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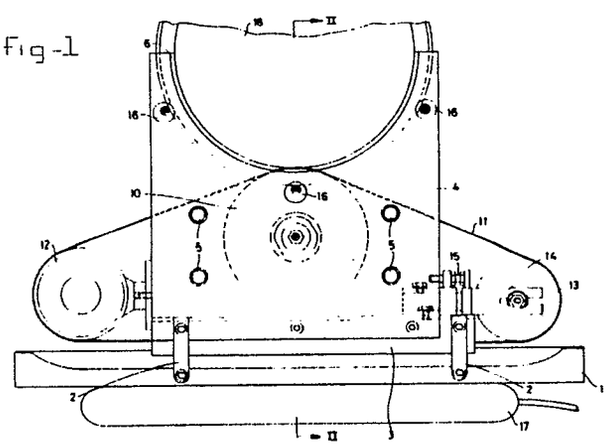
## (54) Device for grinding a bearing journal of the crankshaft of a combustion engine, in particular a diesel engine.

(57) Device for grinding a bearing journal (18) of the crankshaft of a combustion engine, comprising a support (1, 3) having mounted thereon two spaced apart parallel extending upright elements (4) which are provided at their top ends with a circular arc-shaped, concave guide edge (6) so that the imaginary straight line through their centre points forms the axis of an imaginary cylindrical surface, the device also having at least one grinding element (11), the grinding surface of which touches said imaginary cylindrical surface at least along a line, so that when the device is in operation - in which case the crankshaft is rotated and the journal to be treated rotates about its axis, which here essentially coincides with the said imaginary axis - the journal part to be ground is led in an essentially perfect circular path past the grinding surface, while this surface is held in a particular fixed position relative to the said axis.

Fig-1



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# Device for grinding a bearing journal of the crankshaft of a combustion engine, in particular a diesel engine.

The invention relates to a device for grinding a bearing journal of the crankshaft of a combustion engine, in particular a diesel engine.

In diesel engines, in particular those used for the propulsion of ships, a so-called wear ridge often occurs on one or more of the bearing journals of the crankshaft after a long period of use, a phenomenon which results from the lubricating groove present in the bearing shells. For further good functioning of the engine, such a wear ridge must be removed by grinding the bearing journal in question absolutely round again to a diameter slightly smaller than the original diameter.

The known devices for grinding bearing journals of a crankshaft are designed in such a way that they can rotate about the bearing journal in question. Very thin bearing shells are, however, used nowadays in engines, and after removal they leave too little space for these devices.

In these engines the bearing journals therefore cannot be ground on the spot inside the engine, so that the crankshaft has to be dismantled completely and taken off the vessel, which generally means that an opening has to be burned out in the ship's skin, and the crankshaft is then treated on a special crankshaft grinding machine and subsequently replaced in the engine.

It goes without saying that this process is very expensive and takes a long time, during which the vessel is out of service.

The object of the invention is to produce a device of the type mentioned above, with which the crankshaft of even today's engines with thin bearing shells can be treated in the engine as regards grinding one or more of its bearing journals.

This object is achieved in that the device according to the invention comprises a support having mounted thereon two upright elements which extend essentially along two parallel planes spaced apart, and which are provided at their top ends with a circular arc-shaped, concave guide edge in such a way that the imaginary straight line through the centre points of the two circular arcs is perpendicular to the two upright elements and forms the axis of an imaginary cylindrical surface, the diameter of each circular arc being essentially equal to the original diameter of the bearing journal to be treated, and the shortest distance between the guide edges being smaller than the axial length of the bearing journal to be treated, but being greater than the axial dimension of the attacked part of this journal, and the device also has at least one grinding element which is fitted below the guide edges between the upright elements, and the grinding surface of which touches the above-mentioned imaginary cylindrical surface at least along a line, and means are also present to ensure that the guide edges can be held pressed against the journal to be treated on either side of the grinding surface, all this in such a way that when the device is in operation - in which case the crankshaft is rotated and the journal to be treated rotates about its axis, which here essentially coincides with the above-mentioned imaginary axis - the journal part to be ground is conveyed in an essentially absolutely circular path along the grinding surface, while this surface is held in a particular fixed position relative to the said axis.

Thus a device designed in this way does not rotate about the journal to be treated, but is put against the journal to be treated at a place where there is always sufficient space inside the engine, generally below the journal to be treated.

The grinding element is preferably disposed adjustably in such a way between the upright elements that the grinding surface can be moved parallel to itself at least in the direction towards the imaginary axis, so that, when it is found after some time that the grinding surface of the grinding element is no longer lying sufficiently against the journal to be able to carry out its grinding action, this grinding surface can be moved slightly.

The grinding element is disposed adjustably in an advantageous manner between the upright elements in such a way that the ends of the line along which the grinding surface essentially touches the above-mentioned cylindrical surface can be moved independently of each other towards and away from the imaginary axis, so that the grinding surface can be set accurately.

The grinding element preferably has a rotary roller, whose axis of rotation runs essentially parallel to the above-mentioned imaginary axis, the above-mentioned adjustability being obtained through the fact that the roller is mounted on its axis of rotation, said axis being provided at both ends with an eccentric journal, said journals being in line with each other and each being accommodated in an eccentric sleeve which is rotatably connected to the upright element in question.

Since the use of an endless grinding belt as the grinding surface offers many advantages in general for grinding operations, the rotary roller is preferably a supporting roller for an endless grinding belt running over the roller and also being guided around at least one drive roller.

The above-mentioned pressure means are preferably formed by a compressed gas-filled

cushion under the frame. This ensures that any movements of the crankshaft which may occur during the grinding are followed.

It can be desirable to prevent the guide edges from shifting in the axial direction relative to the journal to be treated. For this, outward-projecting guide elements can be disposed on the upright elements, near their guide edges.

The invention is described in greater detail with reference to the drawing, in which:

Fig. 1 shows an example of an embodiment of the device according to the invention;

Fig. 2 shows a section along the line II-II in Fig. 1; and

Figs. 3 and 4 show more clearly the adjustment means for the pressure roller.

As shown in Fig. 1, the device comprises a frame made of a U-section 1, with a U-section 3 fastened thereto by means of strips 2. Two upright elements 4, 4′, in the form of plates, are mounted on either side of the U-section 3, and are held extending accurately parallel to each other by the spacing sleeves 5. Each plate 4, 4′ is provided at its top end with a circular arc-shaped concave recess along which a guide edge 6, 6′ of, e.g., aluminium is disposed.

Extending between the plates 4 and 4′ is a shaft 7 which at both ends merges into an eccentric journal 8, 8′, said journals 8, 8′ being in line with each other. These journals 8, 8′ are accommodated in eccentric sleeves 9, 9′ which are fixed rotatably inside apertures disposed in the plates 4, 4′.

A supporting roller 10 is mounted on the shaft 7 by means of ball bearings in such a way that it rotates about the shaft 7. An endless grinding belt 11 runs round the supporting roller 10 and also runs around a driven roller 12 and a tensioning roller 13. The shaft of the tensioning roller 13 can be moved to and fro along the forks 14 by means of adjusting screws (not shown), and said forks 14 can be moved jointly relative to the frame 3 by means of the set bolt 15 with locking nut.

Guide blocks 16, 16′, which are adjustable due to the fact that they are provided with eccentric apertures, are fitted on the outsides of the plates 6, 6′.

The whole device is supported by an air cushion 17 when it is in operation.

When the device is in operation, it is placed under the bearing journal 18 of a crankshaft 19 to be treated, and by increasing the air pressure inside the air cushion 17, the guide edges 6, 6′ are pressed against the non-attacked parts 18′ of the bearing journal 18. Since these non-attacked parts 18′, with the original diameter of the journal 18, are still absolutely round, the imaginary axis through the centre points of the circular arcs formed by the guide edges 6, 6′ will coincide with the axis of the journal bearing 18. The crankshaft 19 is then turned slowly by means of the turning engine, for example at a speed of 3/4 r.p.m., while the motor driving the driven roller 12 is put into operation, so that the grinding belt 11 is put into rotary motion, while the part of this belt running over the supporting roller 10 has a grinding effect on the bearing journal 18.

Due to the fact that the shaft 7 of the supporting roller 10 is fixed in plates 6, 6′ in a specific position relative thereto, said shaft 7 and thereby also the top part of the periphery of the supporting roller 10 is in a fixed position relative to the above-mentioned imaginary axis, and therefore also relative to the axis of the journal to be treated, so that when said journal is rotated the attacked part thereof to be ground is conveyed along the part of the grinding belt 11 running over the supporting roller 10, this part being at a fixed distance from the axis of the journal 18. The shaft 7 of the supporting roller 10 is generally set in such a way that said shaft runs parallel to the above-mentioned imaginary axis, so that the journal part to be ground is ground absolutely round to a specific diameter over the entire axial length thereof. If, however, the journal 18 has a certain taper, it can be corrected by turning the sleeves 9, 9′ slightly, so that the shaft 7 can be set slightly at an angle.

If necessary, the shaft - and thus the periphery of the supporting roller - can be moved towards or away from the journal 18 to be treated, by turning the shaft 7 a little.

In order to prevent the device from shifting in the axial direction relative to the journal 18, the guide blocks 16, 16′ are forced against the particular radius of the journal 18, as shown in Fig. 2.

## Claims

1. Device for grinding a bearing journal of the crankshaft of a combustion engine, in particular a diesel engine, characterized in that the device comprises a support having mounted thereon two upright elements which extend essentially along two parallel planes spaced apart, and which are provided at their top ends with a circular arc-shaped, concave guide edge in such a way that the imaginary straight line through the centre points of the two circular arcs is perpendicular to the two upright elements and forms the axis of an imaginary cylindrical surface, the diameter of each circular arc being essentially equal to the original diameter of the bearing journal to be treated and the shortest distance between the guide edges being smaller than the axial length of the bearing

journal to be treated, but being greater than the axial dimension of the attacked part of this journal, and the device also has at least one grinding element which is fitted below the guide edges between the upright elements, and the grinding surface of which touches the above-mentioned imaginary cylindrical surface at least along a line, and means are also present to ensure that the guide edges can be held pressed against the journal to be treated on either side of the grinding surface, all this in such a way that when the device is in operation - in which case the crankshaft is rotated and the journal to be treated rotates about its axis, which here essentially coincides with the above-mentioned imaginary axis - the journal part to be ground is conveyed in an essentially absolutely circular path along the grinding surface, while this surface is held in a particular fixed position relative to the said axis.

2. Device according to Claim 1, **characterized in that** the grinding element is disposed adjustably in such a way between the upright elements that the grinding surface can be moved parallel to itself at least in the direction towards the imaginary axis.

3. Device according to Claim 1 or 2, **characterized in that** the grinding element is disposed adjustably between the upright elements in such a way that the ends of the line along which the grinding surface essentially comes into contact with the above- mentioned cylindrical surface can be moved independently of each other towards and away from the imaginary axis.

4. Device according to Claims 1-3, **characterized in that** the grinding element has a rotary roller whose axis of rotation runs essentially parallel to the imaginary axis.

5. Device according to Claim 4, **characterized in that** the roller can rotate about an axis which is provided at both ends with an eccentric journal, said journals being in line with each other and each being accommodated in a sleeve which is connected to the upright element in question.

6. Device according to Claim 5, **characterized in that** the sleeves are eccentric sleeves which are rotatably connected to the upright elements.

7. Device according to Claims 4-6, **characterized in that** the roller is a supporting roller for an endless grinding belt running over the roller and also being guided round at least one drive roller.

8. Device according to Claims 1-7, **characterized in that** the above-mentioned pressure means are formed by a compressed gas-filled cushion under the frame.

9. Device according to Claims 1-8, **characterized in that** outward-projecting guide elements are provided on the upright elements, near their guide edges.

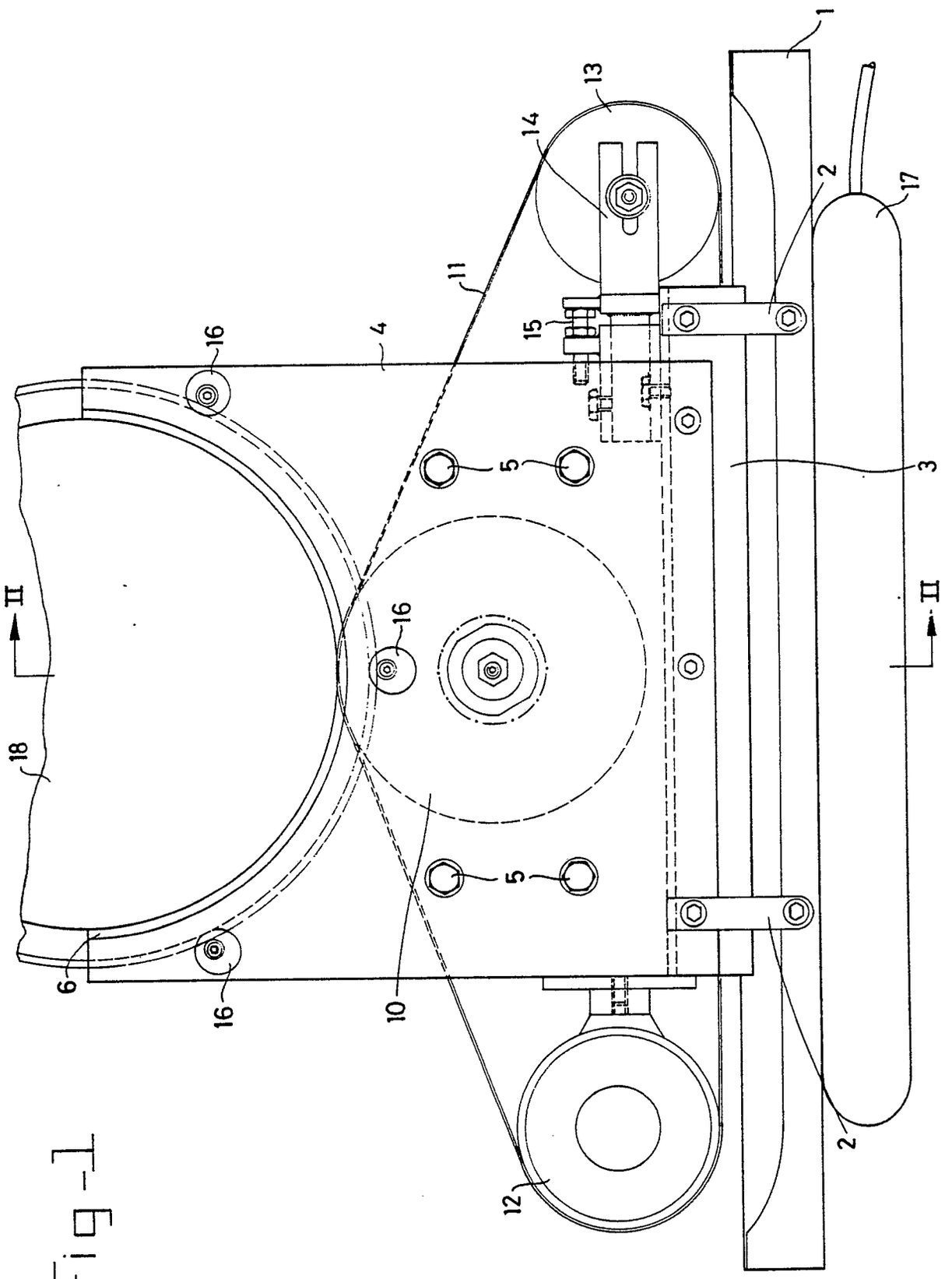



Fig-1

Fig - 2

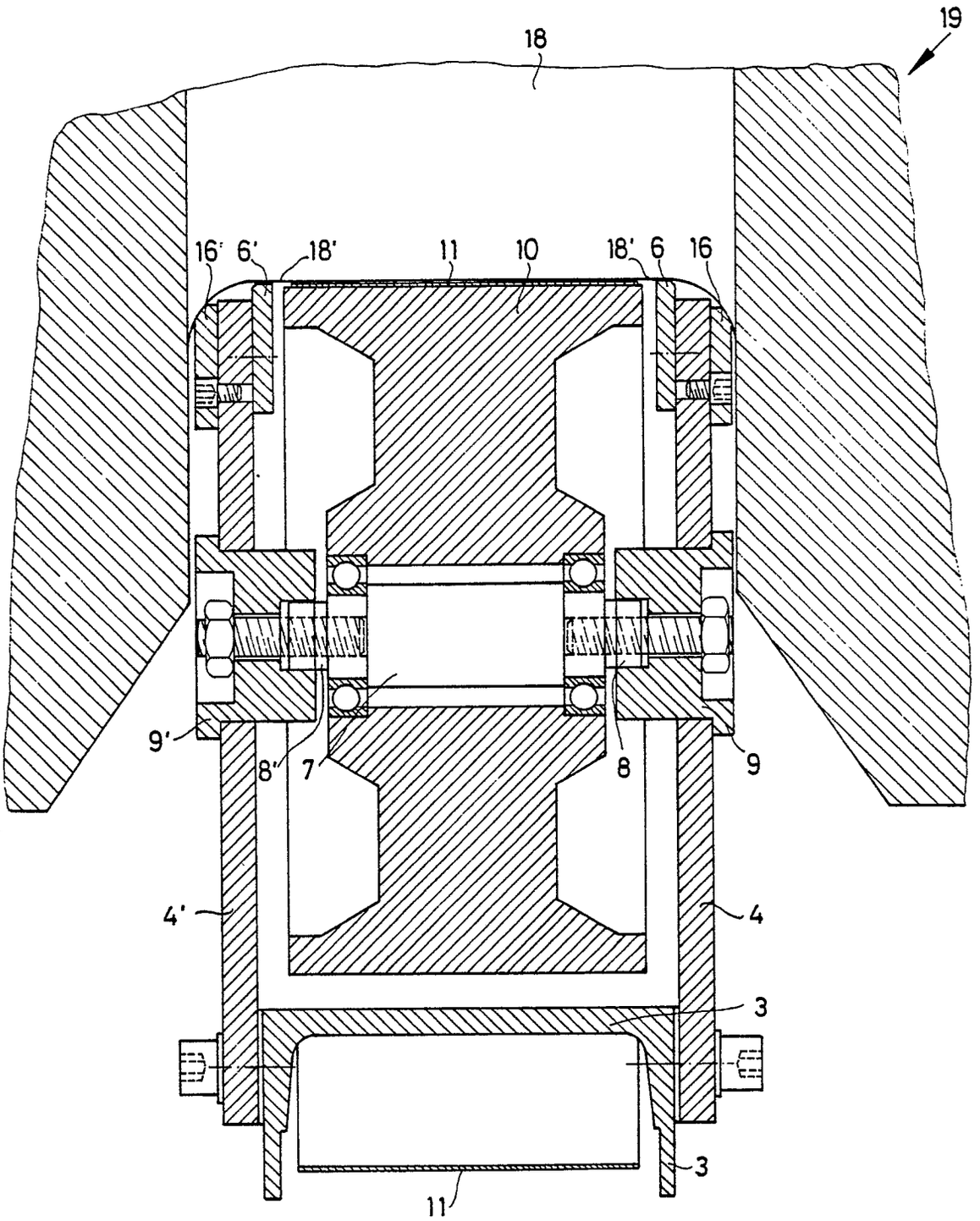


Fig-3

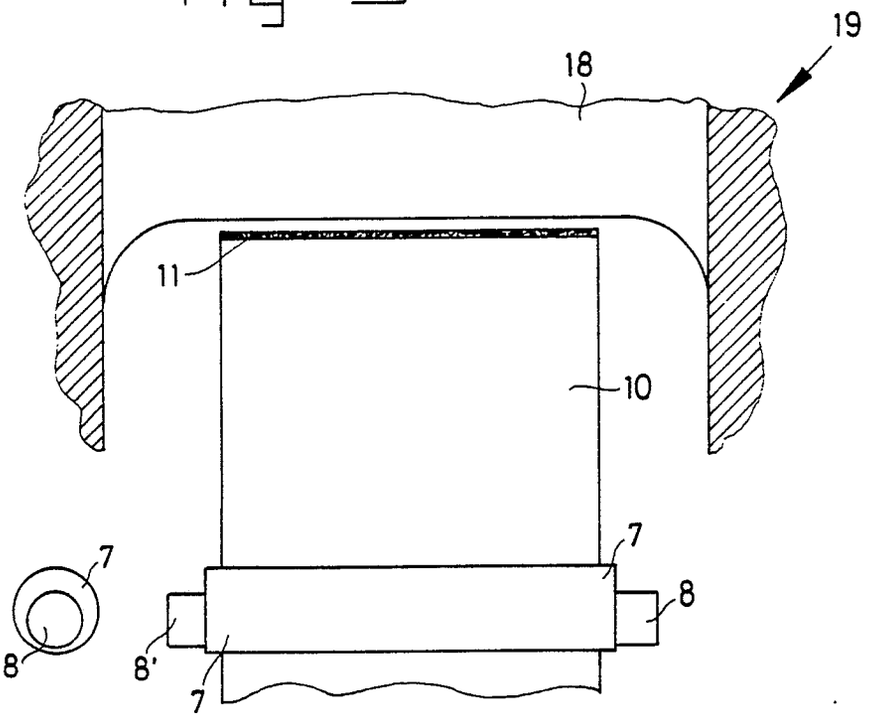
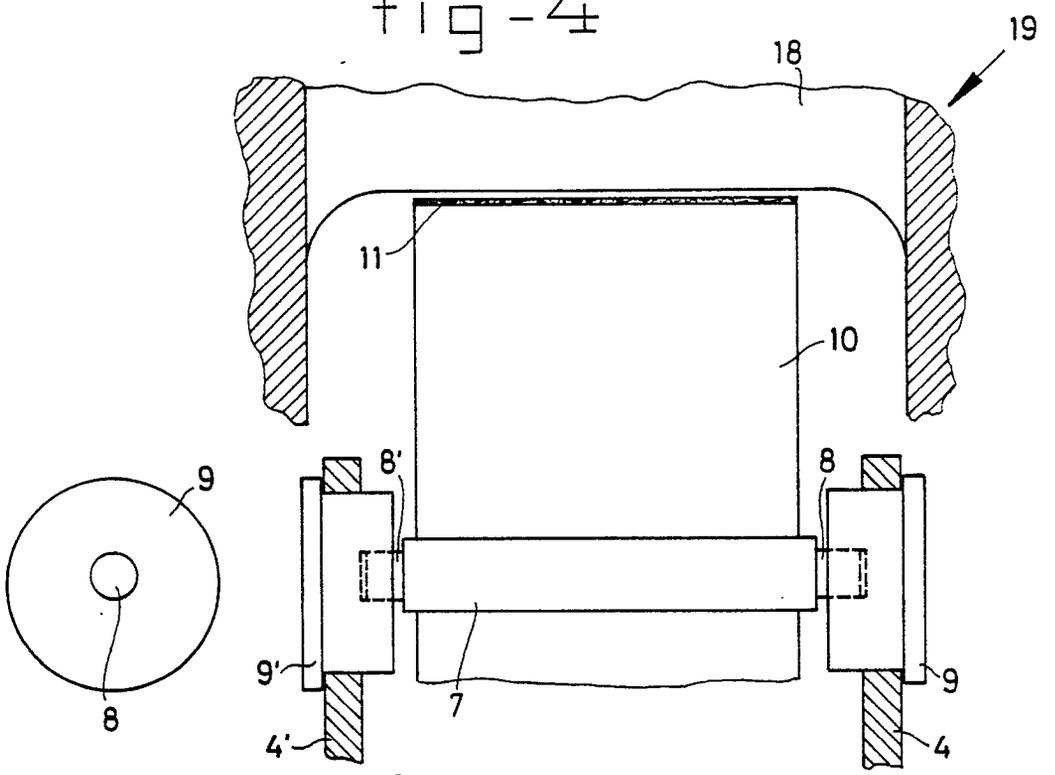



Fig-4



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# EUROPEAN SEARCH REPORT

Application Number

EP 89 20 0704

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |
|---|---|---|---|
| A | DE-A-1 577 434 (MASCHINENFABRIK AUGSBURG-NÜRNBERG)<br>* Claims; figure 1 * | 1 | B 24 B 5/42<br>B 24 B 21/02 |
| A | CH-A- 174 727 (E. GÖTTI)<br>* Figures; claim * | 1 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 24 B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 04-07-1989 | ESCHBACH D.P.M. |

CATEGORY OF CITED DOCUMENTS

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