

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **81102380.3**

(51) Int. Cl.³: **D 04 B 9/06**

(22) Date of filing: **30.03.81**

(30) Priority: **18.04.80 IT 2150080**

(43) Date of publication of application:
28.10.81 Bulletin 81/43

(84) Designated Contracting States:
DE FR GB

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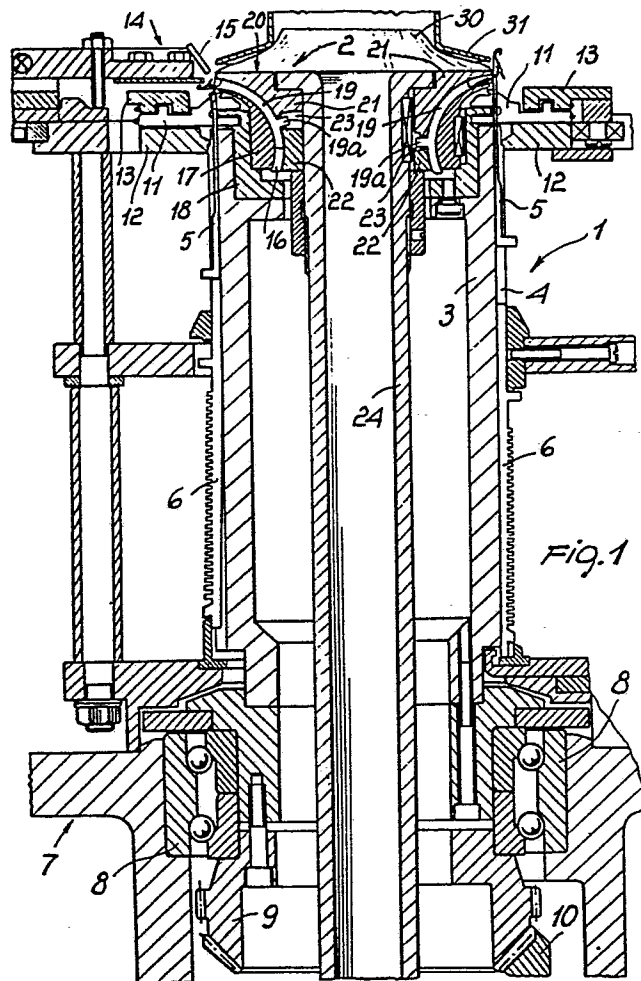
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(54) **Single cylinder circular knitting machine of the type having two needle-carrying structures, for knitting plain and purl stitches.**

(57) In a single cylinder circular knitting machine having two needle beds or needle-carrying structures (1,2), for knitting plain and purl stitches, the upper needle-carrying structure (2) is arranged in the upper inner portion of the needle cylinder (3) and is made rigid therewith. It has needle tricks (16) of arcuate shape for corresponding arcuate needles (19), the center of curvature being located on the cylinder (3) side externally to the upper needle-carrying structure (2). The needles (16) are of the latch type, with the hook and latch being located on the convex side of the respective needles (16). The latter are controlled by means of cams (21,22) located substantially within the needle cylinder (3). In such a machine, the needle dial and related supporting and rotating means are totally absent, and it is possible to provide an equal number of needle tricks (4,16) in both needle-carrying structures (1,2).

EP 0 038 437 A1

COMPLETE DOCUMENT



This invention relates to a single cylinder circular knitting machine of the type having two needle beds or needle-carrying structures, for knitting plain and purl stitches.

5 Conventional knitting machines of this general type are known to have the plain-knitting needles movable vertically in needle tricks in the needle cylinder, the purl-knitting needles being movable radially in needle tricks formed in the needle dial
10 overlying the cylinder. The needle movements are executed through a control means at least in part driven of relative movement with respect to the two needle-carrying structures. With small diameter machines, as employed mainly for hose knitting, the
15 reduced size of the needle dial imposes, however, a reduction on the number of dial needles, which would otherwise end by interfering with one another at the area nearest to the dial center. Accordingly, small diameter knitting machines cannot be implemented
20 for fineness above a certain value.

Another drawback of the machines of the general type in question, but an independent one from their dimensions, is the presence of the needle dial, which prevents the product, specifically a hose or stockings
25 article, from being discharged in an inside-out condition, which is known to better suit the requirements of such finishing steps as the final sewing of the toe ends, and other operations to which a stockings article is normally subjected after it

has been discharged from the machine.

It should be noted that, notwithstanding the radial lay of the dial needles, the height dimension of the structure overlying the cylinder is considerable, on account of the various ancillary members which have to be arranged above the dial, in particular of the cams controlling the dial needles and the dial actuating means. The construction is further complicated by the fact that the whole upper needle-carrying structure must be supported from above.

It has been proposed of overcoming such limitations, albeit unsuccessfully, as detailed herein below. To enable the implementation of small diameter machines with an equal number of needle tricks in both needle-carrying structures, German Patent No. 667,499 proposes of making the dial with needle tricks of arcuate shape, according to a pattern which from a substantially radial direction at the outer edge of the dial is progressively deflected upwardly toward a substantially parallel direction to the machine centerline. In said tricks, there are movably arranged respective needles of arcuate shape which extend substantially through a 90° arc and are controlled by means of rockable jacks and respective horizontal sliders.

The arcuate arrangement of the needle tricks enables the provision in the dial of a greater number of needle tricks than in a conventional dial of the same diameter, since the tricks extend substantially remote from the machine central region. This affords

the possibility of knitting fabrics of great fineness even with small machine diameters. However, the arcuate dimension of the needle tricks increases the height dimension of the machine over machines
5 equipped with conventional dials, while the needle control mechanism is complex and bulky, and increases considerably the difficulty involved in supporting the rotary structure from above. Also, it is not possible to discharge the fabric in an upward
10 direction.

It has also been proposed (German Patent No. 687,914) of making a double cylinder knitting machine in such a manner that the upper needle cylinder has a smaller diameter than the lower needle
15 cylinder and its lower or bottom end is curved outwards, thereby the straight needle tricks in the upper cylinder become arcuate at the bottom portion thereof. The needle tricks accommodate straight needles having an elastic wire-like stem portion each, which
20 adapts itself to the arcuate lay of the respective needle arcuate trick, such that the needles protrude from the upper cylinder in a more or less radial direction.

That machine enables the knitted fabric to be
25 discharged upwardly like in conventional double cylinder machines, and the arcuate configuration of the needle tricks allows the formation of an equal number of tricks in both needle-carrying structures, for the reason set forth hereinabove. However, in
30 addition to the difficult construction of the

elastic shank needles and the vibration to which they are liable upon exiting their respective arcuate tricks, not to mention the wear undergone by the arcuate tricks themselves, a machine of that
5 type has an even greater height dimension, and involves of necessity provisions to support and actuate a more complex, heavy and massive upper rotary structure than a traditional needle dial.

This invention is directed to solve the
10 technical problem of eliminating the aforementioned limitations and disadvantages of dial-equipped single cylinder knitting machines, by providing a single cylinder circular knitting machine having two needle beds or needle-carrying structures,
15 wherein both needle beds or needle-carrying structures can have the same number of needles even with small machine diameters, which machine enables the knitted fabric to be discharged upwardly, that is in an inside-out condition, and comprises a
20 particularly simplified form of support and actuation of the upper needle-carrying structure, with the space requirements of the latter being especially moderate.

According to the invention, the above technical
25 problem is solved, and the invention objects achieved, by a single-cylinder circular knitting machine of the type having two needle beds or needle-carrying structures, for knitting plain and purl stitches,
30 wherein said two structures are arranged

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coaxially one above the other and provided each with needle tricks wherein respective needles are slidably accommodated, the needles in both said structures being controlled through control means at least in part driven of relative motion with respect to said structures and the needles in the upper needle-carrying structure being of arcuate shape and movable in arcuate needle tricks on said upper needle-carrying structure, with said needle tricks extending substantially radially at the outermost edge portion of said upper needle-carrying structure, the knitting machine being characterized in that said upper needle-carrying structure is located inside the top portion of the needle cylinder rigid therewith, in that said arcuately shaped needle tricks have the center of curvature thereof located on the same side as the needle cylinder, the needles in said upper needle-carrying structure being provided with a hook and latch each on the convex side thereof, and in that at the stitch forming area said upper needle-carrying structure is configured to convey the knitted fabric from said stitch forming area to an area located above said upper needle-carrying structure.

A machine so constructed does away with the need for a conventional dial, and the upper needle-carrying structure is an integral part of the needle cylinder, it extending inside the latter and only minimally protruding above it. In addition to the dial, also missing are the supporting means and rotatively driving means therefor, since the upper needle-carrying

structure is here supported and rotated through the needle cylinder. The net result are a considerable simplification of the construction and reduction of the two needle-carrying structure height, as well as
5 an appreciable reduction of costs. To control the arcuate needles, cams supported on the inner portion of the cylinder may be used, such as not to increase the machine overall height beyond the level defined by the two needle-carrying structures.

10 The arcuate configuration of the upper needle-carrying structure enables the implementation, in the upper needle-carrying structure, of the same number of needle tricks as in the lower needle-carrying structure which comprises the needle cylinder, and
15 consequently the production of a knitted fabric of high fineness even with small diameter machines.

Owing to the arcuate needles being held substantially away from the machine center, their related cams are also sufficiently away from the
20 machine central region and pose no problems as regards their configuration and dimensioning.

The knitted fabric, on its way from the stitch formation area toward an area located above the upper needle-carrying structure, is obliged to run
25 externally to said structure, thereby it arranges itself in an inside-out condition. It may be advantageously discharged upwardly, while retaining its inside-out condition, by purposely arranging a conveying tube above the upper needle-carrying structure, wherethrough
30 the knitted fabric may be either vacuum drawn or

driven by other suitable means.

Further features and advantages of the invention will be more readily apparent from the following detailed description of some preferred
5 embodiments thereof, as illustrated by way of example only in the accompanying drawings, where:

Figure 1 is a fragmentary axial sectional view of a first embodiment of the knitting machine according to this invention;

10 Figure 2 is an enlarged detail view of the machine of Figure 1;

Figure 3 is an axial sectional view of the bottom or lower portion of the machine shown in the preceding figures and partly omitted from view in
15 Figure 1;

Figure 4 is an axial sectional view of the top or upper portion of another embodiment of the knitting machine according to this invention; and

Figure 5 is an axial sectional view of the top
20 or upper portion of a further embodiment of this knitting machine.

With initial reference to Figures 1 to 3 of the drawings, a circular knitting machine according to this invention comprises two needle beds or needle-
25 carrying structures, 1 and 2, arranged coaxially above each other. The lower structure 1 comprises a needle cylinder 3, wherein there are formed, in a manner known per se, longitudinal needle tricks 4

accommodating movable latch needles 5, of conventional design, and underlying selecting jacks 6, also of conventional design. The latter can be selected through selecting devices, not shown, which may be in the form of traditional selection drums.

The needle cylinder 3 is carried rotatably by a stationary portion 7 of the machine main frame through bearings 8, and is rotatively driven, in a conventional manner, through a pair of bevel gear wheels 9,10. All around the cylinder 3, at the top portion thereof, there are arranged sinkers 11, of conventional design, which are slidably received in a rotary supporting ring 12 and controlled by a fixed ring 13, the whole assembly being in accordance with well known conventional practices.

The reference numeral 14 designates a yarn feed unit comprising a plurality of yarn feeding fingers 15, e.g. as disclosed in Italian Utility Model. Application No. 21362 B/80 by this same Applicant. The machine is also equipped with control means for the needles 5 and jacks 6, such means comprising conventional cams, not shown herein in any detail because known per se.

According to this invention, the upper needle-carrying structure 2 is arranged in the top inside portion of the cylinder 3 and is rigid therewith, it having needle tricks 16 of arcuate shape with their curvature center located on the same side as the cylinder 3. More specifically, the upper needle-

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carrying structure 2 includes an annular supporting body 17, substantially configured like the top portion of a wineglass and being carried on the cylinder 3 with the interposition of a substantially hollow cylindrical body 18 such that it is rigid for rotation with the cylinder 3 and no gaps are left between the supporting body 17 and cylinder 3. The supporting body 17 and cylindrical body 18 are so configured as not to interfere with the conventional path of movement of the sinkers 11.

The needle tricks 16, which are formed in the top inside portion of the body 17, advantageously extend through an arc of approximately 90 degrees and have their topmost outer portions substantially tangent to a horizontal plane. They accommodate in sliding relationship respective needles 19 of arcuate shape, the radius of curvature of such needles being substantially the same as that of the needle tricks 16. The needles 19, which are of the latch type, have their hooks and latches arranged on the convex side and extend approximately over an arc corresponding to one quarter of a circle. The tricks 16, moreover, are slightly offset angularly with respect to the tricks 4 of the cylinder 3, thereby the needles 5 and 19 cannot interfere with each other in their movements.

Upon the supporting body 17, there is arranged a guiding body 20 the outer peripheral extension whereof matches the upper and internal peripheral extension of the supporting body 17, said guiding

body having its top peripheral edge rounded off for guiding the fabric being knitted upwardly, as will be explained hereinafter. The guiding body 20 and supporting body 17 have each a maximum diameter
5 dimension, as measured respectively above the tricks 16 and at the tricks 16, which is slightly smaller than twice the bottom radius of the tricks 4 on the cylinder 3. In other words, they cannot hinder the raising of the cylinder needles 5 and do leave a
10 gap between them and the raised needles 5 (see right-hand needle 5 in Figure 1).

In the embodiment of Figures 1 to 3, the needles 19 are each provided with a control butt 19a, and the guiding body 20 is configured to present cams
15 21, 22 for controlling the needles 19. More specifically, the cams 21, 22 define, in the guiding body 20, a passageway 23 for the butts 19a of the needles 19. The cams 21, 22, which may be construction-wise similar (excepting for their geometrical profile)
20 to the cams which control the sinkers of a double cylinder machine, have a circumferential extension at the passageway 23 which causes the needles 19 to move along an arc of a circle between two limit positions, namely a yarn pick-up position whereat
25 the hooks and latches of the needles 19 are moved out of the supporting body 17, as shown for the left-hand needle 19 in Figures 1 and 2, and a stitch forming position whereat the hooks and latches of the needles 19 fall within the peripheral contour
30 of the supporting body 17, as shown for the right-

hand needle 19 in Figures 1 and 2. In actual practice, the movement of the active or working ends of the needles 19 outwards of the supporting body 17 will occur in a substantially horizontal
5 direction.

The cams 21,22 are arranged substantially inside the needle cylinder 3 and are carried by a non-pivotable tubular element 24 which extends throughout the cylinder 3 and protrudes out of the
10 latter downwardly at the bevel gear pair 9,10 (Figure 3). Advantageously, it is carried on one end of a lever 25 which extends substantially radially to the cylinder 3 and is journalled with an intermediate point, as at 26, to the stationary
15 portion 7 of the machine. The other end of the lever 25 carries in an adjustable manner, such as by thread engagement, a pin 27, which is locked in place by a nut 28 and abuts against said stationary
20 portion 7 by virtue of the weight of the tubular element 24. Thus, by threading the pin 27 in and out of the lever 25 by suitable amounts, it becomes possible to adjust the tubular element 24 in an axial direction relatively to the supporting body 17 which carries the needles 19. Advantageously, a
25 sleeve 29, attached externally to the tubular element 24, may facilitate the supporting of the cams 21,22.

As will be apparent from the drawings, the needle tricks 16 only extend radially for a short
30 distance, at the top portion thereof, to progressive-

ly acquire a parallel lay to the machine axis of rotation. The short radial extension of the tricks 16 enables the implementation, without any problems, of a number of needle tricks 16 equal to the number of needle tricks 4 on the needle cylinder 3, even with small machine diameters. This not only affords a considerable improvement in the machine fineness over a conventional machine of the same diameter, but also greater stitch variety capabilities, by virtue of the possible selection of the active or working needles of the upper needle-carrying structure among a larger number of needles.

To knit the fabric, the needles 5 and 19 are controlled to complete with their active ends substantially usual movements for a single cylinder knitting machine. However, the knitwork 30, as it is being knitted, is not brought toward the inside of the machine, where no sufficient room is left between the two needle-carrying structures 1 and 2, but rather, thanks to the configuration of the upper needle-carrying structure 2 at the stitch formation area, conveyed outwardly and upwardly, initially around the outer edge of the guiding body 20, and then, being favored by its own tendency to shrink, toward the machine center, at an area overlying the upper needle-carrying structure 2. Of course, it would also be possible to provide mechanical or pneumatic auxiliary means for conveying the knitwork which are adapted to favor the initial phase of movement of the knitwork or fabric 30 along

the outer surface of the top end of the guiding body 20.

Advantageously, above the upper needle-carrying structure 2 and coaxially thereto, there is provided a guiding tube 31 which is formed with a widening out bottom end and is arranged to leave a gap between the latter end and the top of the upper structure 2, in order to allow the knitwork 30 to pass therethrough. The guiding tube 31 may be fixed or rotatable, and may be put in communication with a vacuum source in order to favor the stretching of the fabric and a regular forward movement thereof as it is being knitted. It is not strictly necessary that the tube 31 should extend over a height span equal to the length of the fabric being knitted, but may be substantially shorter, since the fabric or knitwork 30 is allowed to enter at once the vacuum duct connected to the guiding tube 31. Of course, in the guiding tube 31, there may be operated mechanical drawing means of the same type as employed in double cylinder machines. It should be noted that the knitwork 30 moves along the tube 31 in an inside-out condition.

Owing to the knitwork 30 being drawn or pulled upwards directly upon its being knitted, it may be advisable to raise the needles 5 of the cylinder 3 more than in a traditional machine, such as to ensure that the loops just formed are brought under the latches of the respective needles 5 as the latter are raised to again pick up the yarn. The

reduced outside diameter, as explained hereinabove,
of the top end of the guiding body 20 allows the
fabric 30 to arrange itself between the edge of
the guiding body 20 and the shanks of the needles
5 5 in the cylinder 3, thus ensuring a correct
formation of the stitches.

In the embodiment illustrated in Figure 4,
wherein equal elements to those of the preceding
figures have been designated with the same reference
10 numerals, and equivalent elements have been
denoted with the same numerals but primed ('), the
needles 19' are butt-less and controlled by
respective selecting jacks 32 which are slidable
inside the cylinder 3' parallel to the axis thereof,
15 in straight needle tricks 33 formed in the inside
surface of a hollow cylindrical element 34, attached
to the inside surface of the cylinder 3'.

The needles 19' are connected to the jacks 32
through a swivel type of connection, in particular
20 a hooked connection, the needles 19' being provided
with a bottom end 19'b bent outwardly to a hook,
that is bent to form a hook on the concave side
thereof, and the jacks 32 with a hooked top end 32a,
facing inwardly. The hooked ends 19'b and 32a are
25 so designed as to enable the needles 19' to be
either pulled and pushed by the jacks 32.

Furthermore, the jacks 32 are each provided
with at least one butt 35 adapted to follow control
cams 21', 22' arranged within the cylinder 3' and
30 being supported by the tubular element 24. The

circumferential extension of these cams substantially corresponds to that of the dial cams of an equivalent machine. At 36,37, there are indicated the two parts of the guiding body 20',

5 the outer peripheral contour whereof, as viewed in section, follows the path of movement of the needles 19'. The guiding body 20' is rigid with the tubular element 24. The supporting body 17' is instead rigid with a hollow cylindrical body 18', the

10 inside diameter whereof corresponds substantially to that of the cylinder 3'. This embodiment of the invention has the advantage of a more simple construction of the cams controlling the needles in the upper needle-carrying structure.

15 In the embodiment of Figure 5, wherein for equal elements to those of the preceding figures use has been made of the same reference numerals, and for equivalent elements, the same reference numerals have been double primed ("), the needles

20 19" are again butt-less and controlled by respective selecting jacks 32", which are vertically slidable in straight needle tricks 33" formed in the inside surface of the cylinder 3". The connection between the needles 19" and respective jacks 32"

25 is again of the swivel or articulated type, the needles 19" having a protruding hooked bottom end 19"b, and the jacks 32" having a bifurcated top end 32"a for push-pull engagement with the needles 19".

30 The jacks 32" are provided with a butt 35 each, said butt being operative to follow control cams

21", 22" located inside the cylinder 3" and being supported on the tubular element 24 with the interposition of a sleeve element 38. The circumferential extension of the cams 21", 22" is identical to that of the cams 21', 22'. The cylindrical body 18", which intervenes between the cylinder 3" and supporting body 17', is fitted onto the cylinder 3" and has here a shorter axial length, as due to the presence of the needle tricks 33". This embodiment has the advantage of allowing the implementation of cams 21", 22" with a more gentle slope, since the cams are arranged along a circumference extending farther from the machine axis than in the embodiment of Figure 4, actually along a circumference of slightly smaller diameter than the inside diameter of the cylinder 3".

It will be appreciated from the foregoing description that a machine according to the invention is much more simple and economical than a conventional needle cylinder and dial machine, it being destitute of any dial and respective supporting and actuating means, thanks to the two needle-carrying structures being arranged to form a single unit. It also allows the achievement of advantages which are typical of double cylinder knitting machines, without involving the complexity and cost of the latter.

The invention as described is susceptible to many modifications and variations, without departing from the purview of the instant inventive concept.

Thus, as an example, the machine may be provided with a stationary needle cylinder and rotating cams. Instead of the hooked connection between the arcuate needles and respective jacks, a pin and slot system could be employed. The top peripheral portion of the guiding body 20, respectively 20', could be arranged to rotate together with the knitted fabric. Obviously, the knitwork 30 could be drawn, after the initial phase, into the tubular element 24 (should the dimensions of the latter allow it) and be then discharged upwardly. The tubular element 24 could also be closed at the center thereof to favor the drawing of the knitwork around the edge of the guiding body 20, respectively 20'. It is to be understood that the machine described hereinabove need not be provided of necessity with an equal number of needle tricks in both needle-carrying structures 1 and 2, and the upper structure 2 may include, for instance, tricks in one half the number of tricks in the lower structure 1. The machine described may, of course, have a diameter of the same order of magnitude of conventional large diameter knitting machines.

CLAIMS

1 1. A single-cylinder circular knitting
2 machine of the type having two needle beds or
3 needle-carrying structures, for knitting
4 plain and purl stitches , wherein said two
5 structures (1,2) are arranged coaxially one above
6 the other and provided each with needle tricks (4;
7 16,16') wherein respective needles (5;19,19',19")
8 are slidably accommodated, the needles (5;19,19',19")
9 in both said structures being controlled through
10 control means (6;21,22;21',22';21",22") at least
11 in part driven of relative motion with respect to
12 said structures (1,2) and the needles (19,19',19")
13 in the upper needle-carrying structure (2) being of
14 arcuate shape and movable in arcuate needle tricks
15 (16,16') on said upper needle-carrying structure,
16 with said needle tricks (16,16') extending
17 substantially radially at the outermost edge
18 portion of said upper needle-carrying
19 structure (2), characterized in that said
20 upper needle-carrying structure (2) is located
21 inside the top portion of the needle cylinder (3,3',
22 3") rigid therewith, in that said arcuately shaped
23 needle tricks (16,16') have the center of curvature
24 thereof located on the same side as the needle
25 cylinder (3,3',3"), the needles (19,19',19") in said
26 upper needle-carrying structure (2) being provided
27 with a hook and latch each on the convex side thereof,
28 and in that at the stitch forming area said upper
29 needle-carrying structure (2) is configured

30 to convey the knitted fabric (30) from said stitch
31 forming area to an area located above said upper
32 needle-carrying structure (2).

1 2. A circular knitting machine according to
2 Claim 1, characterized in that said needle tricks
3 (16,16') in said upper needle-carrying structure (2)
4 extend at the top extremity thereof substantially
5 tangent to a horizontal plane.

1 3. A circular knitting machine according to
2 either Claim 1 or 2, characterized in that said
3 upper needle-carrying structure (2) comprises a
4 supporting body (17,17') configured to substantially
5 match the shape of a wineglass bowl and being
6 provided with said needle tricks (16,16') of arcuate
7 shape, said supporting body (17,17') being supported
8 by the needle cylinder (3,3',3'') without any gap
9 therebetween, and a guiding body (20,20') located
10 above said supporting body (17,17') and having a
11 rounded top peripheral edge for guiding the knitwork
12 (30) being knitted upwardly, said supporting body
13 (17,17') and said guiding body (20,20') having each
14 a maximum diameter dimension selected not to hinder
15 the movement of said needles (5) in said cylinder
16 (3,3',3'').

1 4. A circular knitting machine according to one
2 or more of the preceding claims, wherein said needles
3 (19,19',19'') of arcuate shape in said upper needle-
4 carrying structure (2) are controlled by means of
5 control cams (21,22;21',22';21'',22''), characterized
6 in that said control cams (21,22;21',22';21'',22'') are

7 arranged substantially inside said needle cylinder
8 (3,3',3").

1 5. A circular knitting machine according to
2 Claims 3 and 4, characterized in that said guiding
3 body (20,20') and said control cams (21,22;21',22';
4 21'',22'') are supported by a tubular element (24)
5 extending axially through said needle cylinder (3,3',
6 3'') and protruding downwardly outward therefrom,
7 said tubular element (24) being carried by a portion
8 (7) of the machine stationary frame.

1 6. A circular knitting machine according to
2 Claim 5, characterized in that said tubular element
3 (24) can be displaced axially within said needle
4 cylinder (3,3',3").

1 7. A circular knitting machine according to
2 one or more of the preceding claims, characterized
3 in that above said upper needle-carrying structure
4 (2) there is arranged a fixed or rotatable guiding
5 tube (31) for conveying the knitwork (30) upwardly.

1 8. A circular knitting machine according to
2 Claim 7, characterized in that said guiding tube (31)
3 has a widening out bottom end, and is positioned to
4 leave a gap between said end and the top of said
5 upper needle-carrying structure (2).

1 9. A circular knitting machine according to
2 Claim 4 and one or more of Claims 1 to 3 and 5 to 8,
3 characterized in that said needles (19',19'') of
4 arcuate shape are controlled by respective selecting
5 jacks (32,32'') arranged to be movable inside said
6 needle cylinder (3',3'') parallel to the axis thereof

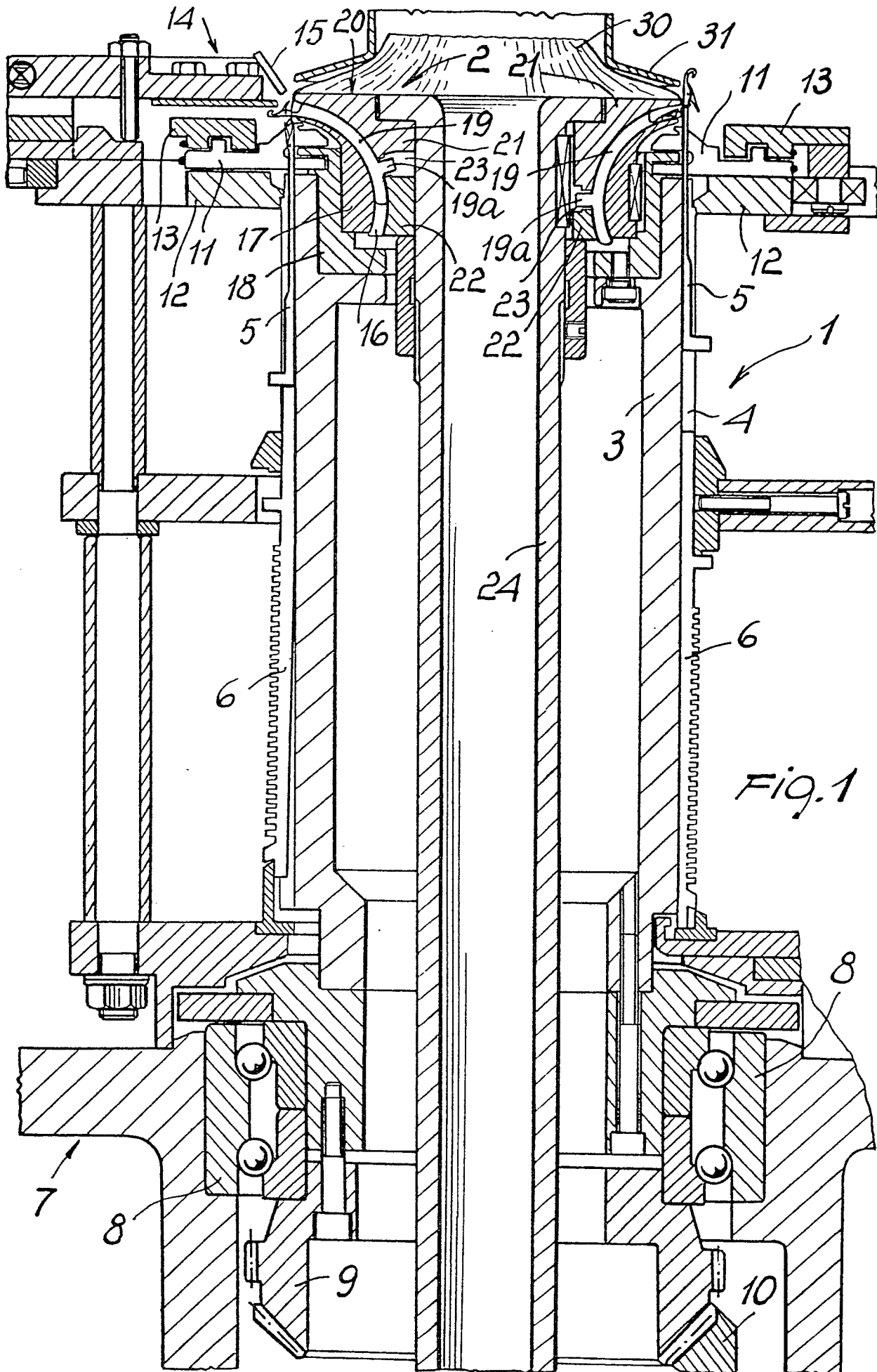
7 and provided each with at least one control butt
8 (35) adapted for engagement with said control cams
9 (21',22';21",22").

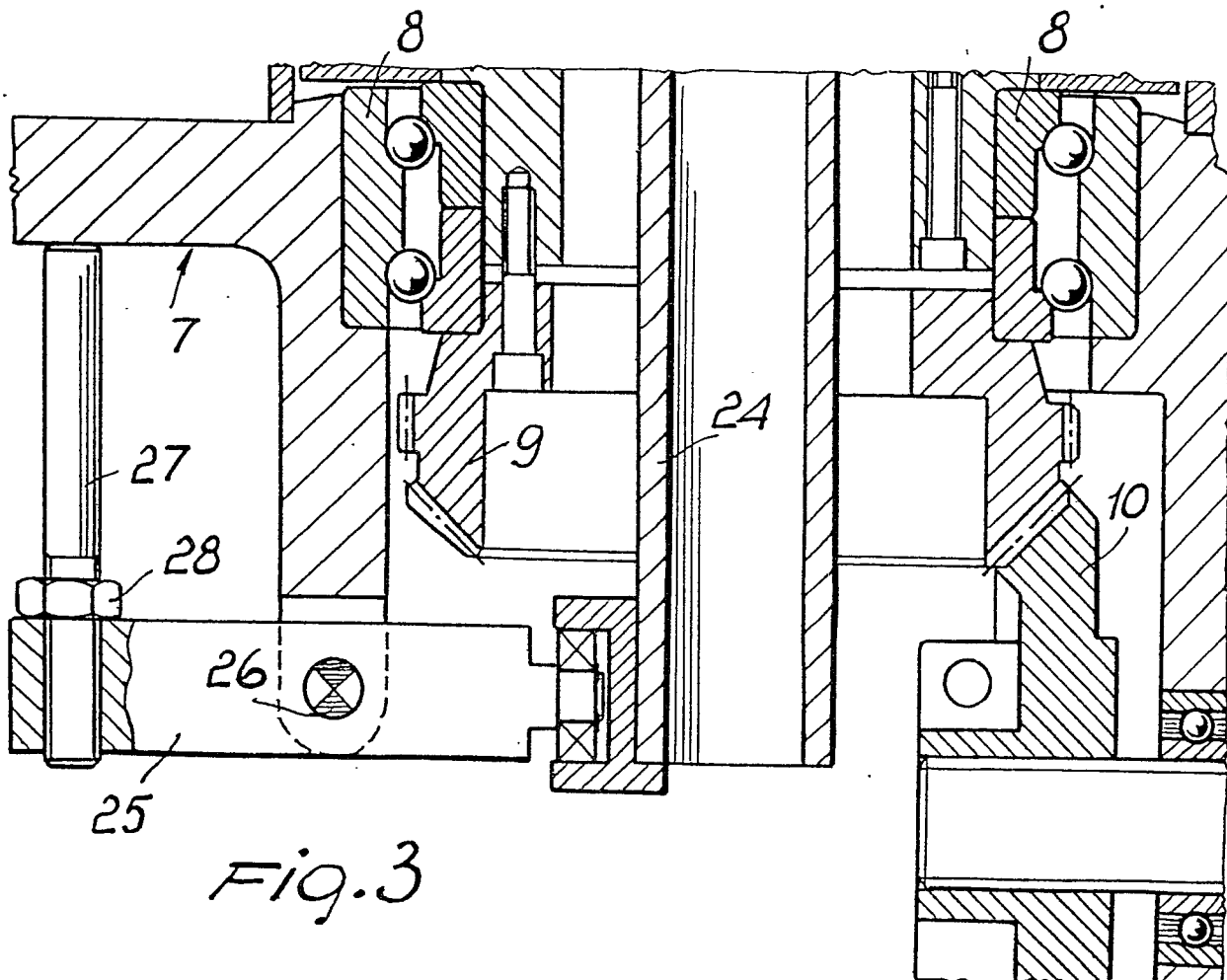
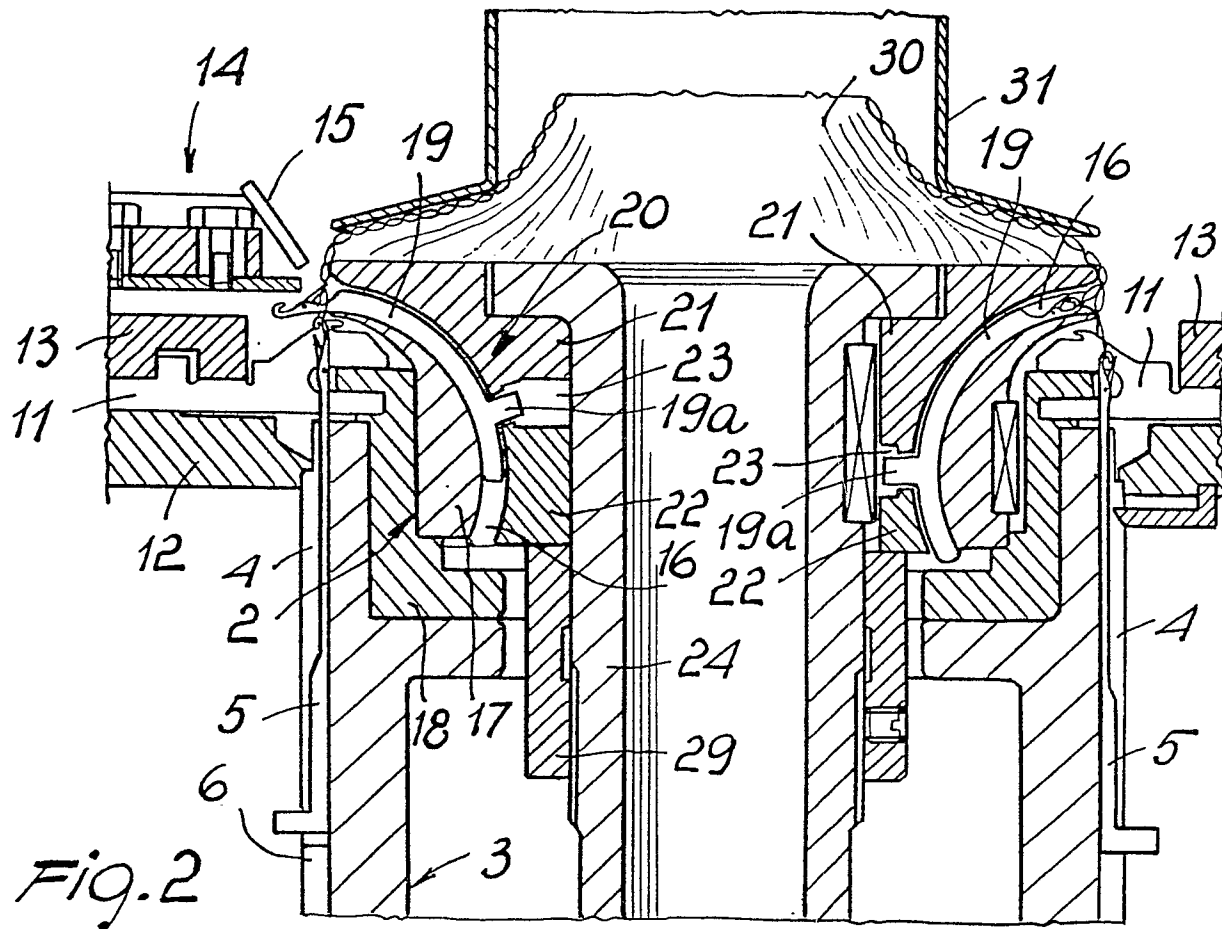
1 10. A circular knitting machine according to
2 Claim 9, characterized in that said selecting jacks
3 (32) are slidable in straight tricks (33) formed on
4 the inside surface of a hollow cylindrical element
5 (34) carried on said needle cylinder (3') internally
6 thereto.

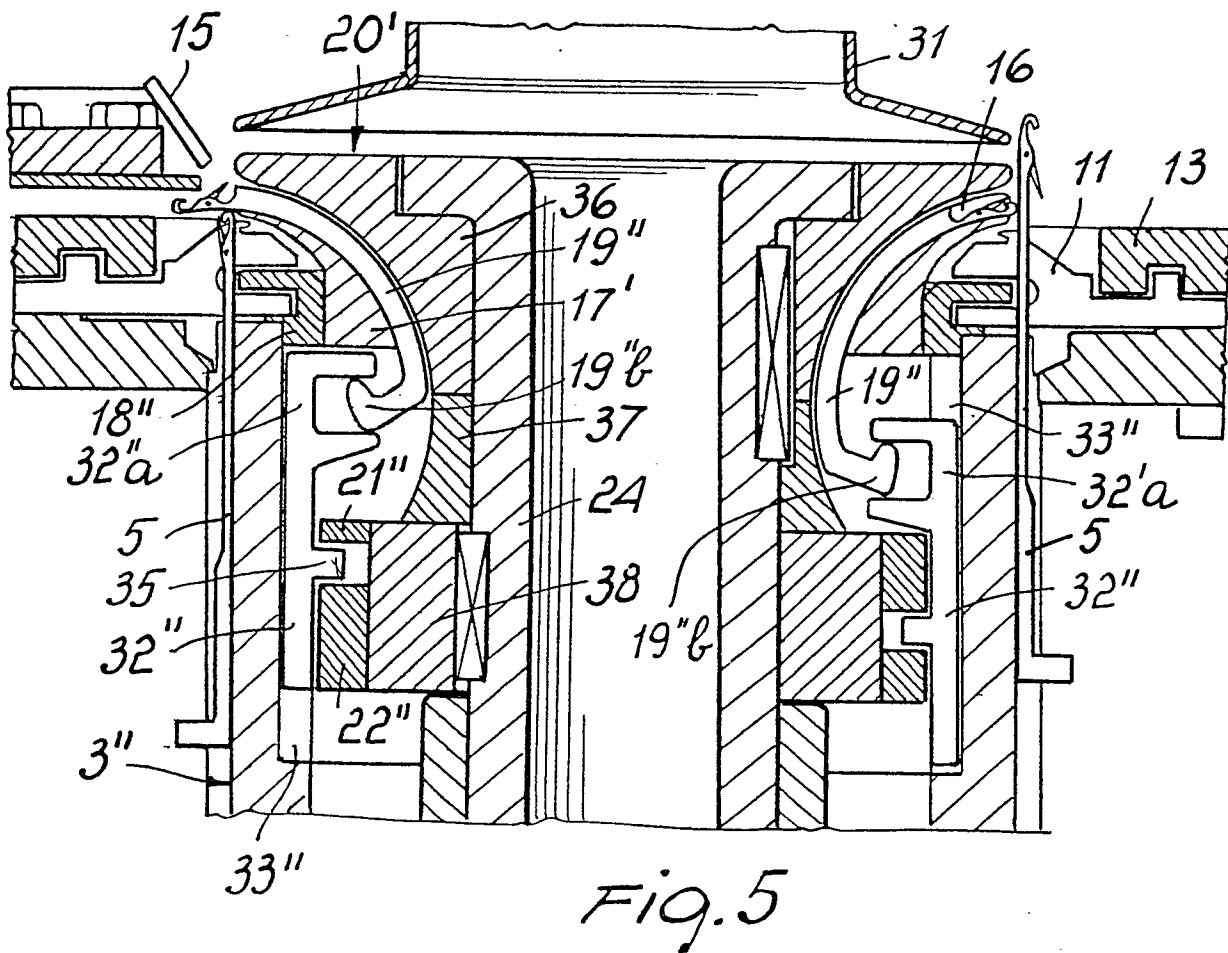
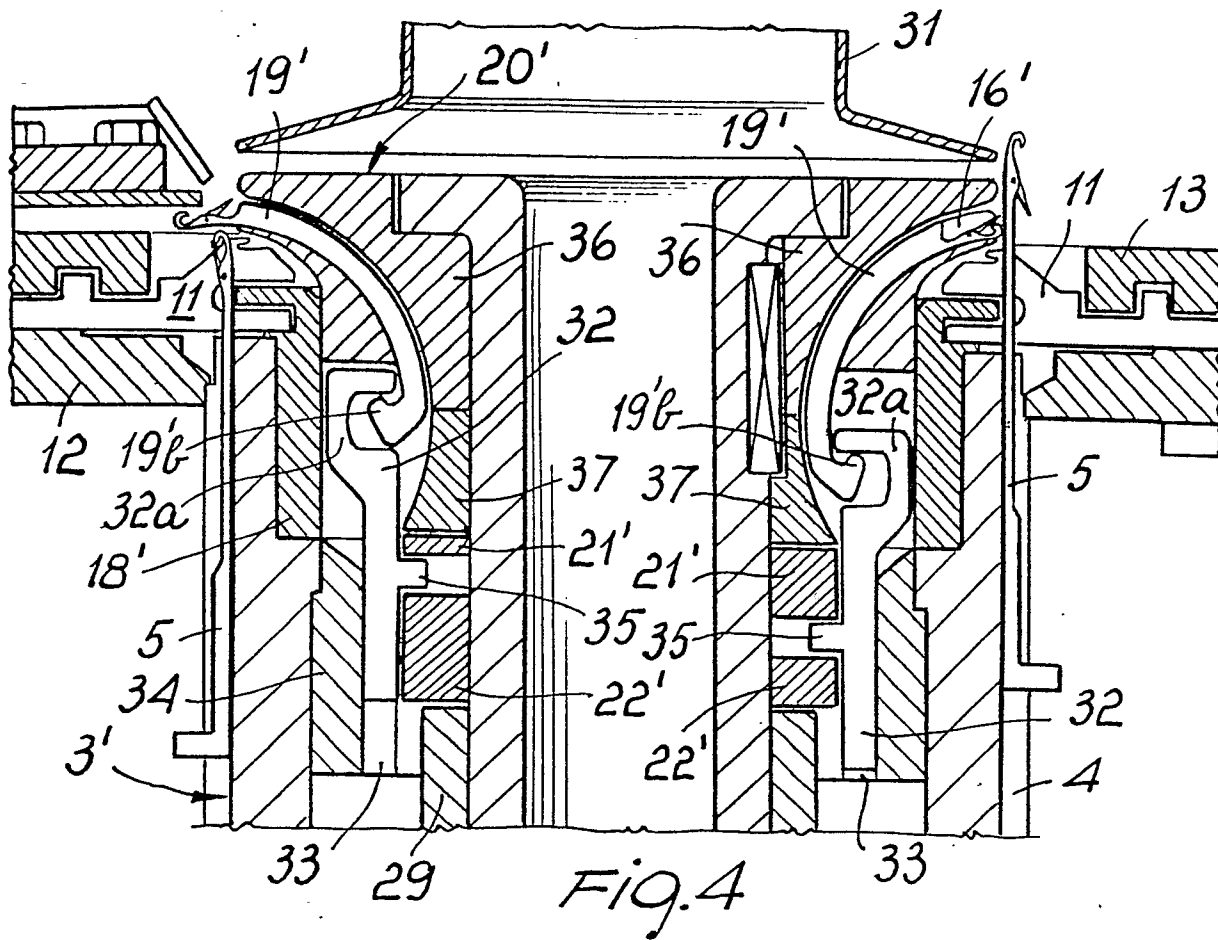
1 11. A circular knitting machine according to
2 Claim 9, characterized in that said selecting jacks
3 (32") are slidable in straight tricks (33") formed
4 on the inside surface of said needle cylinder (3").

1 12. A circular knitting machine according to
2 Claim 9, characterized in that said control cams (21',
3 22';21",22") for controlling said selecting jacks
4 (32,32") are arranged along circumferences having
5 a slightly smaller diameter than the inside diameter
6 of said needle cylinder (3',3").

1 13. A circular knitting machine according to
2 one or more of the preceding claims, characterized
3 in that said needle-carrying structures (1,2) have
4 the same number of tricks (4;16,16'), the tricks in
5 one structure being slightly offset angularly with
6 respect to the tricks in the other of said structures.









DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>GB - A - 111 402</u> (SPIERS) * Page 3, lines 17-22; figure 2 * --	1	D 04 B 9/06
A	<u>GB - A - 109 942</u> (FRANCK) * Claim 1; figure 1 * --	1	
A	<u>DE - C - 918 287</u> (LENKEIT) * The whole document * --	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
A	<u>DE - A - 2 613 179</u> (MAISEL) * Page 5, lines 1-8; figure * -----	1	D 04 B
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	27-07-1981	V. GELDER	