

[54] **ADJUSTING MEANS FOR ADJUSTABLE PARTS IN KNITTING MACHINES**
[75] Inventor: **Heinz Brunner**, Ebingen, Germany
[73] Assignee: **Mayer & Cie Maschinenfabrik**, Wuerth, Germany
[22] Filed: **Aug. 1, 1972**
[21] Appl. No.: **276,960**

2,186,814	1/1940	Adams.....	66/54 X
2,815,651	12/1957	Burdett.....	66/54
2,941,383	6/1960	Mishcon et al.	66/54 X
3,009,340	11/1961	Bram	66/75
3,116,620	1/1964	Hanel et al.	66/54
3,123,991	3/1964	Schmidt	66/54
3,386,268	6/1968	Beckenstein.....	66/54
3,525,239	8/1970	Agulnek.....	66/54

FOREIGN PATENTS OR APPLICATIONS

892,496	10/1953	Germany	66/54
---------	---------	---------------	-------

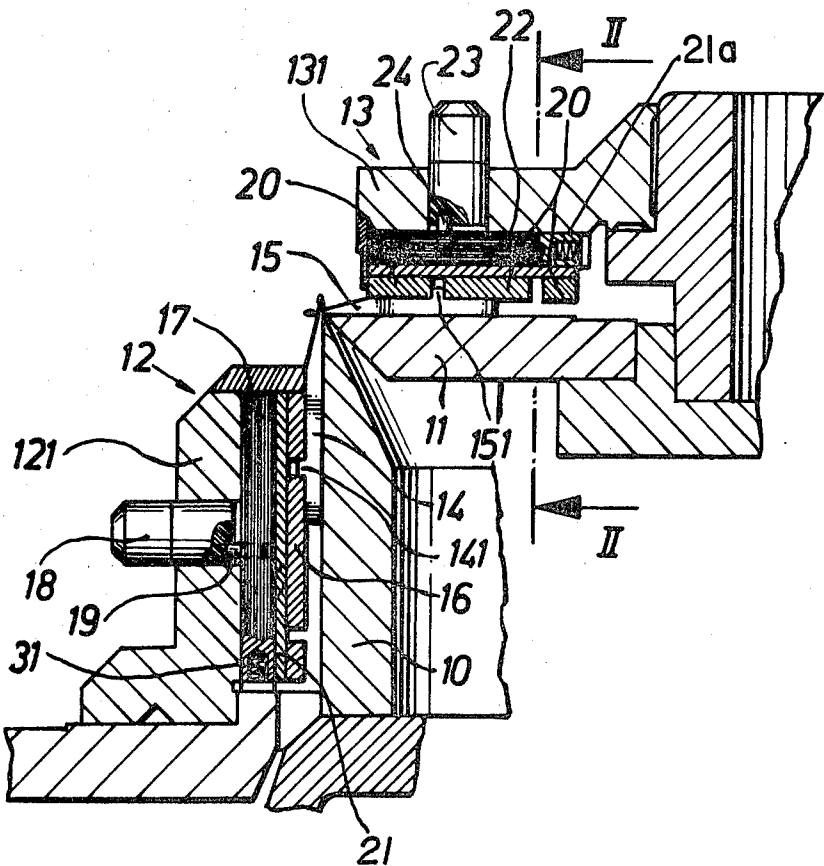
[30] **Foreign Application Priority Data**
Aug. 4, 1971 Germany..... 2138963
Oct. 28, 1971 Germany..... 2153748
[52] U.S. Cl..... **66/19, 66/27, 66/50 R, 66/54, 66/75 R**
[51] Int. Cl..... **D04b 9/06**
[58] Field of Search **66/19, 25, 27, 40, 54, 66/57, 50 R, 75 R**

[56] **References Cited**
UNITED STATES PATENTS
1,056,691 3/1913 Kimes 66/27
1,220,918 3/1917 Wilcomb..... 66/54
1,424,725 8/1922 Howie et al..... 66/54 X

Primary Examiner—James Kee Chi

[57] **ABSTRACT**
An adjustable part having a guiding portion in a knitting machine which is slidably adjustably mounted in a mating groove of the knitting machine. At least a portion of the adjustable part and the mating groove having splined surfaces adapted to guidingly engage each other. Adjusting means are operatively mounted in the knitting machine and are operatively connected to the adjustable part for adjusting the position of the latter in the mating groove.

4 Claims, 6 Drawing Figures



ADJUSTING MEANS FOR ADJUSTABLE PARTS IN KNITTING MACHINES

BACKGROUND OF THE INVENTION

The invention relates to an adjustable part of a knitting machine, such as for example an adjustable cam which is provided with a guiding portion.

Adjustable cams having guiding portions which are guidingly movable in guiding grooves of cam bodies can be adjustably moved along a plane defined by the movement of the cam path, for example the knitting cams of knitting machines, or can be mounted perpendicular to such a plane, when they are formed as so-called sinking cam parts. The guiding parts for the known adjustable cams are mounted in guiding grooves which have rectangular, square, dovetail, round or T-shaped cross sections. The positions of these guides can be adjusted by means of adjusting knobs mounted outside of the operative side of the cam body or can be automatically moved into the desired position. Since the cam bodies must be very compactly constructed, and consequently their guiding portions must be very short, the danger of frequent jamming and consequent malfunctioning is present in the aforescribed known arrangements. It is therefore necessary to construct the guide parts and guide grooves very precisely, that is with very small tolerances, which causes a corresponding increase in the production costs and has the further drawback that when cam parts are exchanged, the new cam parts can not be used without first being worked over and precisely adjusted into the guide grooves. Furthermore, guide grooves having rectangular or square cross sections require special steps when used for the so-called cylinder guiding steps in order to avoid any play in a direction transverse to the sliding direction or to avoid a turning movement of the guide parts.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide adjustable machine parts for knitting machines, in particular adjustable cam parts, which have guide portions that are shaped in such a way that the aforescribed drawbacks are avoided and even with relatively short guide parts there is assured a secure and jam-free guiding of the machine parts.

In accordance with the invention this object is obtained by providing a portion of the surface of the guide part of any of the aforescribed cross sections with splines and providing a corresponding mating splined surface in the guide groove. By means of these mating splined surfaces, the guide parts can be very precisely centered in their guide grooves without requiring large expenses for manufacturing the mating parts with very small tolerances. The guiding of the adjustable parts can be carried out in a completely jam-free manner since the guiding is no longer dependent on the relationship between the length and width or diameter of the corresponding guide parts but only on the relationship between the length and width of the teeth of splined surfaces, the length of which is at all times several times larger than the height of their flanks.

Thus, the guiding means can be embodied as mating splined surfaces. The guide parts having such splined surfaces can be either flat or round. The splined surfaces can cover the entire guiding regions or only a portion of the guide surfaces of the slidable machine parts

and their corresponding supporting and guide grooves. Thus, the example, the mating splined surfaces can only be provided on one side of the guide parts and grooves.

The splined surface can be formed as a flat tooth forming part of the guide part which engages in a corresponding depression in a guide groove wall, respectively in a guide part.

It is to be understood that the use of the arrangement of the invention is not limited to adjustable cams but can also be used in other machine parts of a knitting machine where the adjustment of the parts during the operation of the machine is required. For example, adjustable parts of the pattern arrangement of circular knitting machines or other knitting and weaving machines, by means of which the pattern sliders which act on the pattern feet of pattern jacks or needle jacks in needle beds of knitting machines, can be adjusted with such an arrangement.

BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings, which form part of this application, and in which:

FIG. 1 is a schematic cross-sectional radial view of the loop forming parts of the circular knitting machine, wherein an adjustable cylinder cam and an adjustable dial cam is shown;

FIG. 2 is a cross-sectional view along line II — II of FIG. 1, the parts being illustrated in a larger scale than in FIG. 1;

FIG. 3 is an elevational view of the cylinder cam system showing an adjustable ejection cam part and an adjustable loop forming sinking cam part;

FIG. 4 is a plan view of a dial cam system with adjustable loop forming and ejection cam parts;

FIG. 5 is a radial sectional view similar to FIG. 1 of a second embodiment of the invention;

FIG. 6 is a cross-sectional view along lines VI — VI of FIG. 5 wherein the parts are shown at a larger scale than in FIG. 5.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, and in particular to the cross-sectional view of FIG. 1, there is shown a needle cylinder 10 and a dial disc 11 together with the cam support 12 for the needle cylinder 10 and the cam disc 13 for the dial disc 11. The knitting needles 14 and 15 are longitudinally slidably mounted in the needle cylinder 10 as well as in the dial disc 11. The feet 141 of the needles 14 of the needle cylinder are acted on by an ejection cam 16 which is slidably adjustably mounted in the plane of the cylinder cam support 12. The adjustment of the ejection cam portion 16 is carried out by means of a turnable knob 18 which projects from the exterior side of the cam body 121 which is not illustrated in detail. This turnable knob 18 has a conventional annular guide groove in its interior front surface into which a guide stud 19, which is secured in the guide part 21, projects. A guide part 21, which is only partially illustrated in FIG. 1, is slidably adjustably mounted in the guide groove 17, having a splined surface and is biased by a spring 31, so that an adjustment of the guide part 21 via a turning of the knob 18 and the stud 19 projecting into an annular groove of the knob 18 (not shown) from the guide part 21, is carried out against the action of the spring 31. The guide part

21 is connected by a series of threaded bolts and mating threaded bores to the ejection cam part 16. An equivalent connection is shown in FIG. 2 in connection with the sinking cam 20 and adjustable part 21a. It can be noted by means of the longitudinal shading in FIG. 1, that the guide groove 17 is provided in the longitudinal direction with a splined surface. The only partially illustrated guiding part 21 for the ejection cam part 16 is provided on its exterior side with a similar splined surface which mates with the splined surface of the guide groove 17.

The feet 151 of the dial disc needles 15 are acted on by the cam 20 which is connected to the guide part 21a. The guide part 21a is adjustably slidably radially mounted in the guide groove 22 of a cam body 131. The adjustable movement of the guide part 21a is radial with respect to the axis of the circular knitting machine as well as the axis of the dial disc 11. The guide part 21a has a rectangular cross-section and the dial cam 20 is connected by means of a pair of threaded bolt connections to the guide part 21a as illustrated in FIG. 2. As can be noted from the lateral shading in FIG. 1 and as is shown in detail in FIG. 2, the guide part 21a as well as the guide groove 22 are provided with mating splined surfaces which provide a secure and jam-free guidance of the guide part in the guide groove. In a manner similar to the aforescribed connection between the turnable knob 18 and the guide part 21 the guide part 21a is connected via a stud 24 and an annular groove (not shown) to a knob 23. The turn knob 23 has on its inner front side an annular groove into which projects a stud 24 secured in the guide part 21a and thus the guide part 21a can be manually adjusted by means of the turning of knob 23 against the action of a spring 31a mounted in a corresponding cavity of the guide part 21a and bearing against an end piece projecting from the cam disc 13.

There is illustrated in FIGS. 3 and 4 a plurality of adjustable cam parts in their different positions. Thus in FIG. 3 there is shown an adjustable ejection cam part 16 which coacts with the needles 14 of the needle cylinder, the ejection cam part 16 being shown in its inoperative position in full lines and in dash-dotted lines in its operative position 16'. The guide groove 17 which has a splined surface and which is disposed in the cam body 121 is shown by means of dash and full lines. There are furthermore shown various adjustable cylinder cam parts in FIG. 3, such as the jointly adjustable sinking loop cam parts 25 and an adjustable pre-ejection cam part 26. These cam parts are adjusted by means of parts such as illustrated in FIG. 2 which are slidably moveable in guide grooves 17a and 17b, such parts also being shown by means of dash lines.

FIG. 4 illustrates a plan view of the adjustable sinking loop cams 20 of a dial disc cam system, the sinking loop cams 20 being provided with a splined surface which is slidably disposed in a guide groove 22 having a mating splined surface. The illustrated dial cam system is shown as having an adjustable cam part 27 which acts on the rotating dial needles, said cam part 27 being shown in full lines in its operative position and in dash lines 27' in its inoperative position. This cam part is also mounted by a threaded bolt connection such as is illustrated in FIG. 2 to a guide part which is slidably in guide groove 28, said guide part and guide groove 28 being provided with splined mating surfaces. Furthermore, there are shown in FIG. 4 ejection cam parts 29

(for short needles) and 30 (for long needles) which are pivotally mounted in the cam disc 13. There can also be provided in the region of the guide grooves stud elements which serve to maintain the guide parts in certain predetermined positions.

FIGS. 5 and 6 illustrate a further embodiment of the arrangement of this invention in which FIG. 5 corresponds substantially to FIG. 1 and FIG. 6 corresponds substantially to FIG. 2. Thus it can be noted that the various parts of FIG. 5 and 6 have been designated with the same reference numerals as corresponding parts of FIGS. 1 and 2. Thus it can be noted from FIG. 6 in particular, that the shape of the guiding surfaces of guide member 21' and the guide groove 22' in the dial cam body 131 are different from the splined surfaces of the guide member 21a and the guide groove 22. Thus the dial cam body 131 is provided with a flat tooth 221 which matingly engages a guide groove 211 in the guide member 21', so that the cam member 20, which is connected by means of a pair of threaded bolt connections to the guide part 21', can be adjusted in a radial direction with respect to the dial cam body 131. The flat tooth 221 extends along one of the side walls of the guide groove 22' and extends into a mating guide groove 211 in the guide member 21'. This type of a guiding arrangement also provides a secure and jam-free guiding of the guide part 21' in the cam body 131. The guiding means can also be embodied in the form of a plurality of flat teeth which are disposed on a plurality of sides of the guide groove. Furthermore, the flat teeth can be disposed on the guiding parts and can engage in corresponding flat grooves in the walls of the guide grooves.

As can be noted from FIG. 5 the guide groove 17' is provided with a flat guide groove 171 into which engages a longitudinal flat tooth 162 of a guide member 161. This guide member 161 is biased by a coil spring 31 in the manner similar to the embodiment of FIG. 1. The turning knob 18 slidably moves the guide member 161 in the guide groove 17' via a stud and annular groove connection as described herein above with respect to the embodiment of FIG. 1. The guide member 161 is also acted on by a coil spring 31 in a manner similar to the embodiment of FIG. 1, so that the turn knob 18 must act against the force of that spring when the position of the guide member 161 is adjusted by turning knob 18. Similarly, the turn knob 23 acts on the guide member 21' via the stud 24 which is disposed in a non-illustrated annular guide groove and also acts against the force of a coil spring 31 disposed in a bore in the member 21'.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of preferred embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. In a knitting machine, a first member being adjustably mounted in a predetermined direction in a second member, said first member having a guiding portion and said second member having a guide groove both of which extend in said predetermined direction, said guiding portion and guide groove having confronting mating splined surfaces which extend in said predetermined direction so that when the guiding portion is disposed in said guide groove the guiding portion is

5

adapted to be adjustably moved therein through an arbitrary distance in said predetermined direction without appreciable displacement in a direction transverse to said predetermined direction; and cam means operatively connected to said guiding portion.

2. In a knitting machine, the combination as set forth in claim 1, wherein said surface of said guiding portion has one spline and said surface of said guide groove has one mating groove.

3. In a knitting machine, the combination as set forth in claim 1, wherein said surface of said guide groove has one spline and said surface of said guiding portion

6

has one mating groove.

4. The combination as set forth in claim 1, wherein said knitting machine is of the circular type and has a plurality of cylinder and dial needles operatively mounted in respective needle beds in the circular knitting machine, cam means operatively and adjustably mounted in said circular knitting machine for coaction with said cylinder and dial needles, said guiding portion being connected to said cam means so as to adjust the position of the latter relative to said cylinder or dial needles.

* * * * *

15

20

25

30

35

40

45

50

55

60

65