The invention relates to a coil arrangement for a focus or track control circuit, in which the coils are arranged as a printed circuit on a flexible conductor foil and are provided as adjustment members for the focus or track control circuit.

Coils having a diameter of only about 4mm, which are produced using a very thin wire with a diameter of about 0.08 to 0.1mm, serve for instance as adjustment members in the servo circuits of a CD-player.

A CD-player is equipped with two servo circuits, the focus control circuit and the track control circuit. The focus control circuit focuses a light beam by means of an objective lens on to a recording medium, the so-called CD. The track control circuit acts so that the light beam is guided exactly on the data tracks of the recording medium by the objective lens.

The objective lens can for instance be located in a rectangular housing. At two opposing sides of the housing is arranged one focus coil each for the focus control circuit, their axes extending parallel to the optical axis of the objective lens. At the outer side of each focus coil there are arranged two track coils for the track control circuit, their axes being perpendicular to the axes of the focus coils and extending in the radial direction relative to the CD. Into the interior space of the focus coils projects one leg each of a U-shaped iron yoke or of a horseshoe magnet, so that the track coils lie completely between the legs.

The housing with the objective lens is fixed by a device in such a way that it is movable in the direction of the optical axis and in the radial direction relative to the

CD. The objective lens can therefore be moved perpendicular to the recording medium by means of the focus coils, the adjustment members of the focus control circuit, in order to focus the light beam thereon.

The housing with the objective lens, however, can be shifted in the radial direction by means of the track coils, the adjustment members of the track control circuit, in order to be able to guide the light beam along the data tracks of the plate-like recording medium. In order to limit the length of the track coils, two track coils are arranged on each focus coil next to each other.

It is indeed possible to wind the two track coils, which have a diameter of about 3mm and length of about 0.4mm, by using a very thin wire, however this technique is mastered by only very few manufacturers. If however two separate coils are wound, the wire ends must be soldered to each other. Because the wire for the track coils has however a diameter of only 0.08 to 0.1mm, this solder process is not easy to perform.

It is known from EP-A 0 252 651 to provide the coils of the track control circuit for movement of the objective lens as conductive tracks on a flexible foil. Two foils are provided with coils above. One foil serves for moving the objective lens, whereas by means of the other foil the movements of the objective lens are measured. The other foil is therefore a measurement pick-up.

In JP-A-59 040329 there is known an optical scanning device in which a plurality of coils are glued to a flexible foil, which is glued to the jacket of a cylinder.

In JP-A-60 197940 there is disclosed a conductor foil for an optical scanning device of the following construction.

On a flexible conductor foil having the shape of a T arranged on its head, there is arranged the focus coil on the vertical beam, a track coil being located in each half of the horizontal beam. The foil is fixed at one side of a rectangular housing, which carries the objective lens. The projecting part of the longitudinal beam and the projecting parts of the transverse beams are bent at a right-angle, so that they lie firmly against the sides of the housing.

It is the object of the invention so to construct a coil arrangement for a focus or track control circuit, in which the coils are arranged on a flexible conductor foil as a printed circuit and are provided as adjustment members for the focus or track control circuit, that it can be easily manufactured with simple technical means in order to lower production costs.

The invention achieves this object in that the conductor foil is constructed in an H-shape, that coils are printed in the longitudinal arms of the H, that in the transverse arm there are provided an aperture, soldering terminals and conductive tracks, that the transverse arm is arranged on the upper or lower face of a rectangular housing in which there is located an objective lens, and that the longitudinal arms of the H are bent around the sides of the housing.

There is shown in

Figure 1 a housing with an objective lens, two focus- and four track coils and two U-shaped iron yokes for a

CD-player in top plan view,

Figure 2 the housing of Figure 1 in side view,

Figure 3 the invention according to claim 1.

Figure 1 shows a part of an optical scanning device of a CD-player. At two opposing sides of a housing G, in the centre of which is located an objective lens O, one focus coil F each is fixed, the axes of which extend parallel to the optical axis of the objective lens O. At the outer side of each focus coil F are arranged two track coils S, the axes of which extend perpendicular to the optical axis of the objective lens O. Into the inner space of the focus coil F projects one leg of a iron yoke E, so that the track coils S lie between the two legs of the iron yoke E. At one leg of each iron yoke can be arranged a magnet M.

With reference to Figure 3, the invention will now be described and explained.

Figure 3 shows a conductor foil, which is formed H-shaped. In the longitudinal beams of the H are arranged four coils S. In the transverse beam are located soldering terminals and conductor tracks for the current connections. In the middle of the cross-beam an aperture B is provided for the light beam. The H-shaped foil with the printed circuit is glued to the upper and lower face of the housing G. Due to the aperture B the light beams can shine unhindered through the objective lens O on to the recording medium.

The longitudinal beams of the H-shaped foil are first bent about the fold edges K1 at the first two opposing sides of the housing G. Then the projecting legs of the

longitudinal beams are bent about the fold edges K2 at the other two opposing sides of the housing G. The housing G is now totally wrapped by the foil except the upper and lower faces. In each case two coils are resting one on top of the other. The longitudinal beams can be for instance produced longer and can be printed with more than four coils. In order to raise the field strength, they are folded in such a way, that folding edges are each located between two coils. Each folded leaf then carries one coil.

The invention is suitable for a plurality of interconnected coils of small dimensions. It is especially suitable for the coils of a track control circuit of an optical scanning device, as incorporated in CD-players, video record players, DRAW-disc-players or a magneto-optical recording and/or reproduction device.

CLAIMS

1. A coil arrangement for a focus or track control circuit, in which the coils (S) are arranged as a printed circuit on a flexible conductor foil and are provided as adjustment members for the focus or track control circuit, characterised in that the conductor foil is constructed in an H-shape, that the coils (S) are printed in the longitudinal arms of the H, that in the transverse arm there are provided an aperture (B), soldering terminals and conductive tracks, that the transverse arm is arranged on the upper or lower face of a rectangular housing (G) in which there is located an objective lens (O), and that the longitudinal arms of the H are bent around the sides of the housing (G).

2. A coil arrangement according to claim 1, characterised in that in each longitudinal arm a plurality of coils are located adjacent to each other, that after m coils each longitudinal arm is folded, m being a whole number, so that a plurality of coils lie behind each other.

3. A coil arrangement according to claim 1 or 2, characterised in that the conductor foil has coils printed on both sides.

* C L M S *