960208-7 3105

KU 121192

REPLACED SHEETS SG
☑ Description : paged ...1.... to paged ...10.....
☑ Claim(s) : paged ...11... to paged ...12.....
☑ Drawing(s) : paged ...14... to paged ...14...
☑ Abstract : paged ...13... to paged ...-.....
DATE OF RECEIPT .....

Turn-table for disc-shaped information carriers

The present invention relates to a turn-table for disc-shaped information carriers and to the method for the manufacture thereof, wherein the turn-table has a centering piece which reaches through a central bore in the information carrier and an outer rim surface of the turn-table forms the support surface for the information carrier such as in a CD player for example.

Disc-shaped information carriers which are scanned or recorded upon while rotating on a turn-table for recording and reproducing items of information are generally known. While disc-shaped information carriers in the form of the well-known analogue gramophone record are, as a rule, laid flat on a turn-table and rotate at a relatively low rotational speed of 33 1/3 or 45 revolutions per minute, disc-shaped information carriers, such as the CD or MOD for example, in which the compact storage technique is utilised, are placed-on or clamped at a central region which does not carry any information and rotate at a substantially higher rotational speed in the region of 500 revolutions per minute for example. Due to the high rotational speed and the very small dimensions of the area that has to be scanned as well as to the central clamping of the information carrier, only very small deviations of the rotating information carrier from the envisaged scanning location can be permitted in the radial direction and in height so that large demands are made upon the precision of the fixing and the centering of the information carrier on the turn-table and upon the turn-table.

In addition to the centering, whose precision is affected by the centering piece reaching through the central boring in the information carrier, very close manufacturing tolerances have to be maintained due to the central clamping of the information carrier, in particular as regards the run out in the vertical direction of the turn-table, since a run out of the turn-table of, for example, just 0.05 mm, which represents a maximum permissible upper limit, causes a vertical run out of 0.2 mm at the outer edge of a CD which, in many cases, will no longer

This Sheet Has Been Replaced



ensure the requisite reliability of scanning required for the information carrier.

A turn-table for disc-shaped information carriers, that has been used for many years in CD play-back equipment and which comprises a bearing bush made of brass that is pressed onto the drive spindle of a motor and onto which a flat metal disc forming a support surface for the information carrier and having an inner shoulder is riveted or slotted together with the bearing bush is known c.f. Fig. 3. Due to the tolerances of the riveting surface of the brass bush relative to the support surface of the information carrier, the maximum permissible run out is frequently not maintained and this leads to a high proportion of defective turn-tables or to a high number of reject items. In addition, the mating process involved in the riveting disadvantageously affects the precision of the turn-table and high pressing-forces, which lead to deformations that likewise contribute to the run out and the deviations from a centered position, are required for fixing the brass bushing on the motor spindle. In order to diminish the pressing-force or the supporting surface, grooves were provided in the brass bushing, whereby however, only a further deterioration in respect of the running properties of the turn-table was achieved.

For the purposes of centering the information carrier on the turn-table, there is provided a centering cone which can be displaced along the axis of the turn-table and is formed by a third part. The displaceability of the centering piece along the axis of the turn-table does, it is true, provide the advantage of adapting to the tolerances in the central borings of the information carrier, but, due to the play of the centering piece relative to the axis of the turn-table itself, this causes eccentricities or deviations in the position of the information carrier in a radial direction.

Although there is no longer any overriding significance to be attributed to the rotational mass or the flywheel effect due to the use of an electronic direct drive for the turn-table, it has

This Sheet Has Been Replaced



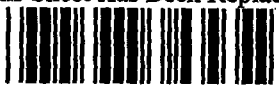
to be mentioned nevertheless, that a high rotational mass or a large flywheel effect is desirable for improving the running properties. The metal parts, which substantially affect the rotational mass, are distributed relatively evenly over the whole region of the turn-table so that a substantially uniform distribution of the mass is present.

Furthermore, a turn-table for accommodating record-like information carriers which consists of a single piece of permanently magnetic, powdered material that is bound together by a synthetic material is known c.f. DE-GM 78 34 662 dated 22.11.1978. An expensive technological process, which affects the costs of the turn-table disadvantageously, is required for the manufacture of the permanently magnetic material that is bound together by a synthetic material. The connection of the turn-table to the motor spindle by a press-seating, which only requires a small effort, leads to stress cracks in the case of the suggested powdered material and hence, to the breakdown of the equipment. Moreover, the range of variations resulting from the manufacturing process used for one piece turn-tables consisting of materials that are bound together by a synthetic material does not satisfy the demands that are being made in respect of precision and dimensional stability. Attempts using designs that are completely of synthetic material have also resulted in the previously described level of precision not being able to be maintained over a long period of time due to the flowing properties of the synthetic material and the tolerances involved in the manufacturing process despite having a plurality of injection points.

Due to the homogeneity of the material, the turn-table does not exhibit any of the features which tend to assist the flywheel effect but rather, they are affected disadvantageously due to the very low weight of the one piece turn-table.

The centering piece does not have a very steep cone so that a relatively exact pre-positioning relative to the turn-table is required for centering the information carrier.

This Sheet Has Been Replaced



In the context of a one piece turn-table, a centering piece, which is additionally placed on the one piece turn-table and is formed of synthetic material springs, is known c.f. Specification CDM 12.3 in N.V. Philips Industrial Activities, Rev. 1.0 dated 14 September 1992, Page 27, Fig. 10. Since the tolerances of the centering piece add to the tolerances, which the support surfaces of the turn-table have in relation to the drive spindle of the motor and which are already involved due to the manufacturing process, and, since synthetic material springs become fatigued after only a very short time, only a very small precision in respect of the centering process can be achieved.

Furthermore, a turn-table for disc-shaped information carriers is known, which consists of a flat metal disc that is shouldered in its inner region and comprises a body of synthetic material - by means of which the motor spindle is accommodated - in its inner region, c.f. Drive unit for compact disc player (KSM-210) in Sony Electronic Devices General Catalog '91, p 76. The outer annular edge of the metal disc serves as the support surface for the information carrier and the body of synthetic material is arranged on the inside of the metal disc at a distance from the inner edge of the surface provided as a support for the information carrier. The inner region of the metal disc has recesses in which the body of synthetic material engages in order to achieve a safeguard in respect of twisting distortion. A shouldered inner surface of the metal disc, which is spaced from the support surface of the information carrier, is used as a sealing surface in the injection moulding tool for inserting the body of synthetic material into the metal disc. Due to the use of a body of synthetic material in the inner region of the turn-table, only very low pressing-forces are required, especially in connection with the mounting of the turn-table on the motor spindle. However, due to the replacement of the brass bushing mentioned hereinabove by a body of synthetic material, no substantial improvements could be achieved as regards the run out of the turn-table, the precision of the centering or the appearance of radial errors and the rotational mass. Only a low precision of the centering could be achieved using an envisaged centering piece which can be displaced in sliding manner on a

This Sheet Has Been Replaced



surface of the body of synthetic material in a direction along the axis of the motor, due to the tolerance chains between the motor spindle and the body of synthetic material as well as between the body of synthetic material and the centering piece and the backlash existing between the body of synthetic material and the centering piece.

Consequently, the object of the invention is to create a turn-table for disc-shaped information carriers which, at low cost, ensures low run out, high centering precision as well as an advantageous rotational mass, mainly by virtue of its construction and its method of manufacture.

In accordance with the invention, this object is achieved by the features indicated in claims 1 and 6 as well as the advantageous developments specified in the appendant claims.

In order to avoid the disadvantage occurring with known turn-tables, there is proposed a turn-table for disc-shaped information carriers which consists of an apertured disc that forms a support surface for the information carrier and comprises a shoulder, which bounds the inner edge of the support surface, in its inner region, wherein, in the inner region of the apertured disc, there is inserted a moulded part that accommodates the driving spindle of the turn-table and embeds the apertured disc in abutting manner up to the shoulder of the support surface of the information carrier. The moulded part is preferably injected as a synthetic material part into the apertured disc in an injection moulding tool, whereby the support surface of the apertured disc for the information carrier is simultaneously used as a reference surface in the injection moulding tool and the inner region of the apertured disc is embedded in the moulded part in abutting manner up to the inner edge of the support surface for the information carrier. The moulded part simultaneously accommodates the driving spindle of the turn-table so that chains of tolerances, which disadvantageously affect the precision of the manufacturing process as regards run out and centering, are avoided due to the construction of, and the method of

This Sheet Has Been Replaced



nufacturing the turn-table. This is achieved, in particular, in that the surface of the apertured disc, which is envisaged later as the support surface for the information carrier, is used as a reference surface in the injection moulding tool. In advantageous manner, the shoulder between the shouldered surface and the support surface for the information carrier serves as a sealing surface in the injection moulding tool. For the purposes of centering the information carrier on the turn-table, use is preferably made of a centering piece which forms a constructional unit with the moulded part that is injected into the inner region of the apertured disc or is simultaneously implemented with the moulded part being integrated therein. The centering piece integrated into the turn-table is formed by a cup-shaped boss which has a rounded shape over a large diametrical region in order to allow centering even in the event of an inexact pre-centering of the information carrier. Since the centering piece is manufactured simultaneously with the moulded part, neither chains of tolerances nor backlash which could disadvantageously affect the precision of the centering occur. It has been discovered that the deviations occurring as a result of the differing diameters of the information carriers or the undersize of the centering piece can be selected to be smaller than the tolerances occurring in the case of the centering piece which is displaceable along the axis of the motor. However, a combination of the proposed turn-table with a displaceable centering piece likewise leads to turn-tables having a very low run out.

As regards the rotational mass or the flywheel effect, it should be noted that the preferably metallic apertured disc exhibits a comparatively greater thickness and that a large flywheel effect or advantageous running properties are achieved, in particular, due to the concentration of the mass elements in the support region of the information carrier.

The turn-table and the said measures enable, at low cost, the manufacture of turn-tables which exhibit a very low run out and a high centering precision, mainly due to the proposed construction and the proposed method of manufacture so that the

This Sheet Has Been Replaced



proportion of turn-tables that are manufactured with defects is lowered and the reliability of the scanning of the information carriers, such as the compact disc or CD, which is also referred to as a digital gramophone record, a data bank CD-ROM, a CD-Video or Photo-CD for example, is increased.

The invention will be explained in more detail hereinafter by means of two embodiments in the drawings. Therein :

Fig. 1 shows a sectional illustration of a first turn-table in accordance with the invention,

Fig. 2 a view of the turn-table in accordance with Fig. 1 from below,

Fig. 3 the construction of a known turn-table and

Fig. 4 a basic sketch of a second turn-table in accordance with the invention as a semi-side-sectional view.

The turn-table illustrated in Fig. 1 consists of an apertured disc LS which has a shoulder S in its inner region and which is embedded in a moulded part F that abuts up to the shoulder S and simultaneously forms a centering piece Z as well as a bushing B for accommodating a driving spindle. The apertured disc LS, whose surface that is not embedded in the moulded part forms the support surface AF for the information carrier, is manufactured as a stamp punched part from a metal ring, in order to enable the information carrier to be clamped in known manner by means of a not-illustrated puck, which serves as a counter support, using magnetic means. Due to the stamping process, there is achieved a high degree of stability, dimensional stability and precision of the upper surface with respect to the apertured disc LS and, in particular, the support surface AF for the information carrier. To this end, especial significance has to be attributed to the planing of the support surface AF during the stamping process, just as in the case of known turn-tables, and the apertured disc has a greater thickness in comparison

This Sheet Has Been Replaced



th the metal disc M of a known turn-table which is illustrated n Fig. 3.

The apertured disc LS of the turn-table illustrated in the Figs. 1, 2 and 4 is embedded internally in a moulded part F that abuts up to the said shoulder S, the moulded part being formed by a body of synthetic material which is injected into the apertured disc LS using an injection moulding tool. The moulded part F is designed in such a way that, in correspondence with Figs. 1 and 4, it is off-set vis a vis the support surface AF for the information carrier in a region extending from the shoulder S up to the centering piece Z and is shaped such as to slope down in a direction towards the centering piece in order to ensure that the placing or clamping of the information carrier occurs exclusively on the support surface AF of the apertured disc LS. None the less, the internally shouldered region of the apertured disc LS is embedded on both sides or completely in the moulded part F or the body of synthetic material that abuts up to the shoulder S of the apertured disc LS. The inner, shouldered region of the apertured disc LS is completely enclosed in the moulded part F or is completely enveloped by the moulded part F, whereby a firm and solid connection between the moulded part F and the apertured disc LS is produced. The connection between the moulded part F and the apertured disc LS is additionally assisted by means of webs or recesses provided internally of the apertured disc LS which are illustrated in Fig. 2 as invisible edges of the body. Furthermore, in correspondence with Fig. 2 and in order to increase the degree of stability and the dimensional stability, strengthening ribs V are provided on the under side of the moulded part F and supports a ring of the moulded part F which is arranged beneath the shouldered inner surface of the apertured disc LS and simultaneously forms an outer rim and an end point for the strengthening ribs V which point in a direction towards the centre of the turn-table. In order to ensure that the recesses in the inner region of the apertured disc LS formed between the support webs are reliably filled when injecting the moulded part F in the injection moulding tool, the strengthening ribs V are arranged in the vicinity of the recesses.

This Sheet Has Been Replaced



this also formed a pre-requisite for being able to design the moulded part F to abut up to the shoulder S of the support surface AF in order to then be able to use, in advantageous manner, the surface of the apertured disc LS envisaged as the support surface AF for the information carrier as a reference surface in the injection moulding tool when injecting the moulded part F and to ensure nevertheless that there was an absolutely reliable safeguard in respect of twisting distortion between the moulded part F consisting of synthetic material and the metallic apertured disc LS. Due to the use of the surface AF of the apertured disc LS envisaged as the support surface AF for the information carrier as a reference surface in the injection moulding tool when injecting the moulded part F, tolerance chains between the support surface of the apertured disc LS and the bushing B for accommodating the drive spindle and in relation to the centering piece Z which is likewise formed by the moulded part as well as between one another are avoided so that a turn-table of this type exhibits very low run out as well as a high precision of centering, mainly by virtue of its special design and the technique used to manufacture it.

Due to the comparatively augmented arrangement of weighty masses in the edge region, the turn-table achieves a greater rotational mass or flywheel effect which has a further advantageous effect upon the running properties of the turn-table.

The advantage of the reduced run out can be used, in correspondence with a second embodiment in Fig. 4, in connection with a centering piece Z which is displaceable relative to the axis of rotation of the turn-table, this enabling adaptation or centering to occur even in the case of extremely large deviations between the, in principle, standardised diameters of the central bores in the information carriers. In agreement with the embodiment corresponding to Fig. 1, the turn-table consists of an internally shouldered apertured disc LS which is embedded in a moulded part F consisting of synthetic material that abuts internally up to the shoulder S which is formed by the inner edge of the support surface AF of the apertured disc LS for the

This Sheet Has Been Replaced



information carrier. The support surface AF of the apertured disc LS for the information carrier is used, in a similarly advantageous manner, as a reference surface when injecting the moulded part F in the injection moulding tool so that turn-tables having a reduced run out are manufactured. The centering piece Z is implemented with locking lugs R that engage in recesses of the moulded part F and is also implemented such as to be displaceable in sliding manner directly on the driving spindle T as well as to be supported on the moulded part F via a spring E. Due to the direct guidance of the centering piece Z on the driving spindle T, tolerance chains are avoided and the precision of the centering is basically determined only by virtue of the backlash between the driving spindle T and the moulded part F. The guideway of the centering piece Z on the driving spindle T can be selected to be comparatively long so that there is only a very small amount of backlash whereby a high degree of precision for the centering process is achieved. Since the embodiments corresponding to Fig. 1 and Fig. 4 differ exclusively only in regard to the centering piece Z used internally of the turn-table, the said advantages concerning the rotational mass or flywheel effect are also applicable for this embodiment.

This Sheet Has Been Replaced



* C L M S *

Claims

1. Turn-table for disc-shaped information carriers, in which an outer edge surface of the turn-table forms a support surface (AF) for the information carrier which is internally bounded by a shoulder (S), and including a central centering piece (Z) which reaches through a central bore in the information carrier, characterised in that, the turn-table is formed by an apertured disc (LS) that has a shoulder (S) and is arranged so as to be embedded internally in a moulded part (F) which accommodates a driving spindle (T) of the turn-table and which abuts up to the shoulder (S) that forms an inner edge of a support surface (AF) of the turn-table for the information carrier.

2. Turn-table in accordance with Claim 1, characterised in that, a centering piece (Z) of the turn-table is integrated in the moulded part (F) and is implemented in one piece with the moulded part (F) as a cup-shaped boss.

3. Turn-table in accordance with Claim 1, characterised in that, a centering piece (Z), which is displaceable on the driving spindle (T) of the turn-table, is arranged to engage in recesses of the moulded part (F) by means of locking lugs (R) and to be supported on the moulded part (F) via a spring (E).

4. Turn-table in accordance with any of the Claims 1 to 3, characterised in that, the apertured disc (LS) is a stamp punched part which is produced from a metal ring and in which there is provided at least one recess in which the moulded part (F) is arranged to engage for the purpose of providing a safeguard in respect of twisting distortion vis a vis the moulded part (F).

5. Turn-table in accordance with any of the Claims 1 to 4, characterised in that, the apertured disc (LS) is formed by a ferro-magnetic metal ring and the moulded part (F) accommodating the apertured disc (LS) and the axis of rotation is a part of synthetic material.

This Sheet Has Been Replaced

6. Method of manufacturing a turn-table in accordance with any of the Claims 1 to 5, characterised in that, the turn-table is manufactured from an apertured disc (LS) which has a shoulder (S) and which is inserted into an injection moulding tool using a reference surface that is envisaged as the support surface (AF) for the information carrier and from a moulded part (F) which is formed so as to embed the apertured disc up to the shoulder (S) of the turn-table bounding the inner part of the support surface (AF) for the information carrier as well as the inner region of the apertured disc (LS) and to contain a boring (B) that is provided for accommodating a driving spindle (T) of the turn-table.

7. Method in accordance with Claim 6, characterised in that, a centering piece (Z) is manufactured in one piece with the part of synthetic material as a cup-shaped boss of the turn-table in an injection moulding tool.

8. Method in accordance with Claim 6, characterised in that, there is used a centering piece (Z) which is specially manufactured and slides on the driving spindle (T), engages in recesses of the turn-table by means of locking lugs (R) and is supported on the turn-table via a spring (E).

9. Method in accordance with any one of the Claims 6 to 8, characterised in that, there are used, as a reference surface in an injection moulding tool, a surface provided as the support surface (AF) of the turn-table for the information carrier and, as a sealing surface in an injection moulding tool, a shoulder (S) which bounds the inner edge of the support surface (AF) for the information carrier.

This Sheet Has Been Replaced

Abstract

Turn-table for disc-shaped information carriers

1. The invention relates to a turn-table for disc-shaped information carriers and to the method for the manufacture thereof.

2.1. The object of the invention is the manufacture of a turn-table having very low run out and a high precision of centering.

2.2. In accordance with the invention, this object is achieved in that the turn-table is formed by an apertured disc (LS) that has a shoulder (S) and is arranged so as to be embedded internally in a moulded part (F) which accommodates a driving spindle (T) and which abuts up to the shoulder (S). A centering piece (Z) is preferably integrated in the moulded part (F) or is implemented as a special part. A low run out is achieved, especially in that a support surface (AF) of the turn-table for the information carrier is used as a reference surface in the injection moulding tool when manufacturing the moulded part (F), whereby chains of tolerances, which affect the precision disadvantageously, are avoided.

2.3. The usage relates to turn-tables for play back and/or recording apparatus for disc-shaped information carriers such as CD, CD-ROM, CD-Video or Photo-CD for example.

3. Fig. 1

This Sheet Has Been Replaced



A-A

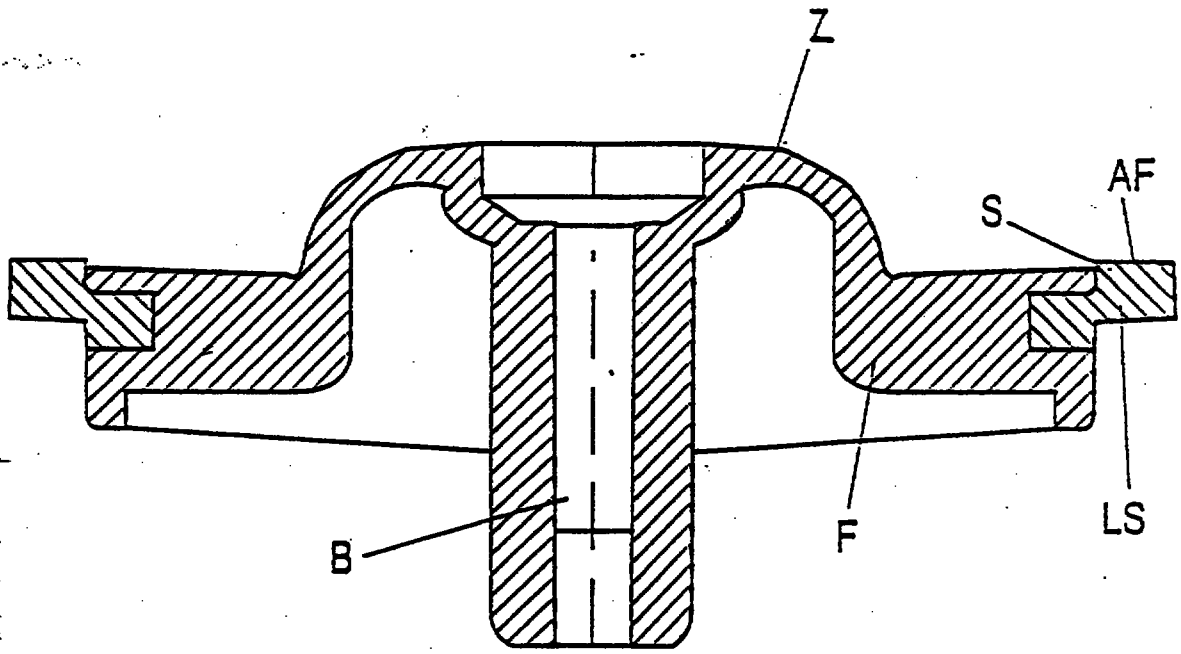


Fig.1

This Sheet Has Been Replaced

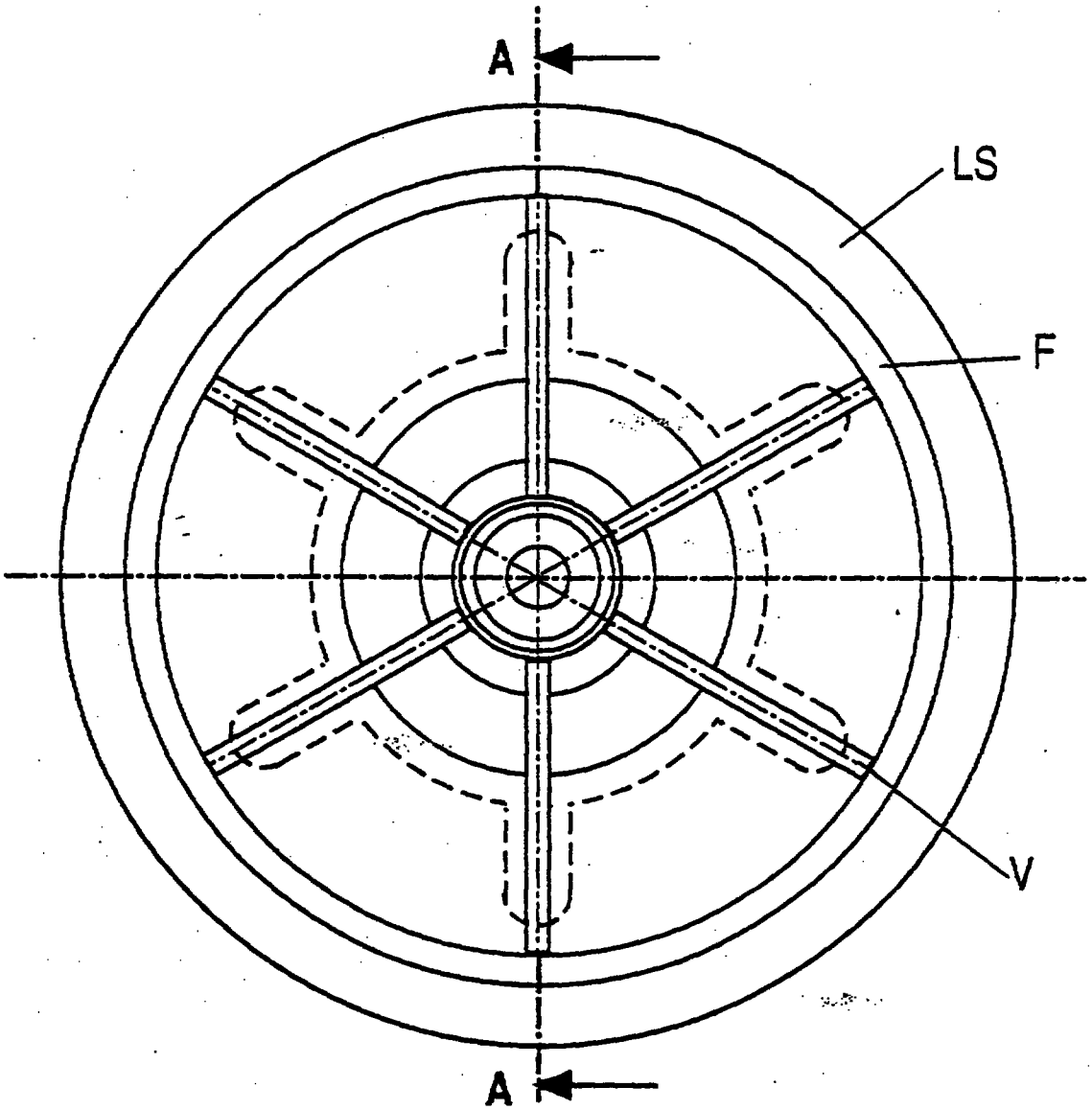


Fig.2

This Sheet Has Been Replaced

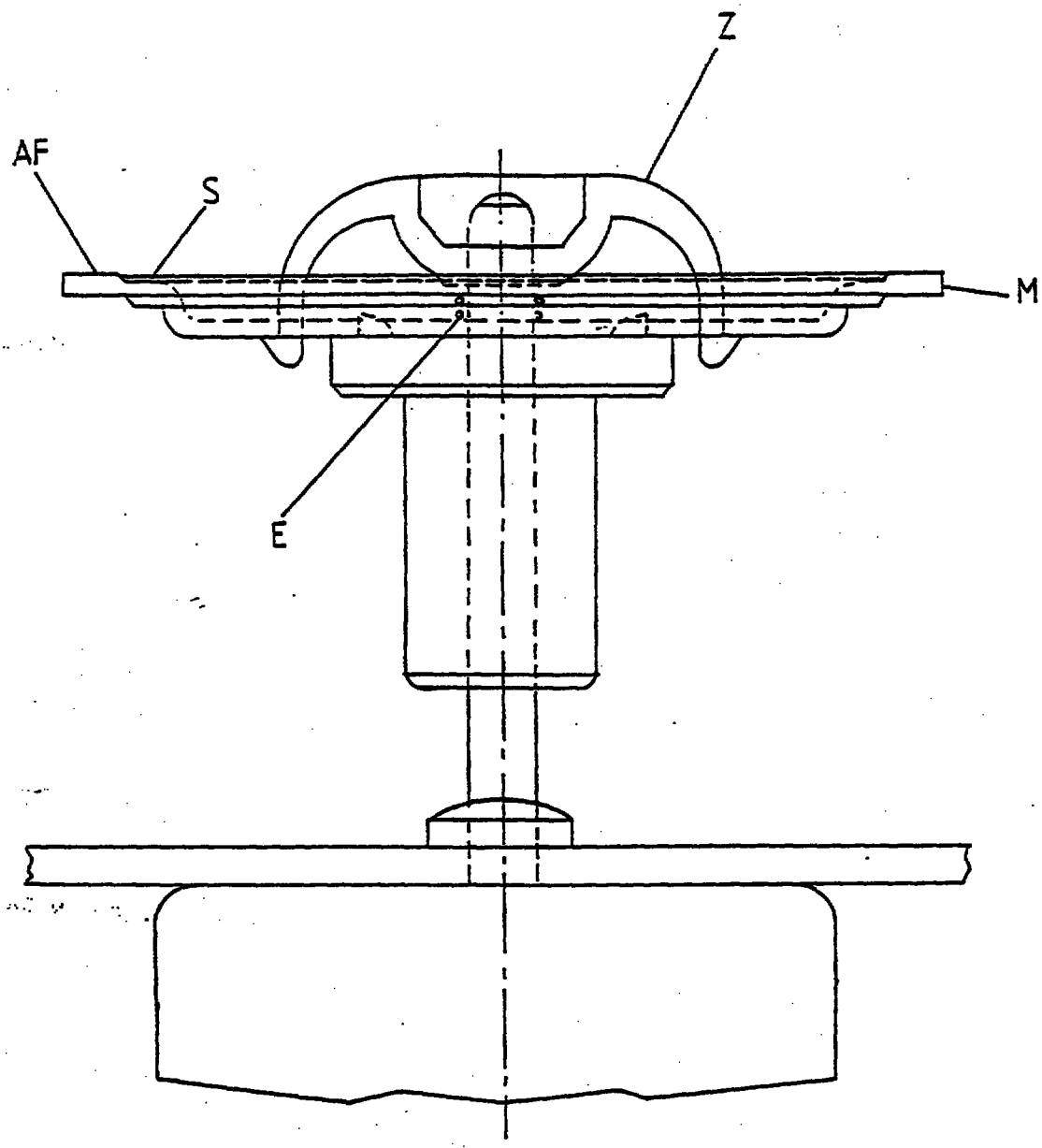


Fig.3

This Sheet Has Been Replaced

/137

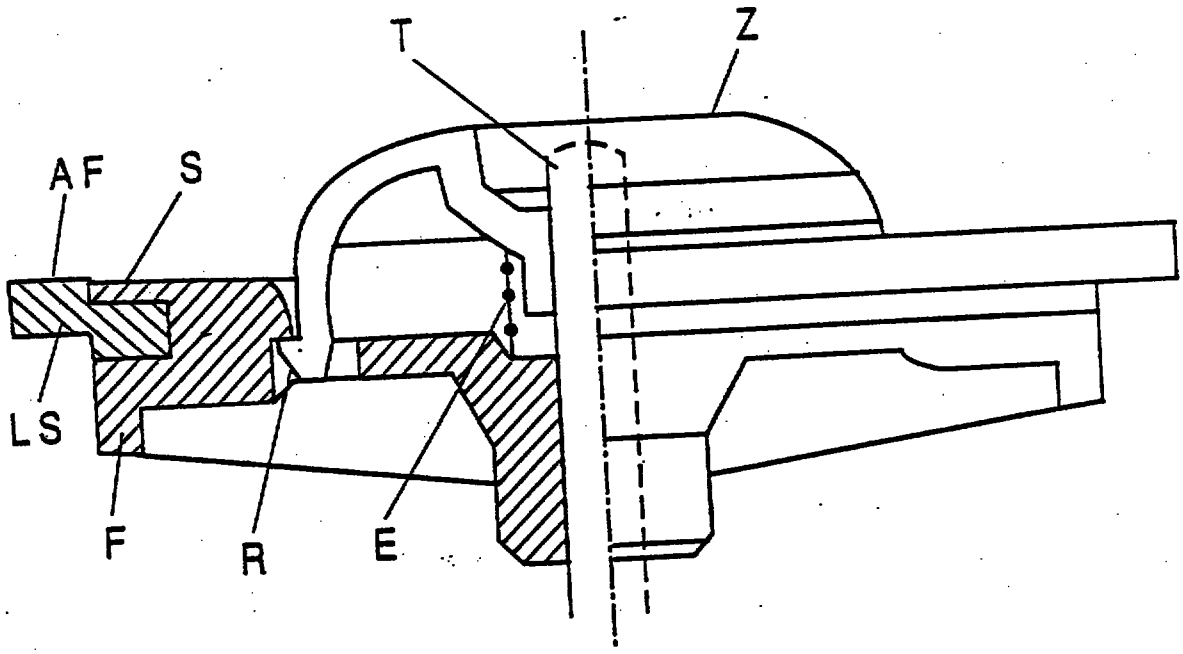


Fig.4

This Sheet Has Been Replaced

REPLACED SHEETS SG
☑ Description : paged ...1... to paged ...10....
☑ Claim(s) : paged ...11... to paged ...12....
☑ Drawing(s) : paged ...1/4.. to paged ...4/4...
☑ Abstract : paged ...13... to paged ...-....
DATE OF RECEIPT .....

9607208-7 IDS
REPLACEMENT SHEETS SG
☑ Description : paged ..1.. to paged ..10..
☑ Claim(s) : paged ..11.. to paged ..12..
☑ Drawing(s) : paged ..1/4 to paged ..4/4
☑ Abstract : paged ..13. to paged ..-...
DATE OF RECEIPT ..7/3/97.....

Turn-table for disc-shaped information carriers

The present invention relates to a turn-table for disc-shaped information carriers and to the method for the manufacture thereof, wherein the turn-table has a centering piece which reaches through a central bore in the information carrier and an outer rim surface of the turn-table forms the support surface for the information carrier such as in a CD player for example.

Disc-shaped information carriers which are scanned or recorded upon while rotating on a turn-table for recording and reproducing items of information are generally known. While disc-shaped information carriers in the form of the well-known analogue gramophone record are, as a rule, laid flat on a turn-table and rotate at a relatively low rotational speed of 33 1/3 or 45 revolutions per minute, disc-shaped information carriers, such as the CD or MOD for example, in which the compact storage technique is utilised, are placed-on or clamped at a central region which does not carry any information and rotate at a substantially higher rotational speed in the region of 500 revolutions per minute for example. Due to the high rotational speed and the very small dimensions of the area that has to be scanned as well as to the central clamping of the information carrier, only very small deviations of the rotating information carrier from the envisaged scanning location can be permitted in the radial direction and in height so that large demands are made upon the precision of the fixing and the centering of the information carrier on the turn-table and upon the turn-table.

In addition to the centering, whose precision is affected by the centering piece reaching through the central boring in the information carrier, very close manufacturing tolerances have to be maintained due to the central clamping of the information carrier, in particular as regards the run out in the vertical direction of the turn-table, since a run out of the turn-table of, for example, just 0.05 mm, which represents a maximum permissible upper limit, causes a vertical run out of 0.2 mm at the outer edge of a CD which, in many cases, will no longer

REPLACEMENT SHEET
07 MAR 1997

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

ensure the requisite reliability of scanning required for the information carrier.

A turn-table for disc-shaped information carriers, that has been used for many years in CD play-back equipment and which comprises a bearing bush made of brass that is pressed onto the drive spindle of a motor and onto which a flat metal disc forming a support surface for the information carrier and having an inner shoulder is riveted or slotted together with the bearing bush is known c.f. Fig. 3. Due to the tolerances of the riveting surface of the brass bush relative to the support surface of the information carrier, the maximum permissible run out is frequently not maintained and this leads to a high proportion of defective turn-tables or to a high number of reject items. In addition, the mating process involved in the riveting disadvantageously affects the precision of the turn-table and high pressing-forces, which lead to deformations that likewise contribute to the run out and the deviations from a centered position, are required for fixing the brass bushing on the motor spindle. In order to diminish the pressing-force or the supporting surface, grooves were provided in the brass bushing, whereby however, only a further deterioration in respect of the running properties of the turn-table was achieved.

For the purposes of centering the information carrier on the turn-table, there is provided a centering cone which can be displaced along the axis of the turn-table and is formed by a third part. The displaceability of the centering piece along the axis of the turn-table does, it is true, provide the advantage of adapting to the tolerances in the central borings of the information carrier, but, due to the play of the centering piece relative to the axis of the turn-table itself, this causes eccentricities or deviations in the position of the information carrier in a radial direction.

Although there is no longer any overriding significance to be attributed to the rotational mass or the flywheel effect due to the use of an electronic direct drive for the turn-table, it has

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

to be mentioned nevertheless, that a high rotational mass or a large flywheel effect is desirable for improving the running properties. The metal parts, which substantially affect the rotational mass, are distributed relatively evenly over the whole region of the turn-table so that a substantially uniform distribution of the mass is present.

Furthermore, a turn-table for accommodating record-like information carriers which consists of a single piece of permanently magnetic, powdered material that is bound together by a synthetic material is known c.f. DE-GM 78 34 662 dated 22.11.1978. An expensive technological process, which affects the costs of the turn-table disadvantageously, is required for the manufacture of the permanently magnetic material that is bound together by a synthetic material. The connection of the turn-table to the motor spindle by a press-seating, which only requires a small effort, leads to stress cracks in the case of the suggested powdered material and hence, to the breakdown of the equipment. Moreover, the range of variations resulting from the manufacturing process used for one piece turn-tables consisting of materials that are bound together by a synthetic material does not satisfy the demands that are being made in respect of precision and dimensional stability. Attempts using designs that are completely of synthetic material have also resulted in the previously described level of precision not being able to be maintained over a long period of time due to the flowing properties of the synthetic material and the tolerances involved in the manufacturing process despite having a plurality of injection points.

Due to the homogeneity of the material, the turn-table does not exhibit any of the features which tend to assist the flywheel effect but rather, they are affected disadvantageously due to the very low weight of the one piece turn-table.

The centering piece does not have a very steep cone so that a relatively exact pre-positioning relative to the turn-table is required for centering the information carrier.

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

In the context of a one piece turn-table, a centering piece, which is additionally placed on the one piece turn-table and is formed of synthetic material springs, is known c.f. Specification CDM 12.3 in N.V. Philips Industrial Activities, Rev. 1.0 dated 14 September 1992, Page 27, Fig. 10. Since the tolerances of the centering piece add to the tolerances, which the support surfaces of the turn-table have in relation to the drive spindle of the motor and which are already involved due to the manufacturing process, and, since synthetic material springs become fatigued after only a very short time, only a very small precision in respect of the centering process can be achieved.

Furthermore, a turn-table for disc-shaped information carriers is known, which consists of a flat metal disc that is shouldered in its inner region and comprises a body of synthetic material - by means of which the motor spindle is accommodated - in its inner region, c.f. Drive unit for compact disc player (KSM-210) in Sony Electronic Devices General Catalog '91, p 76. The outer annular edge of the metal disc serves as the support surface for the information carrier and the body of synthetic material is arranged on the inside of the metal disc at a distance from the inner edge of the surface provided as a support for the information carrier. The inner region of the metal disc has recesses in which the body of synthetic material engages in order to achieve a safeguard in respect of twisting distortion. A shouldered inner surface of the metal disc, which is spaced from the support surface of the information carrier, is used as a sealing surface in the injection moulding tool for inserting the body of synthetic material into the metal disc. Due to the use of a body of synthetic material in the inner region of the turn-table, only very low pressing-forces are required, especially in connection with the mounting of the turn-table on the motor spindle. However, due to the replacement of the brass bushing mentioned hereinabove by a body of synthetic material, no substantial improvements could be achieved as regards the run out of the turn-table, the precision of the centering or the appearance of radial errors and the rotational mass. Only a low precision of the centering could be achieved using an envisaged centering piece which can be displaced in sliding manner on a

This Sheet Has Been Replaced

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

surface of the body of synthetic material in a direction along the axis of the motor, due to the tolerance chains between the motor spindle and the body of synthetic material as well as between the body of synthetic material and the centering piece and the backlash existing between the body of synthetic material and the centering piece.

Consequently, the object of the invention is to create a turn-table for disc-shaped information carriers which, at low cost, ensures low run out, high centering precision as well as an advantageous rotational mass, mainly by virtue of its construction and its method of manufacture.

In accordance with the invention, this object is achieved by the features indicated in claims 1 and 6 as well as the advantageous developments specified in the appendant claims.

In order to avoid the disadvantage occurring with known turn-tables, there is proposed a turn-table for disc-shaped information carriers which consists of an apertured disc that forms a support surface for the information carrier and comprises a shoulder, which bounds the inner edge of the support surface, in its inner region, wherein, in the inner region of the apertured disc, there is inserted a moulded part that accommodates the driving spindle of the turn-table and embeds the apertured disc in abutting manner up to the shoulder of the support surface of the information carrier. The moulded part is preferably injected as a synthetic material part into the apertured disc in an injection moulding tool, whereby the support surface of the apertured disc for the information carrier is simultaneously used as a reference surface in the injection moulding tool and the inner region of the apertured disc is embedded in the moulded part in abutting manner up to the inner edge of the support surface for the information carrier. The moulded part simultaneously accommodates the driving spindle of the turn-table so that chains of tolerances, which disadvantageously affect the precision of the manufacturing process as regards run out and centering, are avoided due to the construction of, and the method of

This Sheet Has Been Replaced



REPLACEMENT SHEET
07 MAR 1997

manufacturing the turn-table. This is achieved, in particular, in that the surface of the apertured disc, which is envisaged later as the support surface for the information carrier, is used as a reference surface in the injection moulding tool. In advantageous manner, the shoulder between the shouldered surface and the support surface for the information carrier serves as a sealing surface in the injection moulding tool. For the purposes of centering the information carrier on the turn-table, use is preferably made of a centering piece which forms a constructional unit with the moulded part that is injected into the inner region of the apertured disc or is simultaneously implemented with the moulded part being integrated therein. The centering piece integrated into the turn-table is formed by a cup-shaped boss which has a rounded shape over a large diametrical region in order to allow centering even in the event of an inexact pre-centering of the information carrier. Since the centering piece is manufactured simultaneously with the moulded part, neither chains of tolerances nor backlash which could disadvantageously affect the precision of the centering occur. It has been discovered that the deviations occurring as a result of the differing diameters of the information carriers or the undersize of the centering piece can be selected to be smaller than the tolerances occurring in the case of the centering piece which is displaceable along the axis of the motor. However, a combination of the proposed turn-table with a displaceable centering piece likewise leads to turn-tables having a very low run out.

As regards the rotational mass or the flywheel effect, it should be noted that the preferably metallic apertured disc exhibits a comparatively greater thickness and that a large flywheel effect or advantageous running properties are achieved, in particular, due to the concentration of the mass elements in the support region of the information carrier.

The turn-table and the said measures enable, at low cost, the manufacture of turn-tables which exhibit a very low run out and a high centering precision, mainly due to the proposed construction and the proposed method of manufacture so that the

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

proportion of turn-tables that are manufactured with defects is lowered and the reliability of the scanning of the information carriers, such as the compact disc or CD, which is also referred to as a digital gramophone record, a data bank CD-ROM, a CD-Video or Photo-CD for example, is increased.

The invention will be explained in more detail hereinafter by means of two embodiments in the drawings. Therein :

Fig. 1 shows a sectional illustration of a first turn-table in accordance with the invention,

Fig. 2 a view of the turn-table in accordance with Fig. 1 from below,

Fig. 3 the construction of a known turn-table and

Fig. 4 a basic sketch of a second turn-table in accordance with the invention as a semi-side-sectional view.

The turn-table illustrated in Fig. 1 consists of an apertured disc LS which has a shoulder S in its inner region and which is embedded in a moulded part F that abuts up to the shoulder S and simultaneously forms a centering piece Z as well as a bushing B for accommodating a driving spindle. The apertured disc LS, whose surface that is not embedded in the moulded part forms the support surface AF for the information carrier, is manufactured as a stamp punched part from a metal ring, in order to enable the information carrier to be clamped in known manner by means of a not-illustrated puck, which serves as a counter support, using magnetic means. Due to the stamping process, there is achieved a high degree of stability, dimensional stability and precision of the upper surface with respect to the apertured disc LS and, in particular, the support surface AF for the information carrier. To this end, especial significance has to be attributed to the planing of the support surface AF during the stamping process, just as in the case of known turn-tables, and the apertured disc has a greater thickness in comparison

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

with the metal disc M of a known turn-table which is illustrated in Fig. 3.

The apertured disc LS of the turn-table illustrated in the Figs. 1, 2 and 4 is embedded internally in a moulded part F that abuts up to the said shoulder S, the moulded part being formed by a body of synthetic material which is injected into the apertured disc LS using an injection moulding tool. The moulded part F is designed in such a way that, in correspondence with Figs. 1 and 4, it is off-set vis a vis the support surface AF for the information carrier in a region extending from the shoulder S up to the centering piece Z and is shaped such as to slope down in a direction towards the centering piece in order to ensure that the placing or clamping of the information carrier occurs exclusively on the support surface AF of the apertured disc LS. None the less, the internally shouldered region of the apertured disc LS is embedded on both sides or completely in the moulded part F or the body of synthetic material that abuts up to the shoulder S of the apertured disc LS. The inner, shouldered region of the apertured disc LS is completely enclosed in the moulded part F or is completely enveloped by the moulded part F, whereby a firm and solid connection between the moulded part F and the apertured disc LS is produced. The connection between the moulded part F and the apertured disc LS is additionally assisted by means of webs or recesses provided internally of the apertured disc LS which are illustrated in Fig. 2 as invisible edges of the body. Furthermore, in correspondence with Fig. 2 and in order to increase the degree of stability and the dimensional stability, strengthening ribs V are provided on the under side of the moulded part F and supports a ring of the moulded part F which is arranged beneath the shouldered inner surface of the apertured disc LS and simultaneously forms an outer rim and an end point for the strengthening ribs V which point in a direction towards the centre of the turn-table. In order to ensure that the recesses in the inner region of the apertured disc LS formed between the support webs are reliably filled when injecting the moulded part F in the injection moulding tool, the strengthening ribs V are arranged in the vicinity of the recesses.

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

this also formed a pre-requisite for being able to design the moulded part F to abut up to the shoulder S of the support surface AF in order to then be able to use, in advantageous manner, the surface of the apertured disc LS envisaged as the support surface AF for the information carrier as a reference surface in the injection moulding tool when injecting the moulded part F and to ensure nevertheless that there was an absolutely reliable safeguard in respect of twisting distortion between the moulded part F consisting of synthetic material and the metallic apertured disc LS. Due to the use of the surface AF of the apertured disc LS envisaged as the support surface AF for the information carrier as a reference surface in the injection moulding tool when injecting the moulded part F, tolerance chains between the support surface of the apertured disc LS and the bushing B for accommodating the drive spindle and in relation to the centering piece Z which is likewise formed by the moulded part as well as between one another are avoided so that a turn-table of this type exhibits very low run out as well as a high precision of centering, mainly by virtue of its special design and the technique used to manufacture it.

Due to the comparatively augmented arrangement of weighty masses in the edge region, the turn-table achieves a greater rotational mass or flywheel effect which has a further advantageous effect upon the running properties of the turn-table.

The advantage of the reduced run out can be used, in correspondence with a second embodiment in Fig. 4, in connection with a centering piece Z which is displaceable relative to the axis of rotation of the turn-table, this enabling adaptation or centering to occur even in the case of extremely large deviations between the, in principle, standardised diameters of the central bores in the information carriers. In agreement with the embodiment corresponding to Fig. 1, the turn-table consists of an internally shouldered apertured disc LS which is embedded in a moulded part F consisting of synthetic material that abuts internally up to the shoulder S which is formed by the inner edge of the support surface AF of the apertured disc LS for the

REPLACEMENT SHEET
07 MAR 1997

information carrier. The support surface AF of the apertured disc LS for the information carrier is used, in a similarly advantageous manner, as a reference surface when injecting the moulded part F in the injection moulding tool so that turn-tables having a reduced run out are manufactured. The centering piece Z is implemented with locking lugs R that engage in recesses of the moulded part F and is also implemented such as to be displaceable in sliding manner directly on the driving spindle T as well as to be supported on the moulded part F via a spring E. Due to the direct guidance of the centering piece Z on the driving spindle T, tolerance chains are avoided and the precision of the centering is basically determined only by virtue of the backlash between the driving spindle T and the moulded part F. The guideway of the centering piece Z on the driving spindle T can be selected to be comparatively long so that there is only a very small amount of backlash whereby a high degree of precision for the centering process is achieved. Since the embodiments corresponding to Fig. 1 and Fig. 4 differ exclusively only in regard to the centering piece Z used internally of the turn-table, the said advantages concerning the rotational mass or flywheel effect are also applicable for this embodiment.

This Sheet Has Been Replaced

* C L M S *

REPLACEMENT SHEET
07 MAR 1997

Claims

1. Turn-table for disc-shaped information carriers, in which an outer edge surface of the turn-table forms a support surface (AF) for the information carrier which is internally bounded by a shoulder (S), and including a central centering piece (Z) which reaches through a central bore in the information carrier, characterised in that, the turn-table is formed by an apertured disc (LS) that has a shoulder (S) and is arranged so as to be embedded internally in a moulded part (F) which accommodates a driving spindle (T) of the turn-table and which abuts up to the shoulder (S) that forms an inner edge of a support surface (AF) of the turn-table for the information carrier.

2. Turn-table in accordance with Claim 1, characterised in that, a centering piece (Z) of the turn-table is integrated in the moulded part (F) and is implemented in one piece with the moulded part (F) as a cup-shaped boss.

3. Turn-table in accordance with Claim 1, characterised in that, a centering piece (Z), which is displaceable on the driving spindle (T) of the turn-table, is arranged to engage in recesses of the moulded part (F) by means of locking lugs (R) and to be supported on the moulded part (F) via a spring (E).

4. Turn-table in accordance with any of the Claims 1 to 3, characterised in that, the apertured disc (LS) is a stamp punched part which is produced from a metal ring and in which there is provided at least one recess in which the moulded part (F) is arranged to engage for the purpose of providing a safeguard in respect of twisting distortion vis a vis the moulded part (F).

5. Turn-table in accordance with any of the Claims 1 to 4, characterised in that, the apertured disc (LS: is formed by a ferro-magnetic metal ring and the moulded part (F) accommodating the apertured disc (LS) and the axis of rotation is a part of synthetic material.

This Sheet Has Been Replaced

* C L M S *

REPLACEMENT SHEET
07 MAR 1997

6. Method of manufacturing a turn-table in accordance with any of the Claims 1 to 5, characterised in that, the turn-table is manufactured from an apertured disc (LS) which has a shoulder (S) and which is inserted into an injection moulding tool using a reference surface that is envisaged as the support surface (AF) for the information carrier and from a moulded part (F) which is formed so as to embed the apertured disc up to the shoulder (S) of the turn-table bounding the inner part of the support surface (AF) for the information carrier as well as the inner region of the apertured disc (LS) and to contain a boring (B) that is provided for accommodating a driving spindle (T) of the turn-table.

7. Method in accordance with Claim 6, characterised in that, a centering piece (Z) is manufactured in one piece with the part of synthetic material as a cup-shaped boss of the turn-table in an injection moulding tool.

8. Method in accordance with Claim 6, characterised in that, there is used a centering piece (Z) which is specially manufactured and slides on the driving spindle (T), engages in recesses of the turn-table by means of locking lugs (R) and is supported on the turn-table via a spring (E).

9. Method in accordance with any one of the Claims 6 to 8, characterised in that, there are used, as a reference surface in an injection moulding tool, a surface provided as the support surface (AF) of the turn-table for the information carrier and, as a sealing surface in an injection moulding tool, a shoulder (S) which bounds the inner edge of the support surface (AF) for the information carrier.

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

Abstract

Turn-table for disc-shaped information carriers

1. The invention relates to a turn-table for disc-shaped information carriers and to the method for the manufacture thereof.

2.1. The object of the invention is the manufacture of a turn-table having very low run out and a high precision of centering.

2.2. In accordance with the invention, this object is achieved in that the turn-table is formed by an apertured disc (LS) that has a shoulder (S) and is arranged so as to be embedded internally in a moulded part (F) which accommodates a driving spindle (T) and which abuts up to the shoulder (S). A centering piece (Z) is preferably integrated in the moulded part (F) or is implemented as a special part. A low run out is achieved, especially in that a support surface (AF) of the turn-table for the information carrier is used as a reference surface in the injection moulding tool when manufacturing the moulded part (F), whereby chains of tolerances, which affect the precision disadvantageously, are avoided.

2.3. The usage relates to turn-tables for play back and/or recording apparatus for disc-shaped information carriers such as CD, CD-ROM, CD-Video or Photo-CD for example.

3. Fig. 1

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

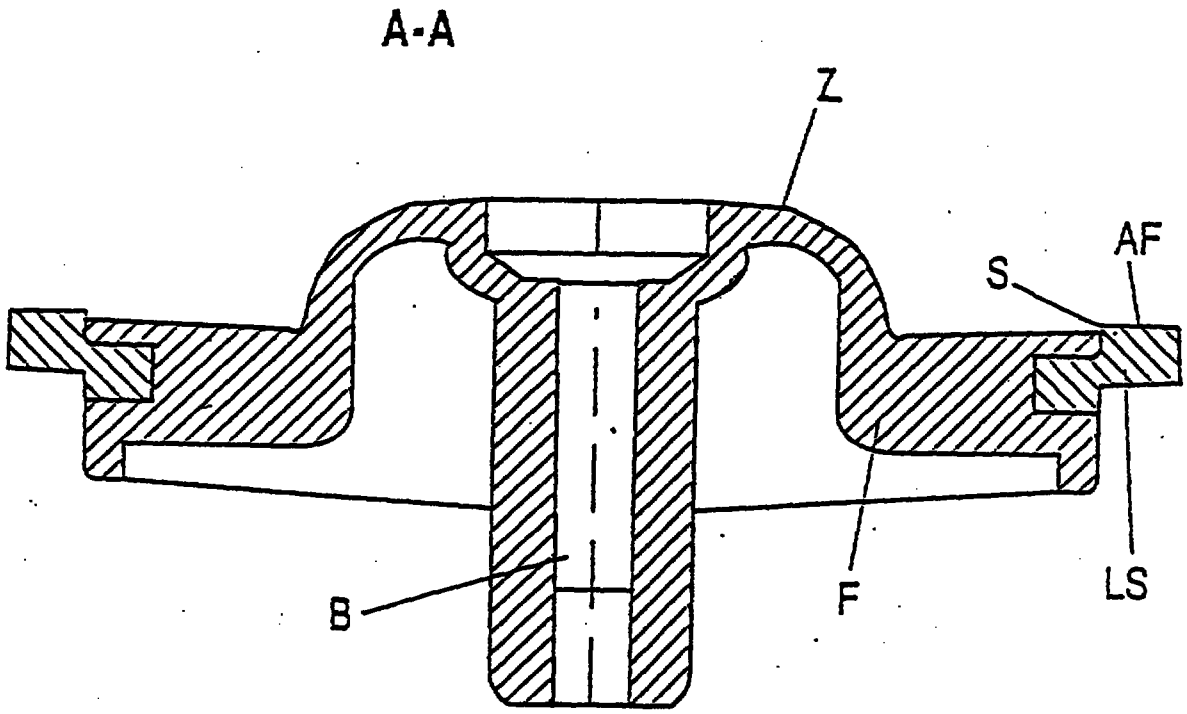


Fig.1

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

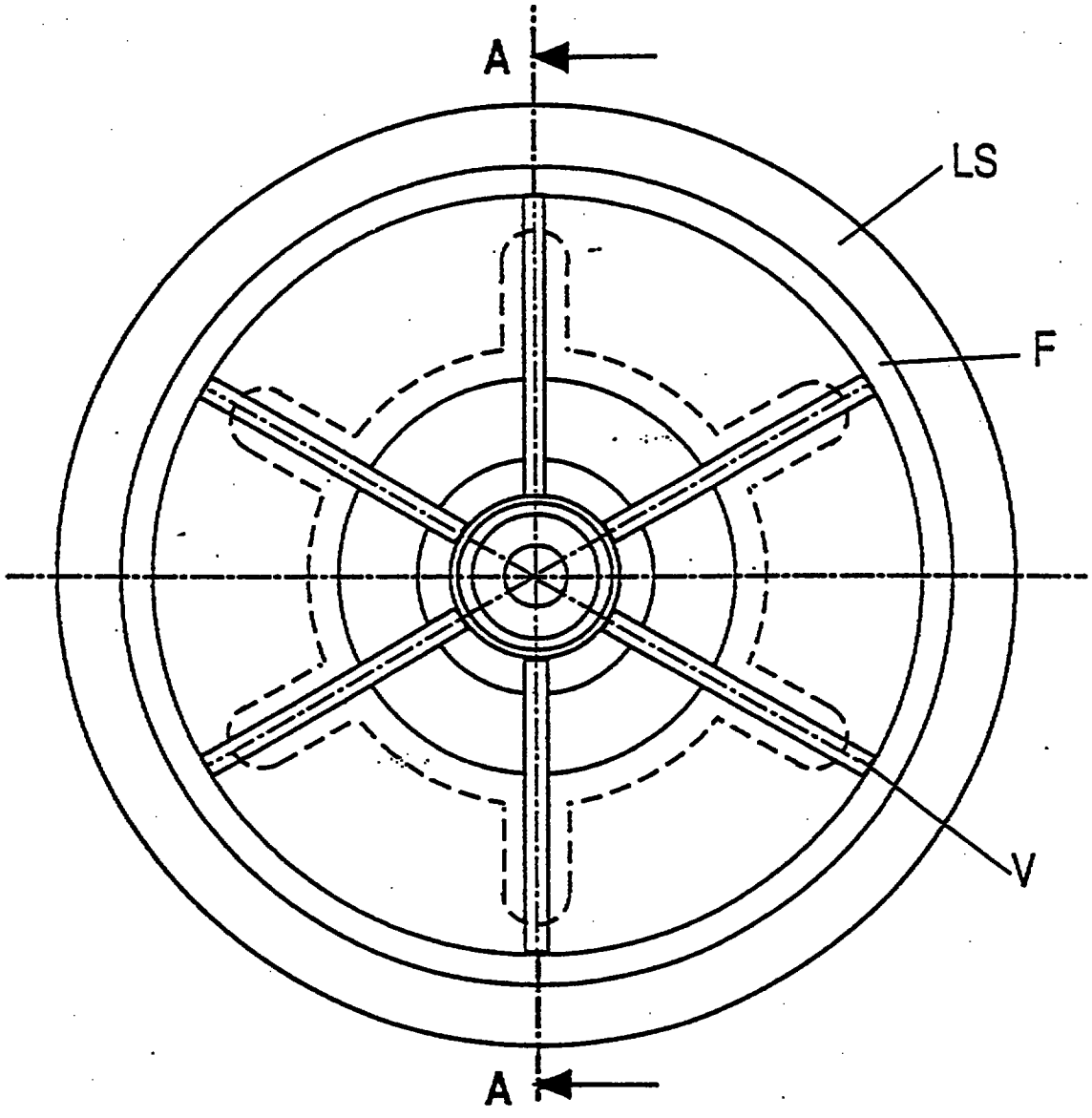


Fig.2

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997

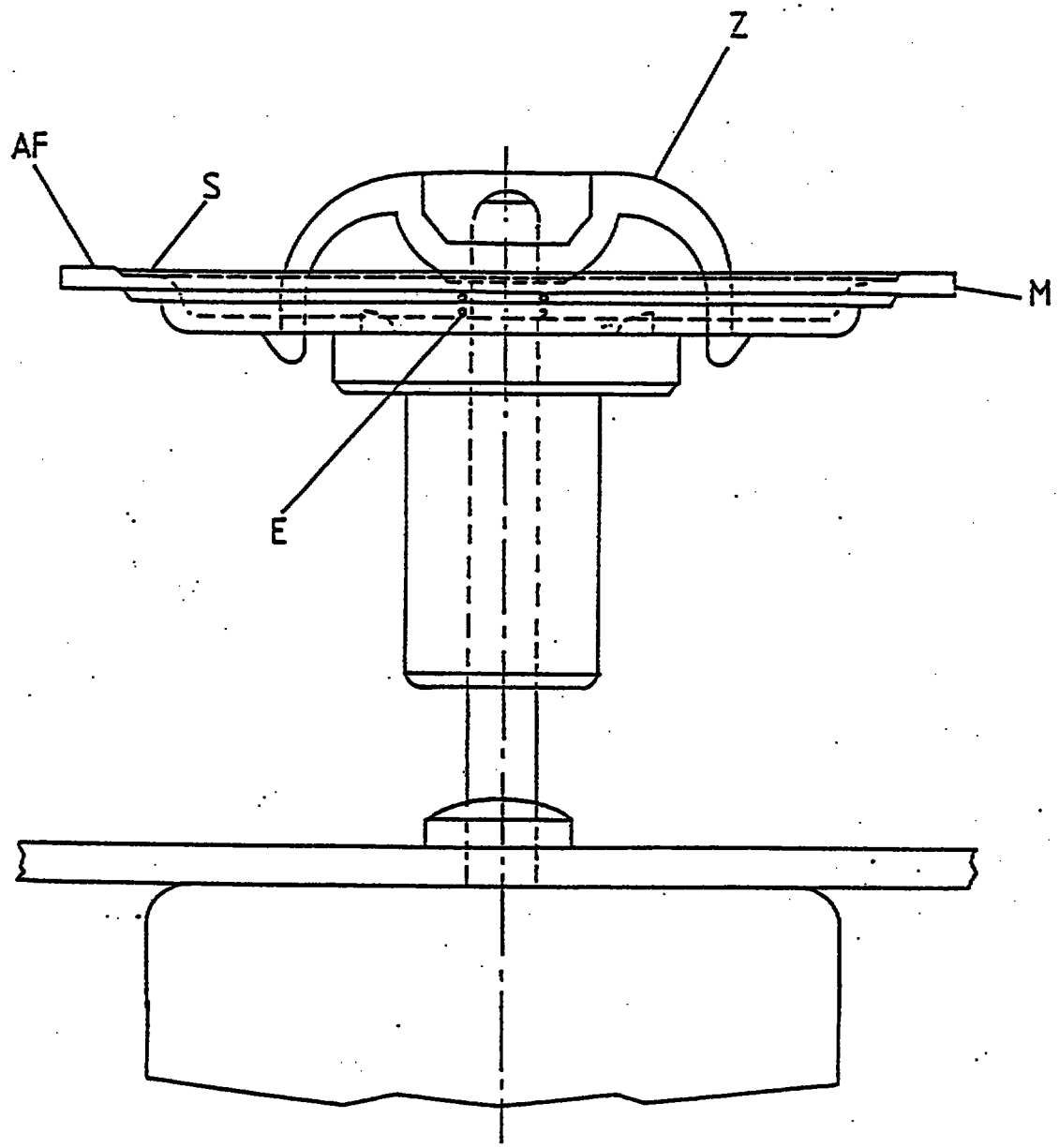
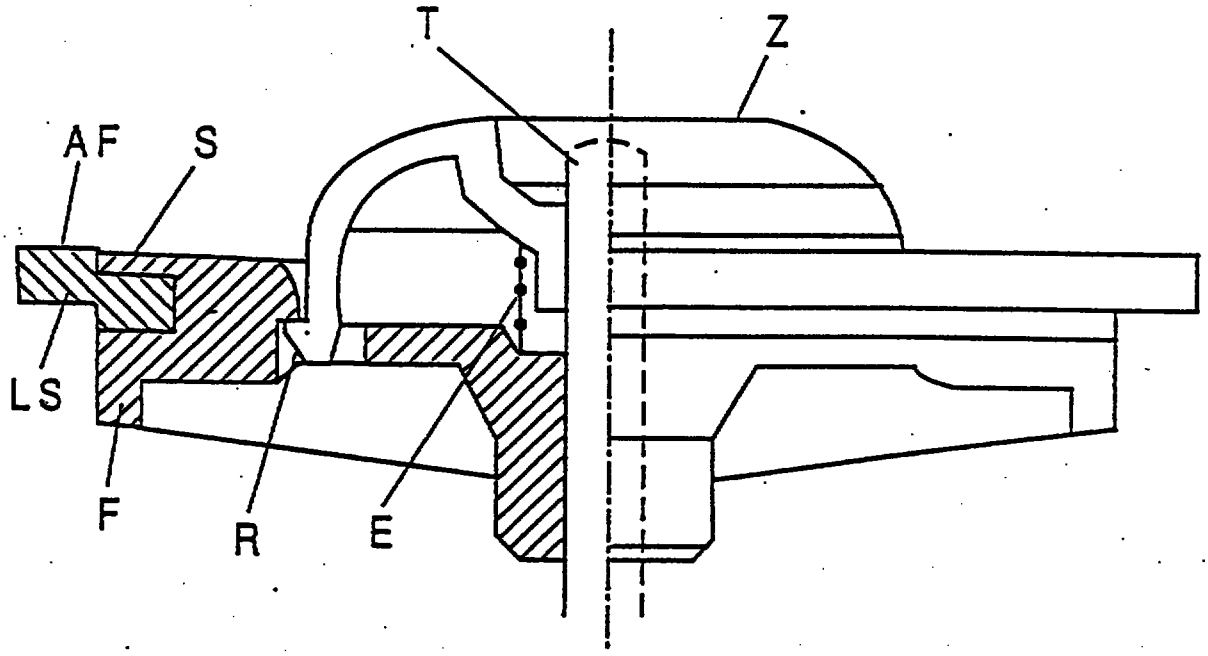


Fig.3

This Sheet Has Been Replaced

REPLACEMENT SHEET
07 MAR 1997



This Sheet Has Been Replaced

Fig.4

THIS SHEET HAS BEEN REPLACED

REPLACEMENT SHEETS SG
☑ Description : paged 1 to paged 8
☑ Claim(s) : paged 1 to paged 10
☑ Drawing(s) : paged 1/4 to paged 4/4
☐ Abstract : paged ..... to paged .....
DATE OF RECEIPT 13/9/97

TURNTABLE FOR DISC-SHAPED INFORMATION CARRIERS

This is a continuation of application Ser. No. 08/150,909, filed Nov. 12, 1993, now abandoned.

BACKGROUND OF THE INVENTION

REPLACEMENT SHEET
13 SEP 1997

The present invention relates to a turntable for disc-shaped information carriers and the process for its production, the turntable having a central centering piece, which engages through a centring bore of the information carrier, and an outer marginal surface of the turntable, such as for example in the case of a CD player, which forms a bearing surface for the information carrier.

Disc-shaped information carriers, which for recording and reproducing information are rotatingly scanned or written to on a turntable, are generally known. While disc-shaped information carriers in the form of the long-known analogue phonographic record are generally placed in full surface contact on a turntable and rotate at a relatively low speed of 33⅓ or 45 revolutions per minute, disc-shaped information carriers, such as for example the CD or MOD, for which the dense storage technique is used are placed or restrained in a central region bearing no information and rotate at a considerably higher speed in the range of, for example, 500 revolutions per minute. On account of the high speed and the small dimensions of the regions to be scanned and on account of the central restraint of the information carrier, only small deviations of the rotating information carrier from the intended scanning location in the radial direction and in the vertical position can be allowed, meaning that high accuracy requirements are imposed on the fixing and centring of the information carrier on the turntable and on the turntable itself.

Apart from the centring, the accuracy of which is influenced by the centring piece engaging through the centring bore of the information carrier, narrow production tolerances have to be maintained on account of the central restraint of the information carrier, in particular with regard to the runout in the vertical direction of the turntable, i.e. the vertical oscillation of the turntable during rotation since a vertical turntable runout of, for example only 0.05 mm, which represents a maximum permissible upper limit,

This Sheet Has Been Replaced

REPLACEMENT SHEET
13 SEP 1997

already causes at the outer edge of a CD a vertical runout of 0.2 mm, which in many cases no longer ensures the scanning reliability required for the information carrier.

There is a known turntable for disc-shaped information carriers which has been used for many years in CD players and has a bearing bush of brass which is pressed onto the drive spindle of a motor and on which an internally offset, flat metal disc is riveted on or splined with the bearing bush and forms a bearing surface for the information carrier, cf. FIG. 3. On account of the tolerances of the riveting surface of the brass bush with respect to the bearing surface of the information carrier, often the maximum permissible vertical runout is not maintained and results in a high proportion of defective turntables and high numbers of rejects. In addition, the joining operation of riveting has an adverse effect on the precision of the turntable, and fastening of the brass bush on the motor spindle requires high pressing-on forces, which result in deformations which likewise contribute to the vertical runout and to centring deviations. In order to reduce the pressing-on force or the load-bearing surface, slots have already been provided in the brass bush, but have only achieved the effect of a further deterioration in the running properties of the turntable.

For centring the information carrier on the turntable, a centring cone which is displaceable in the direction of the spindle of the turntable and is formed by a third part is provided. Although the displaceability of the centring piece on the turntable spindle advantageously permits an adaptation to tolerances of the centring bores of the information carriers, it itself causes eccentricities or deviations of the position of the information carrier in the radical direction on account of the play of the centring piece with respect to the turntable spindle.

Although the moment of inertia or the flywheel moment is no longer attributed prominent importance on account of the electronic direct drive of the turntable, it should be mentioned that nevertheless a high moment of inertia or a great flywheel moment is desirable to improve the running properties. The metal parts essentially influencing the moment of inertia are distributed relatively uniformly over the overall turntable area, so that there is a substantially uniform mass distribution.

Furthermore, a turntable consisting of a single piece of plastic-bonded, permanently magnetic powder material for recording on disc-shaped information carriers is known, cf.

REPLACEMENT SHEET
13 SEP 1997

German Utility Model 78 34 662 of 22.11.1978. For producing the plastic-bonded, permanently magnetic material, a complex technological process is required, which has an adverse effect on the costs of the turntable. The uncomplex connection of the turntable to the motor spindle by means of a press fit has the effect in the case of the proposed powder material of stress cracks, consequently leading to failure of the player. In addition, the production-dependent range of variation of one-piece turntables of plastic-bonded materials does not meet the imposed requirements for accuracy or dimensional stability. Tests with solid plastic versions have shown that, in spite of a plurality of gating points, the accuracy described above cannot be maintained over a lengthy period of time also on account of the flow properties of the plastics and production-dependent tolerances.

On account of the homogeneity of the material, the turntable has no features supporting the flywheel moment, which tend rather to be adversely affected due to the low weight of the one-piece turntable.

The centring piece has a steep cone, meaning that a relatively accurate prepositioning with respect to the turntable is required for centring the information carrier.

Also known in conjunction with a one-piece turntable is a centring piece which is additionally placed on the one-piece turntable and is formed by plastic springs, cf. Specification CDM 12.3 in N.V. Philips Industrial Activities, REV. 1.0 of 14 Sep. 1992, page 27, FIG. **10**. Since the tolerances of the centring piece add to the tolerances which the bearing surfaces of the turntable already have with respect to the drive spindle of the motor for production reasons, and since plastic springs suffer from fatigue for only a short time, only a low centring accuracy can be achieved.

Also known is a turntable for disc-shaped information carriers which comprises a flat metal disc which is offset in the inner region and which has in the inner region a plastic body, by which the motor spindle is received, cf. Drive unit for compact disc player (KSM-210) in Sony Electronic Devices General Catalog '91, page 76. The outer, annular edge of the metal disc serves as a bearing surface for the information carrier and the plastic body is arranged in the inner portion of the metal disc at a distance from the inner edge of the surface intended as a bearing for the information carrier. The inner region of the metal disc has recesses, into which the plastic body engages to achieve an anti-twisting

REPLACEMENT SHEET
13 SEP 1997

effect. As a sealing surface in the injection mould for fitting the plastic body into the metal disc, use is made of an offset inner surface of the metal disc at a distance from the bearing surface of the information carrier. By the use of a plastic body in the inner region of the turntable, lower pressing-on forces are required, in particular for mounting the turntable on the motor spindle. By replacing the brass bush mentioned at the beginning by a plastic body, it has not been possible however to achieve any significant improvements with regard to the vertical runout of the turntable, the centring accuracy or radial errors occurring and the moment of inertia. With an envisaged centring piece which is slidingly displaceable in the direction of the motor spindle on a surface of the plastic body, only a low centring accuracy can be achieved on account of the cumulative tolerances between motor spindle and plastic body and also between the plastic body and the centring piece and on account of the clearance existing between the plastic body and the centring piece.

The object of the invention is therefore to provide a turntable for disc-shaped information carriers which ensures by its very design and its production process a low vertical runout, a high centring accuracy and an advantageous moment of inertia in an uncomplex way.

This object is achieved according to the invention by the features specified in Claims 1 and 6 and by the advantageous designs specified in the subclaims.

SUMMARY OF THE INVENTION

In order to avoid the disadvantages occurring in the case of known turntables, proposed is a turntable for disc-shaped information carriers which comprises a perforated disc which forms a bearing surface for the information carrier and has in the inner region a shoulder bounding the inner edge of the bearing surface, there being inserted in the inner region of the perforated disc a moulded part which receives the rotary spindle of the turntable and embeds the perforated disc right up against the shoulder of the bearing surface of the information carrier. The moulded part is preferably injection-moulded as a plastic part in an injection mould into the perforated disc, the bearing surface of the perforated disc for the information carrier simultaneously being used as a reference surface in the injection mould, and the inner region

REPLACEMENT SHEET
13 SEP 1997

of the perforated disc being embedded in the moulded part right up against the inner edge of the bearing surface for the information carrier. The moulded part at the same time receives the rotary spindle of the turntable, meaning that cumulative tolerances adversely affecting the accuracy of production with regard to vertical runout and centring are avoided by the design and the production process of the turntable. This is achieved in particular by the fact that the surface of the perforated disc intended later as a bearing surface for the information carrier is used in the injection mould as a reference surface. The shoulder between the offset surface and the bearing surface for the information carrier serves in an advantageous way as a sealing surface in the injection mould. For centring the information carrier on the turntable, use is preferably made of a centring piece, which forms a structural unit with the moulded part injection-moulded in the inner region of the perforated disc, or is made simultaneously with and is integrated in the moulded part. The centring piece integrated into the turntable is formed by a pot-shaped hub, which has a rounded-off shape over a large diametral range, in order to permit centring even in the event of inaccurate precentring of the information carrier. Since the centring piece is produced simultaneously with the moulded part, there occur neither cumulative tolerances nor clearances which could adversely affect the centring accuracy. It has been established that the deviations occurring due to different diameters of the information carriers, or the undersize of the centring piece, can be chosen to be smaller than the tolerances occurring in the case of centring pieces which are displaceable with respect to the spindle of the motor. A combination of the proposed turntable with a displaceable centring piece likewise already has the effect, however, of turntables with lower vertical runout.

With regard to the moment of inertia or the flywheel moment, it should be noted that the preferably metallic perforated disc has a comparatively greater thickness and, in particular due to the concentration of mass elements in the bearing region of the information carrier, a high flywheel moment and advantageous running properties are achieved.

The turntable and the said measures permit in an uncomplex way the production of turntables which, by the very design proposed and by the very production process proposed have a low vertical runout and a high centring accuracy, meaning that the proportion of defectively produced turntables is reduced and the scanning reliability of the information carriers, such as for example of the compact

REPLACEMENT SHEET
13 SEP 1997

disc or CD, also referred to as a digital phonographic record, a databank CD-ROM, a CD video or photo CD, is increased.

BRIEF DESCRIPTION OF THE DRAWING

The invention is explained in more detail below with reference to two exemplary embodiments in drawings, in which:

FIG. 1 shows a sectional representation of a first turntable according to the invention,

FIG. 2 shows a view of the turntable according to FIG. 1 from the underside,

FIG. 3 shows the design of a known turntable and

FIG. 4 shows a basic diagram of a second turntable according to the invention with a semilateral sectional view.

DETAILED DESCRIPTION

The turntable represented in FIG. 1 comprises a perforated disc LS, which has in the inner region a shoulder S and is embedded right up to the shoulder S in a moulded part F, which at the same time forms a centring piece Z and a bush B for receiving a drive spindle. The perforated disc LS, the surface of which not embedded in the moulded part forms the bearing surface AF for the information carrier, is produced as a stamped part from a metal ring, in order to permit in a known way the restraining of the information carrier by a puck (not shown), which serves as counterbearing, with magnetic means. The stamping achieves the effect of a high stability, dimensional stability and surface accuracy as far as the perforated disc LS and, in particular, the bearing surface AF for the information carrier are concerned. For this purpose, particular importance is attributed to the planishing of the bearing surface AF during the stamping, as also in the case of known turntables, and the perforated disc has a greater thickness in comparison with the metal disc M represented in FIG. 3 of a known turntable. The perforated disc LS of the turntable represented in FIGS. 1, 2 and 4 is embedded in the inner portion in a moulded part F, which is formed by a plastic body injection-moulded into the perforated disc LS by an injection mould, right up against the said shoulder S. The moulded part F is shaped in such a way that, corresponding to FIG. 1 and FIG. 4, it is offset with respect

REPLACEMENT SHEET
13 SEP 1997

to the bearing surface AF for the information carrier in a region extending from the shoulder S to the centering piece Z, and is formed such that it slopes away further in the direction of the centring piece, in order to ensure exclusive placing or restraining of the information carrier on the bearing surface AF of the perforated disc LS. Nevertheless, the region of the perforated disc LS offset in the inner portion is embedded on both sides and completely in the moulded part F or plastic body right up to the shoulder S of the perforated disc LS. The inner, offset region of the perforated disc LS is completely enclosed in the moulded part F, or is completely enveloped by the moulded part F, whereby a form-fitting and force-fitting connection is established between the moulded part F and the perforated disc LS. The connection between moulded part F and perforated disc LS is additionally supported by webs or recesses provided in the inner portion of the perforated disc LS, which are represented in FIG. 2 as invisible body edges. Furthermore, to increase the stability and dimensional stability, there are, corresponding to FIG. 2, reinforcing ribs V provided on the underside of the moulded part F and they support a ring of the moulded part F arranged underneath the offset inner surface of the perforated disc LS, which ring at the same time forms an outer edge and an end point of the reinforcing ribs V directed towards the centre point of the turntable. In order to ensure reliable filling of the recesses formed between the driving webs in the inner region of the perforated disc LS when injection-moulding the moulded part F in the injection mould, the reinforcing ribs V are arranged in the region of the recesses.

This also created a precondition allowing the moulded part F to be shaped right up against the shoulder S of the bearing surface AF, in order to be able in an advantageous way to use the surface of the perforated disc LS intended as the bearing surface AF for the information carrier also as a reference surface in the injection mould when injection-moulding the moulded part F and nevertheless ensure an absolutely reliable anti-twisting effect between the moulded part F of plastic and the metallic perforated disc LS. By using the bearing surface AF of the perforated disc LS, intended as the bearing surface AF for the information carrier, as a reference surface in the injection mould when injection-moulding the moulded part F, cumulative tolerances are avoided between the bearing surface of the per-

REPLACEMENT SHEET
13 SEP 1997

forated disc LS and the bush B for receiving the drive spindle and with respect to the centring piece Z, likewise formed by the moulded part, and with respect to one another, meaning that such a turntable has by virtue of its special design and its production technology a low vertical runout and a high centring accuracy.

Due to the comparatively concentrated arrangement of weighty mass parts in the edge region, the turntable achieves a greater moment of inertia or flywheel moment, which has further advantageous effects on the running properties of the turntable.

The advantage of the reduced vertical runout can, according to a second embodiment corresponding to FIG. 4, also be used in conjunction with a centring piece Z which is displaceable with respect to the rotary spindle of the turntable and which permits an adaptation or centring even in the event of extremely great deviations between the, in principle uniform, diameters of the centring bores of the information carriers. Just as in the case of the embodiment corresponding to FIG. 1, the turntable comprises a perforated disc S which is offset in the inner portion and is embedded in the inner portion in a moulded part F, consisting of plastic, right up to the shoulder S, which is formed by the inner edge of the bearing surface AF of the perforated disc LS for the information carrier. The bearing surface AF of the perforated disc LS for the information carrier is likewise used in an advantageous way as a reference surface when injection-moulding the moulded part F in the injection mould, meaning that turntables with reduced vertical runout are produced. The centring piece Z is made such that it engages with detents R in recesses of the moulded part F and is displaceable, sliding directly on the drive spindle T, and is supported on the moulded part F by means of a spring E. Due to the direct guiding of the centring piece Z on the drive spindle T, cumulative tolerances are avoided and the centring accuracy is determined essentially only by the clearance between the drive spindle T and the moulded part F. The guidance of the centring piece Z on the drive spindle T may be chosen to be comparatively long, meaning that only a small clearance is set, thereby achieving a high centring accuracy. Since embodiments corresponding to FIG. 1 and FIG. 4 differ only with regard to the centring piece Z used in the inner portion of the turntable, the advantages mentioned with respect to the moment of inertia or flywheel moment also apply to this embodiment.

REPLACEMENT SHEET
13 SEP 1997

What is claimed is:

1. In a turntable for disc shaped records, having;

an annular centrally apertured outer member having a peripheral record bearing surface with a radial inward facing inner edge;

a circular inner member with a central portion for receiving turntable drive means and including means for centering a record;

said outer member having a shoulder at the inner edge of said record bearing surface leading to a protruding offset projection recessed below said record bearing surface, said offset projection extending radially inward of said radial inward facing inner edge toward the drive means receiving portion of said inner member;

the improvement comprising:

said inner member being a non-metallic mouldable material which at its outer periphery completely surrounds and engages the protruding offset projection of said outer member up to and against said shoulder at said record bearing surface; and, the record bearing surface of the outer member is a location reference surface, in a direction normal thereto, for the inner member so as to minimize vertical run out of said turntable.

2. The turntable set forth in claim 1, wherein;

said outer member is metal and said inner member is a plastic material.

3. The turntable set forth in claim 1, wherein;

said inner member has a record facing substantially planar surface disposed below the level of said record bearing surface which slopes further away from the level of said record bearing surface in the direction of the drive means receiving portion.

4. The turntable set forth in claim 1, wherein;

said outer member includes a plurality of recesses in the offset projection having the moulded inner member arranged in engaging manner therewith;

said inner member having a plurality of radial extending reinforcing ribs; and

said ribs being aligned with said recesses.

5. The turntable according to claim 1, wherein;

the inner member is formed and joined to the outer member by injection moulding;

the record bearing surface of the outer member provides a dimensional reference surface for the moulded inner member; and

* C L M S *

REPLACEMENT SHEET
13 SEP 1997

the offset projection of the outer member is completely embedded in the mouldable material of the inner member up to said shoulder.

6. The turntable according to claim 5, wherein;

said outer member is stamped metal and said inner member is a plastic material.

7. The turntable set forth in claim 1, wherein;

the means for centering a record comprises a pot-shaped hub formed as an integral part of said inner member.

8. The turntable set forth in claim 1, wherein;

the means for centering a record comprises a separate hub piece secured to said inner member by detents.

* * * * *

REPLACEMENT SHEET
13 SEP 1997

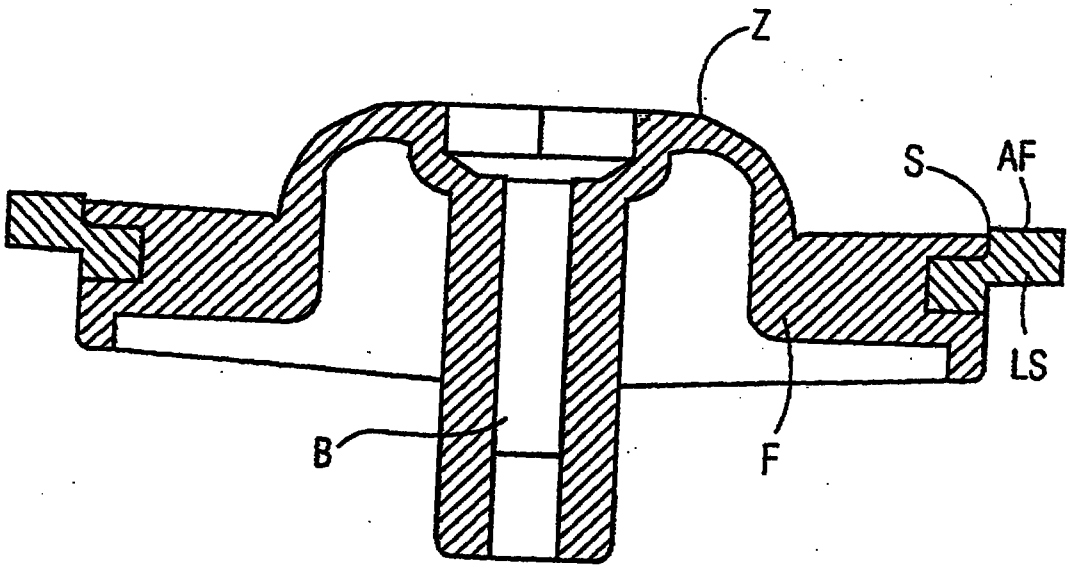


FIG. 1

REPLACEMENT SHEET
13 SEP 1997

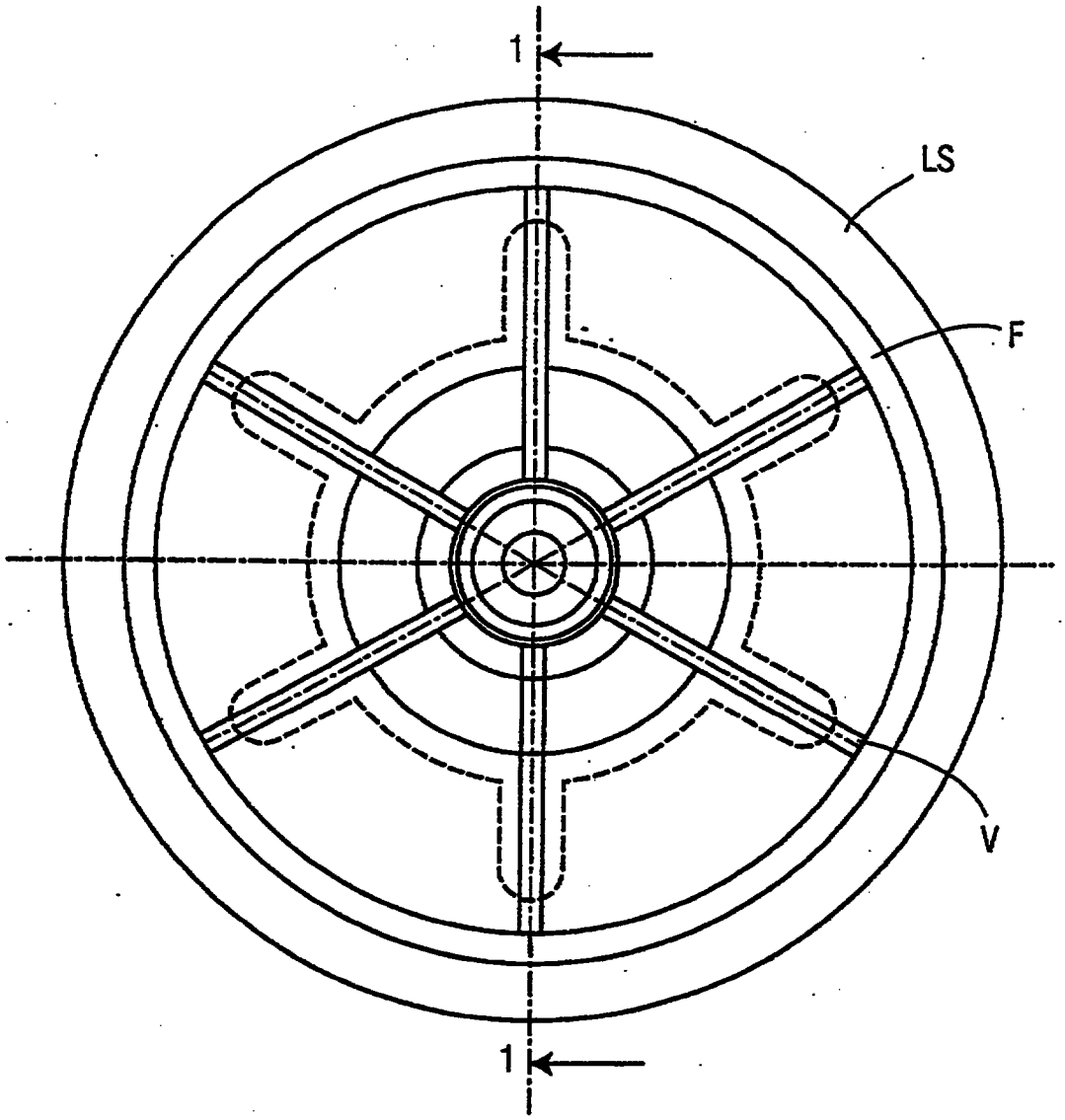


FIG. 2

REPLACEMENT SHEET
13 SEP 1997

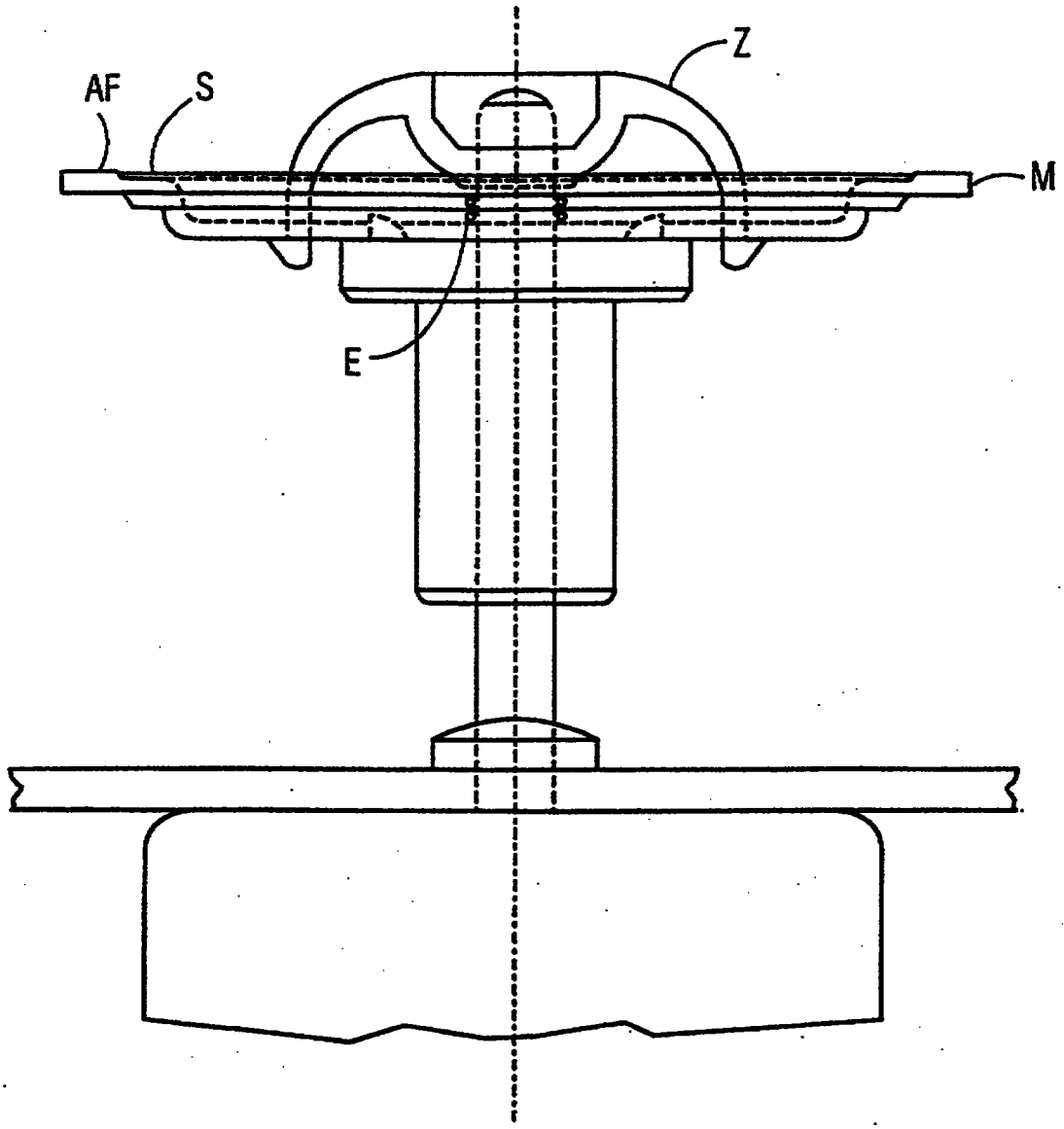


FIG. 3
PRIOR ART

REPLACEMENT SHEET
13 SEP 1997

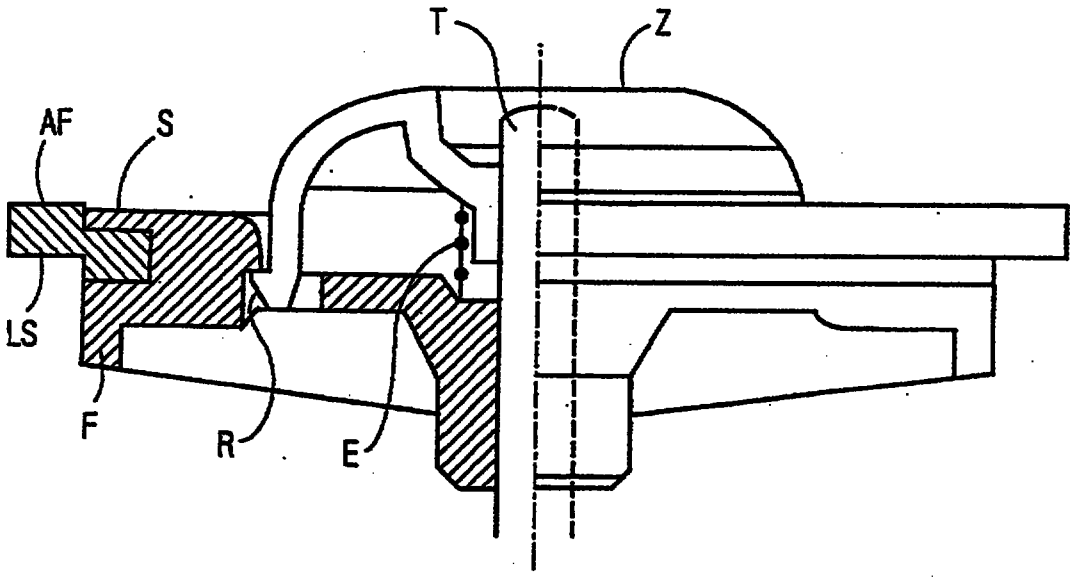


FIG. 4

9107108-7 IPOS

TURN TABLE FOR DISC SHAPED INFORMATION CARRIERS

[57] **ABSTRACT**

A turntable for disc-shaped records includes a disc-centering hub for engaging a centering aperture in the disc-shaped record. A bushing is coaxial with the disc-centering hub and connects the turntable to a driving mechanism. A circular part connects the bushing to an annular outer bearing surface. The annular outer bearing surface has a step portion forming a shoulder normal to the bearing surface and imbedded in the edge of the circular part. The shoulder rises above the circular part to support the disc-shaped records above the circular part by the hub and the bearing surface.

Fig 1

REPLACEMENT SHEET
30 MAR 1998

REPLACEMENT SHEET
16 MAY 1998

TURNTABLE FOR DISC-SHAPED INFORMATION CARRIERS

~~This is a continuation of application Ser. No. 08/150,909, filed Nov. 12, 1993, now abandoned.~~

BACKGROUND OF THE INVENTION

The present invention relates to a turntable for disc-shaped information carriers and the process for its production, the turntable having a central centering piece, which engages through a centring bore of the information carrier, and an outer marginal surface of the turntable, such as for example in the case of a CD player, which forms a bearing surface for the information carrier.

Disc-shaped information carriers, which for recording and reproducing information are rotatingly scanned or written to on a turntable, are generally known. While disc-shaped information carriers in the form of the long-known analogue phonographic record are generally placed in full surface contact on a turntable and rotate at a relatively low speed of 33⅓ or 45 revolutions per minute, disc-shaped information carriers, such as for example the CD or MOD, for which the dense storage technique is used are placed or restrained in a central region bearing no information and rotate at a considerably higher speed in the range of, for example, 500 revolutions per minute. On account of the high speed and the small dimensions of the regions to be scanned and on account of the central restraint of the information carrier, only small deviations of the rotating information carrier from the intended scanning location in the radial direction and in the vertical position can be allowed, meaning that high accuracy requirements are imposed on the fixing and centring of the information carrier on the turntable and on the turntable itself.

Apart from the centring, the accuracy of which is influenced by the centring piece engaging through the centring bore of the information carrier, narrow production tolerances have to be maintained on account of the central restraint of the information carrier, in particular with regard to the runout in the vertical direction of the turntable, i.e. the vertical oscillation of the turntable during rotation since a vertical turntable runout of, for example only 0.05 mm, which represents a maximum permissible upper limit,