Abstract: The present invention relates to an eyeglass lens cleaning apparatus (1) comprising a housing (2) with two protruding arm sections (21) having rotatable heads (7), at least one drive unit (8), an energy source, a shaft arrangement (5), where said housing (2) is provided with said drive unit (8) and said energy source, said shaft arrangement (5) comprises a longitudinal shaft (53) provided inside said arm sections (21), each of said longitudinal shafts (53) being provided with gear means (6) adapted to transfer the rotating movement from said drive unit (8) to said rotatable heads (7), which are arranged on an axis approximately perpendicular to said longitudinal shafts (53) and provided with polishing means (4) adapted to be press against opposite sides of an eyeglass lens, wherein said gear means (6) comprises a crankshaft part (51) of said longitudinal shaft (53) and a groove (71) in said rotatable heads (7), and where said crankshaft part (51) is fitted into said groove (71) for the reciprocal movement of said polishing means (4).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Eyeglass lens cleaning apparatus

Field of the invention
The present invention relates to an eyeglass lens cleaning apparatus comprising a housing with two protruding arm sections having rotatable heads, at least one drive unit, an energy source, a shaft arrangement, where said housing is provided with said drive unit and said energy source, where said shaft arrangement comprises a longitudinal shaft provided inside said arm sections, each of said longitudinal shaft provided with gear means adapted to transfer the rotating movement from said drive unit to said rotatable heads, which are movably and exchangeably arranged on an axis approximately perpendicular to said longitudinal shafts and provided with polishing means adapted to be pressed against opposite sides of an eyeglass lens.

Furthermore, the present invention relates to polishing means for use with the aforementioned eyeglass lens cleaning apparatus.

Background of the invention
People wearing spectacles have at least one problem; no matter how careful they are, the spectacles unavoidably get stained, spotted or greasy, which makes it necessary to polish the eyeglass lenses of the spectacles on a regular basis.

Most commonly, a cloth or paper is used to polish the eyeglasses by hand. However, there are some disadvantages in connection with this method:

- It is difficult to manually apply a uniform pressure on both sides of the eyeglass lens, which prolongs the polishing period needed to clean the eyeglass lenses and achieve a satisfactory result.

- It is difficult to polish the whole surface of an eyeglass lens, especially around the nose pads or the bar connecting the two eyeglass lens rims of the spectacle frame.
- The spectacle frame is exposed to strain because the manual polishing movement on the sides of the eyeglass lenses takes place in different directions, thus wearing on the spectacle frame.

- The use of paper like kitchen paper or paper towels produces small scratches in the surfaces of the eyeglass lenses, which are a permanent source of irritation for the wearer of the eyeglasses.

To avoid the aforementioned disadvantages by polishing eyeglasses by hand with paper or a cloth, different cleaning apparatuses are provided.

In US-A-816,227 is described an eyeglass lens cleaner for cleaning e.g. monocles. The eyeglass lens cleaner is formed as a U-shaped clip provided with exchangeable polishing pads at the end parts positioned opposite each other.

The disadvantage of this eyeglass lens cleaner, used for polishing the eyeglass lenses of spectacles, is that the frame of the eyeglasses is exposed to strain because the polishing movement on both sides of the eyeglass lenses takes place in the same direction.

US 5,222,268 describes a pocket eyeglass lens cleaning apparatus, which is formed as a U-shaped clip provided with a rotating polishing pad and a stationary polishing pad at the end parts. The polishing pads are positioned opposite each other. Furthermore, the pocket eyeglass lens cleaning apparatus comprises a battery and an electrical motor for operating the rotating polishing pad, which reduces the number of hand movements necessary for polishing the eyeglass lenses.

The disadvantage of this pocket eyeglass lens cleaning apparatus is that only one of the polishing pads rotates. Therefore, it is necessary to turn the apparatus to polish both sides of the eyeglass lenses, which prolongs the polishing process. Furthermore, the rotation of the polishing pad exposes the frame of the eyeglasses to strain.
FR-A1-2,750,223 describes an eyeglass lens cleaning apparatus, which is formed with a housing with two protruding arm sections having rotatable heads, two electrical motors and a battery.

The disadvantage of this eyeglass lens cleaning apparatus is that it is unmanageable, because the electrical motors are placed in direct connection to the rotatable head and inside the two protruding arm sections. This causes the eyeglass lens cleaning apparatus to be bulky around the rotatable heads, which is a disadvantage when polishing small spectacles.

A further disadvantage is that the eyeglass lens cleaning apparatus has fixed arm sections, which do not allow any part of the apparatus to be exchanged, except for the rotatable heads. This means that the flexibility of the apparatus is reduced and it is necessary to buy a new apparatus in case any of the arm sections are damaged.

Furthermore, there is no apparent flexibility of the arm sections, which causes problems as regards appliance of the right pressure, when the rotatable heads are pressed against the eyeglass lens.

DE-U1-89 03 613 describes an eyeglass lens cleaning apparatus, which is formed with a housing with two protruding arm sections having rotatable heads, one centrally positioned electrical motor and two batteries, where both rotatable heads are driven by said electrical motor via a belt arrangement.

The disadvantage of this pocket eyeglass lens cleaning apparatus is that the eyeglass lens cleaning apparatus has two springy arms inside the protruding arms for pushing the polishing pads together during the polishing process. When using this pocket eyeglass lens cleaning apparatus, it is necessary to use force to position the eyeglass lens between the polishing pads. This is undesirable when polishing eyeglass lenses of old or fragile spectacles.
Furthermore, the gear means are, although very simple, very time consuming to produce and assemble because of the many parts. Secondly, the gear means are undependable as wear causes slack of the belt and thereby inefficient power transfer, meaning that it is necessary to open the housing every time a belt has to be exchanged.

DE-A1-197 08 811 describes an eyeglass lens cleaning apparatus, which is shaped with a housing with two protruding arm sections having rotatable polishing heads and one centrally positioned electrical motor. Unfortunately, the description and the claim provide no technical details for the reader to use for understanding the described invention.

DE-U1-298 10 702 describes an eyeglass lens cleaning apparatus, which is formed with two arm sections each having a rotatable polishing head, an electrical motor and two batteries. The motor transfers the rotation movement to the polishing head via a spindle arrangement.

The disadvantage of this pocket eyeglass lens cleaning apparatus is that the arm sections are only connected at one point. Thus, repeated use of the apparatus causes the apparatus construction to weaken. Furthermore, the apparatus construction weakens as a result of unpractical storage in drawers, bags etc.

A further disadvantage is that the eyeglass lens cleaning apparatus uses a spindle arrangement to transfer the rotating movement from the motor to the polishing pads. A spindle arrangement is very sensitive to wear of the spindle and will not work properly if the spindle is worn down.

The object of the invention

It is an object of the present invention to address the aforementioned problems by providing an eyeglass lens cleaning apparatus, which is easy producible as simple gear means are adapted to transfer the rotating movement from a drive unit to a rotatable head. Furthermore, the eyeglass lens cleaning apparatus is easy to use, lenient towards
the spectacles and at the same time provides efficient polishing of the surface areas of
an eyeglass lens.

This is obtained with an apparatus for cleaning eyeglass lenses as described in the
preamble of claim 1, and wherein said gear means comprise a crankshaft part of said
longitudinal shaft and a groove in said rotatable heads, and where said crankshaft part
is fitted into said groove for the reciprocal movement of said polishing means.

A further object of the present invention is to provide exchangeable polishing means.

This is obtained with polishing means as described in the preamble of claim 9, and
wherein said polishing means, on a rear side, are provided with a protruding part with
a recess, where said recess is adapted to engage with said bow part of said rotatable
head.

Description of the invention
To obtain an easy producible apparatus for cleaning eyeglass lenses as the apparatus
has simple gear means adapted to transfer the rotating movement from a drive unit to a
rotatable head, said gear means comprise a crankshaft part of said longitudinal shaft
and a groove in said rotatable heads, and where said crankshaft part is fitted into said
groove for the reciprocal movement of said polishing means.

When the drive unit rotates the shaft, the crankshaft part of said longitudinal shaft
rotates in a circle around the longitudinal axis of the longitudinal shaft. By fitting the
parts of or the entire crankshaft part into the groove of said rotatable heads, the circle
movement of the crankshaft part is prevented, and the crankshaft part follows the
groove and move from side to side, hence the rotatable head performs the reciprocal
rotatable movement, which is essential to efficient cleaning of an eyeglass lens.

When polishing an eyeglass lens in a spectacle frame using an eyeglass lens cleaning
apparatus, it is important that the rotatable heads/polishing means are positioned
opposite each other and that they rotate in opposite directions.
By rotating the two rotatable heads/polishing means in opposite directions, the forces resulting from the rotating movement on one side of the eyeglass lens from the first rotatable head is neutralized by an oppositely directed force as a result of the rotating movement on the other side of the eyeglass lens from the other rotatable head. The spectacle frame is therefore not exposed to unnecessary strain.

To obtain an even and efficient polishing effect, the rotatable heads are adapted to operate in a mutual opposite reciprocal movement, ensuring that the polishing means almost rub stains, spots or grease away without moving the rotatable heads.

In comparison to rotatable heads, which rotate in a uniform direction, this method is better, as it is easier to remove a stain by rubbing it away with a reciprocal movement than by wiping it away with a circulating movement.

Using the rotatable heads adapted to operate in a mutual opposite reciprocal movement, the time period necessary for the polishing process to be efficient is reduced significantly.

The gear means connecting the electrical motors to the rotatable heads ensures that the rotatable heads are operated in a mutual opposite reciprocal movement. Furthermore, the gear means provides an efficient power transfer from the motors to the rotatable heads, while the motors are placed in the housing and close to the battery.

By allowing the rotatable heads to be moveable on an axis approximately perpendicular to the longitudinal shafts of the gear means, it is possible to operate the eyeglass lens cleaning apparatus with one hand while holding the spectacles in the other hand. It is possible to press the two protruding arm sections together so the rotatable heads with polishing means are in contact with the opposite sides of the eyeglass lens.
In a preferred embodiment of the present invention said eyeglass lens cleaning apparatus, furthermore, comprises activation means. These activation means being an internal switch, which is positioned inside the housing and connected to the arm sections, whereby a compression force, of a certain level, on the protruding arms activates the internal switch, whereby the energy source is brought in connection with the drive units.

In an alternative embodiment of the present invention, said activation means are a switch, which is used to connect the energy source to the drive units, thereby starting the reciprocal movement of the rotatable heads. The switch is positioned on one of the protruding arms in a position easy to operate while holding the apparatus in the hand.

In a preferred embodiment of the invention, the energy source is a battery, which provides electrical current to the drive units. The battery can be a rechargeable battery or a disposable battery.

Alternatively, the energy source is a mechanical device such as a spring, which has to be wound up on a regular basis for providing the necessary force to rotate the rotatable heads.

To recharge the batteries, said eyeglass lens cleaning apparatus, furthermore, comprises a socket, which is adapted for connection to an energy charger.

In a preferred embodiment of the invention, the drive unit is an electrical motor, which is arranged for a reciprocal movement of the motor shaft. Alternatively, the drive unit is a movement generating set, such as an electromagnetic appliance arranged for creating a reciprocal movement.

In one embodiment of the present invention, the arm sections are exchangeably connected to the housing. The protruding arms are easily exchanged, if there is a problem with the gear means or if the polishing means on the rotatable heads are worn out.
In a second embodiment of the present invention the arm sections are flexible parts of the housing, which makes the housing an easy producible product e.g. by moulding.

In a third embodiment of the present invention, said rotatable heads are provided with a protruding bow part at an end part, which protruding bow part preferably is arranged inside an opening, and said polishing means, on a rear side, are provided with a protruding part with a recess, where said recess is adapted to engage with said bow part of said rotatable head.

The recess and bow part connection make it easy to exchange the polishing means in case the polishing materials are worn out or in case another type of polishing means must be used to ensure efficient polishing of the eyeglass lenses.

Furthermore, the recess and bow part allows connection between the rotatable head and the polishing means, as the polishing means are able to tilt slightly in every direction in regard to the rotatable head, hence the efficiency of the polishing process increases, because it is possible for the polishing means to follow the curvature of an eyeglass lens.

Alternative forms of this the joint connection could be a ball-and-socket joint or any kind of joint, which allows the rotatable heads to tilt in several directions.

When changing either the entire arm section or the rotating heads, it is not necessary to touch the polishing means, which is an advantage as touching of the polishing means is likely to transfer small amounts of grease or fluid from the hand to the polishing material, whereby the efficiency of the polishing process are reduced.

The aforementioned embodiments of the inventions allow the manufacturer of the eyeglass lens cleaning apparatus to produce and sell a basic and full operational version of the eyeglass lens cleaner.
Instead of throwing the entire apparatus away when the polishing means/polishing materials are worn out, the manufacturer provides the costumer with the possibility of buying new parts, e.g. polishing means with different types of polishing materials, rotatable heads of different diameters or sizes, or arm sections with different gear means.

The eyeglass lens cleaning apparatus is manufactured in a range of different types, e.g. a cheap and simple eyeglass lens cleaning apparatus adapted to be used and throw away when the polishing means/materials are worn out or an exclusive eyeglass lens cleaning apparatus with an appealing design and the possibility of changing the protruding arm sections, the cover section, the rotatable heads, the polishing means or the polishing materials.

To press the two protruding arms together and to allow the two protruding arms to have a mutual offset position, the two protruding arm sections are flexible parts of said housing. The flexibility of the protruding arms, furthermore, ensures the possibility to fully polish both sides of the eyeglass lens despite the position of the nose pads or the bar connecting the two eyeglass rims of the spectacle frame.

To ensure that the rotatable heads on the two protruding arms are in near proximity only when the protruding arms are pressed together, and that the polishing means of the rotatable heads are in contact with the surface of the eyeglass lens, the housing, furthermore, comprises an elastic member which is adapted to withstand a compression force on the housing.

The elastic member is arranged in the housing and connected to the arm sections so it counteracts any force compressing the two protruding arms sections together, which causes the protruding arm section to be in a fixed position when the eyeglass lens cleaning apparatus is not in use.

In an embodiment of the invention, the elastic member is an elastic rubber band connecting the end parts of the two protruding arms inside the housing. The rubber
band is arranged so it can be stretched, when a compression force is applied on the two protruding arms and then retracted to its original form, when the compression force on the two protruding arms is reduced.

Alternatively, the elastic member is any kind of a spring, connecting the end parts of the two protruding arms inside the housing.

In one embodiment of the invention it is necessary to change the battery of the eyeglass lens cleaning apparatus, when the battery is run-down. Alternatively, the eyeglass lens cleaning apparatus, furthermore, comprises a socket adapted for connection to an energy charger. Thus, it is possible to recharge the battery repeatedly.

For protection of the entire eyeglass lens cleaning apparatus and especially the polishing means/polishing material, the eyeglass lens cleaning apparatus, furthermore, comprises a cover section, which is adapted to connect to the housing either containing the protruding arms, rotatable heads and the polishing means or to fit between the protruding arms containing the rotatable heads and the polishing means.

The cover section protects against accidental/unwanted activation of the switch, when the eyeglass lens cleaning apparatus e.g. is moving around in a compartment of a bag with other things. Furthermore, the cover section protects unwanted compression of the two protruding arms, thereby preventing the rotatable head to collide and to be damaged.

The cover section is removed before use and can e.g. be connected to the housing with a string, chain or the like, making it easy to locate and put back over the protruding arms, rotatable heads and the polishing means.

It is important that the apparatus has a manageable size making it is easy to carry around. Therefore, the dimension of the eyeglass lens cleaning apparatus makes it possible to carry the apparatus in a handbag or in a pocket.
To exchange the polishing means, when the polishing material are worn out or have absorbed to much dirt, grease or the like, said polishing means are provided with attachments means on a front side, the attachments means being adapted to exchangeably attach a polishing material. The type of attachments means depends on the form of the polishing material.

In one embodiment of the invention the polishing means comprise pads, which are attached with Velcro strips, snap fastener or a bottom form that can engage mechanically with a surface of the rotation heads.

In a second embodiment of the invention the polishing means comprise covers, where the attachments means are provided by the oversize of covers, which are drawn around the polishing means. The covers are provided with an elastic band in the edge part, retaining the covers onto the polishing means by the elastic band.

In a third embodiment of the invention the polishing means comprise brushes, which are fastened to a bottom part e.g. by gluing, welding or by casting the brushes into the bottom part. The attachments for brushes could be Velcro strips, snap fastener or a bottom form engaging mechanically with a surface of the rotation heads.

The attachment means are able to attach the polishing material to the polishing means in a secure manner to prevent the polishing material to be thrown off when the rotatable heads rotate and to ensure that the polishing material follows the reciprocal movements of the rotatable heads.

To ensure an efficient and lenient polishing of the eyeglass lenses, the polishing material are made of micro fibres.

Using polishing means with brushes of micro fibres makes it possible to clean the entire surface of an eyeglass lens of a pair of spectacles despite of the position of the nose pads or the bar connecting the two eyeglass lens rims of the spectacle frame.
Furthermore, it is not necessary to use any cleaning fluid in connection with the inventive eyeglass lens cleaning apparatus, because the micro fibres are well suited for cleaning fluid or grease of a surface and because the micro fibres absorb the fluid/grease and remove solid matter.

Because of the aforementioned advantage of using polishing materials made of micro fibres, it is the preferred embodiment of the invention, but the polishing means can be made of other materials like cotton, wool, soft paper or the like.
Short description of the drawing

The invention is explained below with reference to the accompanying figures wherein:

Fig. 1 shows an eyeglass lens cleaning apparatus according to the invention,

Fig. 2 shows an eyeglass lens cleaning apparatus without a cover section,

Fig. 3 shows a partial cross-section of an eyeglass lens cleaning apparatus,

Fig. 4 shows the inside of an eyeglass lens cleaning apparatus,

Figs. 5-6 show a rotatable head according to the invention, and

Fig. 7 shows a polishing means according to the invention.

The reference numbers on the figures refer to the following:

1. Eyeglass lens cleaning apparatus
2. Housing
21. Protruding arm section
22. Notch
3. Cover section
4. Polishing means
41. Protruding part
42. Recess
5. Shaft arrangement
51. Crankshaft part
52. Coupling
53. Shaft
6. Gear means
7. Rotatable head
71. Groove
72. Opening
73. Bow part
8. Motor
9. Internal switch
Detailed description of the invention

Fig. 1 shows an eyeglass lens cleaning apparatus 1 comprising a housing 2 and a cover section 3 where said cover section 3 is exchangeably connected to said housing 2 and positioned between the protruding arm sections 21 of said housing 2, thereby protecting the polishing means (not shown) and preventing the unwanted activation of said eyeglass lens cleaning apparatus 1. Said protruding arm sections 21 are provided with notches 22 for achieving a better handgrip of the eyeglass lens cleaning apparatus 1.

Fig. 2 shows an eyeglass lens cleaning apparatus 1 without a cover section (not shown), where a polishing means 4 is provided at the end of each protruding arm section 21.

Fig. 3 shows an eyeglass lens cleaning apparatus 1 where motors 8 are placed on the base part 23 of the housing 2.

Each motor is connected to a rotatable head 7 by a shaft arrangement 5, which comprises a coupling 52 and a shaft 53 with a crankshaft part 51. The coupling 52 connects the shaft 53 to the motor 8.

Said rotatable heads 7 are provided with a groove 71 wherein said crankshaft part 51 is fitted and said rotatable heads 7 are furthermore provided with means for exchangeable connection of said polishing means 4.

The gear means 6 comprises said groove 71 and said crankshaft part 51 and provides the transfer of a rotating movement from the motor 8 into a reciprocal movement of said polishing means 4.

Fig. 4 shows how the motors 8 are positioned on the base part 23 and connected by electrical connections 81 to the batteries (not shown) positioned inside the base part 23.
Between the two motors 8 the internal switch 9 is positioned, which activates the motors when the tips of said internal switch 9 is brought together. In the space S between the two arms of said internal switch 9 a spring (not shown) is positioned to prevent the unwanted connection of said tips of said internal switch 9.

This spring (not shown) can be a compressible block, which in a non compressible position keeps said tips of said internal switch 9 apart, and when a force is exercised on the protruding arm sections (not shown), it will allow compression, hence the connection of said tips of said internal switch 9.

Fig. 5 shows a rotatable head 7 with said groove 71 and an opening 72 where said groove 71 is approximately a straight groove, wherein said crankshaft part (not shown) can reciprocate, hence causing the reciprocal movement of said rotatable head 7.

Fig. 6 shows an end view of said rotatable head 7, wherein said opening 72 is provided with a bow part 73 adapted for exchangeable connection of a polishing means (not shown).

Fig. 7 shows a polishing means 4, which on a rear side is provided with a protruding part 41 having a recess 42 adapted to engage with said bow part (not shown) of said rotatable head (not shown).

On a front side 43 said polishing means 4 is provided with attachment means being adapted for exchangeable attachment of a polishing material (not shown).
CLAIMS

1. Eyeglass lens cleaning apparatus (1) comprising a housing (2) with two protruding arm sections (21) having rotatable heads (7), at least one drive unit (8), an energy source, a shaft arrangement (5), where said housing (2) is provided with said drive unit (8) and said energy source, where said shaft arrangement (5) comprises a longitudinal shaft (53) provided inside said arm sections (21), each of said longitudinal shafts (53) being provided with gear means (6) adapted to transfer the rotating movement from said drive unit (8) to said rotatable heads (7), which are arranged on an axis approximately perpendicular to said longitudinal shafts (53) and provided with polishing means (4) adapted to be pressed against opposite sides of an eyeglass lens, characterised in that said gear means (6) comprises a crankshaft part (51) of said longitudinal shaft (53) and a groove (71) in said rotatable heads (7), and where said crankshaft part (51) is fitted into said groove (71) for the reciprocal movement of said polishing means (4).

2. Eyeglass lens cleaning apparatus (1) according to claim 1, characterised in that said rotatable heads (7) are provided with a protruding bow part (73) at an end part, which protruding bow part (73) preferably is arranged inside an opening (72), and said polishing means (4), on a rear side, are provided with a protruding part (41) with a recess (42), where said recess (42) is adapted to engage with said bow part (73) of said rotatable head (7).

3. Eyeglass lens cleaning apparatus (1) according to any of the claims 1-2, characterised in that said protruding arm sections (21) are flexible parts of said housing (2).

4. Eyeglass lens cleaning apparatus (1) according to any of the claims 1-3, characterised in that said eyeglass lens cleaning apparatus (1), furthermore, comprises activation means (9).
5. Eyeglass lens cleaning apparatus according to any of the claims 1-4, characterized in that the eyeglass lens cleaning apparatus (1), furthermore, comprises a cover section (3).

6. Eyeglass lens cleaning apparatus (1) according to any of the claims 1-5, characterized in that said housing (2), furthermore, comprises an elastic member adapted to withstand a compression force on said housing (2).

7. Eyeglass lens cleaning apparatus (1) according to any of the claims 1-5, characterized in that said eyeglass lens cleaning apparatus (1) furthermore comprises a socket adapted for connection to an energy charger.

8. Polishing means (4) for use with an eyeglass lens cleaning apparatus (1) according to any of the claims 1-7, characterized in that said polishing means (4), on a rear side, are provided with a protruding part (41) with a recess (42), where said recess (42) is adapted to engage with said bow part (73) of said rotatable head (7).

9. Polishing means (4) according to claim 8, characterized in that said polishing means (4), on a front side (43), are provided with attachments means being adapted to exchangeably attach a polishing material.

10. Polishing means (4) according to any of the claims 8-9, characterized in that said polishing means (4), furthermore, comprise one of the following: pads, covers or brushes.

11. Polishing means (4) according to any of the claims 8-10, characterized in that said polishing material are made of micro fibres.
### INTERNATIONAL SEARCH REPORT

**International application No.**

PCT/DK 2004/000420

#### A. CLASSIFICATION OF SUBJECT MATTER

**IPC7:** G02C 13/00, A46B 13/02

According to International Patent Classification (IPC) or to both national classification and IPC

#### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC7:** G02C, A46B, A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

EPO-INTERNAL, WPI, PAJ

#### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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* Further documents are listed in the continuation of Box C.  
* See patent family annex.

**Date of the actual completion of the international search**

4 October 2004

**Date of mailing of the international search report**

05-10-2004

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### INTERNATIONAL SEARCH REPORT

Information on patent family members

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