step V-belt reducing gear is freely secured. The stand is made from lengths of No. 7 duralumin channel girder and from sheet 2.5 mm thick, joined together by screws.

The running band, consisting of a continuous band of perforated cloth (19), wound on two drums, is secured to the frame by means of an axle (10). The driving drum (9) rotates in ballbearings firmly secured to the body of the running band (27); the driven drum (20) can be moved along the girders of the frame by means of the tension adjusters of the band (22). The top part of the band slides along a smooth strip of metal (17), thus preventing the band from hanging down as a result of the animal's body weight. To prevent the band from slipping off the drums, they are flanged at their edges.

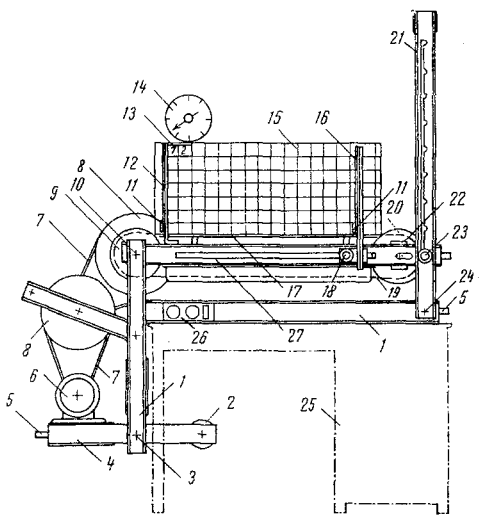

Fig. 1. General appearance of the treadmill (explanation in text).

A metal screen (15) is secured to the body of the running band. The front surface of the screen is painted white, with a black grid painted on it. For investigations using a motion picture camera, a tablet bearing the number of the experiment (13) and an electrical time indicator (14) are fixed to the screen. The latter consists of a circular dial 200-300 nm in diameter, around which a pointer rotated by an SD-60 synchronized electric motor moves at the rate of 1 rev/sec. The time indicator and the tablet with the number of the experiment are in the field of view of the camera and are photographed together with the animal moving against the background of the screen grid.

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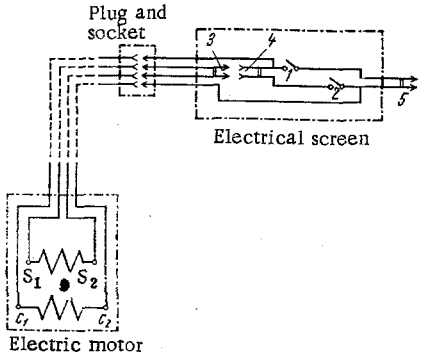

Fig. 2. Electrical circuit of the treadmill: 1) switch; 2) pushbotton; 3) plug of starter winding; 4) socket; 5) plug for power supply; S_1 and S_2) contacts for starter winding of electric motor; C_1 and C_2) contacts of working winding of electric motor.

Two metal partitions are also fixed to the body of the running band: one stationary (12) and the other movable (16). A grid is painted on the surface of both partitions. The movable partition can be moved along the running band, thereby altering its working length. By means of a screw clip (18), the movable partition can be fixed in the required partition. The use of a movable partition serves two purposes: 1) it limits the working length of the running band, and thus prevents the animal from "walking" along it, and thereby varying the running speed; 2) by further shortening the working length of the running band, the animal is forced to take shorter steps than it would if running in a free state. Areas of the partition bordering on the moving band are covered with strips of felt in close contact with the band (11), thus preventing the animal's limbs from being pulled beneath the partition.

The speed of movement of the band is determined by multiplying the length of the circumference of the drum (allowing for the thickness of the band) by the speed of its rotation. The latter is measured by means of a revolution counter and seconds timer or by means of an accurate tachometer.*

By turning it around the axle (10), the running band is given the required angle of inclination, which is fixed by means of the strut (21) and screws (23). The strut is movable relative to the axle (24).

Rotation of the driving drum (9) is effected by means of an electric motor (6) fixed to a movable platform (4). The platform can be turned around the axle (3), so that the weight of the motor keeps the belt (7) of the V-drive taut. Part of the weight of the electric motor is balanced by the counterpoise (2).

Changes in the speed of movement of the running band are effected by means of a V-belt reducing gear providing any one of six possible speeds of rotation of the driving drum by moving the belt (7) to the appropriate pair of pulleys (8).

Electric motor is regulated by means of an electrical screen (26) fixed to the frame of the treadmill. The electrical circuit of the treadmill is shown in Fig. 2.

The speed of movement of the band can be varied between 0.6 and 3.5 m/sec, and the angle of inclination of the running band between 0 and 40° in steps of 5°. The length of the working part of the running band can be varied from 0.20 to 0.80 m. The width of the band is 0.19 M. A nonsynchronized single-phase type AOLB-31-4† electric motor, with a power of 0.27 kW, giving 1440 rpm, is used. The dimensions of the treadmill are 1.65 × 1.65 × 0.55 m, and its weight is 70 kg.

*The speed of movement of the band can also be determined by a simpler method. For this purpose, a mark is painted white across the band, and by means of a seconds timer the frequency with which this mark passes by a stationary point on the treadmill is measured. The product of the length of the band and the number of times that the mark passes the point gives the speed of movement of the band.

†If a three-phase electricity supply is available in the laboratory, the 0.6 kW type AOL2-11-4 electric motor, which is the same size as the AOLB-31-4, can be used. In this case, control over the electric motor is simplified and is effected by means of a three-phase reversing switch.