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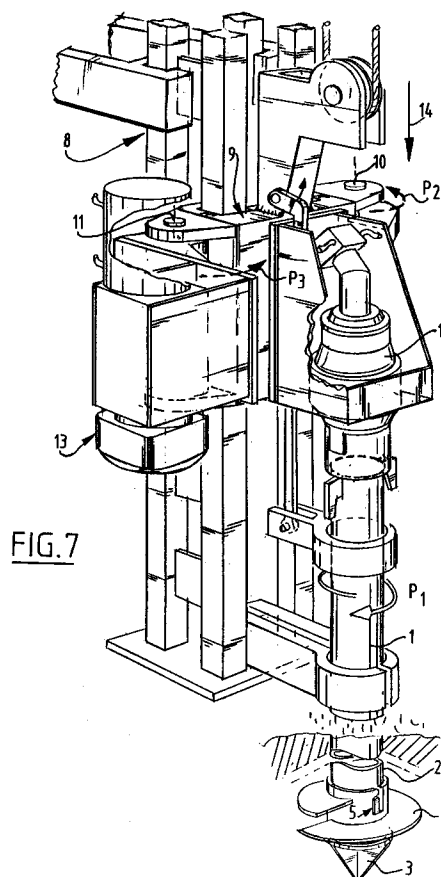
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NL-2517 GK Den Haag (NL)**(54) **Method for arranging concrete piles in the ground**

(57) According to the invention a hollow pipe provided on the end with a drill head is carried in rotatably driven and drilling manner into the ground. After the bearing layer has been reached, further ramming takes place for a time with a ram block in order to achieve a sufficient settling. The pipe is then filled with concrete mortar and reinforcement and pulled out of the ground while being vibrated.

This method is particularly intended for use in built-up areas.

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The invention relates to a method for arranging concrete piles in the ground by placing into the ground a hollow cylindrical pipe, filling the interior of the pipe with reinforcement and concrete and removing the hollow cylindrical pipe from the ground.

With regard to the generated vibrations and possible resulting damage to the foundations of existing buildings it is not possible or desirable to drive piles into the ground in built-up areas.

In order to avoid this drawback, hollow cylindrical pipes are carried in rotating or drilling manner into the ground and the interior of the pipe is filled with reinforcement and concrete after it has reached the desired depth. The pipe is then removed from the ground.

This method has the drawback that after the concrete pile has been formed in the ground, the pile can still penetrate a certain distance further into the ground due to settling. Such settling, and in particular the distance over which this takes place, is not the same for all piles of a foundation, so that in extreme cases the foundation will move out of the desired horizontal position.

The invention has for its object to obviate this drawback. This is achieved according to the invention in that an end part provided with helical lines is arranged on the end of the pipe to be driven into the ground, the pipe is driven rotatingly into the ground and finally an impact force is applied to the pipe.

Because the pipe is further rammed for a time, the cylindrical pipe will undergo a settling such that the danger of further penetration of the concrete pile into the ground is avoided. Since this further ramming takes place after the desired bearing layer has already been reached, the degree of vibration generated in the ground will be so small that there is no danger to existing buildings.

In order to limit still further the danger of damage to surrounding foundations or buildings as a consequence of the further ramming, it is proposed according to the invention that the applied impact force is formed by a ram block lowered into the pipe.

The ram block can apply the impact force to an inner edge arranged on the bottom end of the pipe. It is also possible for the impact force to be applied by the ram block to concrete poured into the bottom end of the pipe.

The invention further relates to a pile-driving installation for performing the method according to the invention.

The invention is further elucidated with reference to the drawings.

In the drawings:

fig. 1-6 show the different stages for introducing and again removing a cylindrical pipe with a

method according to the invention,

fig. 7 shows a preferred embodiment of the pile-driving installation for performing the method according to the invention,

fig. 8 shows an embodiment of the pile-driving installation for performing the method according to the invention, wherein drilling takes place in ground-compacting manner and further ramming takes place with a ram block, while the pipe is pulled by means of the vibrator, this as an embodiment of the BOVI-PILE, and

fig. 9 shows an embodiment of the invention, wherein drilling takes place in ground-compacting manner and the expanded foot is then arranged with a ram block. The pipe is subsequently filled with concrete and the pipe pulled with a vibrator, this as an embodiment of the BOVI-PILE.

Fig. 1-6 show schematically the manner of arranging a hollow cylindrical pipe and subsequent removal thereof from the ground.

On the pipe 1, known under the trade name of BOVI-PILE, is placed an end part 2 which has a tip-shaped part 3 as well as a helical part 4. The end part 2 is connected to the pipe by means of a pin-slot connection 5. Using a hydraulic rotation motor 6 the pipe 1 is rotated in the direction of arrow P1 and penetrates in manner of a drill into the ground.

When the position according to fig. 2 is reached, the pipe is further rammed by means of the ram block 7 such that it is set in operationally reliable manner into the bearing layer in the ground. The reinforcement (fig. 3) and then the concrete mortar (fig. 4) are subsequently carried into the hollow pipe.

The pipe is then set into vibration using the block (fig. 5) and simultaneously moved vertically upward. The vibration has the purpose of compacting the concrete. The end part 2 is a lost end part and remains behind in the ground. Finally (fig. 6), the hollow pipe is wholly removed from the ground and the concrete pile is formed in the ground. The head of the pile can optionally be finished to height.

Fig. 7 shows an embodiment of a pile-driving installation according to the invention. A sub-frame 9 is placed on the post 8. A hydraulic rotation motor 12 and a ram block 13 are arranged on sub-frame 9 for rotation round the respective shafts 10 and 11. By swivelling in the direction of arrows P2 respectively P3 the hydraulic rotation motor 12 or the ram block 13 can be carried as desired into the ramming position above pipe 1.

As is usual, the whole frame can be displaced vertically in the direction of arrow 14 along the post 8.

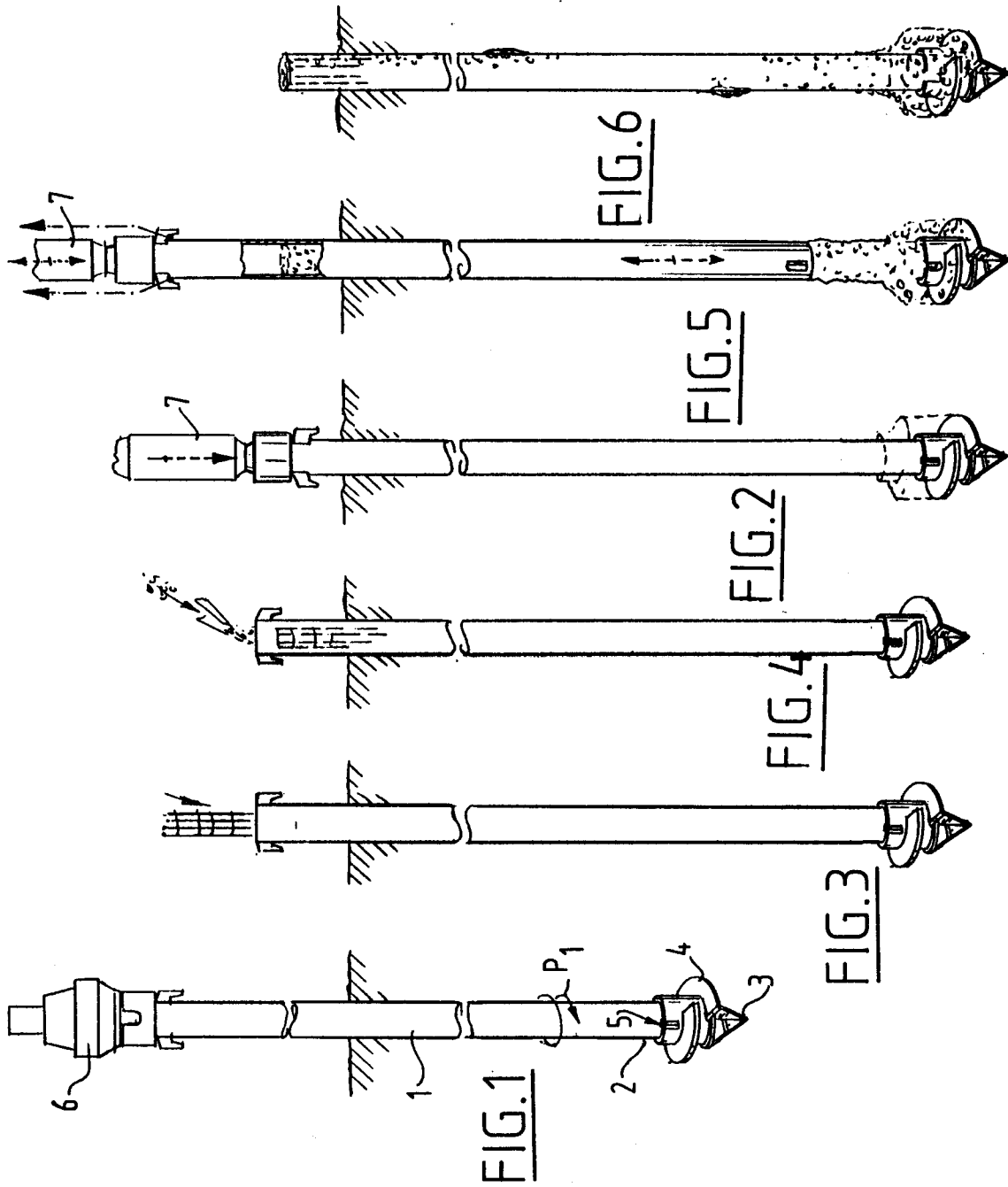
According to the embodiment of fig. 8, a ram block 20 is lowered into the pipe for further ram-

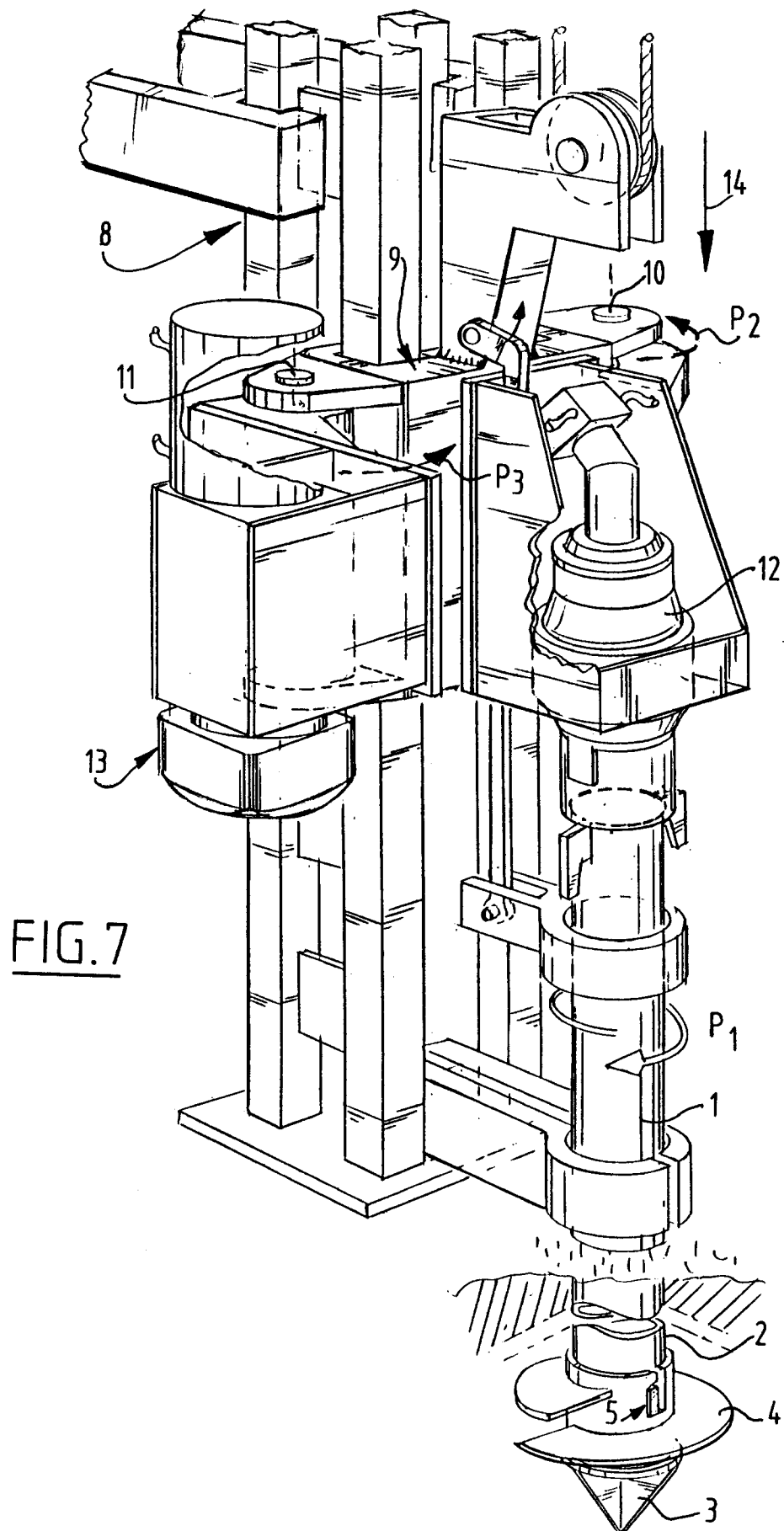
ming. This ram block 20 exerts its impact force on an inner edge 21 on the bottom edge of the pipe. In the usual manner the pipe is then filled with concrete and removed from the ground while the vibrator vibrates.

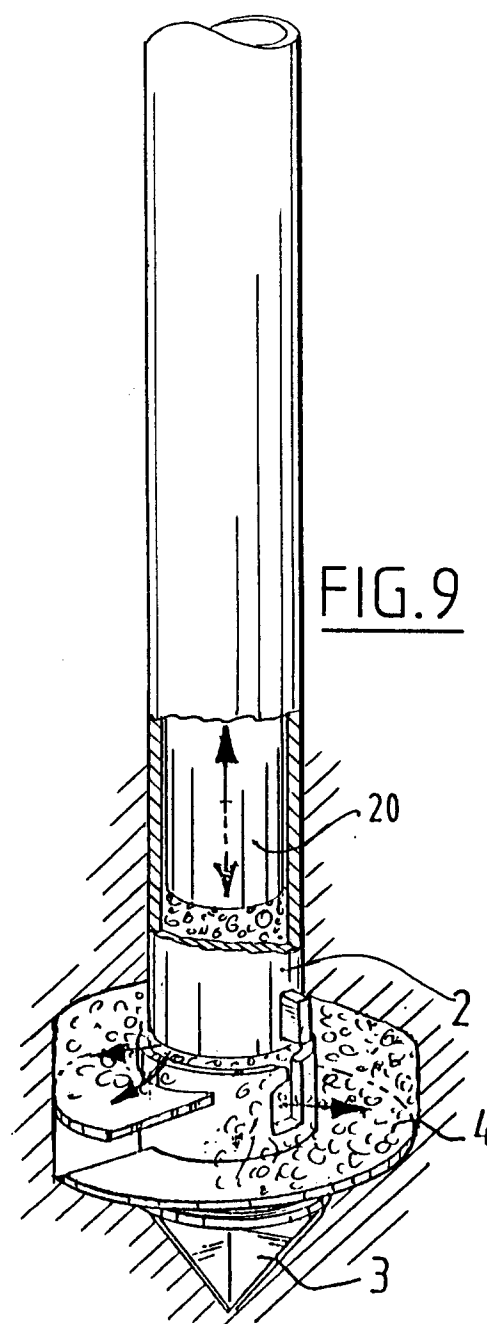
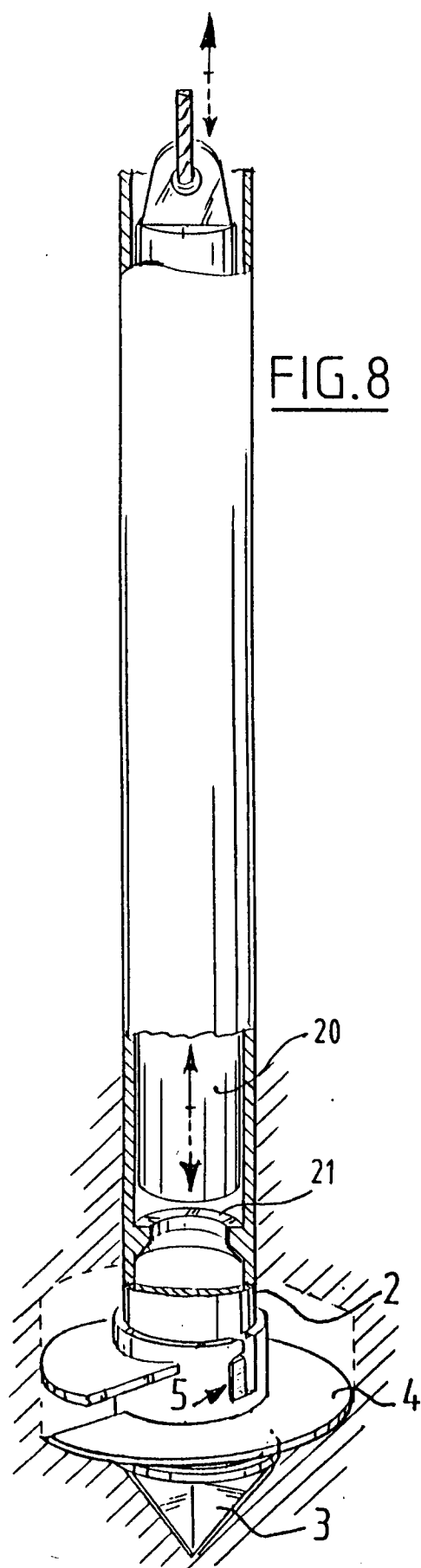
According to the embodiment of fig. 9, prior to further ramming the pipe is lifted slightly and a quantity of concrete introduced into the thereby resulting space. After compacting with the ram block 20 or further ramming a spherical foot is obtained at the bottom end of the pile which increases the load capacity of the pile. As in the foregoing embodiments, removal of the pipe takes place using a vibrator.

### Claims

1. Method for arranging concrete piles in the ground by placing into the ground a hollow cylindrical pipe, filling the interior of the pipe with reinforcement and concrete and removing the hollow cylindrical pipe from the ground, **characterized in that** an end part provided with helical lines is arranged on the end of the pipe to be driven into the ground, the pipe is driven rotatingly into the ground and finally an impact force is applied to the pipe.
2. Method as claimed in claim 1, **characterized in that** the impact force is applied to the top part of the pipe.
3. Method as claimed in claim 1, **characterized in that** the impact force is applied by a ram block lowered into the pipe.
4. Method as claimed in claim 3, **characterized in that** the impact force is applied to an inner edge in the bottom end of the pipe.
5. Method as claimed in claim 3, **characterized in that** the impact force is applied to concrete poured into the bottom end of the pipe.
6. Method as claimed in claim 1, **characterized in that** the end part is releasably connected to the pipe.
7. Method as claimed in claims 1-6, **characterized in that** the number of strikes amounts to about one hundred.
8. Method as claimed in claims 1-7, **characterized in that** the end part is a lost end part.
9. Pile-driving installation for performing the method as claimed in claims 1-8, **characterized by** a sub-frame which is rotatable round a shaft on the post and which supports a rotation motor for rotatably driving a pipe and a ram block for generating an impact force such that the rotation motor or the ram block can be placed as desired above a ramming position.
10. Pile-driving installation as claimed in claim 9, **characterized in that** the rotation motor respectively the ram block can each be swivelled round a vertical shaft.









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## EUROPEAN SEARCH REPORT

Application Number  
EP 95 20 1609

| 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.6) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | BE-A-754 765 (FUNDEX) 18 January 1971<br>* claims; figures *<br>---                                                        | 1,6,8                                                | E02D7/26<br>E02D5/38<br>E02D5/44             |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                            |                                                      |                                              |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                            | Date of completion of the search<br>7 September 1995 | Examiner<br>Voutsadopoulos, K                |
| <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                                                                                            |                                                      |                                              |