(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 April 2005 (21.04.2005)

PCT

(10) International Publication Number
WO 2005/035851 A1

(51) International Patent Classification[7]: D04B 15/18

(21) International Application Number:
PCT/CZ2004/000066

(22) International Filing Date: 14 October 2004 (14.10.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PV2003-2832 16 October 2003 (16.10.2003) CZ

(71) Applicant *(for all designated States except US)*: **AMTEK, SPOL. S R.O.** [CZ/CZ]; Olbrachtovo namesti 3, 624 00 Brno (CZ).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **PISKULA, Frantisek** [CZ/CZ]; Olbrachtovo namesti 3, 624 00 Brno (CZ).

(74) Agent: **MUSIL, Dobroslav**; Patent Office, Cejl 38, 602 00 Brno (CZ).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

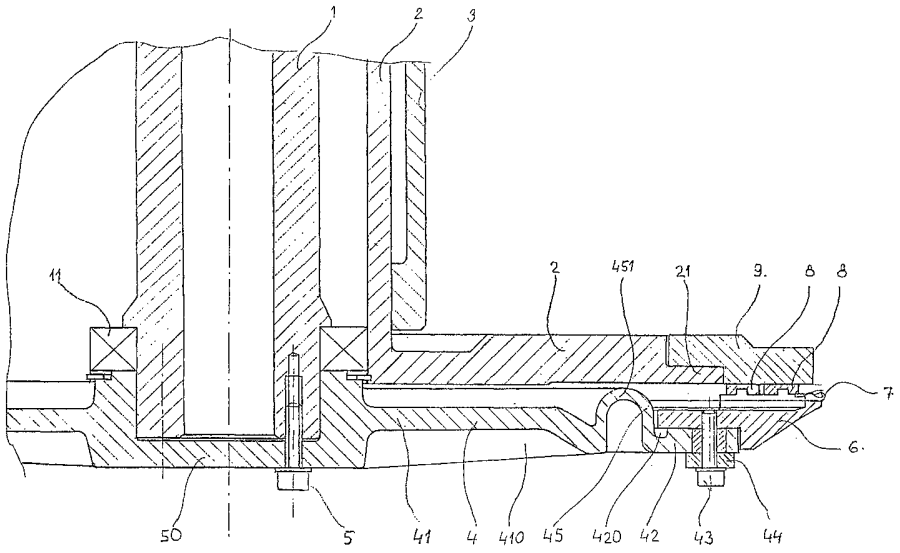
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv)) for US only*

Published:
— *with international search report*

[Continued on next page]

(54) Title: DOUBLE JERSEY CIRCULAR KNITTING MACHINE



(57) Abstract: The invention relates to a double jersey circular knitting machine with a cylinder bed and a needle dial (6) supporting knitting means and arranged concentrically around the machine axis, while the cylinder bed is arranged on a cylinder bed support pivoted in the machine bed and the needle dial (6) is dismountably connected with the needle dial (6) support (4) mounted on the bottom end of the centre shaft (1) situated in the upper part of the machine and synchronously driven by a cylinder bed support drive. Between an outer part (42) of the needle dial (6) support (4) for fixation of the needle dial (6) and an inner part (41) of the needle dial (6) support (4) and/or between the needle dial (6) support (4) and the needle dial (6) are temperature compensation means radially movable in a limited range for stabilization of differences in heat dilatation of the needle dial (6) and the needle dial (6) support (4).

WO 2005/035851 A1

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Double jersey circular knitting machine

Technical field

The invention relates to a double jersey circular knitting machine with a cylinder bed and a needle dial supporting knitting means and arranged concentrically around the machine axis, while the cylinder bed is arranged on a cylinder bed support pivoted in the machine bed and the needle dial is dismountably connected with the needle dial support mounted on the bottom end of the shaft situated in the upper part of the machine and asynchronously driven by a cylinder bed support drive.

Background art

Double jersey circular knitting machines are used for production of a knitted fabric by a motion of knitting means, as a rule needles, positioned in grooves arranged parallel with a needle cylinder axis and radially on a needle dial. Needles are in their grooves by a known manner actuated in a periodic reverse motion by turning of the beds using cam system in the direction of grooves. Nevertheless a cylinder bed is fitted by a well known manner on a cylinder bed support and the needle dial is by a well known manner fitted on the needle dial support, which is connected with a bottom part of an axle, which is coaxially arranged with the axis of a machine.

By the motion of knitting means is in beds produced a fair amount of heat and the beds can be heated to 50 °C to 80 °C and even more. On the other hand, in bed supports the heat is not produced. Temperature differences result in different heat dilatation and the place of connection of bed with the supports is subjected to a high mechanical stress.

In cylinder beds is this problem with the addition of expanding of the entire cylinder bed support and loading of a bearing. This dilemma is solved for instance in DE 2829678, DE 3906773, US 5.493.876, EP 647.732 and CZ 2000-4932 (PCT/CZ01/00077).

In needle dials are known solutions with a high radial width of the bed, which is for example using screws fixed on a flange arranged on the bottom end of the axle, where it is centred using centring step, see US 5.099.661, US 5.224.360 or it is centred using centring screws, see DE 196 53 761. The bed

temperature is lower on a small inner diameter, by which is the bed fixed and thus the forces acting on the bed connection are in permissible allowance. The disadvantage is the necessity to machine a high amount of material and also material costs for quality material needed for bed manufacturing are increased. Narrow ring beds are less material and production demanding, however the temperature in the fixing place is almost the same as in the place of needle grooves. Consequently high forces act on bed – support connection, which screw connection stressed on friction is not able to stand and the bed shifts in regard of the support with all negative consequences on machine precision.

The goal of the invention is to eliminate or at least to substantially minimize the drawbacks of the known solutions.

Principle of the invention

The goal of the invention has been reached by a double jersey knitting machine, whose principle consists in that between an outer part of a needle dial support for fixation of a needle dial and an inner part of the needle dial support and/or between the needle dial support and the needle dial are arranged temperature compensation means radially movable in a limited range for stabilization of differences in heat dilatation of the needle dial and the needle dial support.

In a preferred embodiment the temperature compensation means radially movable in a limited range are composed of radially flexible ring arranged coaxially with the machine axis and situated between the outer and inner part of the needle dial support.

According to one preferred embodiment has the radially flexible ring cross section in a shape of a symmetric or asymmetric U-shape, whose arms are up turned or down turned and one of the arms is connected with the inner part of the needle dial support and the second arm is connected with the outer part of the needle dial support.

According to another preferred embodiment has the radially flexible ring cross section consisting of a thin-walled cylindrical part arranged coaxially with the machine axis, while the bottom part of the thin-walled cylindrical part is connected with the outer part of the needle dial support and the upper part of the thin-walled cylindrical part is connected with the inner part of the needle dial support.

In another preferred embodiment has the radially flexible ring cross section consisting of a thin-walled cylindrical part arranged coaxially with the machine axis, while the upper part of the thin-walled cylindrical part is connected with the outer part of the needle dial support and the bottom part of the thin-walled cylindrical part is connected with the inner part of the needle dial support.

According to another preferred embodiment the temperature compensation means radially movable in a limited range are composed of radially movable means connecting the needle dial with the needle dial support.

According to another preferred embodiment are the temperature compensation means radially movable in a limited range composed of substantially horizontally arranged flanges situated on the outer circumference of the needle dial support and on the inner circumference of the needle dial, while the flanges are situated above each other and in one of the flanges are in parallel with the machine axis arranged openings, to which is assigned a stud or a pin intervening by its second straight or eccentrically arranged end into a radially arranged groove in the second flange, while the flanges are together in the perpendicular direction to the flanges connected by means with limited thrust and with the possibility of mutual radial shift of the flanges.

Nevertheless it is advantageous, if in the end of the pin or the stud intervening into the radially arranged groove is in one of the flanges situated a block with the opening parallel with the machine axis and two parallel walls assigned to the walls of said radially arranged groove.

Nevertheless it is advantageous, if on the pin intervening to the radially arranged groove is in one flange rotatably arranged an eccentric member positioned in the opening of the block.

In terms of the entire machine it is advantageous, if the needle dial support is arranged in the shape of a plate perpendicular to the machine axis, while according to one preferred embodiment is the needle dial support on its upper and/or bottom part fitted with radial ribs.

In a preferred embodiment are on the outer part of the needle dial support arranged centring eccentric members, which are pivoted along the axes parallel to the machine axis and which centre the needle dial, while on the needle dial is

concentrically with the machine axis arranged a centring seating assigned to the centring eccentric members.

Description of the drawing

The invention is schematically shown in the drawings in which Fig. 1 represents an example of embodiment of a heat dilatation compensator of a needle dial in the shape of radially flexible ring with U-shaped cross section and a needle dial support, Fig. 1a represents an example of embodiment of a heat dilatation compensator of the needle dial in the shape of radially flexible ring as a thin-walled cylindrical part, connected on top with the inner part and on bottom with the outer part of the needle dial support, Fig. 1b represents an example of embodiment of a heat dilatation compensator of the needle dial in the shape of radially flexible ring as a thin-walled cylindrical part, connected on top with the outer part and on bottom with the inner part of the needle dial support, Fig. 1c represents a vertical section of one of centring eccentric members arranged on the outer part of the needle dial support, Fig. 2 represents an example of embodiment of one arrangement of fixation of the needle dial on the support, Fig. 3 represents an example of embodiment of a heat dilatation compensator of the needle dial with radially movable means and the needle dial support according to Fig. 2, Fig. 3a represents a bottom view of the heat dilatation compensator of the needle dial and the needle dial support from Fig. 3, Fig. 3b represents a plane A-A section from Fig. 3, Fig. 4 represents another example of embodiment of a heat dilatation compensator of the needle dial with radially movable means and the needle dial support according to Fig. 2, Fig. 4a represents a bottom view of the heat dilatation compensator of the needle dial and the needle dial support from Fig. 4, Fig. 4b represents a plane B-B section from Fig. 4.

Specific description

The invention is described on an example of embodiment of a double jersey circular knitting machine, which is arranged in a well known manner.

A needle dial **6** support **4** is fixed on the bottom end of a centre shaft **1** and the outer part **42** of the needle dial **6** support **4** is formed basically as a horizontal flange, on whose upper surface is mounted the needle dial **6** using screws **43** and means **44** for positioning the radial and axial position. Above the needle dial **6** are

by an appropriate manner on the flange **21** on the bottom end of the centre shaft **1** bush **2** positioned dish shaped needle cams **9** with needle cams **8**.

The machine is fitted with a heat dilatation compensator of the needle dial **6** and the needle dial **6** support **4**, while the common feature of further described variants of the heat dilatation compensator of the needle dial **6** and the needle dial **6** support **4** is that the heat dilatation compensator of the needle dial **6** and the needle dial **6** support **4** is formed by temperature compensation means radially movable in a limited range.

In the example of embodiment shown in Fig. 1 is the outer part **42** of the needle dial **6** support **4** near its inner edge thinned by a groove **420**, which forms a ring exhibiting higher flexibility than other parts of the outer part **42** of the needle dial **6** support **4**. The thinned part of the outer part **42** of the needle dial **6** support **4** and the inner part **41** of the needle dial **6** support **4** are connected with a heat dilatation compensator, which is formed as an integral part of the needle dial **6** support **4**, for instance in the example of embodiment shown in Fig. 1 as a U-shaped radially flexible ring **45** with U-shaped arms turned down. The diameter of U-shape wall is smaller compared to the diameter of the wall of other parts **41**, **42** of the needle dial **6** support **4**, so that the U-section exhibits required flexibility in radial direction, while maintaining the rigidity in other directions. Due to heating the needle dial **6** by the machine run is also heated up the outer part **42** of the needle dial **6** support **4** in principle to the same temperature, so this part **42** of the needle dial **6** support **4** is being more heat expanded than the cooler inner part **41** of the needle dial **6** support **4**. The difference in expansion of both parts **41**, **42** of the needle dial **6** support **4** is compensated by an elastic deformation of the radially flexible ring **45** representing the heat dilatation compensator. Nevertheless the outer U-shaped arm forming the radially flexible ring **45** is deflected outwards, which would lead in torsion of the outer edge of the outer part **42** of the needle dial **6** support **4** upwards. Such tendency is compensated by the groove **420** near the inner edge of the outer part **42** of the needle dial **6** support **4**, which while heating causes bending of the outer part **42** of the needle dial **6** support **4** downwards due to radially acting forces, whose point of action is approximately in the centre of gravity of the assembly of needle dial **6** and the outer part **42** of the needle dial **6** support **4**. Thus the motion of the needle dial **6** during its heat dilatation is with a high accuracy horizontal. Thereto is contributing also heat

distortion compensation of the inner part **41** of the needle dial **6** support **4** fitted on its bottom side or also on its upper side with stiffening radial ribs **410** and further fitted with a flange **50** for fixation of the support **4** with screws **5** on the centre shaft **1**. Shear force acting between the needle dial **6** and the needle dial **6** support **4** is so much reduced that screws **43** can hold it reliably and there does not happen any mutual shear motion of the needle dial **6** and the needle dial **6** support **4**.

The heat dilatation compensator can be realized also with another advantageous profile, which exhibits radial flexibility, for instance it can be formed as a thin-walled cylinder **452**, **453** (see Fig. 1a, 1b) or its profile can be S- or Z-shaped or it can be formed by other appropriate means. However the principle of the heat dilatation compensator in this part of the double jersey circular knitting machine is always in analogy to the above described principle of the heat dilatation compensator with the U-shaped profile.

In another example of embodiment is the heat dilatation compensator formed in another appropriate arrangement, while it is always a question of in a temperature compensation means radially movable in a limited range.

In all above and below described embodiments can be advantageously used centring of the needle dial **6** using eccentric centring members **422** shown in example of embodiment according to Fig. 1c pivoted around axes parallel to the machine axis on studs **4222** in openings arranged on the circumference of the outer part **42** of the needle dial **6** support **4**. The centring members **422** can be turned for instance using hex key inserted into the hexagonal opening **4221**. Turning the eccentric part **4223** of the eccentric centring member **422** effects on the centring step **61** of the needle dial **6** and lateral action of forces from the centring members **422** is the needle dial **6** perfectly centred. In the example of embodiment of the heat dilatation compensator shown in Fig. 2, 3, 3a and 3b are in the outer part **42** of the needle dial **6** support **4** formed openings **460**, which are fitted with studs **461**, on whose ends is a hexagonal opening **4610** and/or there are not represented facets for key used for turning the stud **461**. The studs **461** are in the support **4** secured against spontaneous coming off for instance using a safety member **464** positioned on the support **4**. On the upper end of the stud **461** is eccentrically positioned a pin **462**, on which is mounted a block **463** fitting into the radially arranged groove **60** in the fixing flange **62** of the needle dial **6**. The pin

462 and the block 463 are secured for instance using a lock ring 465. Turning of the studs 461 causes turning the eccentrically positioned pins 462 and consequently the blocks 463 traverse, by which means it is possible to exactly centre the needle dial 6. Nevertheless the needle dial 6 is to the support fastened only by a limited momentum defined by for instance by tightening torque used for tightening the screws 43 connecting the needle dial 6 support 4 or defined by the properties of disc springs optionally inserted under the heads of these screws 43. This enables radial movement of the needle dial 6, which is accurately directed and centred on the blocks 463 conducted in grooves 60 in the fixing flange 62 of the needle dial 6. It is evident that the arrangement of the studs 461 and eccentric pins 462 can be also backwards, i.e. the stud 461 is positioned in the needle dial 6 and the eccentric pin 462 with the block 463 are arranged in the outer part 42 of the needle dial 6 support 4.

In the example of embodiment of a heat dilatation compensator shown in Fig. 2, 4, 4a, 4b are in the needle dial 6 positioned pins 471, on which bottom ends are mounted eccentric members 472, on which are positioned blocks 473 fitted with guiding surfaces corresponding to the walls of radial grooves 421 in the outer part 42 of needle dial 6 support 4. Also in this embodiment it is possible to use safety members, for instance by way of safety member 474. Also this embodiment can be performed in reverse order, that is the pins 471 with the eccentric members 472 and blocks 473 are positioned in outer part 42 of the needle dial 6 support 4 and the blocks fit into the radial grooves 421 in the needle dial 6. Also in this embodiment is employed the arrangement and the function of the screws 43 connecting the needle dial 6 support 4 and optional disc springs under heads of the screws 43.

In the embodiment shown in Fig. 2, 2a, 2b, 3, 3a, 3b is the needle dial 6 while heating during the machine run more expanded than cooler support 4, while the limited thrust of the fixing screws 43 of the needle dial 6 to the needle dial 6 support 4 enables mutual radial traverse of the needle dial 6 and the needle dial 6 support 4, during which the studs 461 with the blocks 463 and eccentric members (for example eccentric pin 462, eccentric member 472) prevent undesirable tangential or lateral traverse of the needle dial 6, which retains the accuracy of the machine run and the quality of knitting.

Industrial applicability

The invention is applicable in double jersey circular knitting machines.

5

PATENT CLAIMS

1. Double jersey circular knitting machine with a cylinder bed and a needle dial supporting knitting means and arranged concentrically around the machine axis, while the cylinder bed is arranged on the cylinder bed support pivoted in the in the machine bed and the needle dial is dismountably connected with the needle dial support fixed on the bottom end of the shaft situated in the upper part of the machine and asynchronously driven by a cylinder bed support drive, characterized by that between the outer part (42) of the needle dial (6) support (4) for fixation of needle dial (6) and inner part (41) of the needle dial (6) support (4) and/or between the needle dial (6) support (4) and the needle dial (6) are temperature compensation means radially movable in a limited range for stabilization of differences in heat dilatation of the needle dial (6) and the needle dial (6) support (4).

2. Double jersey circular knitting machine as claimed in Claim 1, characterized by that the temperature compensation means radially movable in a limited range composed of radially flexible ring (45) arranged coaxially with the machine axis and situated between the outer and inner part (42, 41) of the needle dial (6) support (4).

3. Double jersey circular knitting machine as claimed in Claim 2, characterized by that the radially flexible ring (45) cross section is a symmetric or asymmetric U-shape, whose arms are up turned or down turned and one of the arms is connected with the inner part (41) of the needle dial (6) support (4) and the second arm is connected with the outer part (42) of the needle dial (6) support (4).

4. Double jersey circular knitting machine as claimed in Claim 2, characterized by that the radially flexible ring (45) cross section consists of a thin-walled cylindrical part (452) arranged coaxially with the machine axis, while the bottom part of the thin-walled cylindrical part (452) is connected with the outer part (42) of the needle dial (6) support (4) and the upper part of the thin-walled cylindrical part (452) is connected with the inner part (41) of the needle dial (6) support (4). 5. Double jersey circular knitting machine as claimed in Claim 2,

characterized by that the radially flexible ring (45) profile consists of a thin-walled cylindrical part (453) arranged coaxially with the machine axis, while the upper part of the thin-walled cylindrical part (453) is connected with the outer part (42) of the needle dial (6) support (4) and the bottom part of the thin-walled cylindrical part (453) is connected with the inner part (41) of the needle dial (6) support (4).

6. Double jersey circular knitting machine as claimed in Claim 1, characterized by that the temperature compensation means radially movable in a limited range are composed of radially movable means connecting the needle dial (6) with the needle dial (6) support (4).

7. Double jersey circular knitting machine as claimed in Claim 6, characterized by that the temperature compensation means radially movable in a limited range are composed of substantially horizontally arranged flanges situated on the outer circumference of the needle dial (6) support (4) and on the inner circumference of the needle dial (6), while the flanges are situated above each other and in one of the flanges are in parallel with the machine axis arranged openings, to which is assigned a stud (461) or a pin (471) intervening by its second straight or eccentrically arranged end into a radially arranged groove (60, 421) in the second flange, while the flanges are together in the perpendicular direction to the flanges connected by means with limited thrust and with the possibility of mutual radial traverse of the flanges.

8. Double jersey circular knitting machine as claimed in Claim 7, characterized by that in the end of the pin (471) or the stud (461) intervening into the radially arranged groove (421, 60) is in one of the flanges situated a block (463, 473) with the opening parallel with the machine axis and two parallel walls assigned to the walls of said radially arranged groove (421, 60).

9. Double jersey circular knitting machine as claimed in Claim 8, characterized by that on the pin (471) intervening into the radially arranged groove (421) is in one flange rotatably arranged an eccentric member (472) positioned in the opening of the block (473).

10. Double jersey circular knitting machine as claimed in any of Claims 1 to 9, characterized by that the needle dial (6) support (4) is arranged in the shape of a plate perpendicular to the machine axis.

11. Double jersey circular knitting machine as claimed in Claim 10, characterized by that the needle dial (6) support (4) is on its upper and/or bottom part fitted with radial ribs (410).

12. Double jersey circular knitting machine as claimed in any of previous Claims, characterized by that on the outer part of the needle dial support are arranged centring eccentric members (422), which are pivoted around the axes parallel to the machine axis and which centre the needle dial (6), while on the needle dial (6) is concentrically with the machine axis arranged a centring seating (61) assigned to the centring eccentric members (422).

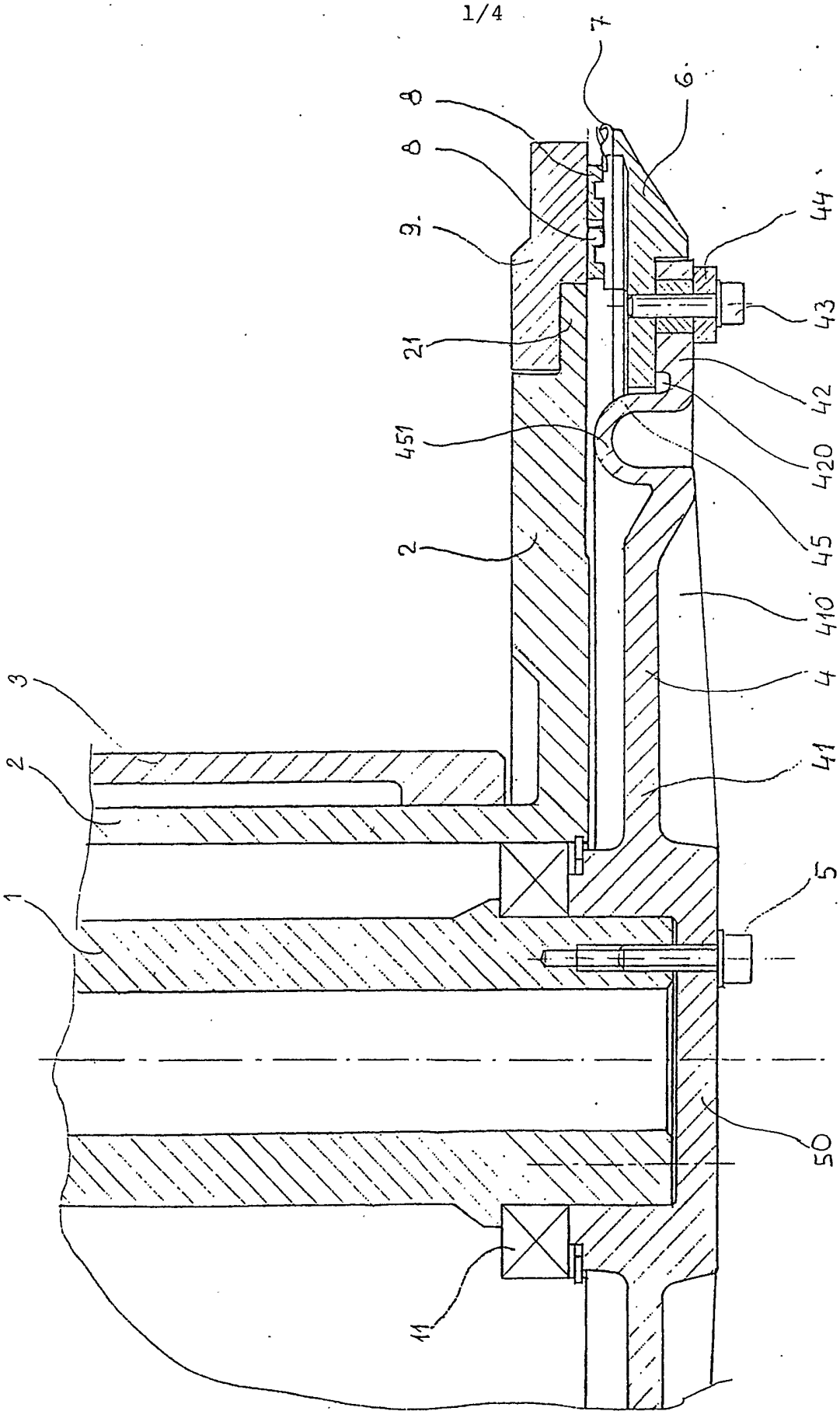


Fig. 1

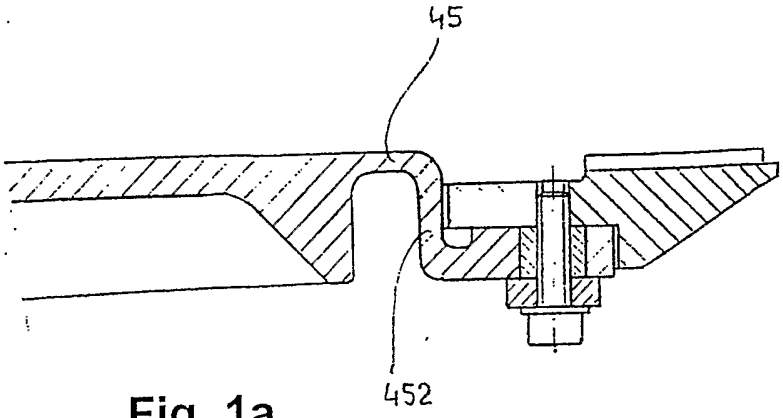


Fig. 1a

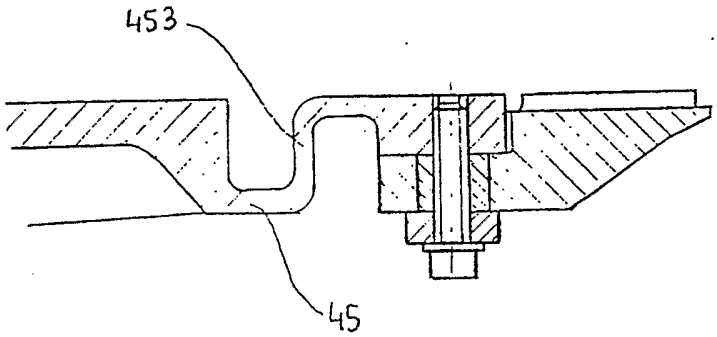


Fig. 1b

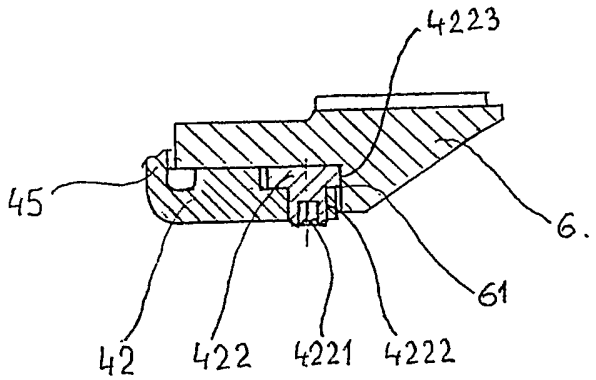
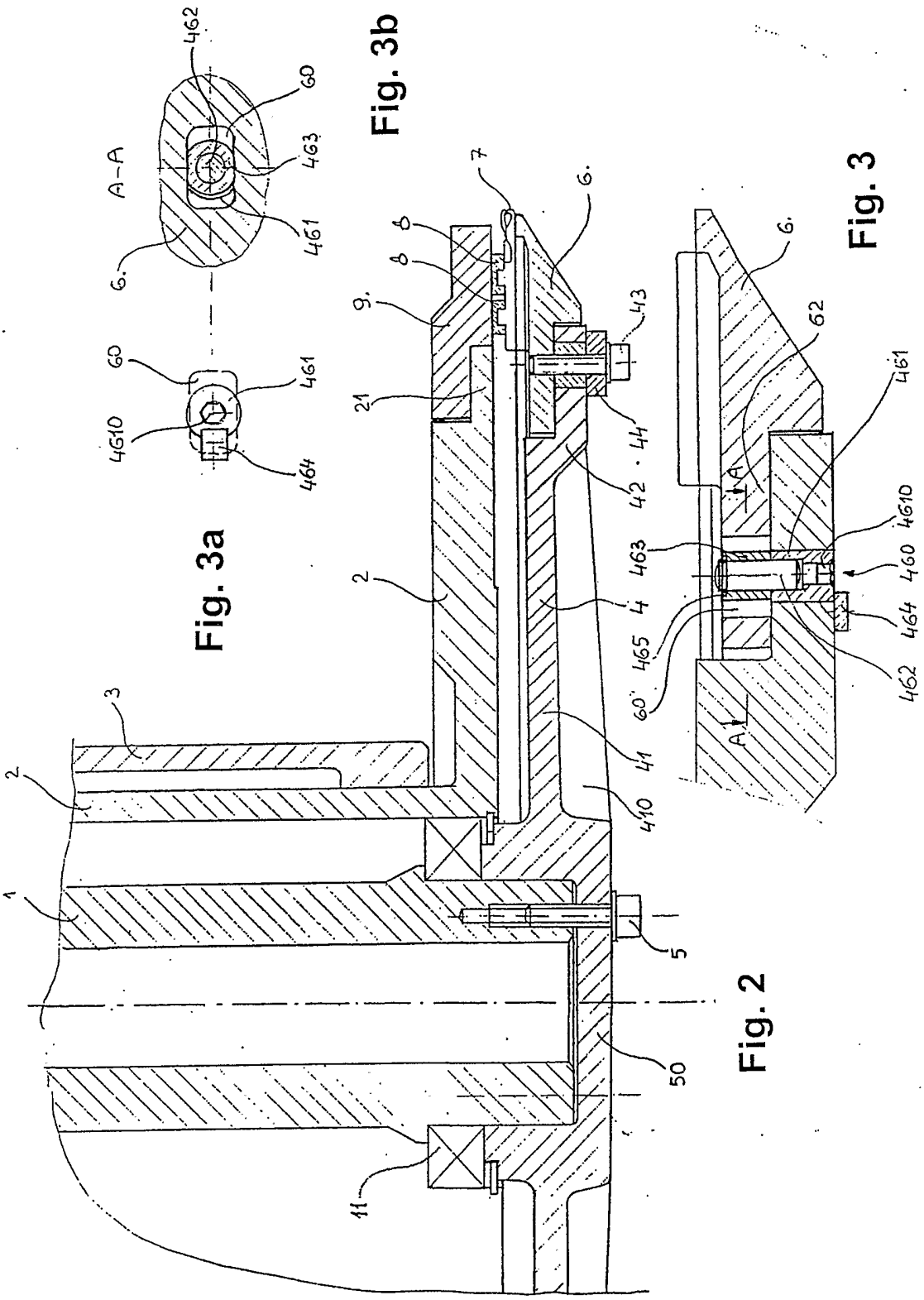


Fig. 1c


A-A
462
60
463
461
6.
4610
464
Fig. 3a
Fig. 3b
7
6.
8
8
9.
43
21
44
42
2
4
41
410
3
2
1
5
50
11
Fig. 2
Fig. 3
62
A
A
461
4610
463
460
464
465
60
462

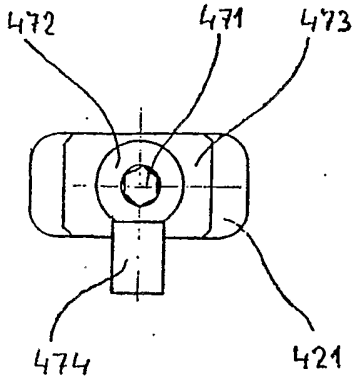


Fig. 4a

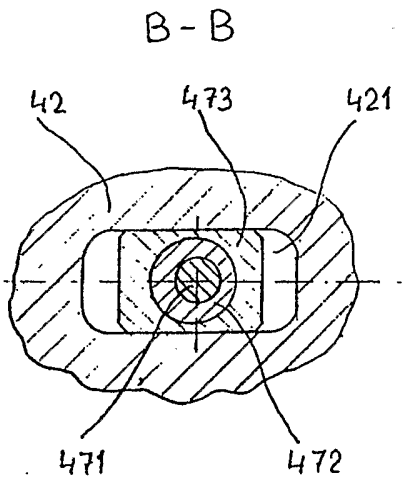


Fig. 4b

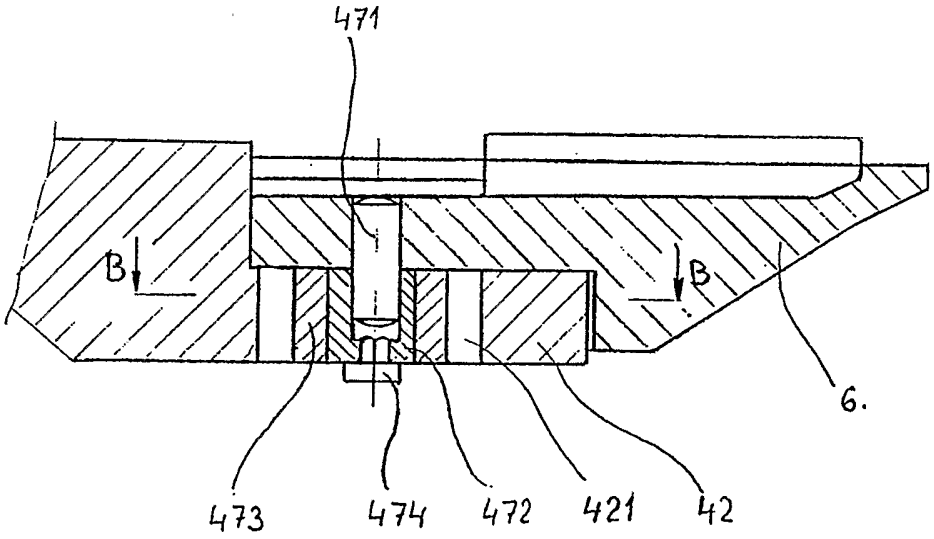


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CZ2004/000066

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D04B15/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
A	GB 2 139 650 A (* TERROT STRICKMASCHINEN GMBH) 14 November 1984 (1984-11-14) page 2, lines 4-15; figures 3,4	1
A	WO 02/053816 A (AMTEK, SPOL. S R.O; PISKULA, FRANTISEK) 11 July 2002 (2002-07-11) cited in the application page 6, lines 19-26; figures 1,4	1
A	DE 196 53 761 A1 (SIPRA PATENTENTWICKLUNGS- UND BETEILIGUNGSGESELLSCHAFT MBH, 72461 ALBS) 25 June 1998 (1998-06-25) cited in the application column 9, lines 12-19; figures 12,13	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 March 2005	04/04/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel (+31-70) 340-2040, Tx 31 651 epo nl, Fax (+31-70) 340-3016	Sterle, D

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/CZ2004/000066

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2139650 A	14-11-1984	DE 3316382 A1	15-11-1984
		JP 1993027 C	22-11-1995
		JP 7026293 B	22-03-1995
		JP 60002759 A	09-01-1985
		US 4571957 A	25-02-1986
WO 02053816 A	11-07-2002	CZ 291398 B6	12-02-2003
		WO 02053816 A1	11-07-2002
		TW 575704 B	11-02-2004
DE 19653761 A1	25-06-1998	DE 59707039 D1	23-05-2002
		EP 0849386 A1	24-06-1998
		ES 2175255 T3	16-11-2002
		JP 10195742 A	28-07-1998
		TW 392009 B	01-06-2000
		US 6131417 A	17-10-2000