

Description

Background and Summary of the Invention

An interferometer measures the change in distance between a reference point and a movable point by measuring the change in optical path length between the two points. The change in the optical path length is measured by counting the number of fringes in an interference pattern caused by a measurement beam reflected from the movable point and a reference beam that follows a fixed path.

The optical path length (OPL) is the product of the length of the beam's path and the refractive index of the medium through which the beam passes. Generally, the OPL is made up of a number of segments through air, which has a low refractive index, and a number of segments through glass, or some other medium of high refractive index.

If the OPL changes due to the effects of a change in temperature on the refractive index of the optical elements of the measuring instrument, the instrument will register an erroneous distance change, just as if the distance to be measured had changed.

Early efforts to eliminate thermally induced errors were directed to the largest source of error, the mechanical supports for the optics. To compensate for temperature variations, the supports were arranged so the change in position of the optical components in the reference beam path was the same as the change for the components in the measurement beam path.

Recently, interferometer instruments have been used in applications demanding increased measurement accuracy, for example wafer steppers for large scale integrated circuits. This has led to a need to further compensate for thermally induced errors.

One proposed solution, is described in US-A-4 711 574 "Minimum Deadpath Interferometer and Dilatometer", published December 8, 1987 and assigned in common with this application. The device disclosed incorporates interferometer optics with a common path for the reference and measurement beams. With the beam following the same path through the optics, changes in either the refractive index or the dimensions of the optical elements affect the OPL of both beams equally. This technique is particularly suitable for differential interferometers. However, it requires complex optics, which lower the optical efficiency of the instrument and are relatively expensive.

US-A-3 788 746 (BALDWIN and RUFF) discloses a plane mirror interferometer comprising: a light source for producing coherent light forming a

measurement beam and a reference beam that are polarised in mutually orthogonal planes; a light detector; reflecting means having no optical path length, mounted on a movable measurement plane; and incorporated optical means comprising polarising beam splitter means, including an internal plane junction between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path to said detector, direct the measurement beam along a measurement path, combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means are not collinear.

However, the optical path lengths of the beams through the optical elements are different. Thus, changes in temperature limit the accuracy of the interferometer.

EP-A-0 227 544 (ZYGO CORP) discloses a plane mirror interferometer comprising: a light source for producing coherent light forming a measurement beam and a reference beam that are polarised in mutually orthogonal planes; a light detector; reflecting means having no optical path length, mounted on a movable measurement plane; first polarising beam splitter means to separate the beams spatially; incorporated optical means comprising polarising beam splitter means, including an internal plane junction between two optical elements, in thermal equilibrium with the optical means, to direct the reference beam along a reference path to said detector, to direct the measurement beam along a measurement path, combine it via the first polarising beam splitter means with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means are not collinear but have the same optical path length through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.

This document is relevant only under Article 54(3) EPC, and then only for Germany, France, and the United Kingdom.

An object of this invention is to provide a high

thermal stability interferometer that is relatively low cost, has high optical efficiency and less complex optics, and is easy to align and use.

According to the invention there is provided a plane mirror interferometer comprising: a light source for producing coherent light forming a measurement beam and a reference beam that are polarised in mutually orthogonal planes; a light detector; reflecting means having no optical path length, mounted on a movable measurement plane; incorporated optical means comprising polarising beam splitter means, including an internal plane junction between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path to said detector, direct the measurement beam along a measurement path, combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means comprising two quarter wave plates inclined to each other to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means are not collinear, but have the same optical path length through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.

In the Netherlands EP-A-0 227 544 is not relevant. Accordingly, the invention is alternatively defined as a plane mirror interferometer comprising: a light source for producing coherent light forming a measurement beam and a reference beam that are polarised in mutually orthogonal planes; a light detector; reflecting means having no optical path length, mounted on a movable measurement plane; incorporated optical means comprising polarising beam splitter means, including an internal plane junction between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path to said detector, direct the measurement beam along a measurement path, combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means are not collinear, the interferometer being characterised in that the reference path and measurement path have the same optical path length

through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.

As the optical path lengths of the beams are equal through elements of the same refractive index, any temperature change alters the length of the measurement path and the reference path equally, thereby compensating.

The preferred embodiment of the present invention compensates for changes in temperature by incorporating optics in which the reference and measurement beams follow different but optically equivalent paths through optical elements that are in thermal equilibrium. That is, the path lengths through the high refractive index medium of the optics are the same length, but do not follow the same path. Because the beams are not constrained to follow the same path, fewer optical elements are needed and shorter OPLs can be used resulting in less complexity, better optical efficiency, easier alignment and lower cost.

Brief Description of the Drawings

Figure 1 is a schematic representation of an interferometer constructed in accordance with the preferred embodiment of the invention, showing the paths of the reference and measurement beams.

Figure 2 is a schematic representation of an interferometer constructed in accordance with an alternative embodiment of the invention, showing the paths of the reference and measurement beams.

Detailed Description of the Invention

The preferred embodiment of the invention is a plane mirror interferometer shown in Figure 1. The interferometer uses a light source 11 to produce a reference beam 13 and a measurement beam 15. Light source 11 is preferably a two-frequency laser producing a reference beam 13 of frequency f_1 linearly polarized in the plane of the drawing and a measurement beam of frequency f_2 linearly polarized perpendicular to the plane of the drawing. The reference beam 13 and the measurement beam 15 are directed to the optical assembly 20 of the interferometer, which reflects reference beam 13 back to detector 17 and transmits measurement beam 15 to a movable measurement mirror 21. The mirror surface 22 of movable mirror 21 reflects the measurement beam back to optical assembly 20 and then back to detector 17. Detector 17 uses a mixing polarizer to mix the two beams and a photodetector to detect the fringes of the resulting interference pattern.

According to the teachings of the invention, the optical elements of optical assembly 20 are so arranged that the reference beam 13 and the measurement beam 15 follow equivalent optical path lengths through the optical assembly 20, whose elements are in thermal equilibrium. Optical assembly 20 comprises a polarizing beam splitter 23 with a beam splitting surface 24 at a 45 degree angle to the incident light beams, quarter wave plates 25 and 27 and a cube corner 29. Quarter wave plate 25 is transparent on both surfaces while quarter wave plate 27 has a high reflectance coating on one of its surfaces. Quarter wave plates 25 and 27 have the same thickness and are made of the same material. Quarter wave plates 25 and 27 effectively rotate the plane of polarization of the beams by 90 degrees each time the beams traverse a quarter wave plate twice. Thus, the elements in the reference path of optical assembly 20 are of the same material and size as their counterparts in the measurement path.

The path of reference beam 13 is reflected by beam splitting surface 24 to quarter wave plate 27 which changes its polarization state. Then beam 13 passes through the polarizing beam splitter 23 is reflected by cube corner 29 back through polarizing beam splitter 23 again to quarter wave plate 27 which again changes its polarization state. Next, beam 13 is reflected by beam splitting surface 24 on a path parallel to its original path towards detector 17.

Measurement beam 15, being polarized perpendicular to reference beam 13, passes through beam splitting surface 24 and through quarter wave plate 25 to movable mirror 21 which reflects it back toward optical assembly 20, again through quarter wave plate 25. This time beam 15 is reflected by beam splitting surface 24 toward cube corner 29 which returns it to beam splitting surface 24 which directs measurement beam 15 back through quarter wave plate 25 to moveable measurement mirror 21 and then back through quarter wave plate 25. With the polarization state changed one more time, measurement beam 15 passes through beam splitting surface 24 to detector 17.

It can be seen from an examination of Figure 1 that where reference beam 13 and measurement beam 15 do not follow a common path, their path lengths through the elements of optical assembly 20 are equivalent. In particular, path a of reference beam 13 through the beam splitter and quarter wave plate 27 is the same length as path a' of measurement beam 15 through the beam splitter and quarter wave plate 25. Similarly, path b of reference beam 13 is the same length as path b' of measurement beam 15. And path c from beam splitter surface 24 to cube corner 29 and return is common to both reference beam 13 and measure-

ment beam 15. Thus, if the temperature of optical assembly 20 changes affecting the dimensions and the refractive index of the optical elements, the optical pathlengths of reference beam 13 and measurement beam 15 will be equally affected if the elements of optical assembly 20 remain in thermal equilibrium.

An alternative embodiment showing an application of the invention to differential measurements is shown in Figure 2. Here the optics are adapted to allow the reference beam to be directed to a reference mirror 31 located close to the movable mirror 33. This minimizes the "dead path" difference between the measurement beam and the reference beam further compensating for thermally induced errors in the air path between the optical assembly and the movable mirror 33.

In the embodiment of Figure 2, the optical assembly 30 includes a polarizing beam splitter 35, which is a compound prism comprising a porro prism 37 having a triangular cross section, with a polarizing beam splitter surface 36 at a 45 degree angle to the incident beams, connected to a parallelogram prism 34.

Beam splitter 35 has a mirrored surface 38 which is parallel to beam splitting surface 36. Optical assembly 30 also includes cube corner 39 and quarter wave plates 41, 43 and 45. Transparent quarter wave plates 41, 43 and 45 have the same thickness and are made of the same material.

Reference beam 13 is directed to beam splitter 35 where on its first pass, it passes through beam splitting surface 36 out through quarter wave plate 41 to reference mirror 31 where it is reflected back towards the beam splitter 35 again through quarter wave plate 41. With changed polarization state, beam 13 is now reflected by surface 36 down through quarter wave plate 43 to cube corner 39 which reflects it back through quarter wave plate 43 again with changed polarization state. Beam 13 now passes through surface 36 to mirrored surface 38 of beam splitter 35 which directs it through quarter wave plate 45 to reference mirror 31 back through quarter wave plate 45 to surface 38 which directs the beam back down towards surface 36 where it is reflected to detector 17.

Measurement beam 15, polarized perpendicular to beam 13, is reflected by surface 36 on its first pass, towards mirrored surface 38 which directs the beam through quarter wave plate 45 to movable measurement mirror 33, back through quarter wave plate 45 to mirrored surface 38. With changed polarization state as a result of passing through the quarter wave plate, the beam 15 is directed down and passes through surface 36, through quarter wave plate 43 to cube corner 39, back through quarter wave plate 43 again with changed polarization state to surface 36 which re-

flects beam 15 through quarter wave plate 41 to movable measurement mirror 33, then back through quarter wave plate 41, where finally with its polarization state changed again, the measurement beam 15 passes through surface 36 to detector 17.

An inspection of the paths of reference beam 13 and measurement beam 15 in Figure 2 reveals that where the beams follow paths that are not common, their lengths are equivalent. Thus, paths a, b and c of reference beam 13 have the same length as paths a', b' and c' of measurement beam 15.

Claims

Claims for the following Contracting States :
DE, FR, GB

1. A plane mirror interferometer comprising: a light source (11) for producing coherent light forming a measurement beam (15) and a reference beam (13) that are polarised in mutually orthogonal planes; a light detector (17); reflecting means (22,33) having no optical path length, mounted on a movable measurement plane (21); incorporated optical means (20,30) comprising polarising beam splitter means, including an internal plane junction (24,36) between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path (a,b,c) to said detector, direct the measurement beam along a measurement path (a', b',c), combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means (25,27,41,43,45) comprising two quarter wave plates inclined to each other to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means (20,30) are not collinear but have the same optical path length through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.
2. An interferometer according to claim 1, wherein the plane junction lies at 45° to the direction of the beams.
3. An interferometer as claimed in claims 1 or 2, wherein the measurement beam and the reference beam consist of light of different wavelengths.

4. An interferometer as claimed in any preceding claim, wherein the measurement path includes the round trip distance to the reflecting means (22,33) twice.

Claims for the following Contracting State : NL

1. A plane mirror interferometer comprising: a light source (11) for producing a coherent light forming a measurement beam (15) and a reference beam (13) that are polarised in mutually orthogonal planes; a light detector (17); reflecting means (22,23) having no optical path length, mounted on movable measurement plane (21); incorporated optical means (20,30) comprising polarising beam splitter means, including an internal plane junction (24,36) between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path (a,b,c) to said detector, direct the measurement beam along a measurement path (a', b',c), combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means (25,27,41,43,45) to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means (20,30) are not collinear, the interferometer being characterised in that the reference path and measurement path have the same optical path length through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.
2. An interferometer according to claim 1 wherein the plane junction lies at 45° to the direction of the beams.
3. An interferometer as claimed in claims 1 or 2, wherein the measurement beam and the reference beam consists of light of different wavelengths.
4. An interferometer as claimed in any preceding claim, wherein the measurement path includes the round trip distance to the reflecting means (22,23) twice.

Revendications

Revendications pour les Etats contractants
suivants : DE, FR, GB



flects beam 15 through quarter wave plate 41 to movable measurement mirror 33, then back through quarter wave plate 41, where finally with its polarization state changed again, the measurement beam 15 passes through surface 36 to detector 17.

An inspection of the paths of reference beam 13 and measurement beam 15 in Figure 2 reveals that where the beams follow paths that are not common, their lengths are equivalent. Thus, paths a, b and c of reference beam 13 have the same length as paths a', b' and c' of measurement beam 15.

Claims

Claims for the following Contracting States : DE, FR, GB

1. A plane mirror interferometer comprising: a light source (11) for producing coherent light forming a measurement beam (15) and a reference beam (13) that are polarised in mutually orthogonal planes; a light detector (17); reflecting means (22,33) having no optical path length, mounted on a movable measurement plane (21); incorporated optical means (20,30) comprising polarising beam splitter means, including an internal plane junction (24,36) between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path (a,b,c) to said detector, direct the measurement beam along a measurement path (a', b',c), combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means (25,27,41,43,45) comprising two quarter wave plates inclined to each other to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means (20,30) are not collinear but have the same optical path length through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.
2. An interferometer according to claim 1, wherein the plane junction lies at 45° to the direction of the beams.
3. An interferometer as claimed in claims 1 or 2, wherein the measurement beam and the reference beam consist of light of different wavelengths.

4. An interferometer as claimed in any preceding claim, wherein the measurement path includes the round trip distance to the reflecting means (22,33) twice.

Claims for the following Contracting State : NL

1. A plane mirror interferometer comprising: a light source (11) for producing a coherent light forming a measurement beam (15) and a reference beam (13) that are polarised in mutually orthogonal planes; a light detector (17); reflecting means (22,23) having no optical path length, mounted on movable measurement plane (21); incorporated optical means (20,30) comprising polarising beam splitter means, including an internal plane junction (24,36) between two optical elements, in thermal equilibrium with the optical means to separate the beams, direct the reference beam along a reference path (a,b,c) to said detector, direct the measurement beam along a measurement path (a', b',c), combine it with the reference beam, and direct it to said detector, said measurement path including the round trip distance to the reflecting means on the movable measurement plane; and quarter wave plate means (25,27,41,43,45) to change the respective plane of polarisation of a beam, through which both beams pass a multiple of two times, wherein the reference path and the measurement path through the optical means (20,30) are not collinear, the interferometer being characterised in that the reference path and measurement path have the same optical path length through optical elements of the same refractive index, so that thermally induced changes in the optical path lengths of the reference path and of the measurement path through the optical means are the same.
2. An interferometer according to claim 1 wherein the plane junction lies at 45° to the direction of the beams.
3. An interferometer as claimed in claims 1 or 2, wherein the measurement beam and the reference beam consists of light of different wavelengths.
4. An interferometer as claimed in any preceding claim, wherein the measurement path includes the round trip distance to the reflecting means (22,23) twice.

Revendications

Revendications pour les Etats contractants suivants : DE, FR, GB



1. Un interféromètre à miroir plan comprenant: une source de lumière (11) pour produire une lumière cohérente formant un faisceau de mesure (15) et un faisceau de référence (13) qui sont polarisés dans des plans mutuellement orthogonaux ; un détecteur de lumière (17); des moyens de réflexion (22, 33) n'ayant pas de longueur de trajet optique et montés dans un plan de mesure mobile (21) ; des moyens optiques incorporés (20, 30) comprenant des moyens de division de faisceau de polarisation, comportant une jonction plane interne (24, 36) entre deux éléments optiques, en équilibre thermique avec les moyens optiques pour séparer les faisceaux, pour diriger le faisceau de référence le long d'un trajet de référence (a, b, c) vers ledit détecteur, pour diriger le faisceau de mesure le long d'un trajet de mesure (a', b', c), pour le combiner avec le faisceau de référence, et pour le diriger vers ledit détecteur, ledit trajet de mesure comprenant la distance de parcours aller-retour jusqu'aux moyens de réflexion prévus dans le plan de mesure mobile ; et des moyens formant plaques quart d'onde (25, 27, 41, 43, 45), comprenant deux plaques quart d'onde inclinées mutuellement, pour changer le plan respectif de polarisation d'un faisceau et que les deux faisceaux traversent un multiple de deux fois, interféromètre dans lequel le trajet de référence et le trajet de mesure à travers les moyens optiques (20, 30) ne sont pas colinéaires mais ont la même longueur de trajet optique à travers des éléments optiques du même indice de réfraction, de sorte que des variations, causées thermiquement, de longueurs de trajet optique respectivement du trajet de référence et du trajet de mesure à travers les moyens optiques sont les mêmes.

2. Un interféromètre selon la revendication 1, dans lequel la jonction plane fait un angle de 45° avec la direction des faisceaux.

3. Un interféromètre tel que revendiqué dans la revendication 1 ou 2, dans lequel le faisceau de mesure et le faisceau de référence se composent de lumière de longueurs d'ondes différentes.

4. Un interféromètre tel que revendiqué dans une quelconque des revendications précédentes, dans lequel le trajet de mesure comprend deux fois la distance de parcours aller-retour jusqu'aux moyens de réflexion (22, 23).

Revendications pour l'Etat contractant suivant : NL

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1. Un interféromètre à miroir plan comprenant une source de lumière (11) pour produire une lumière cohérente formant un faisceau de mesure (15) et un faisceau de référence (13) qui sont polarisés dans des plans mutuellement orthogonaux ; un détecteur de lumière (17) des moyens de réflexion (22, 23) n'ayant pas de longueur de trajet optique et montés dans un plan de mesure mobile (21) ; des moyens optiques incorporés (20, 30) comprenant des moyens de division de faisceau de polarisation, comportant une jonction plane interne (24, 36) entre deux éléments optiques, en équilibre thermique avec les moyens optiques pour séparer les faisceaux, pour diriger le faisceau de référence le long d'un trajet de référence (a, b, c) vers ledit détecteur, pour diriger le faisceau de mesure le long d'un trajet de mesure (a', b', c), pour le combiner avec le faisceau de référence, et pour le diriger vers ledit détecteur, ledit trajet de mesure comprenant la distance de parcours aller-retour jusqu'aux moyens de réflexion prévus dans le plan de mesure mobile ; et des moyens formant plaques quart d'onde (25, 27, 41, 43, 45) pour changer le plan respectif de polarisation d'un faisceau, que les deux faisceaux traversent un multiple de deux fois, le trajet de référence et le trajet de mesure à travers les moyens optiques (20, 30) n'étant pas colinéaires, l'interféromètre étant caractérisé en ce que le trajet de référence et le trajet de mesure ont la même longueur de trajet optique à travers des éléments optiques du même indice de réfraction, de sorte que des variations, causées thermiquement, de longueurs du trajet de référence et du trajet de mesure à travers les moyens optiques soient les mêmes.

2. Un interféromètre selon la revendication 1, dans lequel la jonction plane fait un angle de 45° avec la direction des faisceaux.

3. Un interféromètre tel que revendiqué dans la revendication 1 ou 2, dans lequel le faisceau de mesure et le faisceau de référence se composent de lumière de longueurs d'ondes différentes.

4. Un interféromètre tel que revendiqué dans une quelconque des revendications précédentes, dans lequel le trajet de mesure comprend deux fois la distance de parcours aller-retour jusqu'aux moyens de réflexion (22, 23).

Patentansprüche

Patentansprüche für folgende Vertragsstaaten : DE, FR, GB



1. Planspiegelinterferometer mit: einer Lichtquelle (11) zum Erzeugen von kohärentem Licht, welches einen Meßstrahl (15) und einen Referenzstrahl (13) bildet, die in zueinander orthogonalen Ebenen polarisiert sind, einem Lichtdetektor (17), einer reflektierenden Vorrichtung (22, 33) ohne optische Weglänge, die an einer bewegbaren Meßebe (21) angebracht ist, einer eingebauten optischen Vorrichtung (20, 30) mit einer polarisierenden Strahlenteilungsvorrichtung, die einen inneren ebenen Übergang (24,36) zwischen zwei optischen Elementen in thermischem Gleichgewicht mit der optischen Vorrichtung aufweist, um die Strahlen zu trennen, den Referenzstrahl längs einem Referenzweg (A, B, C) zum Detektor zu leiten, den Meßstrahl längs eines Meßweges (a', b', c) zu leiten, mit dem Referenzstrahl zu kombinieren und zum Detektor zu leiten, wobei der Meßweg die Entfernung zur reflektierenden Vorrichtung auf der bewegbaren Meßebe und zurück umfaßt, und mit einer Lambda-Viertel-Platten-Vorrichtung (25, 27, 41, 43 45) mit zwei zueinander geneigten Viertel-Wellen-Platten zum Verändern der entsprechenden Polarisations-ebene eines Strahles, durch die beide Strahlen ein Vielfaches von Zweimal hindurchgehen, wobei der Referenzweg und der Meßweg durch die optische Vorrichtung (20, 30) hindurch nicht kollinear sind, sondern dieselbe optische Weglänge durch optische Elemente desselben Brechungsindex aufweisen, so daß thermisch induzierte Veränderungen der optischen Weglängen des Referenzweges und des Meßweges durch die optische Vorrichtung dieselben sind.
2. Interferometer nach Anspruch 1, bei dem der ebene Übergang mit den Strahlen einen Winkel von 45° einschließt.
3. Interferometer nach Anspruch 1 oder 2, bei dem der Meßstrahl und der Referenzstrahl aus Licht unterschiedlicher Wellenlängenwelle bestehen.
4. Interferometer nach einem der vorangehenden Ansprüche, bei dem der Meßweg zweimal die Entfernung von und zur reflektierenden Vorrichtung (22,33) umfaßt.

Patentansprüche für folgenden Vertragsstaat :
NL

1. Planspiegelinterferometer mit: einer Lichtquelle (11) zum Erzeugen von kohärentem Licht, welches einen Meßstrahl (15) und einen Referenzstrahl (13) bildet, die in zueinander orthogona-

len Ebenen polarisiert sind, einem Lichtdetektor (17), einer reflektierenden Vorrichtung (22, 33) ohne optische Weglänge, die an einer bewegbaren Meßebe (21) angebracht ist, einer eingebauten optischen Vorrichtung (20, 30) mit einer polarisierenden Strahlenteilungsvorrichtung, die einen inneren ebenen Übergang (24,36) zwischen zwei optischen Elementen in thermischem Gleichgewicht mit der optischen Vorrichtung aufweist, um die Strahlen zu trennen, den Referenzstrahl längs einem Referenzweg (A, B, C) zum Detektor zu leiten, den Meßstrahl längs eines Meßweges (a', b', c) zu leiten, mit dem Referenzstrahl zu kombinieren und zum Detektor zu leiten, wobei der Meßweg die Entfernung zur reflektierenden Vorrichtung auf der bewegbaren Meßebe und zurück umfaßt, und mit einer Lambda-Viertel-Platten-Vorrichtung (25, 27, 41, 43 45) zum Verändern der entsprechenden Polarisations-ebene eines Strahles, durch die beide Strahlen ein Vielfaches von Zweimal hindurchgehen, wobei der Referenzweg und der Meßweg durch die optische Vorrichtung (20, 30) hindurch nicht kollinear sind, dadurch gekennzeichnet, daß der Referenzweg und der Meßweg dieselbe optische Weglänge durch optische Elemente desselben Brechungsindex aufweisen, so daß thermisch induzierte Veränderungen der optischen Weglängen des Referenzweges und des Meßweges durch die optische Vorrichtung dieselben sind.

2. Interferometer nach Anspruch 1, bei dem der ebene Übergang mit den Strahlen einen Winkel von 45° einschließt.
3. Interferometer nach Anspruch 1 oder 2, bei dem der Meßstrahl und der Referenzstrahl aus Licht unterschiedlicher Wellenlängenwelle bestehen.
4. Interferometer nach einem der vorangehenden Ansprüche, bei dem der Meßweg zweimal die Entfernung von und zur reflektierenden Vorrichtung (22,33) umfaßt.