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(11) **EP 0 698 429 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.02.1996 Bulletin 1996/09

(51) Int. Cl.⁶: **B21D 11/12**

(21) Application number: **94870141.2**

(22) Date of filing: **25.08.1994**

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB IT LI LU NL SE

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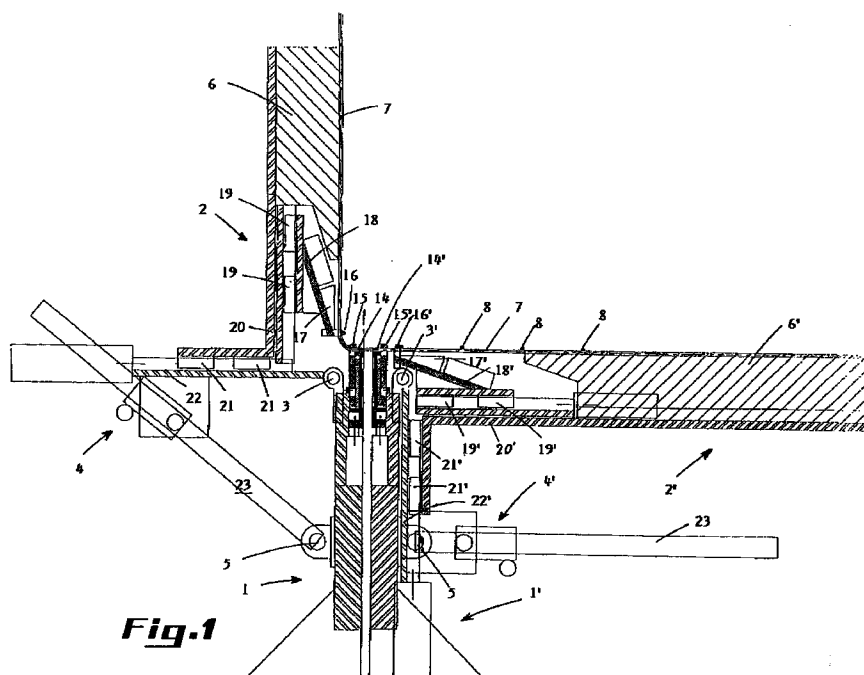
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(54) **Device for bending in one operation a series of parallel bars pertaining to a net**

(57) The invention relates to a device for bending in one operation a series of parallel bars of a net, characterised in that it consists of bending means which are movable with respect to a frame and extend perpendicular with respect to the bars to be bent, with four pressure pieces being successively mounted both on the frame and on the movable bending means, the two inner pieces

of which being situated on the one side and the two outer pieces on the other side with respect to the longitudinal axis of the bar and some of these pressure pieces may be movable with respect to the longitudinal axis of the bar, in such a manner that different bar diameters can be clamped.



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Description

This invention relates to a device for bending in one operation a series of parallel bars of a net, consisting of longitudinal bars and cross bars welded thereon, according to the principle of the four point disposition meaning that use is made of two opposite bending moments, the points of action of which displace in such a manner that no other forces occur during the bending operation than said moments.

Bending machines for bending the cross bars destined for forming a net are known. Machines for bending the cross bars of a net already formed and consisting of longitudinal bars and cross bars welded thereon also exist.

The machines just referred to correspond to the type wherein the bar is bent by a device wherein the bar is treated according to the principle of the three or of the four point disposition. Two variants of this three point disposition exist which are described hereinafter.

Variant 1

The bar can indeed be bent by exerting a pushing force with a movable cam between two fixed cams supporting the bar.

The bar bends around this middle movable cam over a bending diameter equal to the one of this movable cam.

Variant 2

In case of a three point disposition the movable cam may act on one side of the two fixed cams (one above and one underneath the bar). The bent bar shows then a bending diameter equal to the one of the fixed cam on the side of the movable cam.

Bending machines for one bar based on this three point disposition have the advantage of permitting different bar diameters to be bent without adjustment. However, the drawback is that only one bar can be bent at the same time and that another bending diameter requires another cam involving the necessary adjustment time.

In bending machines based on the four point disposition two opposite moments are realised with two combinations of two opposite pushing forces. The movements of the points of action of this pushing forces result from the bending of the bar. The bending diameter of the bar is a function of the distance between the two middle points of action and the realised bending angle.

Bending machines for one bar based on the four point disposition have the advantage of permitting bars with different diameters to be bent without adjustment whilst adjusting to another bending diameter requires little time. The drawback of known machines operating according to this principle is the fact that they can bend only one bar.

A clear picture of an apparatus for bending one bar, built according to this principle of the four point disposition, is given by the European patent 0 226 167.

Machines known hitherto for bending a net operate according to the principle described hereinabove under "Variant 2". Such machines have therefore the advantage of permitting indeed to bend an entire net, whilst no adjustment of the pushing cams is required as long as the bending diameter of the bar is not changed.

The drawback of such machines is clearly that for each changed bending diameter an adjustment of the pushing cams is required. Bending machines based on this principle operate only for nets having an identical cross bar diameter. When the net has different cross bar diameters, serious bending errors appear.

The invention has therefore as object to provide a device, the operation of which is based on the four point disposition, and which allows to bend entire nets with non-identical bar diameters without adjustment of the pushing cams as a result of automatic adaptation of certain essential components to the different bar diameters.

To allow this according to the invention, it consists of bending means which are movable with respect to a frame and extend perpendicular or substantially perpendicular with respect to the bars to be bent, with four pressure pieces being successively mounted both on the frame and on the movable bending means, the two inner pieces of which being situated on the one side and the two outer pieces on the other side with respect to the longitudinal axis of the bar and some of these pressure pieces may be movable with respect to the longitudinal axis of the bar.

Still according to the invention said bending means consist of a bending table with pressure pieces connected thereto.

In a particularly advantageous embodiment of the invention said bending table is hingedly connected to said frame.

The device is constructively designed in such a manner that it comprises at least one, but preferably two bending benches which are movable to and away from each other.

Other details and advantages of the invention will become apparent from the following description of a device for bending the bars of a net according to the invention. The description is only given by way of example and can in no way be interpreted as a limitation of the invention. The referral numerals relate to the figures annexed hereto.

Figure 1 is a schematic side view with partial cross sections of a device according to the invention in double disposition.

Figures 2 and 3 illustrate also schematically the principle of so-called four point disposition, of which the device according to the invention forms a particularly attractive realisation.

Figure 4 illustrates according to a perspective view the arrangement of the pressure means on the frame and on the bending table.

The Figure 1 annexed to this description shows thus clearly a device according to the invention in a possible double disposition of two bending benches. On both sides of the longitudinal symmetrical plane the device comprises a frame 1, respectively 1'. In case of such a double disposition the frames 1 and 1' are removable from each other. To this end it is sufficient that one of these frames, for example frame 1, is a fixed frame, whereas frame 1' is movable by means which do not pertain to the invention, in such a manner that all characteristics of the bent net can be met.

For a good understanding of the invention it has to be noted very clearly that, in case of a possible omission of the frame 1 together with the movable components connected thereto and characterising the device, the net can rest on a fixed component pertaining to the device, for example a supply table. Such an arrangement will not be described here further into detail.

To a frame 1, respectively 1' is mounted a hinged bending table 2, 2'. The hinge axis of the bending tables 2, 2' is referred to by references 3, 3'.

Each bending table 2, 2' may take in any position. The bending table 2 can take in for example the position shown in figure 1 by using very different pushing means. One thereof is for example the spindle mechanism 4, 4' with hinge points 5, 5' relative to the frame 1 respectively 1'.

A flat support 6, respectively 6' is provided onto each bending table, onto which support the net lies and can be displaced over. One cross bar from such a net is shown in Figures 1 and 4 and has been given the reference 7, 7'. The longitudinal bars, only some of which are shown, are referred to by the reference 8 (in Figure 4 - 8, 8', 8'').

At each cross bar 7, 7' means are now provided to bend this cross bar pertaining to a net according to the four point principle described hereinabove. This occurs without adjustment of pressure pieces. Indeed each of the cross bars are bent according to the principle illustrated in Figures 2 and 3, independent of their diameter.

Figure 3 shows indeed schematically a non movable component referred to by the reference 9. Pressure pieces connected thereto have the references 10, 11 and 10', 11'. The movable component accomplishing the same function as the bending table described hereinabove is schematically shown in these Figures and referred to by the reference 12. Pressure pieces cooperating therewith have the reference 10' and 11'.

When the movable component 12 is going to displace now to take in i.a. the position which appears from Figure 3, the bar 13 curves to be bent finally according to an angle resulting from the adjustment and the change of the distance and the angle separating the non-movable component 9 from the movable component 12. When 11 and 11' are non-movable pressure pieces and/or 10 and 10' are pressure pieces which are on the contrary movable relative to the bar, it is clear that nets having bars which may be of different diameters can be clamped

and bent without having to use exchangeable pressure pieces.

By applying this principle to the device, more details of which are shown in figure 1 only by way of example, a net finished in advance can therefore each time be bent according to the required angle.

To be able to achieve this with technically reliable means, said pressure pieces consist of movable pushing cams 14, 14' and clamping means acting as hooks 15, 15'. For each bending table, these two components form the two first points from the series of four required for bending a bar according to the principle already described in detail hereinabove. Each bending table further comprises pressure pieces acting as clamping means and formed by hooks 16, 16' and pushing means acting as pressure pieces consisting of wedge-shaped blocking means 17, 17' come each time again.

The wedge-shaped blocking means 17, 17' can be activated in any way just like the pushing cams 14, 14', either by a spindle mechanism, or by a hydraulic or pneumatic pistons. The wedge-shaped blocking means 17, 17' are displaced along obliquely disposed sliding plates 18, 18'. These plates are in their turn fixed onto movable slides or linear guides 19, 19', which, as can be deduced from Figure 1, are part of the component 20, pertaining to the bending table 2. A similar movable slide 21' is situated between component 20, 20' and 22, 22'. This component 22, 22' is connected to the hinge axis 3, 3' mentioned already hereinabove.

From the description given hereinabove of the device according to the invention it appears that nets, the diameter of the bars of which showing different values, can be bent in an original way by using the principle of the four point disposition clearly described hereinabove. Changing or adjusting pressure pieces in function of the different diameters of bars to be bent is entirely omitted. For the first time, the possibility is therefore given to bend nets with different bar diameters in a perfect way on an industrial scale and at a high production rate.

The invention is of course not limited to the embodiment described herein by way of example and a lot of modifications could be applied thereto, provided they fall within the scope of the annexed claims.

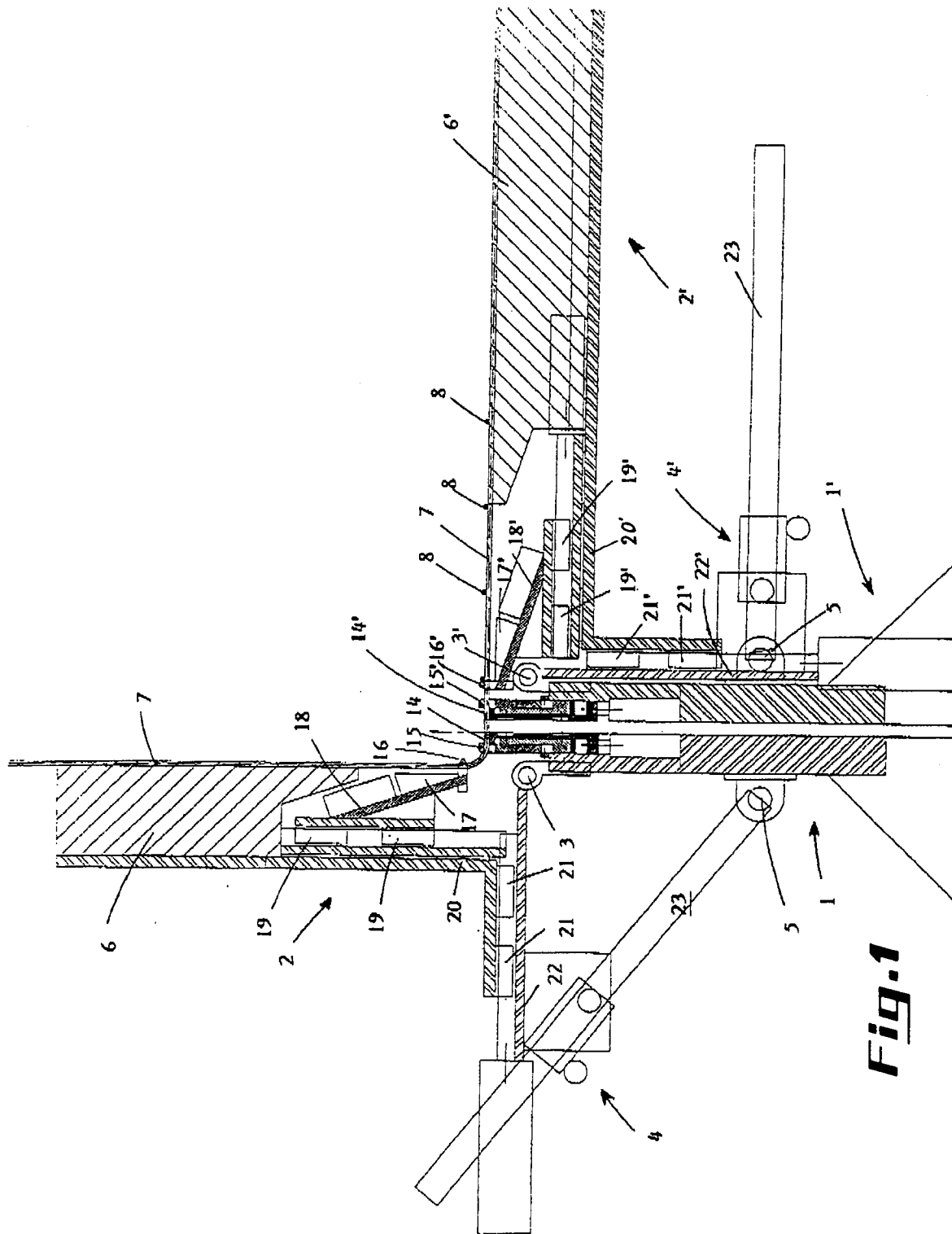
Claims

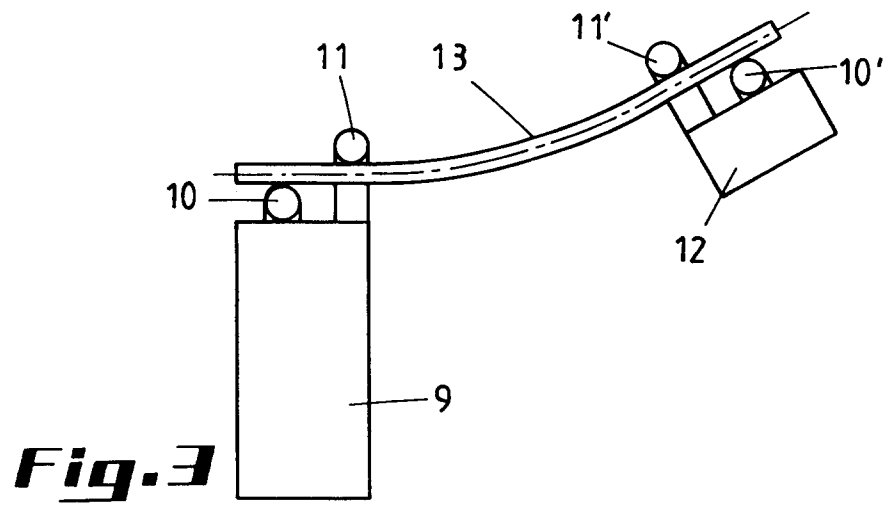
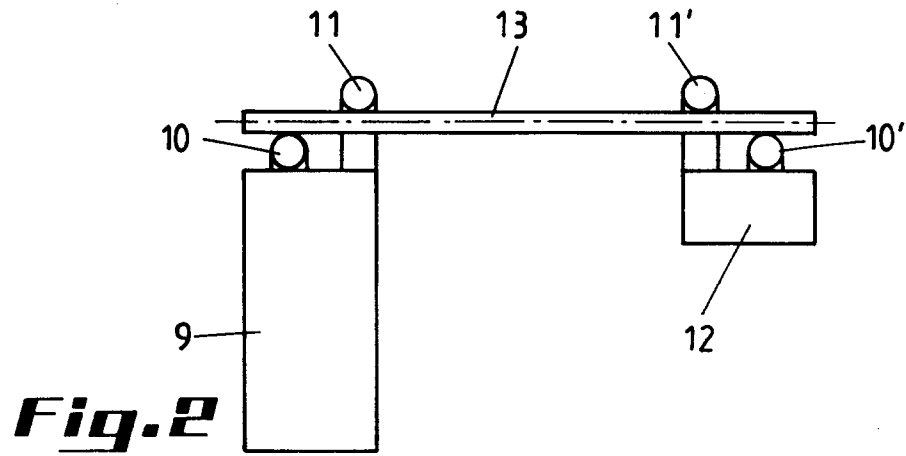
1. A device for bending in one operation a series of parallel bars of a net, consisting of longitudinal bars and cross bars welded thereon, according to the principle of the four point disposition meaning that use is made of two opposite bending moments, the points of action of which displace in such a manner that no other forces occur during the bending operation than said moments, characterised in that it consists of bending means which are movable with respect to a frame and extend perpendicular or substantially perpendicular with respect to the bars to be bent, with four pressure pieces being successively mounted both on the frame and on the movable

bending means, the two inner pieces of which being situated on the one side and the two outer pieces on the other side with respect to the longitudinal axis of the bar and some of these pressure pieces may be movable with respect to the longitudinal axis of the bar, in such a manner that different bar diameters can be clamped. 5

placed by means of a push arm (23) which is hingedly mounted on said frame (1, 1').

2. A device according to claim 1, characterised in that said bending means consist of a bending table (2, 2') with pressure pieces connected thereto. 10
3. A device according to claim 2, characterised in that said bending table (2, 2') is hingedly connected to said frame (1, 1') at the place of the hinge axis (3, 3'). 15
4. A device according to any one of the claims 1 to 3, characterised in that it comprises at least one, but preferably two bending benches which are movable to and away from each other and formed by frames (1, 1') and bending tables (2, 2'). 20
5. A device according to any one of the claims 1 to 4, characterised in that the pressure pieces mounted on said frame consist of clamping means, which are movable or not and formed by hooks (15, 15'). 25
6. A device according to any one of the claims 1 to 5, characterised in that the pressure pieces mounted on said movable bending means consist of clamping means, which are movable or not and formed by hooks (16, 16'). 30
7. A device according to any one of the claims 1 to 6, characterised in that the pressure pieces mounted on said frame consist of pushing cams (14, 14'), which are movable or not. 35
8. A device according to any one of the claims 1 to 7, characterised in that the pressure pieces mounted on said bending table consist of wedge-shaped blocking means (17, 17'). 40
9. A device according to any one of the claims 5 to 8, characterised in that said wedge-shaped blocking means (17, 17') are mounted movable to and fro on sliding plates (18, 18') mounted obliquely onto said bending table (2, 2'). 45
10. A device according to claim 9, characterised in that said sliding plates (18, 18') are mounted in their turn on a slide (19, 19'), which can be displaced parallel to the bar to be bent and which is itself connected via an angle profile (20, 20') to a movable slide (21, 21') filed in its turn on the hinged component (22). 50 55
11. A device according to any one of the claims 2 to 10, characterised in that said component (22) is dis-





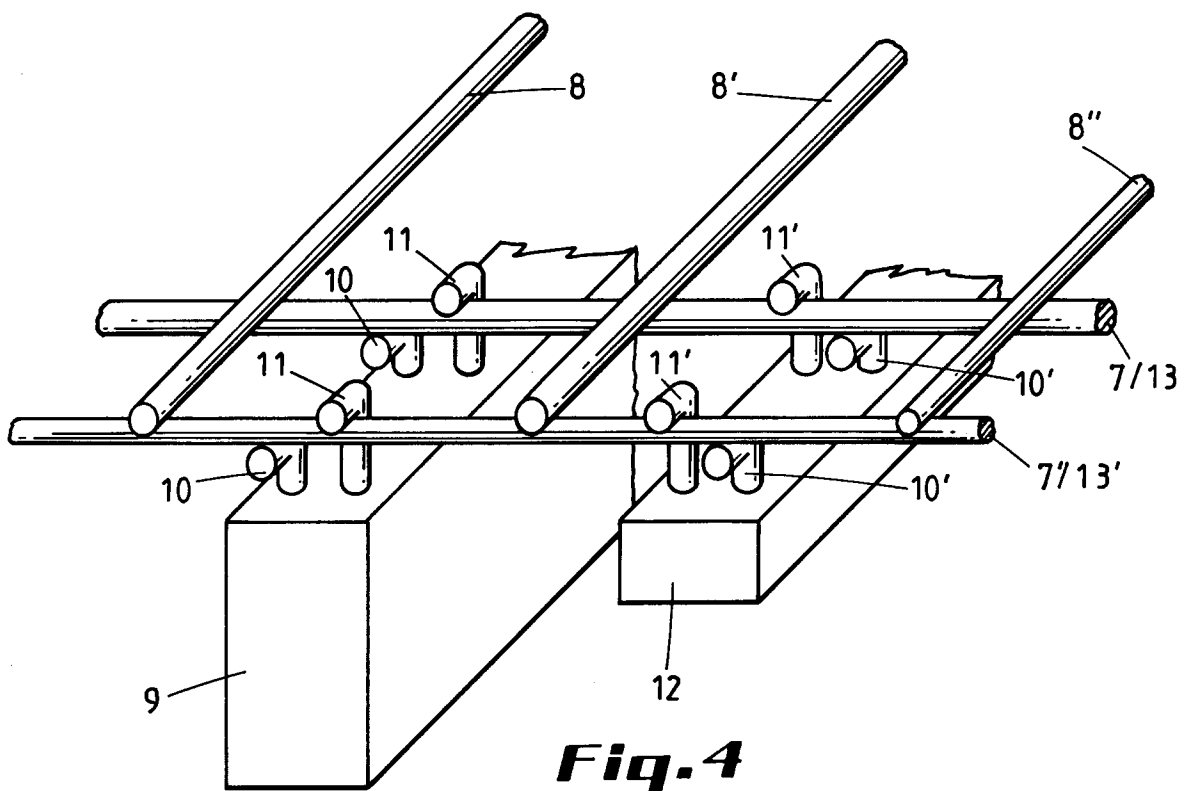


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 94 87 0141

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)
D,A	EP-A-0 226 167 (DISCHLER) * the whole document *	1	B21D11/12
A	FR-A-2 152 967 (BOCK)		
A	DE-A-22 37 151 (AGROPOL)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B21D B21F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 February 1995	Examiner Peeters, L
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			

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