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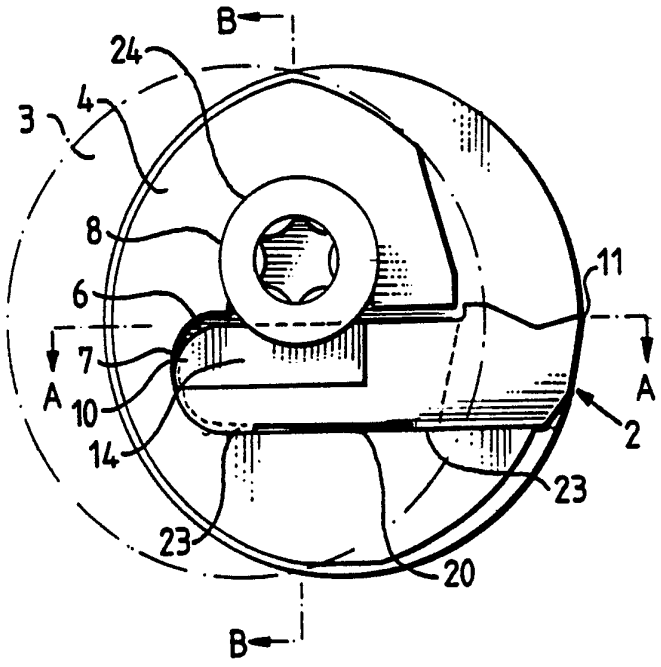
(54) Title: TOOL ARRANGEMENT FOR MACHINING RESTRICTED SPACES, E.G. FOR INTERNAL TURNING



(57) Abstract

Provided at the end part of the shaft is a seat, which permits the positioning of and a stable support for a cutter in at least two of the principal directions utilized in the machining operation, so that the stresses imposed on the cutter during such machining are transferred in an effective fashion to the shaft. A novel feature is the arrangement on the shaft of at least one tightenable fastening device which, after tightening, engages with the cutter and forces it against at least one surface on the seat, and the arrangement on the cutter of stop parts with which the fastening device is intended to engage only once the cutter, after displacement relative to the seat on the shaft and whilst still remaining in contact with it, has reached its operating position.

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Tool arrangement for machining restricted spaces, E.G. for internal turning.

Technical field

The invention relates to an arrangement for tools for cutting machining, in particular turning in restricted spaces, for example turning inside a hole or in a tube-like workpiece.

Tools intended for operations of this kind are previously disclosed, and as a general rule comprise a cutter of hard metal, carbide material or similar attached by means of a threaded connection to the end of a shaft or similar capable of being inserted into the hole or the tube, in which case the arrangement is such that, in order to remove a worn cutter or in order to fit a new one, it is necessary fully to unscrew a screw passing through the cutter before the cutter can be removed or attached. The fact that it is necessary to keep track not only of the cutter, which in many cases is very small, but also of a loose screw, and to fit the latter into a threaded hole in the shaft, makes the operation difficult, in addition to which there is always the risk of using a cutter for an excessive period in order to avoid having to change the cutter.

Object of the invention

The object of the invention is to make available an improved arrangement which, at the same time as it provides a secure grip, also facilitates the replacement of cutters to a considerable degree, in conjunction with which no handling of loose components, apart from the cutter itself, is called for.

Description of the invention

The idea behind the invention is the provision at the end part of the shaft of a seat, which provides positioning of, and a stable support for a cutter in at least two of the principal directions utilized in the machining operation, so that the stresses imposed on the cutter during such machining are transferred in an effective fashion to the shaft, the arrangement on the shaft of at least one tightenable fastening device which, after tightening, engages with the cutter and forces it against at least one surface on the seat, and the arrangement on the cutter of stop parts with which the fastening device is intended to engage only once the cutter, after displacement relative to the seat on the shaft and whilst still remaining in contact with it, has reached its operating position.

Description of illustrative embodiments

The invention is described in more detail below with reference to the accompanying drawing, in which:

Fig. 1 shows a view from the side of the end part of a first embodiment of a tool arranged in accordance with the invention;

Fig. 2 shows the same tool viewed from the front;

Fig. 3 is a section taken along the line A-A in Fig. 2;

Fig. 4 is a section taken along the line B-B in Fig. 2;

Fig. 5 shows a modified embodiment of a cutter viewed from the side facing towards the shaft;

Fig. 6 shows the cutter in accordance with Fig. 5 viewed

from the side on which the cutting edge projects;

Fig. 7 shows the cutter in accordance with Fig. 5 viewed from the outward-facing side;

Fig. 8 is a section taken along the line A-A in Fig. 5; and

Fig. 9 is a section taken along the line B-B in Fig. 5.

The designation 1 is used in the drawing in respect of the end part of the shaft of a tool holder, which is intended to carry a tool and, more specifically, a cutter generally designated by 2. The tool in question here is intended for turning in restricted spaces, for example inside a hole, or in a tube-like workpiece or similar.

The shaft 1, which may be of circular cross-section along a further part 3 indicated by a dashed and dotted line, exhibits a thinner end part 4 of non-round cross-section produced by turning off on one side. Arranged on or at the end surface 5 is a transverse groove 6 terminated by a curved end wall 7, and situated next to it in a partially overlapping relationship is a circular recess 8 with a coaxially threaded central bore 9 arranged in the longitudinal direction of the shaft.

The cutter 2 is bar-shaped with a rounded inner end 10 and a laterally displaced projection 12 at the other end for supporting the edge 11. A corner is chamfered in connection with the inner end on the base part 13 of the cutter, which is of essentially rectangular cross-section, so as to produce an inclined surface 14. The opposite corner, which connects the sides 15 and 16 of the cutter, exhibits a small chamfer 17, which means that a longitudinal clearance occurs between the walls 18 and 19 of the transverse groove 6 and the opposing lateral surfaces 15 and 16 of the

cutter. Shallow recesses 20 and 21 are arranged on the aforementioned downward and inward facing sides 15 and 16 of the cutter 2, so that only end heels 22 and 23 remain. The purpose of the clearance at 17 and the aforementioned heels is that the cutter must be capable of resting in a stable fashion against the walls 20 and 21 of the groove.

The fastening element, which is designated by 24, consists of a screw with a threaded shaft part 25 which engages with the threaded central bore 9, a cylindrical transitional part 26 and a cylindrical head 27 with a conical underside 28 forming essentially the same angle with the longitudinal axis of the supporting shaft as the inclined surface 14 on the cutter 2.

When fitting a cutter 2, the fastening element 24, i.e. the screw, must be loosened slightly so that the rear end part of the cutter 2 can be displaced laterally into the groove 5 for such a distance that it bottoms against the end of the groove at the point 7, in conjunction with which the inclined surface 14 will slide in beneath the inward-facing conical surface 28 of the screw head 27. As the screw 24 is tightened, the conical surface 28 will engage with the inclined surface 14 of the cutter and will force it inwards so that the heels 22 and 23 come into stable contact with the sides 18 and 19 of the groove.

The screw may have a right-hand or a left-hand thread, depending on the intended direction of working of the cutting edge 11, so that as vibrations arise, the screw does not exhibit a tendency to turn in a direction which causes the cutter to move out of the groove 4. The screw 24 may have a left-hand thread in the embodiment shown in Figs. 1-4.

The simple handling facilitates cutter replacement to a

considerable degree, and it should be noted that the new embodiment is in no way more bulky than the previously disclosed designs.

The embodiment in accordance with Figs. 5-9 differs purely in terms of its design from the previously described embodiment and can be used for the machining of holes and similar with a diameter only slightly exceeding the diameter of the shaft of the tool holder.

The cutter in accordance with Figs. 5-9, which is generally designated by 32, consists of an essentially circular main part 33 and an axially displaced essentially radially extending projection 34, which supports the cutting edge 35. The side 36 facing outwards from the shaft designated by 31 exhibits a transcurrent hole with an essentially round hole part 37 situated eccentrically or in a radially offset fashion away from the side with the projection 34, and with a hole part 38 integral with the former hole part and similarly transcurrent, although centrally situated and with a smaller diameter or area than the former hole, which latter hole part is surrounded by a countersunk part 39 arranged concentrically around it, which extends forwards as far as the edge of the hole part 37. The countersunk part forms a step-like edge around the centrally situated hole part 38.

The side of the cutter 32 facing towards the supporting shaft, which can be appreciated most clearly from Figs. 5, 6, 8 and 9, exhibits a plane surface part 40, which encloses the major proportion of the central hole part 38 and in so doing terminates at the further hole part 37. Situated radially outside the surface part 40 is a conically tapered part 41 with a top angle of the order of 140°, which is also intersected by the larger hole part 37. A heel 42, the outward-facing side of which lies in the

same plane as the plane central surface part 40, extends over the inclined part 41 in the direction of the edge projection 34, 35. The heel thus exhibits essentially parallel triangular lateral surfaces, as shown on the right in Fig. 9.

The end part of the supporting shaft for the cutter 32 is executed in a complementary fashion and has a central threaded bore 43 surrounded by a plane annular surface 44, to which an enclosing inclined surface 45 is connected. The inclined surface 45 is interrupted by a groove 46 with an outwardly increasing depth adapted to the form of the heel 42.

When fitting a cutter 32 to the supporting shaft, the screw indicated in Fig. 1 with the designation 47 must be unscrewed for a sufficient distance to permit the screw head to be introduced through the larger hole part 37, i.e. with the cutter in a laterally displaced position. The cutter is then centred on the end of the supporting shaft by displacing the shank of the screw into the smaller hole part 38, in conjunction with which the heel 42 is fitted at the same time into the groove 46, which positions the cutter in such a way as to prevent it from rotating about its centre. Once the cutter has reached the indicated position, the screw 47 is tightened. Removal takes place in the reverse sequence.

The interaction between the plane and conical surfaces and the rotational stabilization by means of the heel 42 mean that the cutter is fixed in a stable fashion, and that the desired distribution of forces is obtained.

PATENT CLAIMS

1. Arrangement for tools for cutting machining, in particular for machining in restricted spaces such as internally in holes and inside hollow workpieces, utilizing a cutter holder and a cutter attached to it at one free end of its shaft, which cutter is held in position on the shaft end by means of a threaded connection or similar, in conjunction with which the shaft end part (1, 31) is provided with at least two stop parts (18, 19) so arranged as to interact with at least two engagement parts (15, 16) on a cutter (2), which stop parts and engagement parts are oriented and located in such a way that a cutter (2) is essentially fixed simply by contact engagement so as to prevent movement caused by the forces acting during the cutting machining operation, and in conjunction with which the cutter is provided with stop parts (14, 38) with which at least one fastening device (24, 47) arranged at the end of the shaft is intended to engage so as to stabilize the cutter in contact engagement, **characterized** in that a transverse groove (6), open in one lateral sense and closed in the other, is arranged at the end of the supporting shaft, where it defines the stop part, in that a threaded essentially axial bore (9) for the fastening device in the form of a screw (24) provided with a cylindrical head with a form and size appropriate to a recess in the cutter holder and merging into the bore, is arranged next to said groove, which has stop parts (18, 19) situated in the axial and radial planes, and which exhibits an inclined or conical all-round contact surface (28) on the side facing towards its shaft end, in conjunction with which the cutter, which is capable of being introduced into the transverse groove (16) in a part

facing outwards from the groove, is provided with an engagement surface for the inclined part of the fastening device, so that, with the fastening device in its unscrewed position, the cutter is capable of being moved freely into or out of engagement with the transverse groove, whereas, once the aforementioned device has been tightened, the cutter is fixed to the end of the supporting shaft, and in that each of the engagement parts of the cutter exhibits its own pair of long shallow recesses (20, 21) and separate supporting heels (22, 23) situated in association with the ends of the respective engagement part, permitting the movement-free tightening of the cutter to the two stop parts (18 and 19).

2. Arrangement in accordance with Patent Claim 2, **c h a r a c t e r i z e d** in that the complementary contact surface of the cutter is inclined essentially at the same angle as the stop surface (28) of the screw-like fastening device (24).

AMENDED CLAIMS

[received by the International Bureau on 1 October 1992 (01.10.92); original claims 1 and 2 replaced by amended claims 1 and 2 (2 pages)]

1. Arrangement for tools for cutting machining, in particular for machining in restricted spaces such as internally in holes and inside hollow workpieces, utilizing a cutter holder and a cutter insert attached to the holder at one free end of the holder shaft, which cutter insert is held in position on the shaft end by means of a threaded fastening device, or the like, the holder shaft end (1, 31) being provided with a transverse groove with at least two abutment means (18, 19) so arranged as to interact with at least two engagement portions (15, 16) on a cutter insert (2), which abutment means and engagement portions are oriented and located in such a way that a cutter insert (2) already by the contact engagement between said means and portions is essentially fixed in a way preventing movement caused by the cutting machining operation stresses, the cutter insert (2) also being provided with contact means (14, 38) arranged to be engaged by at least one fastening device (24, 47) arranged at the end of the shaft so as to stabilize the cutter insert in holder shaft engaging position,
c h a r a c t e r i z e d in that the transverse groove (6), is open in one lateral sense and closed in the other, is localized at the free end face of the holder shaft, and includes sides forming the abutment means (18, 19) situated in the axial and radial planes, in that next to said groove is arranged a threaded essentially axial bore (9) for the threaded fastening device, said device being in the form of a screw (24) provided with a cylindrical head with a shape and size closely adhering to the shape and size of a mouth portion of a recess in the cutter holder merging into the threaded bore, and provided with, between said cylindrical head and a threaded shaft portion, an inclined or conical all-round contact surface (28) facing towards the screw shaft portion, in that the cutter insert, to be introduced into the trans-verse groove (16), has on a side thereof, facing outwardly when fitted into the groove, a contact surface for the conical al-around contact surface of the screw, so that, with the fastening ot the screw in its loosened position, the cutter insert is freely movable into or out of engagement with the transverse groove, whereas,

in its tightened position, the cutter insert is fixed inside the groove, and in that each of the engagement portions of the cutter insert exhibits long shallow recesses (20, 21) separating supporting heels (22, 23) adjacent the edges of the respective engagement portions, securing a stable movement-free clamping of the cutter towards the two abutment means forming groove sides (18 and 19).

2. Arrangement in accordance with Patent Claim 2, c h a r a c t e r i z e d in that the outwardly facing contact surface of the cutter insert is inclined essentially at the same angle as the conical all around contacts surface (28) of the fastening device (24) screw.

Fig. 1

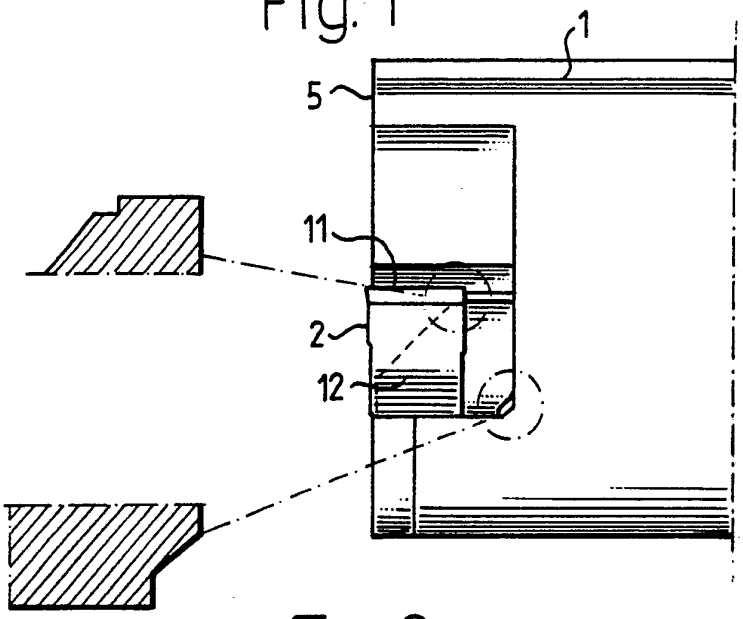


Fig. 2

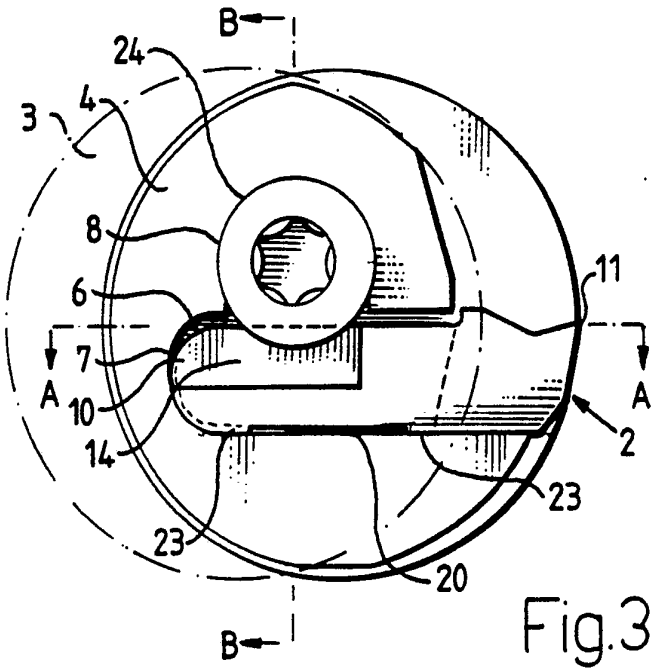


Fig.3

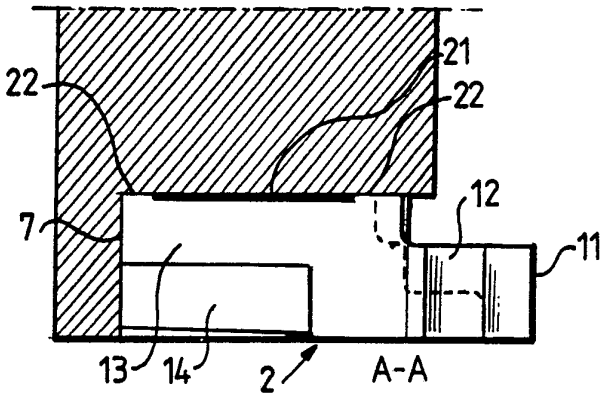


Fig. 4

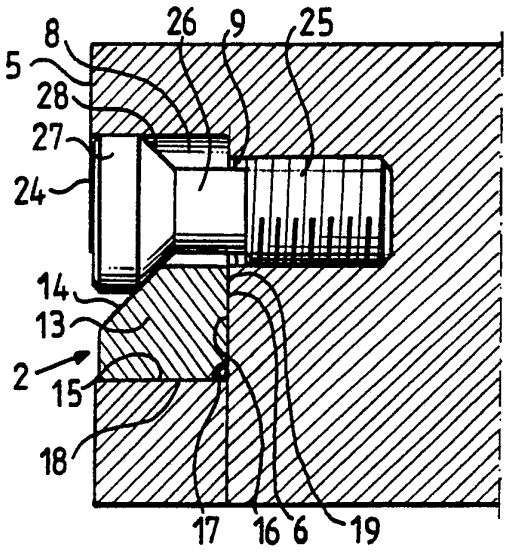


Fig.5

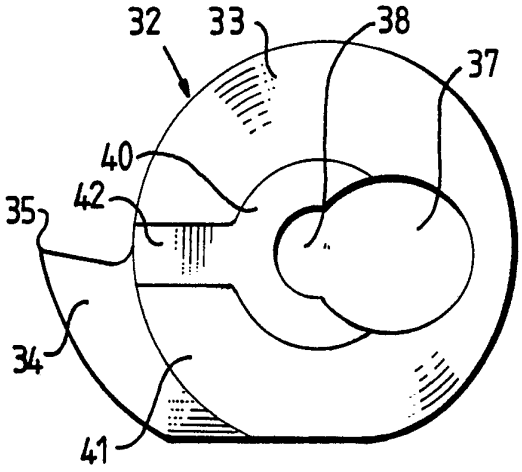


Fig.6

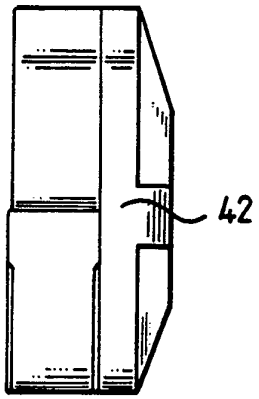


Fig.7

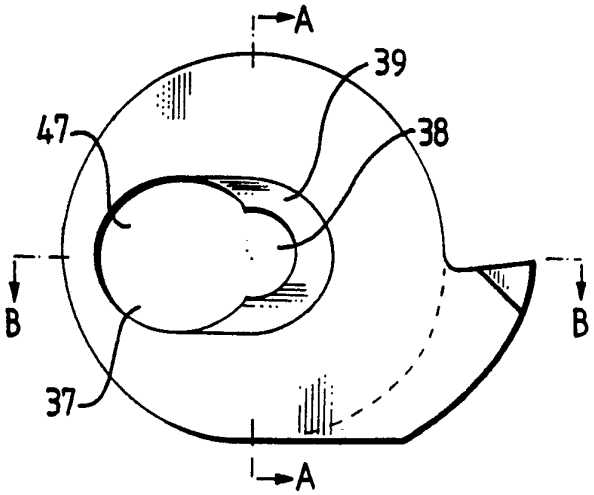
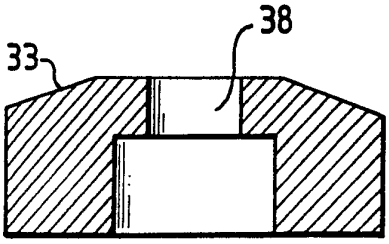


Fig.8



A- A

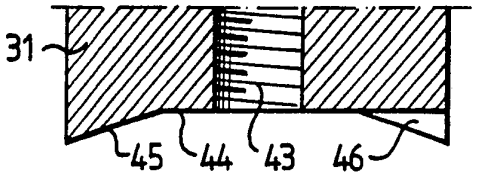
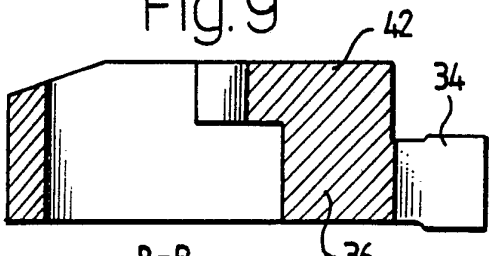


Fig.9



B-B

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 92/00286

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: B 23 B 27/08, 29/02

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	B23B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	SE, B, 463753 (BOHANNAN) 21 January 1991, see page 2, line 35 - page 3, line 33; figures 2-3B	1
Y	--	2
X	US, A, 4102591 (ALCORN) 25 July 1978, see column 2, line 60 - column 4, line 38; figures 1-4	1,3
Y	--	2
A	SE, B, 337732 (MC CREERY) 16 August 1971, see figure 1; claim 1	1
	--	
A	EP, A2, 0268001 (MONTANWERKE WALTER GMBH) 25 May 1988, see column 8, line 1 - line 25; figures 9-12	1
	--	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
31st July 1992	1992 -08- 05
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Petter Sörsdahl

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
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A	US, A, 3754309 (JONES ET AL) 28 August 1973, see column 4, line 23 - line 44; figures 13-16 --	1
A	US, A, 3298254 (A. VASSALLO) 17 January 1967, see the whole document --	1
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A	US, A, 4714384 (LAGERBERG) 22 December 1987, see column 2, line 58 - column 3, line 10; figures 1-5 --	4,5

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 92/00286

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 01/07/92
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