CLAIMS

1. An encoder comprising:

a track having optical effecters which are arranged to have an absolute pattern along a measurement direction and configured to reflect or transmit light;

a point light source configured to emit diffusion light to the track; ~~and~~

a light receiving array having light receiving elements arranged along the measurement direction, and configured to receive light reflected or transmitted at the track, ~~the~~ each light receiving element~~s~~ is capable of falling within an area which is positioned corresponding to an area between the optical effecters and to which light reflected or transmitted at the track ~~dose~~ does not reach; ~~.~~ and

when a width of an emitting surface of the point light source in the measurement direction is ϕ, a minimum width of the optical effecters in the measurement direction is y, a width of the light receiving elements in the measurement direction is x, a distance from the emitting surface to the optical effecters is u, and a distance from the optical effecters to the light receiving elements is v, the following relation is satisfied

$$\phi \leq \{y \times (u + v) - u \times x\}/v$$

~~2. The encoder according to claim 1, wherein~~

~~a width of an emitting surface of the point light source in the measurement direction and a width of the light receiving elements in the measurement direction are set, so that the light receiving elements fall within the area which is positioned corresponding to the area between the optical effecters and to which light reflected or transmitted at the track dose not reach.~~

~~3. The encoder according to claim 2, wherein~~

~~when the width of the emitting surface in the measurement direction is ϕ, a minimum width of the optical effecters in the measurement direction is y, the width of the light receiving elements in the measurement direction is x, a distance from the emitting surface to the optical effecters is u, and a distance from the optical effecters to the light receiving elements is v, the following relation is satisfied.~~

~~$\phi \leq \{y \times (u + v) - u \times x\}/v$~~

~~4~~2. The encoder according to claim ~~2~~1, wherein

when ~~the width of the emitting surface in the measurement direction is ϕ, a minimum width of the optical effecters in the measurement direction is y, the width of the light receiving elements in the measurement direction is x, and a~~ the distance from the emitting surface to the optical effecters u is equal

to ~~a~~ the distance from the optical effecters to the light receiving elements v, the following relation is satisfied~~.~~

$$\phi \leq 2 \times y - x$$

~~5~~3. A motor with an encoder comprising:

a linear motor in which a movable element moves with respect to ~~a~~n stator, or a rotary motor in which a rotor moves with respect to ~~a~~n stator; and

the encoder according to any one of claims 1 to ~~4~~2, configured to detect at least one of a position and a speed of the movable element or the rotor.

~~6~~4. A servo system comprising:

a linear motor in which a movable element moves with respect to ~~a~~n stator, or a rotary motor in which a rotor moves with respect to ~~a~~n stator;

an encoder according to any one of claims 1 to ~~4~~2, configured to detect at least one of a position and a speed of the movable element or the rotor; and

a controller configured to control the linear motor or the rotary motor based on a result detected by the encoder.

CLAIMS

1. An encoder comprising:

a track having optical effecters which are arranged to have an absolute pattern along a measurement direction and configured to reflect or transmit light;

a point light source configured to emit diffusion light to the track;

a light receiving array having light receiving elements arranged along the measurement direction, and configured to receive light reflected or transmitted at the track, each light receiving element is capable of falling within an area which is positioned corresponding to an area between the optical effecters and to which light reflected or transmitted at the track does not reach; and

when a width of an emitting surface of the point light source in the measurement direction is ϕ, a minimum width of the optical effecters in the measurement direction is y, a width of the light receiving elements in the measurement direction is x, a distance from the emitting surface to the optical effecters is u, and a distance from the optical effecters to the light receiving elements is v, the following relation is satisfied

$$\phi \leq \{y \times (u + v) - u \times x\}/v$$

2. The encoder according to claim 1, wherein

when the distance from the emitting surface to the optical effecters u is equal to the distance from the optical effecters to the light receiving elements v, the following relation is satisfied

$$\phi \leq 2 \times y - x$$

3. A motor with an encoder comprising:

a linear motor in which a movable element moves with respect to a stator, or a rotary motor in which a rotor moves with respect to a stator; and

the encoder according to any one of claims 1 to 2, configured to detect at least one of a position and a speed of the movable element or the rotor.

4. A servo system comprising:

a linear motor in which a movable element moves with respect to a stator, or a rotary motor in which a rotor moves with respect to a stator;

an encoder according to any one of claims 1 to 2, configured to detect at least one of a position and a speed of the movable element or the rotor; and

a controller configured to control the linear motor or the rotary motor based on a result detected by the encoder.