

The present invention relates to a digital pulse generator with a rotatable disc and sensors cooperating therewith, for emitting digital pulses which depend on the direction of rotation.

These pulse generators are known in digital technology as digital encoders. They comprise a rotatable disc which can be scanned mechanically by sliding contacts, optically by optoelectronic sensors or magnetically based on the Hall effect or inductively. The disc is moved past the pulse-triggering element such as the slider, photodiode, Hall element or coil. There are two sensors which are arranged offset by a certain angle. It is possible to gather from the pulse trains which are phase-shifted and delivered by said sensors the direction of rotation of the pulse generator, so that for example a counter connected thereto counts up or down, of which the count can be evaluated digitally or, after conversion, in analogue form thereby.

Such a device is known for example from DE-A-30 15 971. It serves to recognise the left or right movement of a body. In this device two sensors (e.g. Hall generators) are fixedly mounted opposed to a train of N/S magnet poles, which alternate and are arranged at the periphery of a rotating body, such that their mutual spacing does not equal the spacing of the individual magnet poles. As a result, with the aid of an evaluation device connected to the sensors the direction of rotation of the

rotating body can be determined, which arises from the phase displacement of the signals delivered from the sensors. Moreover, the known device has a further fixed magnet pole pair, the poles of which have a spacing which corresponds to the spacings of the magnet poles of the rotating body. This is designed to ensure that the rotating body latches into place always in a fixed position of rest, as was achieved mechanically for example by the known ball-latching mechanism. The torque characteristics of the device do not change here however.

Pulse generators of the previously described type are widespread in digital electronics and are even increasing in importance in entertainment electronics. Thus the pulse generator is often used to control one after the other different functions depending on the operating command by the user of the equipment. Thus it is possible for example to change the transmitter setting, the volume setting, the bass and treble settings and the sound balance of the device with this single pulse generator. This occurs such that these different functions are assigned to the pulse generator by preselection keys.

The object underlying the invention is to so design a pulse generator that its operation is made easier. This object is achieved by the invention provided in patent claim 1. Other advantageous refinements of the invention arise from the dependent claims.

The invention has the advantage that the pulse generator acts differently for adjusting the volume by means of a latched characteristic from adjusting the transmitter selection for example, in which the pulse generator has flywheel-like characteristics. When adjusting the bass, treble or the sound balance of the audio amplifier on the other hand in some circumstances a constant fairly large torque is desirable.

The invention will be explained below by way of an embodiment.

Figure 1 shows the plan view and

Figure 2 shows the side view of the arrangement.

In Figures 1 and 2 a conventional construction of a pulse generator is shown schematically. It consists of a disc 1 which has at its periphery at uniform angular spacings equally uniform projections 4. These act on sensors 2 and 3 which comprise coils which cooperate with the projections 4 of the disc 1 which are formed as magnets. The sensors 2 and 3 may be formed also in the form of forked light barriers which embrace the projections 4 of the disc 1. In an evaluation circuit 5 both the direction of rotation of the disc 1 and the pulse count are detected from the signals from sensors 2 and 3 for the purpose of stepped adjustment of a value for adjusting the function magnitudes.

The disc 1 is moved via an axle 7 mounted in a bearing 6, which the user drives via a knob 8.

If latched operation of the pulse generator is required by the operating function, a current is sent via a control unit 9 through magnets 10 and 11 which are arranged at a certain angular spacing at the periphery of the disc 1 opposed to the projections 4. As a result a rotation by touch of the disc 1 takes place and occurs in small angular steps. The strength of the latching effect is adjustable by the size of the current through the magnets 10 and 11.

If there is required with a different operating function rotation of the disc 1 and thus of the pulse generator, which is not latched but which is provided with frictional characteristics, this may be achieved by a control unit 9 energising an eddy-current brake 12, the effectiveness of which can be varied by a current of suitable size produced by the control unit 9. Thus in advantageous manner the disc 1 may be formed itself as part of the eddy-current brake. It is also conceivable to produce the rotation provided with friction by a motor in short-circuit operation.

If rotation with flywheel effect is demanded, for example when adjusting the transmitter of a receiving device, the current through the magnets 10 and 11 and the eddy-current brake 12 is switched off, an inert mass arranged in the knob 8 supporting this effect.



Patent Claims

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1. A digital pulse generator with a rotatable disc (1) and with sensors (2,3) cooperating therewith, for emitting digital pulses which depend on the direction of rotation of the pulse generator and with a device (9,10,11,12) which changes the torque characteristics of the pulse generator, characterised in that the device (9,10,11,12) changes the torque characteristics in dependence on the function of the pulse generator (1,2,3,4,5).
2. A digital pulse generator according to claim 1, characterised in that the device (9,10,11,12) switches over the pulse generator (1,2,3,4,5) according to the function into a latched or into a stiff or easy-running mode.
3. A digital pulse generator according to claim 1, characterised in that the latched operation is produced with the aid of an arrangement consisting of electromagnets (10,11) in cooperation with the disc (1) of the pulse generator.
4. A digital pulse generator according to claim 1, characterised in that switchover to the easy-running or stiff mode takes place with the aid of an eddy-current brake (12).
5. A digital pulse generator according to claim 3, characterised in that the disc (1) of the pulse generator (1,2,3,4,5) is formed as part of the eddy-current brake (12).