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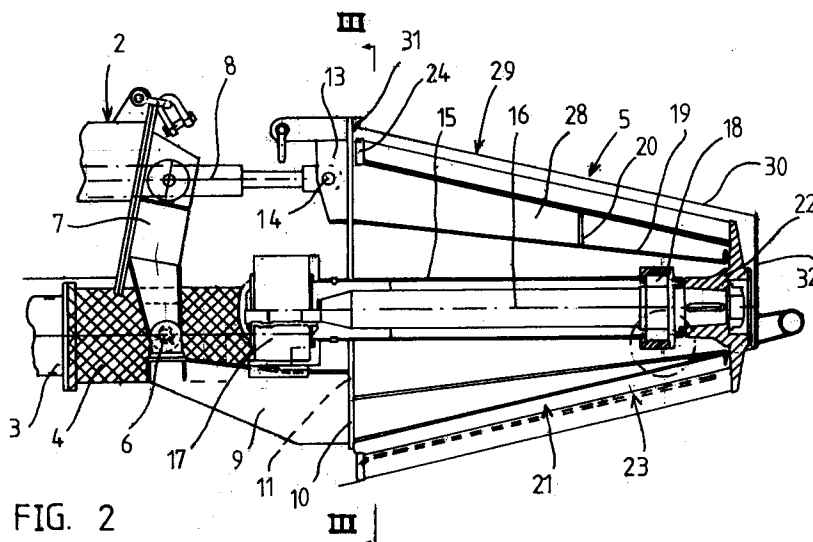
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NL-2596 HG Den Haag (NL)(54) **Cutter assembly such as for mounting to the ladder of a suction dredger.**

(57) Cutter assembly mountable to the ladder (2) and/or the suction pipe (3) of a suction dredger. The cutter assembly comprises a motor-driven cutter (21) with a number of knives (23) and an apron (19) fixedly arranged within the cutter and connected to a radial end plate (10) to which the suction pipe connects. On the apron (19) a guiding blade (20) has been mounted, which runs such that the sludge

loosened by the knives is led to the suction opening (11) located in said end plate (10). A cover (29) has been mounted around a part of the cutter (21), which cover is at some distance from the knives (23) and, seen in its direction of rotation (V), over an angle such that only the part of the cutter which in operating position is located near the bottom (38, 39), remains free.

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The invention relates to a cutter assembly which is mountable to the ladder and/or the suction pipe of a suction dredger, which cutter assembly comprises a rotatably mounted, motor-driven and cage-shaped cutter with a number of knives arranged around the axis of rotation and with at least their ends connected to each other and an apron being fixedly arranged within the cutter and extending opposite the cutter knives and being shaped as a body of revolution, which apron has been connected to an end plate running radially and being positioned near the suction pipe.

Such a cutter assembly is known from NL-A-7013543 and has the disadvantage, that there is the possibility of not all loosened dredgings ending up in the suction pipe.

This is particularly undesirable if, for example, in dredging sludge the sludge to be removed is polluted by heavy metals and the like, such as occurs more and more in practice. There is a danger that the loosened sludge will be whirled up, polluting the surrounding water and deposits again at other locations. This is highly undesirable.

The object of the invention is to improve the cutter assembly described above in such a way, that said disadvantages are removed as much as possible.

According to the invention, to that end it is provided for, that the wall of the apron facing the cutter knives is at some distance from the knives and that on said wall, there is a guiding blade being substantially square to the wall and extending up to the knives, which blade runs such that the sludge loosened by the knives is transported to the suction opening situated in the end plate of the apron, with a cover having been fitted around part of the cutter, the cover extending at some distance from the knives and seen in direction of rotation thereof in such a way that only the part of the cutter where the material to be cut enters, is open.

Through this, it is achieved that all sludge loosened by the cutter knives is almost directly supplied to an enclosed space and that all sludge ends up in the suction pipe.

Generally, the guiding blade will run spirally under such an angle that the direction of movement of the sludge supplied thereto by the cutter knives is deflected into the direction of the suction opening.

In order to achieve a most favourable operation of the cutter knives, it can be provided for, that, seen in direction of rotation of the cutter, the outer edge of the knives leads in relation to the inner edge and that a substantially flat part connects to the inner edge, which part extends against the direction of rotation and runs almost tangential in relation of the body of revolution described by the inner edge of the cutter knives.

Although generally, the cutter will have a conical shape, such as is the case with the known device, the cutter can also be made cylindrical. However, this will need no further explanation.

In order to affect the sludge immediately next to the sludge to be loosened by the cutter as little as possible, it can be provided for, that the opposing longitudinal edges of the cover, which encloses the cutter, have each been provided with a cross-plate, such that both the cross-plates are almost in one plane, which plane will run almost horizontally in operating position of the cutter assembly.

Here, in particular the cross-plates will have a part facing inwardly, which forms a cutting device together with the cutter knives. Through this, plants such as for example reed, can be cut through and the danger of the cutter getting blocked by such plants is almost excluded.

In working with the cutter assembly, it will be moved across the bottom substantially square to the axis of rotation of the cutter, and that in both directions. Herein, the cutter will always keep rotating in the same direction. In moving the cutter assembly in the direction in which the cutter also rotates near the bottom, the sludge can be brought into the enclosed space directly. When, however, the cutter assembly is moved across the bottom in opposite direction, with the one cross-plate approximately sliding across the bottom, the loosened sludge will first have to get past the open space between the opposing cross-plate and the bottom. Through this, functioning of the assembly would be adversely affected. In order to prevent this, it can be provided for, that the cover is pivotable around the longitudinal axis of the cutter assembly, or has a pivotable portion.

For a most favourable operation of the cutter assembly according to the invention, it is desirable that the cross-plates of the cover always connect to the bottom in the best possible way. In order to achieve this, it can be provided for, that the cutter assembly has been pivotably connected to the ladder by means of a substantially horizontal shaft and that means are present for bringing the assembly to a desired position and for keeping it therein and means for remote determination of the position of the assembly.

Herein, there will further be a flexible connection between the suction pipe portions connected to the ladder and to the cutter assembly.

The invention is now explained by way of an embodiment, illustrated in the drawing, in which:

fig. 1 diagrammatically shows a side view of a part of a suction dredger with a ladder mounted thereto, which has been provided with a cutter assembly according to the invention;

fig. 2 diagrammatically shows a vertical section across a cutter assembly according to the inven-

tion with a part of the accompanying ladder;
 fig. 3 diagrammatically shows a section according to line III-III of fig. 2; and
 fig. 4 diagrammatically shows a plan view of the device of fig. 2.

In fig. 1, 1 indicates a part of a suction dredger provided with a ladder 2, which in relation to the suction dredger 1 is pivotable around a horizontal axis not further indicated. A suction pipe 3 has been connected to the ladder 2, which pipe has one side extending to a pump mounted on the suction dredger and not further indicated and has the other side connected to the cutter assembly 5 by means of the flexible pipe 4. This cutter assembly 5 has been pivotally connected to a portion 7 protruding from the ladder 2, by means of the horizontal shaft 6, see also fig. 2, and is kept in the desired position by means of the hydraulic cylinder 8.

The ladder 2 can be brought to the desired height in a known way by means of a cable and winch not further indicated, the cutter assembly 5 then being in the operating position.

The cutter assembly 5 will now be described by way of the figures 2, 3 and 4 and comprises a bracket 9 connected to the end plate 10. In the end plate 10 the suction opening 11 is present, which connects to the part 12 of the suction pipe, which part has the other side connected to the flexible pipe 4.

The end plate 10 has been provided with a bracket 13 representing the point of connection 14 for the hydraulic cylinder 8, while an opening not further indicated can be provided in the bracket. Through this, the cutter assembly 5 can be almost fixedly connected to the ladder 2 by means of some bow shackles, for example when the assembly 5 is put out of operation and the hydraulic cylinder 8 has been disconnected.

A pipe 15 has been mounted in the end plate 10, which pipe serves for supporting the shaft 16, which can be driven by means of the hydraulic motor 17. To that end, for example the bearing 18 is situated between the pipe 15 and the shaft 16.

The end plate 10 has also been connected to the conical apron 19 on which the guiding blade 20 has been mounted. As appears from figures 3 and 4, the blade is almost square to the plate 19 and extends across this plate in a helical shape such that it ends at the end plate 10 just after the suction opening 11, as seen in the direction of rotation V of the cutter 21 to be described hereinafter.

First, the cutter 21 comprises the hub 22, which has been mounted on the shaft 16 and has been secured on it by way of a key and nut not further indicated. From the part running radially, the knives 23 extend towards the supporting ring 24,

which is situated near the end plate 10.

As appears in particular from fig. 3, the outer edge 25 of the cutter knives 23 runs ahead of the inner edge 26 as seen in the direction of rotation V of the cutter 21 and a substantially flat part 27 connects to the inner edge 26. It was found, that in this way, the radially inward flow of sludge loosened by the cutter knives 23 is improved. The sludge gets into the space 28 between the cutter and the apron 19 and is guided to the suction opening 11 in the plate 10 by the guiding blade 20 present in said space.

The cover 29, which is substantially in the shape of a conical plate 30, extends around a part of the cutter 21. The plate 30 has at one end been provided with a ring 31, which has been secured to the end plate 10 by means of bolts not further indicated. At the other end, the cover has been closed by a disc 32, which is situated near the end of the cutter 21.

As appears in particular from fig. 3, the plate 30 lies at some distance from the cutter knives 23 and each of the longitudinal edges 33 of the plate 30 has been provided with a cross-plate 34. The cross-plates 34 are supported by a U-shaped bent pipe 35, the part 36 of which lies in front of the disc 32, as appears in particular from fig. 4. The pipe 35 can then serve as buffer when an object would be present under water. The pipe parts situated near the longitudinal edges 33 have further been supported by means of the plates 37.

The edges of the cross-plates 34 facing the cutter 21 have been cut obliquely, like the edges of the cutter knives 23, so that these edges can cooperate for cutting through plants or the like.

As appears from fig. 3, the cross-plates 34 will be at such height in relation to the cutter 21, that they determine the thickness of the layer of sludge to be loosened.

In the situation illustrated in fig. 3, the cutter assembly 5 moves in the direction of the arrow P. Therein, the cross-plates 34 have been brought in an almost horizontal plane 38 by means of the hydraulic cylinder 8, see fig. 1. When the assembly moves in the opposite direction, the loosened sludge should first have to be moved along the opening which, as seen in fig. 3, then exists between the left cross-plate 34 and the plane 39. In connection therewith, it will be desirable, that either the cutter assembly 5 can be rotated a little around its longitudinal axis, or the plate 30 of the cover 29 has a portion, which in circumferential direction, so in the direction of the arrow V or opposite thereto, is slidable in relation to the remaining part of the plate. Sliding again can take place with the help of a hydraulic cylinder or in another known way. These possibilities have not further been indicated in the drawing, since they will be apparent to an

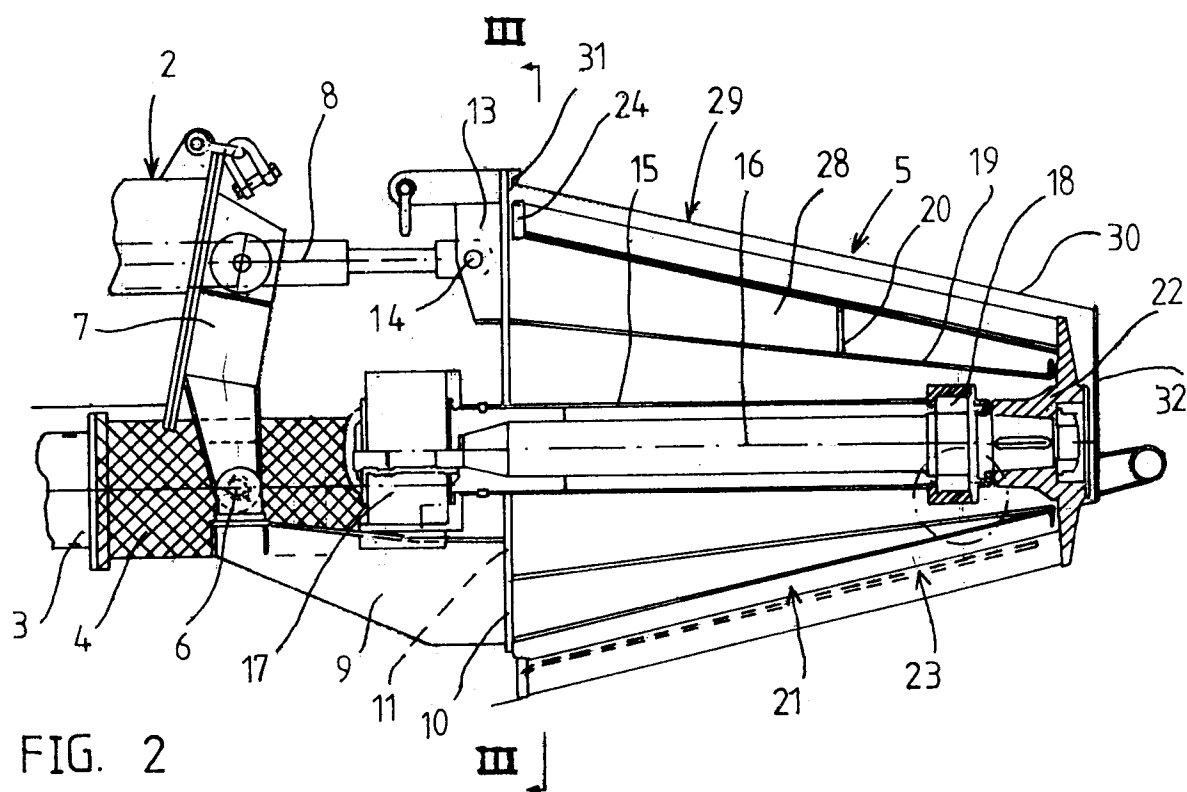
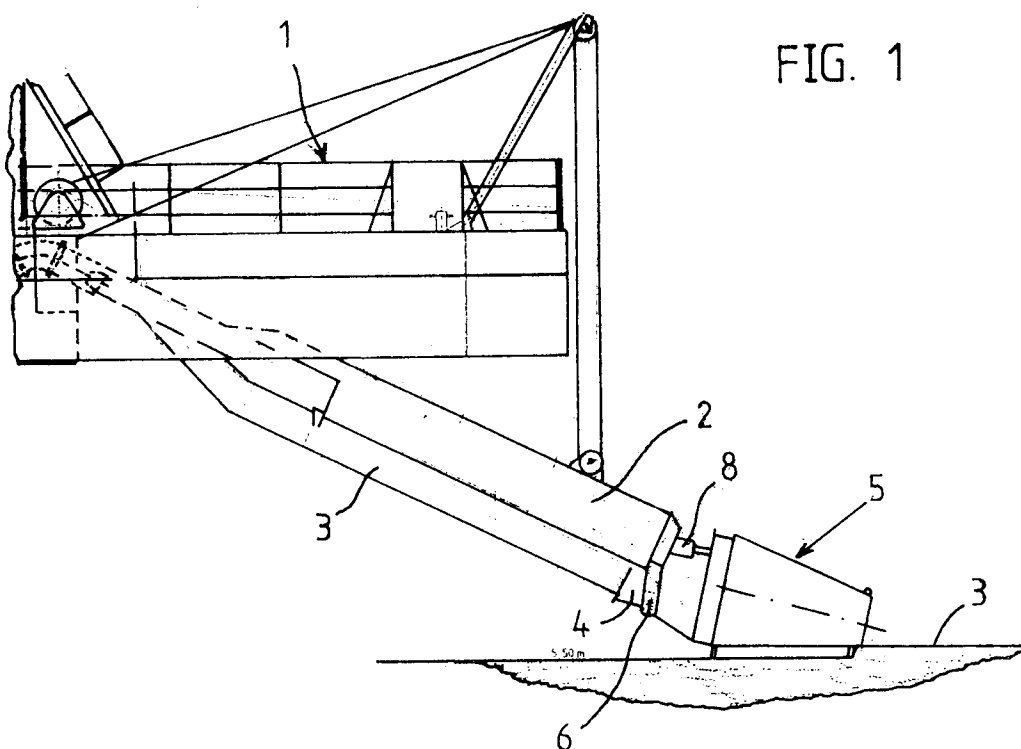
expert. One can also make further modifications which are within the inventive idea.

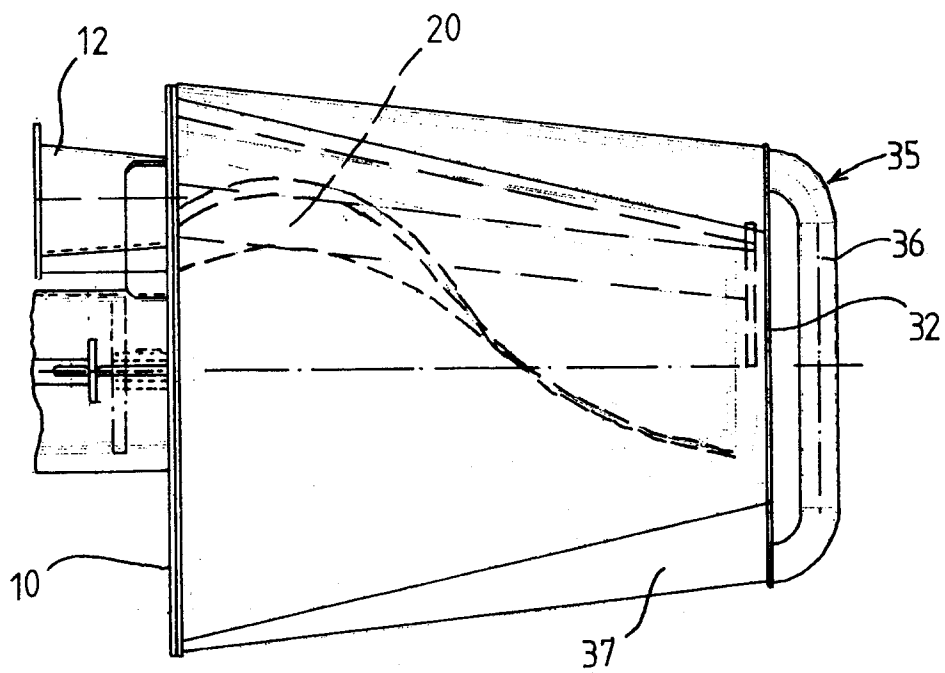
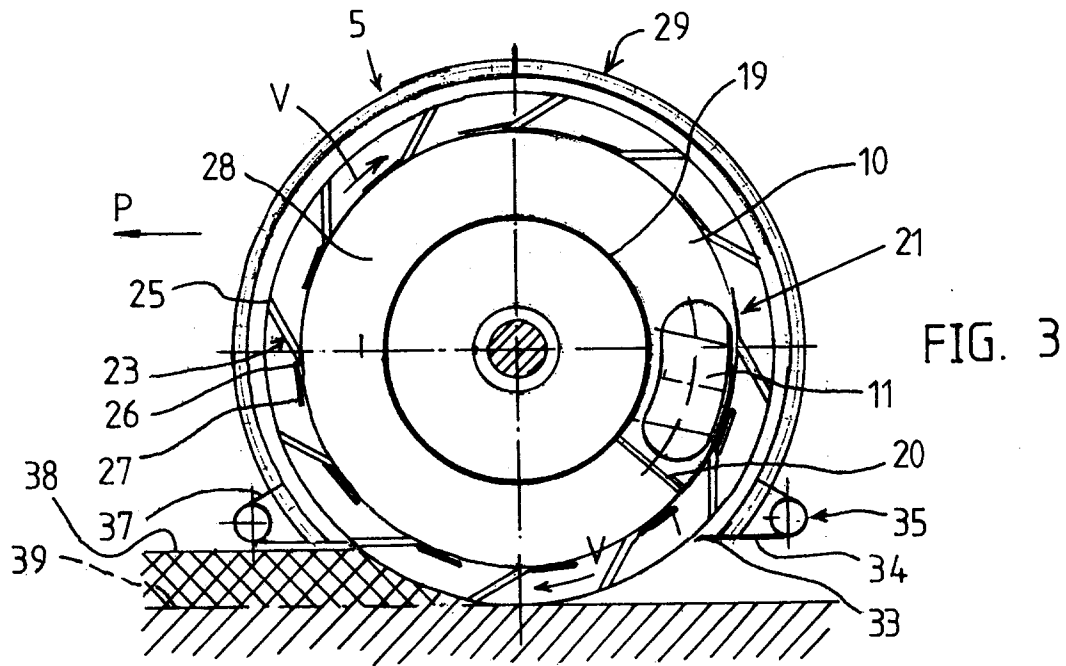
Claims

1. Cutter assembly which is mountable to the ladder (2) and/or the suction pipe (3) of a suction dredger (1), which cutter assembly comprises a rotatably mounted, motor-driven and cage-shaped cutter (21) with a number of knives (23) arranged around the axis of rotation and with at least their ends connected to each other and an apron (19) being fixedly arranged within the cutter and extending opposite the cutter knives and being shaped as a body of revolution, which apron has been connected to an end plate (10) running radially and being positioned near the suction pipe (3), characterized in that the wall of the apron (19) facing the cutter knives (23) is at some distance from the knives and that on said wall, there is a guiding blade (20) being substantially square to the wall and extending up to the knives, which blade runs such that the sludge loosened by the knives is transported to the suction opening (11) situated in the end plate (10) of the apron, a cover (29) having been fitted around part of the cutter (21), the cover extending at some distance from the knives (23) and seen in direction of rotation thereof (V) in such a way that only the part of the cutter where the material to be cut enters, is open.
2. Cutter assembly according to claim 1, characterized in that the guiding blade (25) runs spirally under such an angle that the direction of movement of the sludge supplied thereto by the cutter knives (23) is deflected into the direction of the suction opening (11).
3. Cutter assembly according to claim 1 or 2, characterized in that seen in direction of rotation (V) of the cutter (21), the outer edge (25) of the knives (23) leads in relation to the inner edge (26) and that a substantially flat part (27) connects to the inner edge (26), which part extends against the direction of rotation and runs almost tangential in relation of the body of revolution described by the inner edge (26) of the cutter knives (23).
4. Cutter assembly according to one of the preceding claims, characterized in that the opposing longitudinal edges (33) of the cover (29), which encloses the cutter (21), have each been provided with a cross-plate (34), such that both the cross-plates are almost in one plane (38), which plane runs almost horizontally in operat-

ing position of the cutter assembly (5).

5. Cutter assembly according to claim 4, characterized in that the cross-plates (34) have a part facing inwardly, which forms a cutting device together with the cutter knives (23).
6. Cutter assembly according to one of the preceding claims, characterized in that the cover (29) is pivotable around the longitudinal axis of the cutter assembly (5), or has a pivotable portion.
7. Cutter assembly according to one of the preceding claims, characterized in that the cutter assembly (5) has been pivotably connected to the ladder (2) by means of a substantially horizontal shaft (6) and that means (8) are present for bringing the assembly to a desired position and for keeping it therein and means for remote determination of the position of the assembly, while a flexible connection (4) is present between the suction pipe portions (3, 12) connected to the ladder (2) and to the cutter assembly (5).







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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 3801

| 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.5) |
| A | EP-A-0 430 316 (BOSKALIS) * column 4, line 8 - column 5, line 30; figures * --- | 1,3,6,7 | E02F3/92 |
| A | US-A-3 807 066 (PROEHL) * column 1, paragraph 65 - column 2, paragraph 17; figures * --- | 3 | |
| A | NL-A-7 812 140 (REBA) * the whole document * --- | 1-3,5,6 | |
| A | FR-A-2 282 036 (TAX) * page 6, line 35 - page 7, line 34; figures * --- | 2 | |
| A,D | NL-A-7 013 543 (BOS & KALIS) * the whole document * ----- | 1 | |
| | | | TECHNICAL FIELDS SEARCHED (Int. Cl.5) |
| | | | E02F |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 01 JUNE 1993 | Examiner DE SCHEPPER H.P.H. |
| CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | | | |