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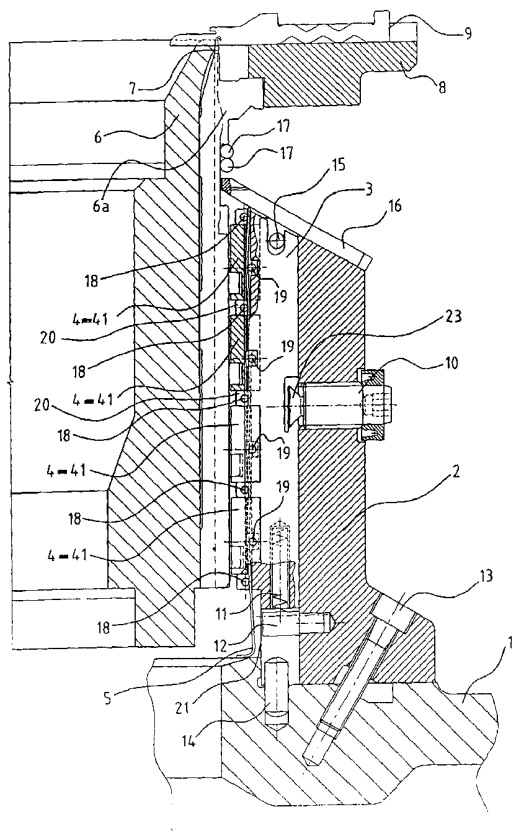
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(54) Title: KNITTING MACHINE



(57) Abstract: The invention relates to a knitting machine with at least one bed with ribs between which knitting means are situated free to move and coupled with needle cams serving to control them, each of them consisting of at least one needle cam section (4), with needle cams arranged on at least one needle cam carrier arranged at a fixed distance from the bed on at least one carrier (1) of needle cam blocks and fitted with attachment and positioning means for fixing the needle cam sections (4) and for keeping the position of the needle cam sections in relation to the stationary and/or movable part (2, 3) of the needle cam carrier, said attachment and positioning means permitting in the dismantled state of the needle cam carrier to mount and/or to remove the needle cam sections (4) from the front side of the needle cam carrier. The attachment means consists of at least one shifting attachment means (5) arranged substantially parallel to the front side (21) of the needle cam carrier by means of which at least one needle cam section (4) is held on the needle cam carrier and of at least one positioning means arranged substantially normal to the front side (21) of the needle cam carrier by means of which the needle cam sections (4) are held in required position in relation to the needle cam carrier.

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Knitting machine

Technical field

The invention relates to a knitting machine with at least one bed with ribs between which knitting means are situated free to move and coupled with needle cams serving to control them, each of them consisting of at least one needle cam section, with needle cams arranged on at least one needle cam carrier arranged at a fixed distance from the bed on at least one carrier of needle cam blocks and fitted with attachment and positioning means for fixing the needle cam sections and for keeping the position of the needle cam sections in relation to the stationary and/or movable part of the needle cam carrier, said attachment and positioning means permitting in the dismantled state of the needle cam carrier to mount and/or to remove the needle cam sections from the front side of the needle cam carrier.

Background of the invention

Knitting machines can be fitted with various needle cam arrangements which can consist each of one or more than one needle cam sections. In a solution well known to specialists and frequently used, the needle cam sections are mounted fixed or even exchangeably on a needle cam carrier and form on the front side of the needle cam carrier a closed groove-shaped path for the butts of the knitting means, or also the needle cam sections form a needle cam path controlled by the motion of the knitting means. A combined solution is also well-known. The fixing means of the needle cam sections consist as a rule of holes fitted with threads in the front side of the needle cam carrier and of bolts passing through the holes in the needle cam parts and used to fix the needle cam sections to the needle cam carrier. Besides these fixing means there are used as a rule positioning means for the needle cam sections made as pins (plugs), holes and similar elements which fix the position of the needle cam sections on the needle cam carrier in any direction normal to the direction in which the fixing means are active, i.e., in all directions lying in the plane parallel or tangential to the surface of the bed with knitting means (see for instance US 4037434, DE 2544197, DE 2746725).

In a known solution, a single attachment bolt is used to fix a plurality of needle cam sections on one needle cam carrier (EP 03114062). In another known solution, the needle cam sections are analogically fixed to the movable parts of the needle cam carriers so as to permit for instance to adjust the loop length (DE 2245416, DE 3002540, DE 3104298, EP 0348896). To keep a constant play between the needle cam sections and the bed with knitting means, the movable part of the needle cam carrier is as a rule situated in a tight guiding parallel with the bed.

In another known arrangement, the needle cam sections are mounted on the needle cam carrier movable parts adapted to move in the direction parallel to the bed with knitting means or in the direction normal to the bed. The shifting of the needle cam sections into the required position will change their action on the knitting means and consequently also the knit structure. However, this invention does not relate to the machines arranged in this way.

The drawback of the above described solution with the use of bolts as attachment means consists in the high amount of work required for the assembly and for the exchange of the needle cam sections, in particular in modern machines equipped with high numbers of knitting systems. While the amount of work required for the assembly and exchange of the needle cam sections is partly reduced in the version with a single attachment bolt for all needle cam sections on one needle cam carrier, the necessity of bolting the needle cam sections persists. A drawback of the embodiment with a single attachment bolt consists also in high manufacturing costs due to high requirements placed on the precision.

In still another known solution, the needle cam sections are freely seated on a sliding guide without the use of attachment means, and their movement in the direction normal to the bed is limited on the one side by the needle cam carrier and on the other side by the bed ribs or by the knitting means (DE 3937390). The drawback of this arrangement consists in high requirements placed on the precision, parallelism, and length, of the sliding seat for the needle cam sections which are indispensable to prevent the needle cam sections from getting stuck during their motion in the direction normal to the bed. Another drawback of the free seating of the needle cam sections on the needle cam carriers without attachment means consists in the risk that a drop in caution during their assembly can let the needle cam sections

fall out of the sliding guide. A possible protection of the needle cam sections against falling out by increasing the length of the sliding guide becomes inefficient in some positions of the needle cam carrier, and locking the needle cam sections by springs on the principle of a well-known type of connector increases the production costs.

Having in mind the well-known solutions, the invention intends to eliminate the above drawbacks of the known arrangements of knitting machines with needle cam sections while permitting easy handling of the needle cam block with mounted needle cam sections in any position without the risk for the needle cam section to fall out before the needle cam carrier has been mounted on the machine.

Principle of the invention

The goal of the invention has been reached by a knitting machine making use of the fact that during the knitting the needle cam sections are exposed to forces acting in a plane substantially parallel with the front side of the needle cam carrier so that the attachment of the needle cam sections on the needle cam carrier is sufficiently provided for by at least one shifting attachment means arranged substantially parallel to the front side of the needle cam carrier while the fixing of the position of the needle cam sections in relation to the needle cam carrier is provided for by at least one positioning means arranged substantially normal to the front side of the needle cam carrier. The shifting attachment means is preferably shaped longitudinally and is inserted by shifting into the passage made in the needle cam sections and in the needle cam carrier.

The needle cam sections are held in due position in relation to the needle cam carrier by at least one positioning means arranged substantially normal to the front side of the needle cam carrier. During the assembly operation of the needle cam sections on the needle cam carrier removed from the needle cam carrier blocks, the needle cam sections are inserted in the positioning means in the direction substantially normal to the front side of the needle cam carrier while at least one shifting attachment means is inserted in the direction parallel with the front side and thus quickly and easily locks the needle cam sections on the needle cam carrier which is then together with the mounted needle cam section in its turn mounted on

the machine in a well-known manner. This permits to obtain quick and easy mounting (assembly) of the needle cam sections on the needle cam carriers without the use of bolt connections. The handling of the needle cam carrier with the mounted needle cam sections is easy and is reliably protected from the risk of the falling out of the needle cam sections. The use of the attachment and positioning means, permitting the quick and easy assembly and exchange of the needle cam sections without the use of attachment bolts also permits to reduce the demands placed on the precision of the manufacture and thus to cut costs of production. Other favourable features of the invention are specified in the subclaims.

Description of the drawings

The invention is schematically shown in the enclosed drawings in which Fig. 1 is a radial section through the needle cam system and bed of a circular knitting machine with the arrangement of the needle cam sections according to the invention, Fig. 2 a detail of the arrangement of the shifting attachment means and of the needle cam sections, Fig. 3a a view of the front side of the needle cam carrier with mounted needle cam sections held by the flat elastic shifting attachment means and held in due position by positioning means, Fig. 3b a cross section A-A through the needle cam carrier with mounted needle cam sections and with the shifting attachment means inserted into the passage made by pins in the needle cam sections and in the movable part of the needle cam carrier, Fig. 4 a longitudinal section A through the needle cam carrier with mounted needle cam sections held in due position by the positioning means and attached to the needle cam carrier by a shifting attachment means circular-shaped in section, Fig. 4b a cross section A-A through the needle cam carrier with the needle cam sections arranged as shown in Fig. 4a, Fig. 5a a broken-out longitudinal section through the needle cam carrier with the needle cam sections and with the shifting attachment means in the passage, consisting of projections on the needle cam sections and on the needle cam carrier, for the shifting attachment means, Fig. 5b a cross section A-A through the needle cam carrier with the needle cam sections arranged as shown in Fig. 5a, Fig. 6a a broken-out longitudinal section through the needle cam carrier with the needle cam sections and with the shifting attachment means in the passage for the shifting attachment means consisting of

parts of a T-shaped groove, Fig. 6b a cross section A-A through the needle cam carrier with the needle cam sections arranged as shown in Fig. 6a, Fig. 7a a view of a part of the needle cam carrier with a mounted needle cam section rotatably mounted on the positioning means consisting of a pin and with the shifting attachment means adapted to be inserted from the lateral side of the needle cam carrier, Fig. 7b a longitudinal section A-A through the arrangement shown in Fig. 7a with the positioning means situated on the moving and on the stationary part of the needle cam carrier, Fig. 8a a needle cam carrier with the needle cam sections mounted on the movable part of the needle cam carrier, Fig. 8b a cross section through the arrangement shown in Fig. 8a, Fig. 9 a needle cam carrier with mounted stationary needle cam sections position-determined by a groove provided in the stationary part of the needle cam carrier, Fig. 9a a cross section B-B through the arrangement shown in Fig. 9, Fig. 9b an oblique section A-A through the arrangement shown in Fig. 9 in the direction normal to the shifting direction of the obliquely shifting attachment means, Fig. 9c a detail of the arrangement shown in Fig. 9 with the positioning means made as a pin entering the groove provided on the movable part of the needle cam carrier, Fig. 10 a detail of the needle cam carrier with a mounted stationary needle cam section and with an obliquely moving needle cam section with a positioning guide arranged on the stationary needle cam section, Fig. 10a a cross section A-A through the arrangement shown in Fig. 10, Fig. 10b a longitudinal section B-B through the arrangement shown in Fig. 10 in the area of the obliquely shifting needle cam section, Fig. 11 a detail of the needle cam carrier with the mounted stationary needle cam section position-determined by positioning means situated on the stationary needle cam section and held in position by attachment means provided on the stationary needle cam section, Fig. 11a an oblique section A-A through the arrangement shown in Fig. 11 in the direction normal to the direction of the motion of the obliquely moving needle cam section, and Fig. 11b a longitudinal section B-B through the arrangement shown in Fig. 11 in the direction of the axis of the movable part of the needle cam carrier.

Specific description

The invention will be demonstrated on a single-bed circular knitting machine whose parts important for the invention are shown in Fig. 1 in a cross section as a needle cam system in the area of a circular cylindrical needle bed 6 showing the details required for explaining the principle of the invention. Details relating to the fixing and drive of the needle bed 6 and of a sinker bar 8 as well as the usual arrangement of the needle cams for controlling knitting means – needles 7 and sinkers 9 – are well known to those skilled in the art and their representation has been therefore omitted for the sake of the simplification of the description.

The machine carries a needle cam section block carrier 1 having fixed thereto with screws 13 at least one stationary part 2 of the needle cam carrier in which there is arranged in a guide parallel with ribs 6a of the needle bed 6 a movable part 3 of the needle cam carrier fitted with positioning means 20 arranged substantially normal to a front side 21 of the needle cam carrier. The positioning means 20 hold needle cam sections 4 in due position in the direction parallel with the ribs 6a of the needle bed 6. Side walls 22 of the movable part 3 of the needle cam carrier hold the needle cam sections 4 in due position in the sense of rotation of the needle bed 6 rotating in a well-known manner and moving in the direction normal to the plane of representation of Fig. 1. Parallel with the front side 21 of the needle cam carrier, a passage 24 consisting of pins 18 and 19 alternately arranged on the movable part 3 of the needle cam carrier and on the needle cam sections 4 carries inserted therein a shifting attachment means 5 made in a preferred embodiment as a flat member elastic in the direction normal to its longitudinal axis and elastically deflected by the pins 18 in the direction towards, and by the pins 19 away from, the front side 21 of the needle cam carrier while being inserted into the passage 4. The shifting attachment means 5 is particularly advantageous in that, due to its transversal elasticity, it holds (presses) the needle cam sections 4 onto the front side 21 of the needle cam carrier with a defined force not preventing the movement of the needle cam sections 4 along the side wall 21 of the stationary part 2 of the needle cam carrier for instance when adjusting the stitch length by means of an adjusting screw 10 whose taper section 23 serves as a stop for the movable part 3 of the needle cam carrier pressed onto it by a value defining spring 11. After the adjusting screw 10 has been screwed in, the value

defining spring 11 moves the movable part 3 of the needle cam carrier in parallel with the ribs 6a upwards to a cover sheet 16. When the adjusting screw 10 has been screwed out, the taper section 23 of the adjusting screw 10 moves the movable part 3 of the needle cam carrier in the opposite direction, i.e., downwards. The movable part 3 of the needle cam carrier is at this stage protected against falling out of the guide by a pin 15 and the range of motion is limited from the upper side of the movable part 3 of the needle cam carrier by the cover sheet 16, and from the lower side of the movable part 3 of the needle cam carrier, by a defining cube 12 seated in the stationary part 2 of the needle cam carrier.

In a preferred embodiment, the position of the needle cam carrier is defined by a positioning pin 14 inserted in a groove acting as a guide of the movable part 3 of the needle cam carrier situated in the stationary part 2 of the needle cam carrier.

In another, not illustrated embodiment of the invention, the position of the movable part 3 of the needle cam carrier can be adjusted in another suitable manner, for instance by replacing the adjusting screw by a cylindrical pin equipped on its front side with a spiral-shaped groove cooperating with a pin situated on the movable part 3 of the needle cam carrier.

Fig. 2 shows in detail the attachment of the needle cam sections 4 by means of the elastic shifting attachment means 5. Fig. 3a shows the needle cam carrier in arrangement shown in Fig. 1 as viewed from the front side 21 of the needle cam carrier with the mounted needle cam sections 4. Fig. 3b shows a cross section through the arrangement of the needle cam carrier of Fig. 1 with the stationary part 2 and with the movable part 3 of the needle cam carrier with the installed needle cam section 4, and the pin 19 arranged in the needle cam section 4 and making a part of the passage 24 for the flat shifting attachment means 5.

Figs. 4a and 4b show respectively a longitudinal and a cross section of another arrangement according to the invention in which the shifting attachment means 5 consists of a wire circular in cross section and the passage 24 for the shifting attachment means consists of orifices alternately provided in the needle cam sections 4 and in the movable part 3 of the needle cam carrier. The adjustment of the movable part 3 of the needle cam carrier is in the shown example of embodiment made as a

cylindrical stop pin 25 having at its front a spiral-shaped groove adapted to receive an adjusting pin 26 situated on the movable part 3 of the needle cam carrier.

Figs. 5a, 5b, 6a, 6b show other embodiments of the passage 24 for the shifting attachment means 5. In Figs. 5a, 5b, the passage 24 for the shifting attachment means 5 consists of projections 27, 28, alternately arranged on the needle cam carrier and on the needle cam sections 4 and so bent that their end arms are oriented in opposite directions. Figs 6a, 6b show respectively a longitudinal and a cross section through an arrangement in which the needle cam carrier and the needle cam sections are alternately equipped with T-shaped grooves 29 and 30 making up the passage 24 for the shifting attachment means 5.

Each of these two examples of embodiment preferably uses a flat and elastic shifting attachment means 5. In a not represented example of embodiment, the passage 24 for the shifting attachment means 5 can consist of a suitable combination of suitable projections, suitable groove sections of suitable profile such as T-profile, suitable pins, etc.

Figs. 7a, 7b show the needle cam section 4 with positioning means consisting of a pin 31 situated in the stationary part 2 of the needle cam carrier and of a pin 32 inserted into the movable part 3 of the needle cam carrier made as an adjusting (setting) pin 25 with a groove on its front side. The embodiment of the passage 24 for the shifting attachment means 5 which is inserted from the lateral side of the needle cam carrier is shown in Fig. 7b and consists of the projections 27, 28 alternately arranged on the needle cam carrier and on the needle cam section 4. The shifting attachment means 5 holds the needle cam section 4 rotatably mounted on the pin 31 on the front side 21 of the needle cam carrier. Due to its spiral-shaped groove, the rotation of the adjusting (setting) pin 25 is transmitted in a way on the pin 32 and via the latter on the needle cam section 4 whose position, and consequently the stitch length of the knitwear, can be adjusted in this manner.

Fig. 8a shows in front view another example of embodiment of the invention, and Fig. 8b, a cross section through it. In this example of embodiment, each needle cam consists of a stationary needle cam section 40 and of a moving needle cam section 41 situated next to it. The stationary needle cam sections 40, held by the shifting attachment means 5, are situated on the stationary part 2 of the needle cam

carrier and are held in position, on the one hand, by pins 33 inserted into a groove 330 arranged on the front side 21 of the needle cam carrier in the direction normal to the longitudinal axis of the needle cam carrier and, on the other side, by a projection 34 provided on the stationary needle cam sections 40 and inserted into a groove 340 situated on the front side 21 of the needle cam carrier in the direction parallel with the longitudinal axis of the needle cam carrier. The moving needle cam sections 41 are in the arrangement shown in Figs. 8a, 8b attached and positioned on the movable part 3 of the needle cam carrier similarly to the needle cam sections 4 of the example of embodiment shown in Fig. 1.

In the embodiment shown in Figs. 8a, 8b, the knit structure can be modified by the exchange of the stationary needle cam sections while the moving needle cam sections 4 are used to adjust the stitch length, so that the exchange of the moving needle cam sections 4 will change the course of the clearing as may be required by the knitting technology (technique).

Another preferred embodiment, shown in Figs. 9, 9a, 9b, uses obliquely shifting moving needle cam sections 37 position-determined by an obliquely positioned groove 370 situated in the front side 21 of the needle cam carrier and receiving a projection 35 situated at the rear side of said obliquely moving shifting needle cam section 37, and the positioning means 20 made as projections on the front side of the movable part 3 of the needle cam carrier. The movement of the movable part 3 in the direction of its longitudinal axis displaces the obliquely shifting needle cam section 37 in the direction of the axis of the groove 370. Another embodiment of the positioning means of the moving needle cam section 37 in relation to the movable part 3, as for the rest arranged in accordance with Fig. 9, is shown in Fig. 9c where the positioning means consists of a pin 36 inserted into a groove 360 provided on the movable part 3 of the needle cam section in the direction normal to the longitudinal axis of the movable part 3 of the needle cam carrier. This arrangement serves to an easy exchangeability of the obliquely shifting moving needle cam sections 37 and to their joint adjustment, for instance in the well-known multirace knitting machines with the oblique shifting of the needle cam sections forming sinker cams.

In still another embodiment shown in Figs. 10, 10a and 10b, the obliquely shifting moving needle cam sections are positioned by a positioning guide 373 arranged on stationary needle cam sections 40 positioned on the stationary part 2 of the needle cam carrier by positioning means 20 and by the pin 33 situated on the stationary needle cam section 40 inserted into the groove 330 provided on the front side of the stationary part 2 of the needle cam carrier. In relation to the movable part 3 of the needle cam carrier, the obliquely shifting needle cam section is positioned by projections 374 on its rear side inserted into a corresponding groove 375 located in the movable part of the needle cam carrier. The longitudinal movement of the movable part 3 results in the oblique movement of the needle cam sections in the direction of the positioning guide 373.

In a preferred embodiment shown in Figs. 11, 11a, and 11b, the moving obliquely shifting needle cam sections 37 are held by means of their holding projections 371 and holding means 372 arranged in the form of a recess on the rear side of the stationary needle cam sections 40 parallel with the positioning guide 373 situated on the stationary needle cam sections 40 and used to set the position of the moving needle cam sections in relation to the stationary part 2 of the needle cam carriers. The positioning of the moving obliquely shifting needle cam sections 37 in relation to the movable part 3 of the needle cam carrier is provided for by a projection 38 situated on the obliquely shifting needle cam section 37 and inserted into a groove 39 made on the front side of the movable part 3 of the needle cam carrier. The projection 38 can be substituted with a pin seated in the needle cam section 37 and inserted into the groove 39. The stationary needle cam sections 40 used to hold the moving obliquely shifting needle cam sections 37 are in their turn preferably held by a single shifting attachment means 5 arranged in one of the above described variants.

The positioning guide 373 can be arranged also in a not represented prismatic shape and then substitutes both the holding means 372 for holding and the positioning of the moving obliquely shifting needle cam sections 37. In another not represented variant, the positioning and holding of the stationary needle cam sections can be provided for by a part analogical to the arrangement of the movable part of the needle cam carrier of Fig. 1, solidly connected with the stationary part 2 of the needle cam carrier. By the use of suitable material, this will permit to achieve compensation

of the thermal expansion and exact run of the needle cam positions according to the needle expansion due to the machine heating.

The relative arrangement of the positioning means on the needle cam sections and on the needle cam carrier can be opposite to that described above, so that for instance the projection on the needle cam section inserted into the groove on the needle cam carrier can be replaced by the projection on the needle cam carrier inserted into the groove on the needle cam section. Analogically, the pin situated on the needle cam section can be replaced by the pin situated on the needle cam carrier inserted into the groove or into a hole made in the needle cam section.

In addition to the shown examples of embodiment, a mutual combination from some of the shown examples of embodiment is also possible. The examples of embodiment serve only to explain the invention, not to limit it. An analogical application of the invention is possible also in dial cams of double-bed knitting machines, in sinkers of single-bed machines, and in other types of knitting machines. The scope of the invention is defined by the above patent claims.

PATENT CLAIMS

1. Knitting machine with at least one bed with ribs between which knitting means are situated free to move and coupled with needle cams serving to control them, each of them consisting of at least one needle cam section, with needle cams arranged on at least one needle cam carrier arranged at a fixed distance from the bed on at least one carrier of needle cam blocks and fitted with attachment and positioning means for fixing the needle cam sections and for keeping the position of the needle cam sections in relation to the stationary and/or movable part of the needle cam carrier, said attachment and positioning means permitting in the dismantled state of the needle cam carrier to mount and/or to remove the needle cam sections from the front side of the needle cam carrier, characterized by that the attachment means consists of at least one shifting attachment means (5) arranged substantially parallel to the front side (21) of the needle cam carrier by means of which at least one needle cam section (4) is held on the needle cam carrier and of at least one positioning means arranged substantially normal to the front side (21) of the needle cam carrier by means of which the needle cam sections (4) are held in required position in relation to the needle cam carrier.

2. Knitting machine as claimed in Claim 1, characterized by that the shifting attachment means (5) consists of a substantially longitudinally shaped element inserted into a passage (24) provided on the needle cam carrier and in the needle cam sections (4) in the direction substantially parallel with the front side (21) of the needle cam carrier along and/or across the direction of ribs (6a).

3. Knitting machine as claimed in any of Claims 1 and 2, characterized by that the passage (24) for the shifting attachment means (5) consists of pins (19, 18) alternately arranged in the needle cam sections (4) and in the needle cam carrier across the longitudinal dimension of the shifting attachment means (5), the shifting attachment means (5) passing along the pins (19) arranged in the needle cam

sections (4) on the side remote from the needle cam carrier and along the pins (18) arranged in the needle cam carrier on the side adjacent to the needle cam carrier.

4. Knitting machine as claimed in Claim 3, characterized by that the shifting attachment means passes in the passage (24) for the shifting attachment means (5) alternately along the pins (18, 19) on at least one needle cam section (4) and on the needle cam carrier and is elastically deflected, on the needle cam section (4) by means of the pins (19) in the direction away from the needle cam carrier, and on the needle cam carrier by means of the pins (18) towards the needle cam carrier.

5. Knitting machine as claimed in Claims 1 and 2, characterized by that the passage (24) for the shifting attachment means (5) consists in the direction along this means (5) of holes situated alternately in at least one needle cam section (4) and in the needle cam carrier and through which the shifting attachment means (5) alternately passes.

6. Knitting machine as claimed in Claims 1 and 2, characterized by that the passage (24) for the shifting attachment means (5) consists of projections (27, 28) alternately arranged on at least one needle cam section (4) and on the needle cam carrier and that the shifting attachment means (5) passes in the passage (24) for the shifting attachment means (5) along the projections (28) arranged in the needle cam section (4) on the side remote from the needle cam carrier, and along the projections (27) on the needle cam carrier on the side adjacent to the needle cam carrier.

7. Knitting machine as claimed in Claims 1 and 2, characterized by that the needle cam section (4) and the needle cam carrier are alternately equipped with substantially T-shaped grooves (29) and that the shifting attachment means (5) passes in the passage (24) for the shifting attachment means alternately through the T-shaped grooves (29, 30) arranged in at least one needle cam section (4) and in the needle cam carrier.

8. Knitting machine as claimed in Claims 3 to 7, characterized by that the passage (24) for the shifting attachment means (5) consists of a combination of the pins (18, 19) and/or of holes situated alternately in at least one needle cam section (4) and in the needle cam carrier and/or of T-grooves (29, 30) alternately provided on at least one needle cam section (4) and on the needle cam carrier.

9. Knitting machine as claimed in any of Claims 1 to 8, characterized by that the cross section of the shifting attachment means (5) is substantially constant.

10. Knitting machine as claimed in Claim 9, characterized by that the cross section of the shifting attachment means (5) is circular.

11. Knitting machine as claimed in Claim 9, characterized by that the cross section of the shifting attachment means (5) is substantially flat.

12. Knitting machine as claimed in Claim 11, characterized by that the cross section of the shifting attachment means (5) is rectangular.

13. Knitting machine as claimed in Claim 11, characterized by that the cross section of the shifting attachment means (5) is square.

14. Knitting machine as claimed in any of Claims 1 to 13, characterized by that the shifting attachment means (5) is elastic in at least one direction normal to its longitudinal dimension.

15. Knitting machine as claimed in any of Claims 1 to 14, characterized by that the positioning means of the needle cam section (4) consist of surfaces made on the needle cam section (4) and on the needle cam carrier.

16. Knitting machine as claimed in Claim 15, characterized by that the surfaces serving as the positioning means of the needle cam section (4) are made as sides of grooves (330, 340, 360, 370) and/or of projections (33, 34, 35, 36) arranged on the needle cam carrier and/or on at least one needle cam section (4).

17. Knitting machine as claimed in any of Claims 1 to 14, characterized by that the positioning means of the needle cam section (4) consist of at least one projection provided on one of the pair of parts needle cam section (4) – needle cam carrier inserted into a corresponding recess provided in the second part of said pair of parts.

18. Knitting machine as claimed in any of Claims 1 to 14, characterized by that the positioning means of the needle cam section (4) consist of at least one pin provided on one of the pair of parts needle cam section (4) – needle cam carrier and of a corresponding hole and/or groove provided in the second part of said pair of parts.

19. Knitting machine as claimed in any of Claims 15 to 18, characterized by that the positioning means are arranged on at least one needle cam section (4) and on a movable part (3) of the needle cam carrier.

20. Knitting machine as claimed in Claim 19, characterized by that the positioning means on the needle cam section (4) and on the movable part (3) of the needle cam carrier consist of a pin provided, on one side, on one of the pair of parts needle cam section (4) – movable part (3) of the needle cam carrier and on the other side of a groove arranged on the other of said pair of parts and oriented substantially radially in relation to the axis of the pin serving as positioning means for the needle cam section (4) and of the stationary part (2) of the needle cam carrier.

21. Knitting machine as claimed in any of Claims 15 to 18, characterized by that the positioning means are arranged on at least one needle cam section (4) and on the stationary part (2) of the needle cam carrier.

22. Knitting machine as claimed in Claim 21, characterized by that the positioning means on the stationary part (2) of the needle cam carrier and on the needle cam section consist of a pin and a hole and that said needle cam section is rotatably mounted around the axis of said pin in relation to the stationary part (2) of the needle cam carrier.

23. Knitting machine as claimed in any of Claims 15 to 18, characterized by that the positioning means are arranged on at least one needle cam section (4) and on the stationary part (2) of the needle cam carrier and/or on a stationary needle cam section (40) and on the movable part (3) of the needle cam carrier.

24. Knitting machine as claimed in any of Claims 1 to 23, characterized by that the needle cam carrier is on its movable part (3) fitted with at least one parallel key adapted to move in a guide parallel with the longitudinal direction of the ribs (6a) of the needle bed in which positioning and/or holding (fixing) means for at least one needle cam section (4) are arranged.

25. Knitting machine as claimed in Claim 24, characterized by that the parallel key is substantially rectangular in cross section and is led in a guide provided on the front side (21) of the needle cam carrier.

26. Knitting machine as claimed in any of Claims 1 to 25, characterized by that the needle cam carrier is fitted with a parallel key fixed to the stationary part (2) of the needle cam carrier on which positioning and/or holding (fixing) means for at least one stationary needle cam section are provided.

27. Knitting machine as claimed in Claim 26, characterized by that the parallel key is substantially rectangular in cross section and is led in a groove provided on the front side (21) of the needle cam carrier.

28. Knitting machine as claimed in any of Claims 1 to 27, characterized by that the positioning means of a movable obliquely displaceable needle cam section (37) are arranged in form of a projection (35) on the rear side of the obliquely displaceable needle cam section inserted into a groove provided on the front side (21) of the stationary part (2) of the needle cam carrier and that the axis of said groove is situated obliquely in relation to the longitudinal axis of knitting means and/or in relation to the longitudinal axis of the movable part (3) of the needle cam carrier.

29. Knitting machine as claimed in any of Claims 1 to 28, characterized by that the positioning means of the movable obliquely displaceable needle cam section (37) are arranged in form of a positioning guide (373) provided on at least one stationary needle cam section (40) and that the direction of the positioning guide (373) is oriented obliquely relative to the longitudinal axis of the knitting means and/or to the longitudinal axis of the movable part (3) of the needle cam carrier.

30. Knitting machine as claimed in any of Claims 28 to 29, characterized by that the movable obliquely displaceable needle cam section (37) is coupled by the positioning means with the movable part (3) of the needle cam carrier.

31. Knitting machine as claimed in any of Claims 28 to 30, characterized by that the movable obliquely displaceable needle cam section (37) carries holding (fixing) projections (371) having related thereto holding (fixing) means (372) provided on the stationary needle cam section (40) and serving to hold (fix) the movable obliquely displaceable needle cam section (37) to the front side (21) of the needle cam carrier.

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Fig. 1

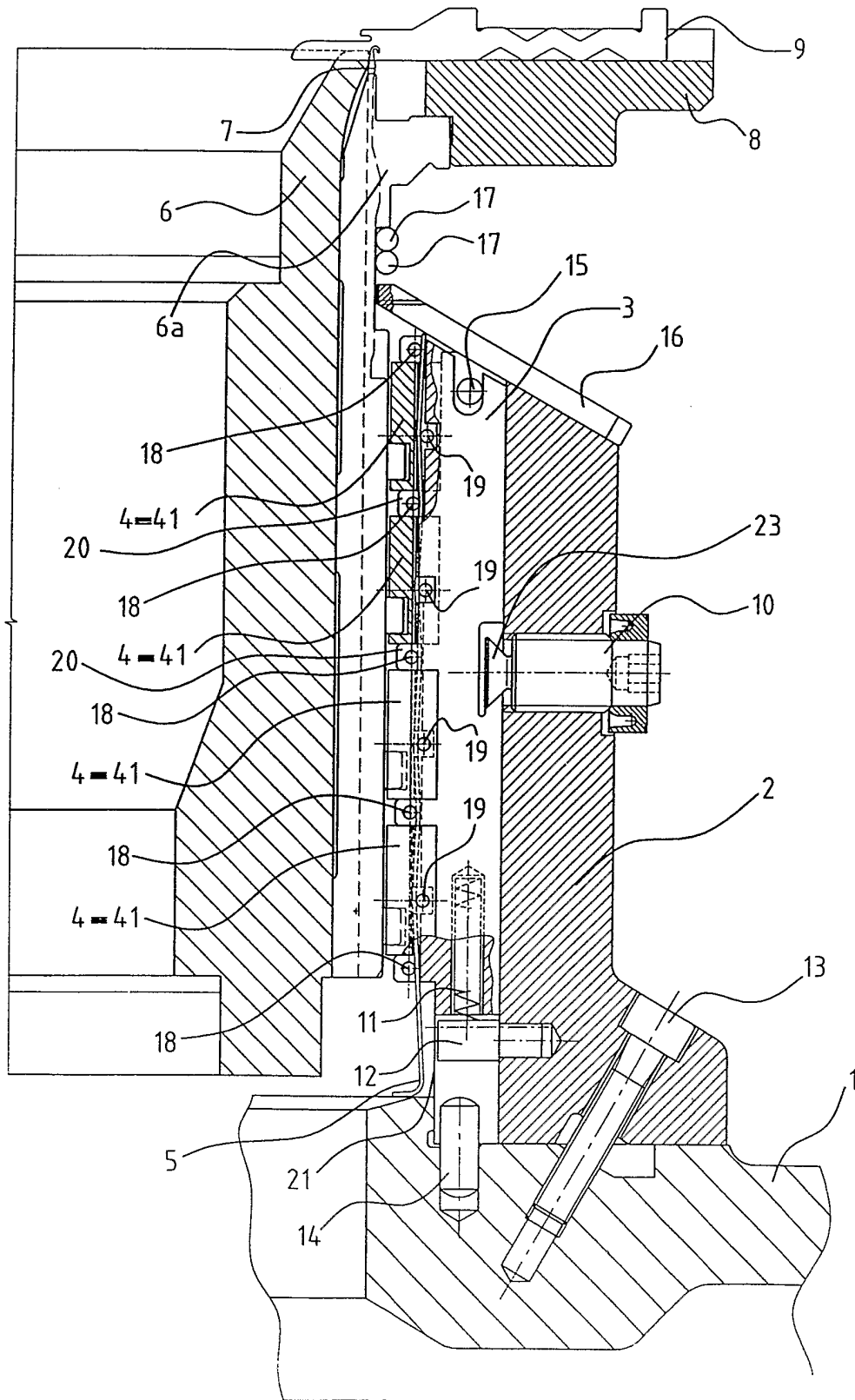


Fig. 2

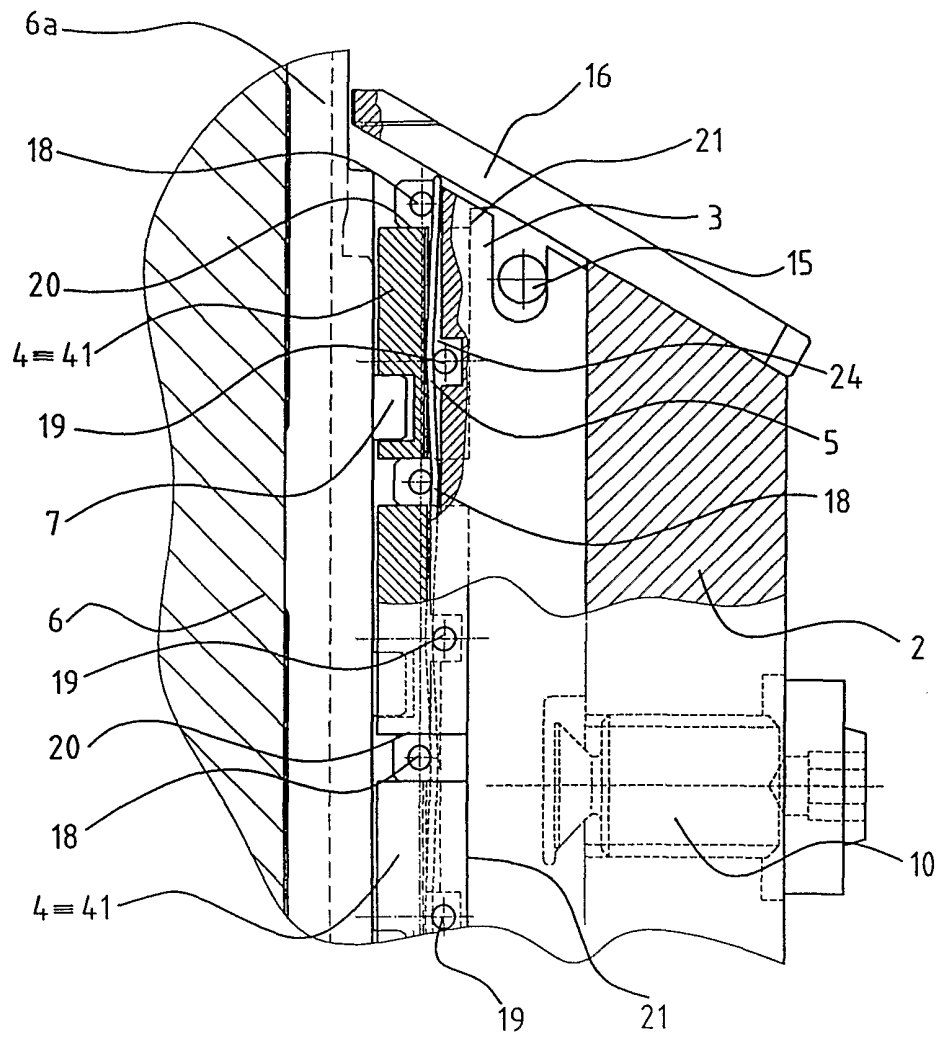


Fig. 3a

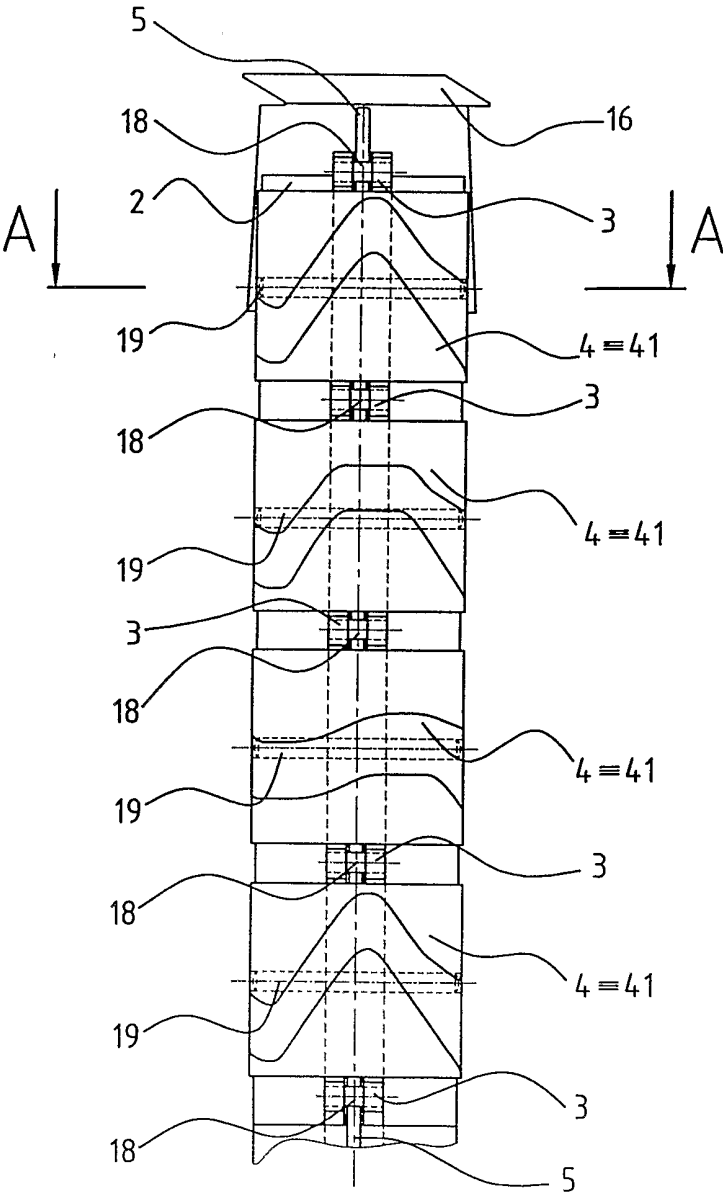


Fig. 3b

A-A

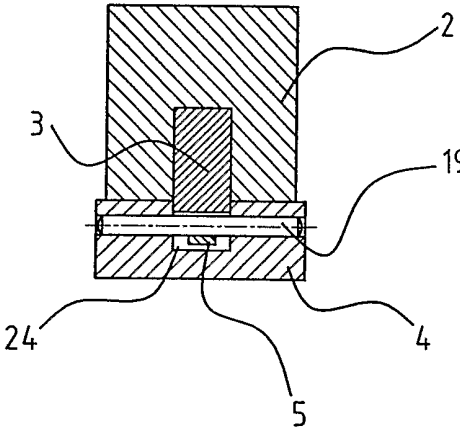


Fig. 4a

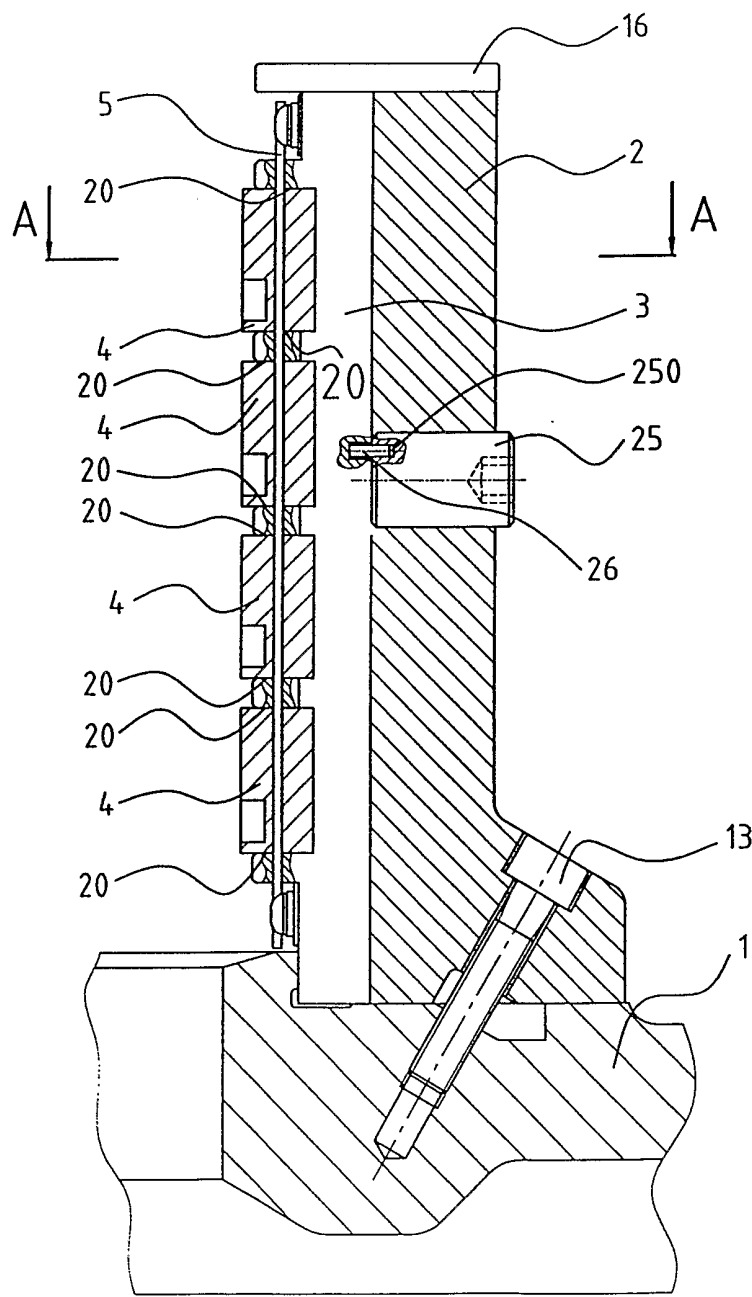


Fig. 4b

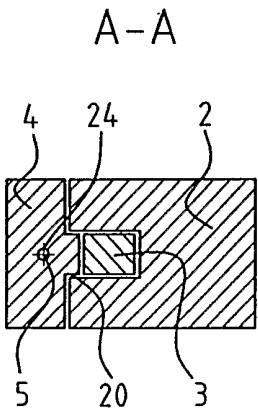


Fig. 5a

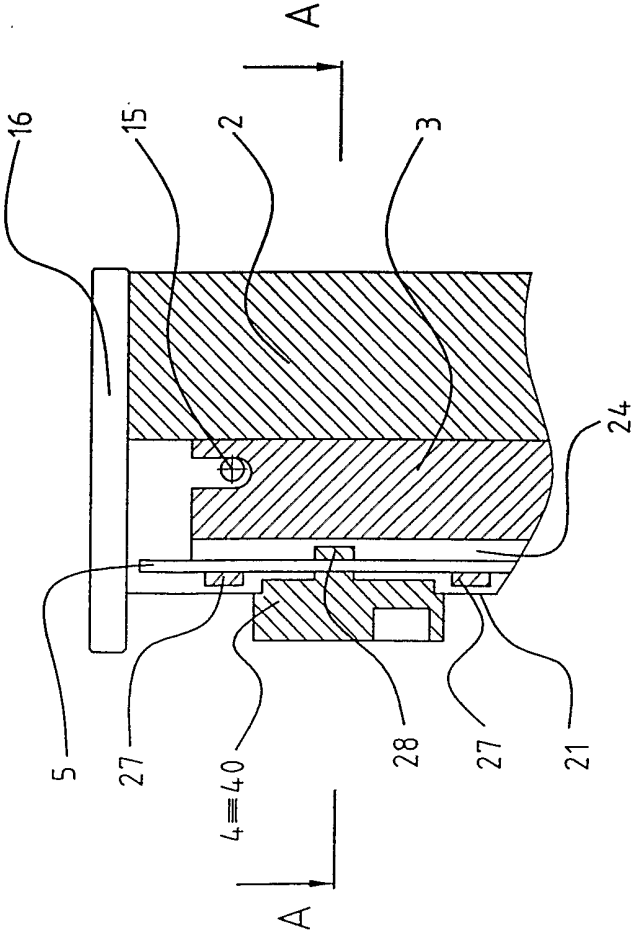


Fig. 5b

A-A

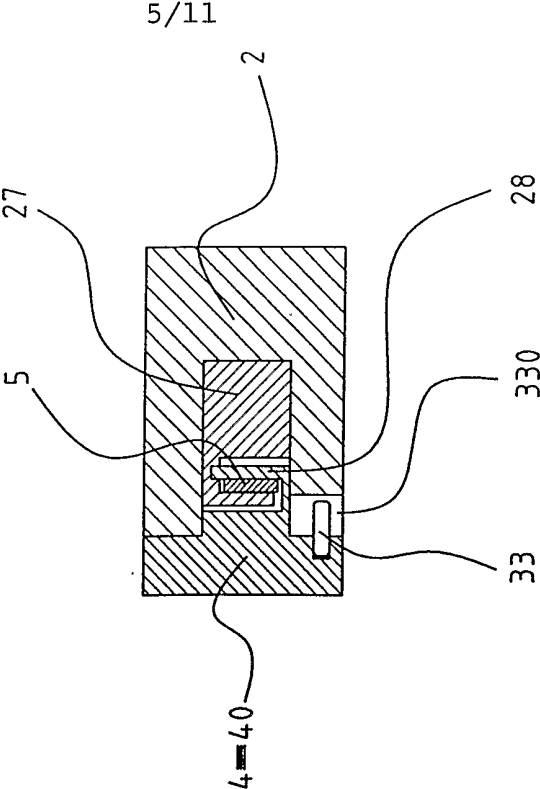


Fig. 6a

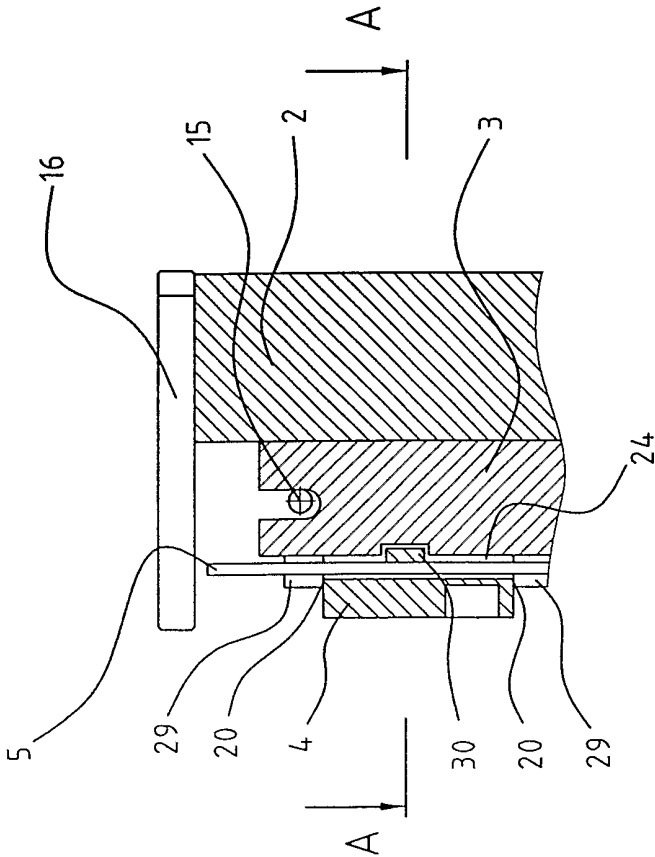


Fig. 6b

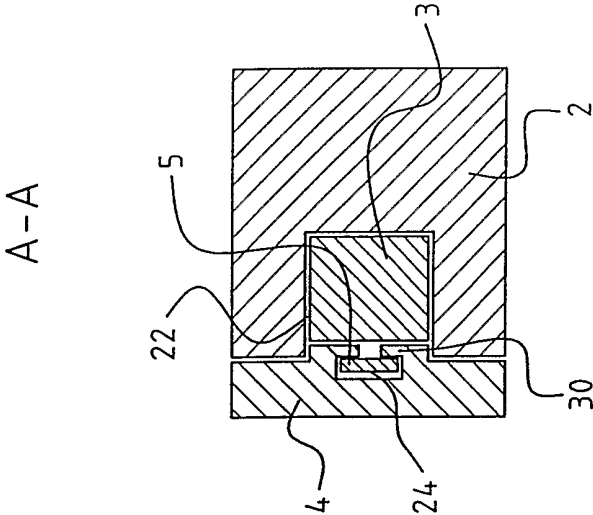


Fig. 7a

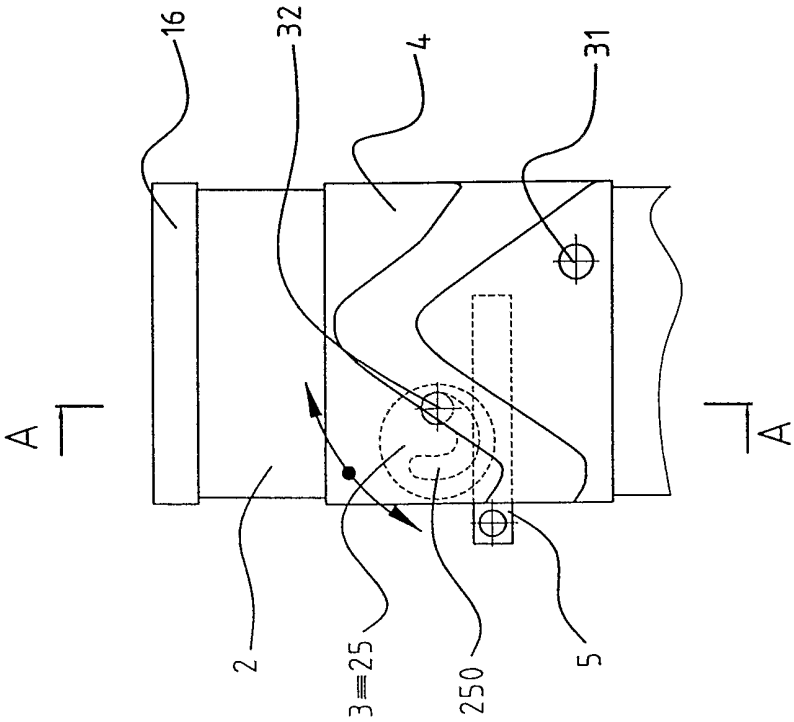


Fig. 7b

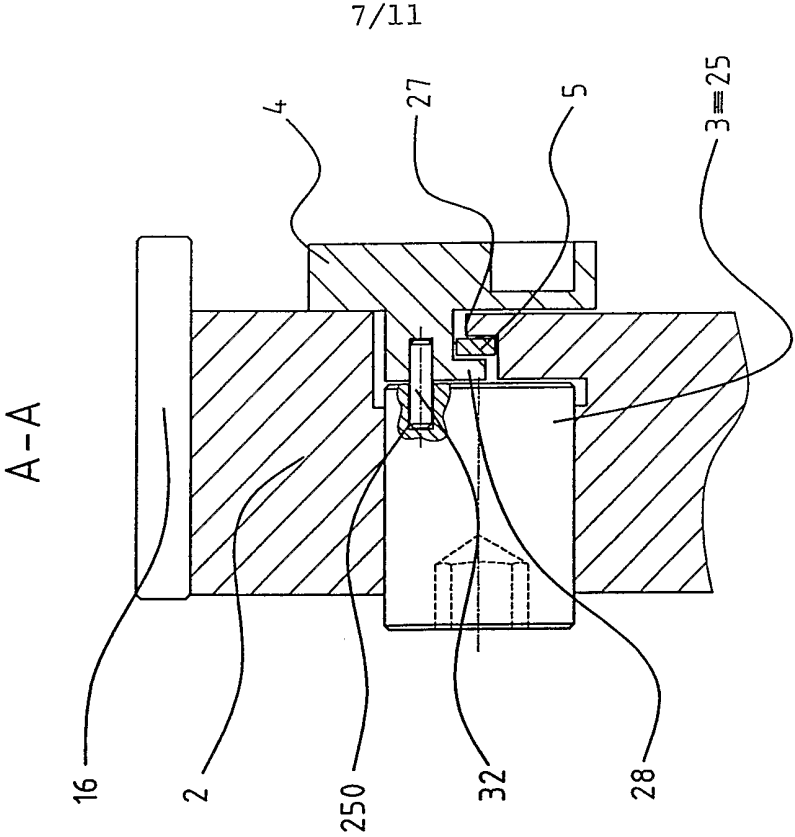


Fig. 8a

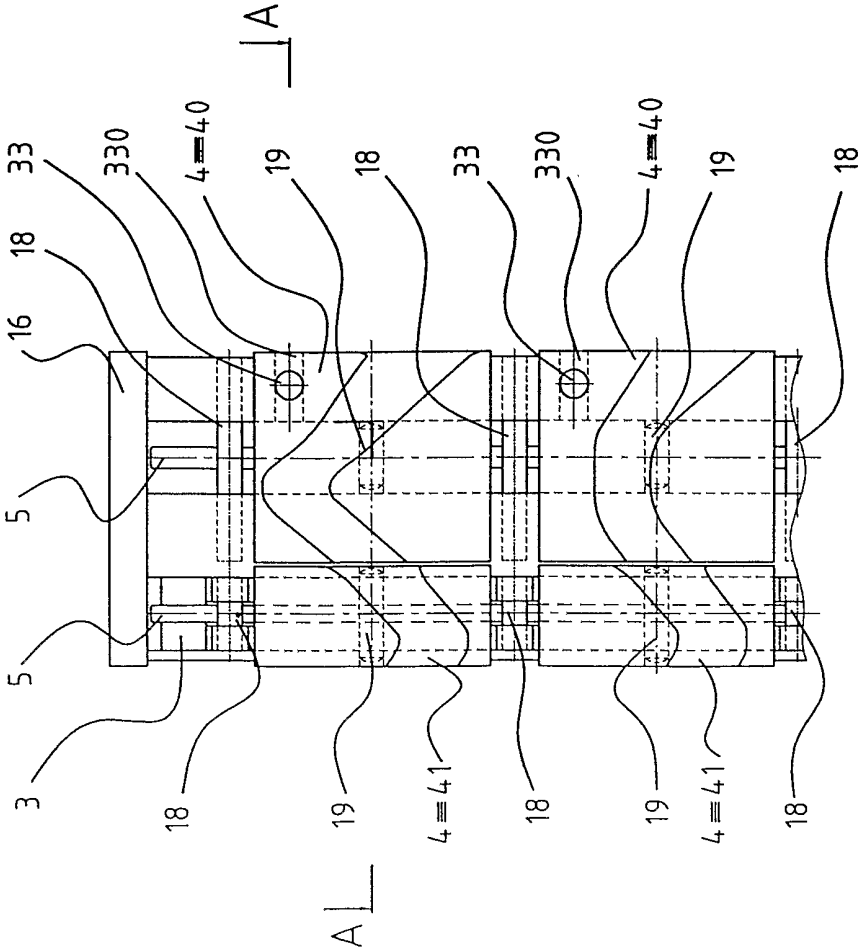
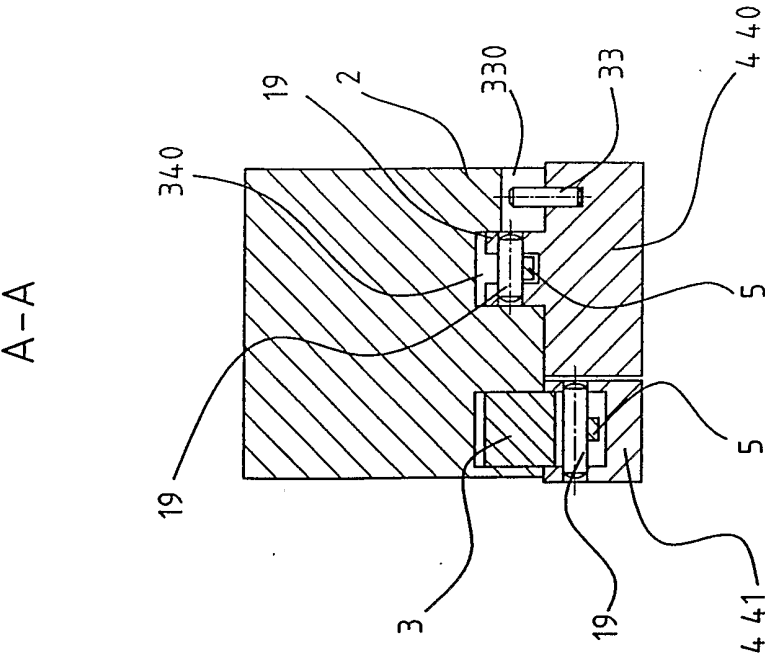


Fig. 8b



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Fig. 9a

B-B

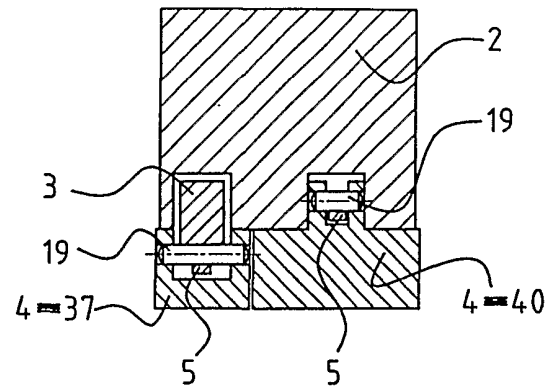


Fig. 9b

A-A

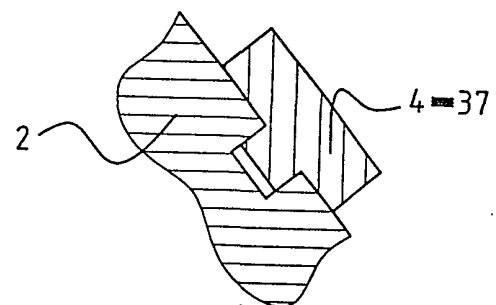


Fig. 9c

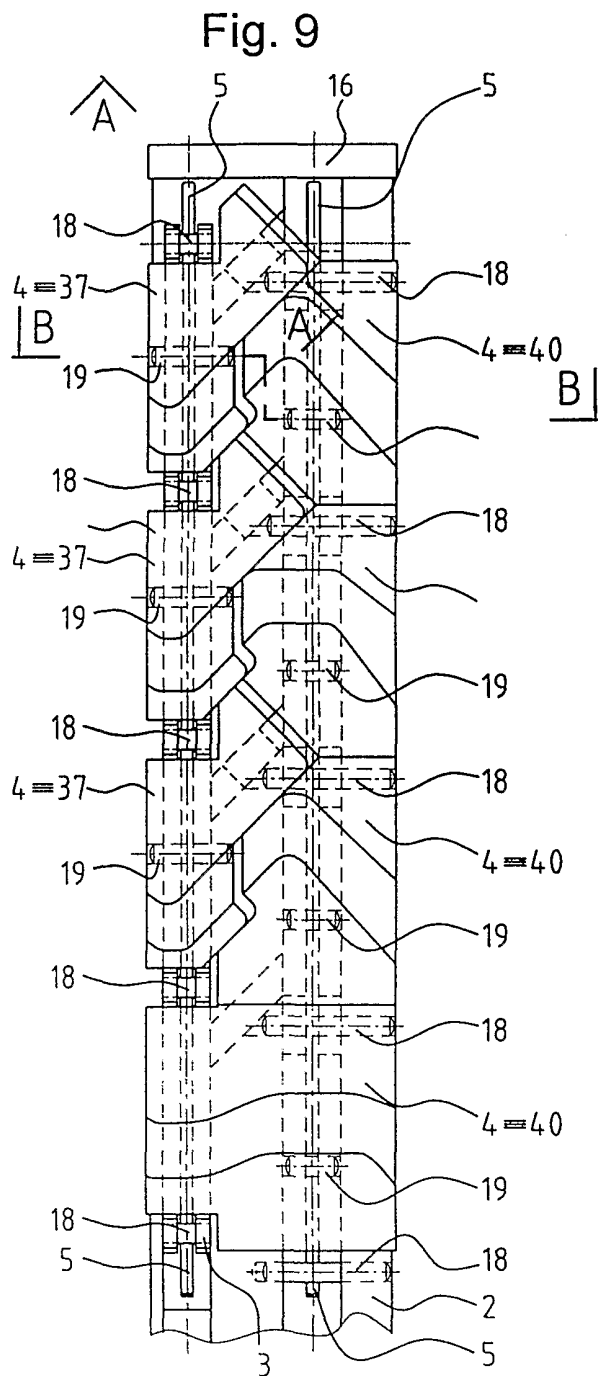
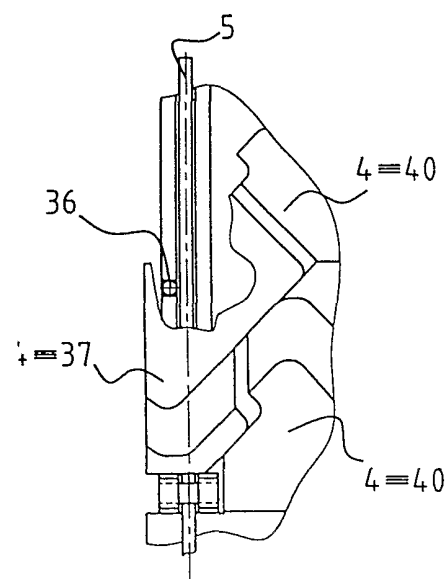


Fig. 10

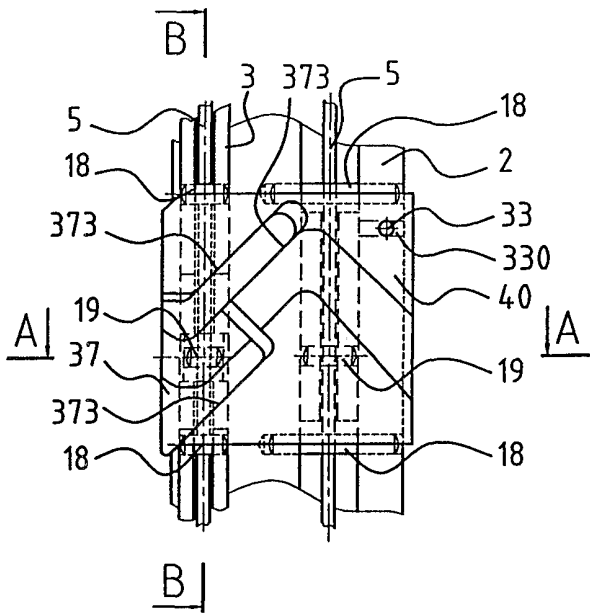


Fig. 10b
B-B

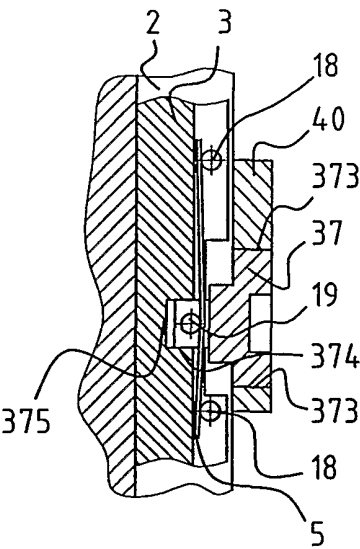


Fig. 10a

A-A

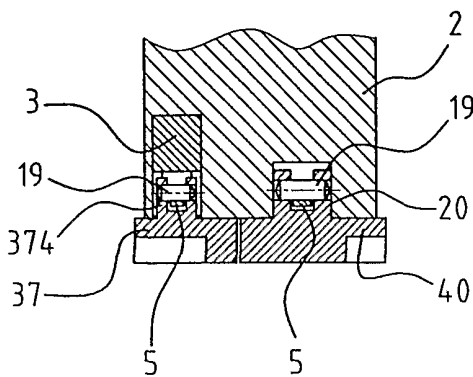


Fig. 11

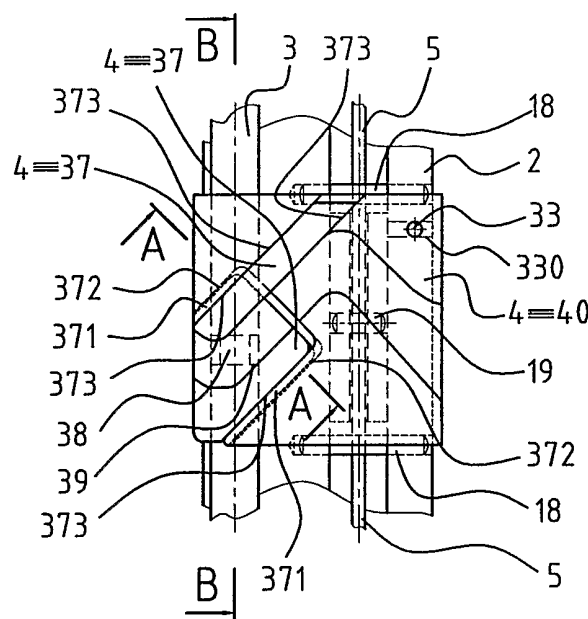


Fig. 11b

B-B

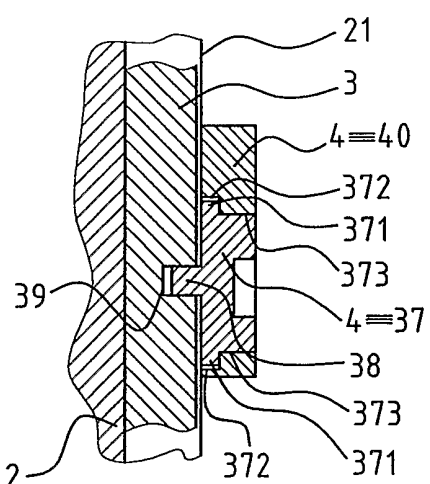
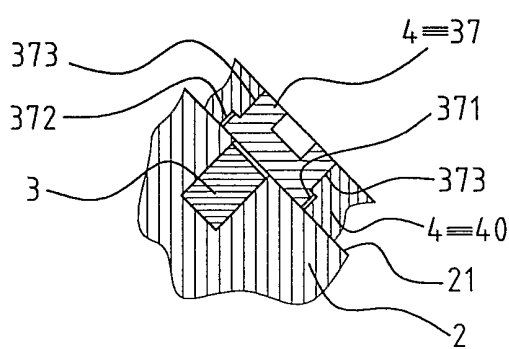


Fig. 11a

A-A



INTERNATIONAL SEARCH REPORT



Application No

PCI/CZ 01/00076

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D04B15/32

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 314 062 A (V U KONCERNOVA UCELOVA ORG ZVS) 3 May 1989 (1989-05-03) cited in the application column 2, line 7 - line 31; figures 1-3 ----	1,2,7,9, 10, 15-17,21
A	GB 2 237 820 A (SIPRA PATENT BETEILIGUNG) 15 May 1991 (1991-05-15) ----	
A	EP 0 348 896 A (V U KONCERNOVA UCELOVA ORG ZVS) 3 January 1990 (1990-01-03) cited in the application ----	
A	DE 22 20 014 A (ELITEX) 14 December 1972 (1972-12-14) -----	

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Patent family members are listed in annex.

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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

16 April 2002

Date of mailing of the international search report

29/04/2002

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Van Gelder, P

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CZ 01/00076

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