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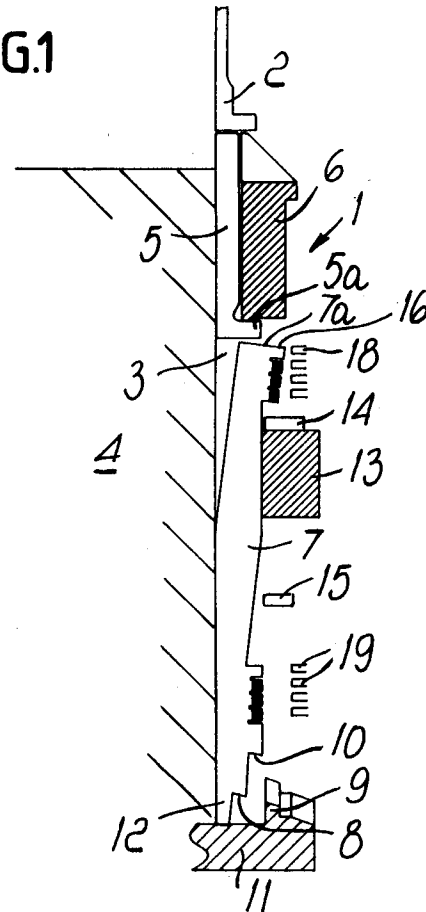
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54 **Improved needle selector in circular knitting machine for manufacturing mens' socks or the like.**

57 The improved needle selector (1) in a circular knitting machine has an oscillating arm (7) which is arranged on the same plane as a needle (2) and has a top (7a) that abuts from below against a sub-needle (5). The arm (7) has, at its base, two heels (8,10) at different levels for engaging a lifting cam profile (9). The arm (7) is selectively movable to a lateral position, in which the heels (8,10) at different levels do not interfere with the lifting cam profile (9), or to two positions in which one of the two heels (8,10) interferes with the profile (9), a low position, a casting-off position, and a holding position of the needle (2) being obtained respectively in these positions of the arm (7).

**FIG.1**



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The present invention relates to an improved needle selector in circular knitting machine for manufacturing mens' socks or the like.

Circular knitting machines for manufacturing mens' socks or the like are known which have a needle cylinder that has a usually vertical axis and is affected by multiple peripheral longitudinal millings or grooves in which respective needles are mounted so as to slide vertically.

The needles rest, in a downward region, on the top of a respective sub-needle which is also vertically movable and can be actuated to move downwardly by a cam profile. In order to modify the characteristics of the product being knitted, certain needles must be actuated upwardly with respect to a low needle position at each turn for a short extent, in order to place the needle so that it holds the stitch, or for a longer extent, in order to place the needle so that it casts off the stitch. Knitting machines are currently set up so that the needles that must hold or cast off must be set and selected beforehand, since it is not usually possible to actuate the same needle sometimes with a short vertical movement and sometimes with a long vertical movement. Some machines that allow this selection have two selection units which are arranged in parallel and are therefore rather bulky and heavy and accordingly do not allow high speeds of operation.

Known selectors are constituted by an oscillating arm which is arranged on the same plane as the needle; its top is meant to abut from below against the sub-needle, and its lower end is selectively arranged in either a lateral position, in which it does not interfere with a lifting cam profile, or in a position in which it interferes with said profile: the length of the arm and the profile of the cam determine the possible vertical movement of the needle, which is fixed: either long or short.

As a consequence, in known machines it is necessary to replace some oscillating arms which have a certain length with others that have a different length in order to change the selection; this makes it rather difficult to modify the needle selection, and it is furthermore impossible to modify the characteristics of the product during knitting.

A principal aim of the present invention is to obviate the described drawbacks of known devices, by providing an improved needle selector in a circular knitting machine for manufacturing mens' socks or the like that allows to freely select the needles which are meant to pass low, retain a stitch, or cast off a stitch according to requirements, without requiring replacement of any components.

An object of the present invention is to provide an improved needle selector in a circular knitting machine for manufacturing mens' socks or the like

that has limited bulk and weight so that it can have a high operating speed.

Another object of the present invention is to achieve the above aim and objects with a structure that is simple, relatively easy to execute in practice, safe in use, effective in operation, and has a relatively low cost.

With the foregoing aim and objects in view, the present invention provides an improved needle selector in a circular knitting machine for manufacturing mens' socks or the like, of the type comprising an oscillating arm which is arranged on the same plane as the needle and has a top that is meant to abut from below against the sub-needle, characterized in that said arm has, at its base, two heels at different levels which are suitable to engage a lifting cam profile, and in that said arm is suitable to selectively move to a lateral position, in which the heels at different levels do not interfere with said lifting cam profile, or to two positions in which one of said heels interferes with said profile; the low position, the casting-off position, and the holding position of the needle being obtained respectively in said positions of the arm.

Further characteristics and advantages of the present invention will become apparent and evident from the following detailed description of a preferred but not exclusive embodiment of an improved needle selector in a circular knitting machine for manufacturing men's socks or the like according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a schematic sectional side view, taken along a vertical plane, of a selector with the corresponding needle mounted in a cylinder; figures 2 and 3 are side views, similar to the view of figure 1, with the selector in different configurations.

With particular reference to the above figures, the reference numeral 1 generally designates an improved selector for needles 2 in a circular knitting machine for manufacturing men's socks or the like according to the invention.

The selectors and the needles are mounted in a known manner at respective longitudinal millings or grooves 3 which are distributed along the lateral surface of the cylinder 4: a respective sub-needle 5 is arranged below the needle and protrudes towards the outside of the cylinder with a lateral tab 5a that is suitable to be lowered by the lower profile of an annular cam 6.

The selectors are of the type constituted by an arm 7 that oscillates about a horizontal axis; the width of said arm decreases starting from its center towards its two ends, and the arm is arranged in the same plane as the needle; the top 7a of the arm 7 is meant to abut from below against the sub-

needle.

The heel 8 of the arm is adapted to be arranged selectively in a lateral position, in which it does not interfere with a profile of a lifting cam 9, or in a position in which it interferes with said

The oscillating arm 7 has a second heel 10 at a different level and is suitable to assume an intermediate position, shown in figure 2, in which the second heel is arranged in a position in which it interferes with the profile of the cam 9.

The profile of the cam 9 rises from a ring 11 on the upper surface whereof the lower end 12 of the arm rests.

Depending on whether the lower end of the arm is arranged to not interfere with the cam or to interfere by means of the second heel 10 or to interfere with the cam by means of the heel 8, the needle remains in the low position or, when it travels over the cam profile, moves to a holding position or finally to a casting-off position.

In the figures, the reference numeral 13 schematically designates the ring that guides and retains the selectors: reset levers, respectively 14 and 15, are present above and below the ring 13 and constitute means for returning the selectors to the intermediate condition shown in figure 2.

The arm 7 has two selection teeth 16 and 17 on its outer side in an upper position and in a lower position; said teeth can also be provided in series of positions shown in the figures (and referenced by the letters a, b, c, and d) and are suitable to be actuated by respective selection levers 18 and 19 which are mounted as shown in the figures (referenced by the letters a, b, c, and d); it is necessary to distribute the teeth and the levers at various levels due to their bulk, which prevents their arrangement at a single level: in the figures, the teeth in the positions "a" have been left white and the other positions that the teeth can assume have been colored black.

The operation of the selector according to the invention is evident: in the inactive condition, the arm is arranged as shown in figure 2; the arm is moved into this position by the reset levers 14 and 15, and in this position the interference of the cam with the heel 10 moves the needle so that it holds the stitch; starting from this configuration, if the lever 18 is actuated, the heel 8 is moved, figure 3, vertically above the cam profile 9 that raises the needle to the casting-off position; starting from the position shown in figure 2, if the lever 19 is actuated, the heel 8 and the second heel 10 move into a configuration in which they do not interfere with the profile of the cam (figure 1) and the needle remains in the low position.

It has thus been observed that the invention achieves the intended aim and objects, and in

particular that it allows to instantly select, at will, which needles must remain low, which needles must hold the stitch and which needles must cast off, without requiring complicated, bulky, or heavy equipment so as to allow a high operating speed.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

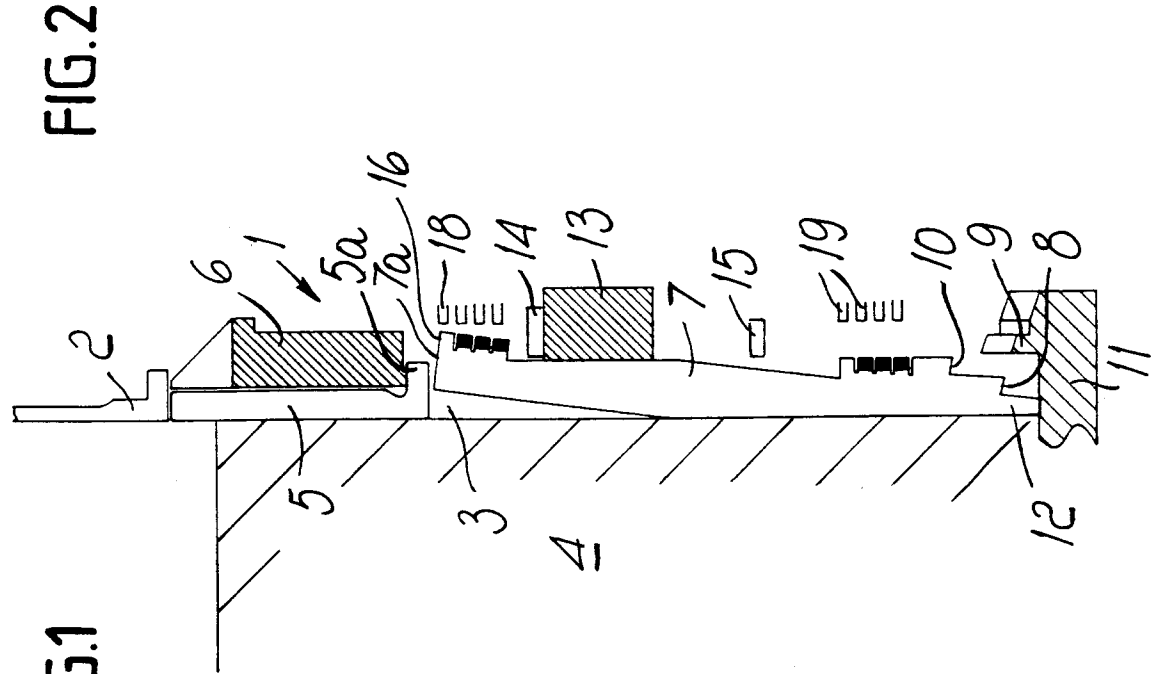
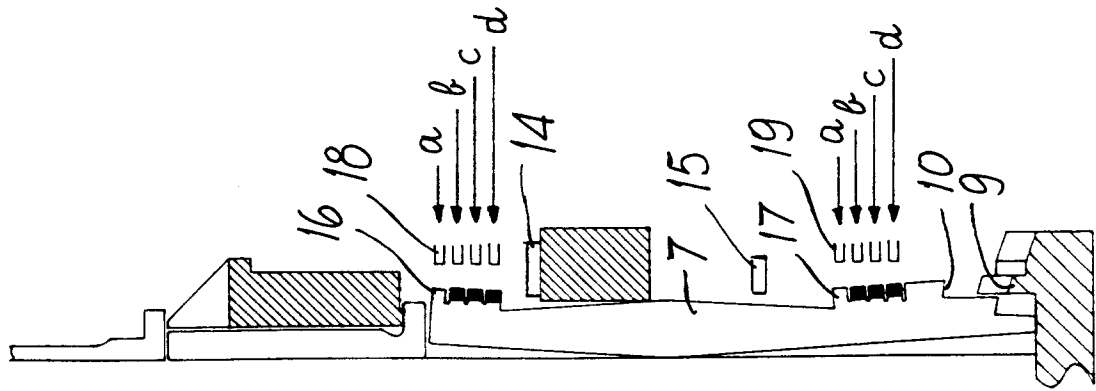
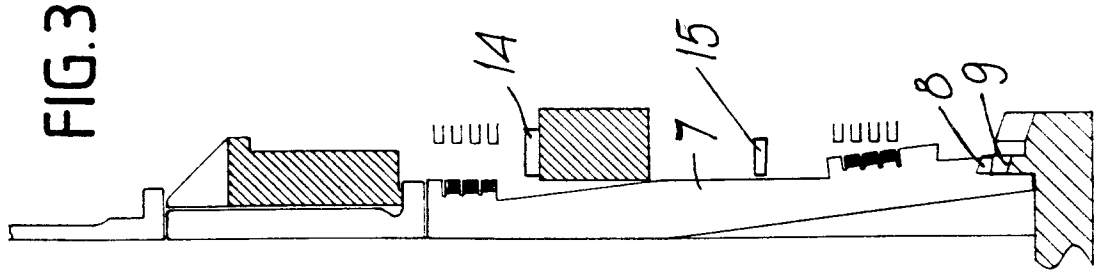
All the details may furthermore be replaced with other technically equivalent ones.

In practice, the materials employed, as well as the shapes and dimensions, may be any according to the requirements without thereby abandoning the protective scope of the appended claims.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

#### Claims

1. Improved needle selector in a circular knitting machine for manufacturing mens' socks or the like, of the type which comprises an oscillating arm which is arranged on the same plane as the needle and has a top that is meant to abut from below against the sub-needle, characterized in that said arm has, at its base, two heels at different levels which are suitable to engage a lifting cam profile, and in that said arm is suitable to selectively move to a lateral position, in which the heels at different levels do not interfere with said lifting cam profile, or to two positions in which one of said heels interferes with said profile; the low position, the casting-off position, and the holding position of the needle being obtained respectively in said positions of the arm.
2. Selector according to claim 1, characterized in that means for returning said arm to an intermediate position are provided.
3. Selector according to claim 1, characterized in that said arm has selection teeth on one side in an upper position and in a lower position, said teeth being suitable to be actuated by respective selection levers.
4. Selector according to claim 1, characterized in that said selection teeth and said levers can assume different levels owing to their bulk.





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EUROPEAN SEARCH REPORT

Application Number  
EP 94 12 0075

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US-A-3 004 413 (FELKER) * column 2, line 64 - column 4, line 66; figures 1-8 *	1-4	D04B15/68
A	EP-A-0 425 996 (LONATI S.P.A.)		
A	DE-A-29 37 386 (SIPRA)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			D04B
Place of search	Date of completion of the search	Examiner	
THE HAGUE	11 April 1995	Van Gelder, P	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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