Jan. 21, 1969 A. H. WIDDOWSON ET AL 3,422,638

CIRCULAR KNITTING MACHINES

Filed June 27, 1966 Sheet 1 of 3

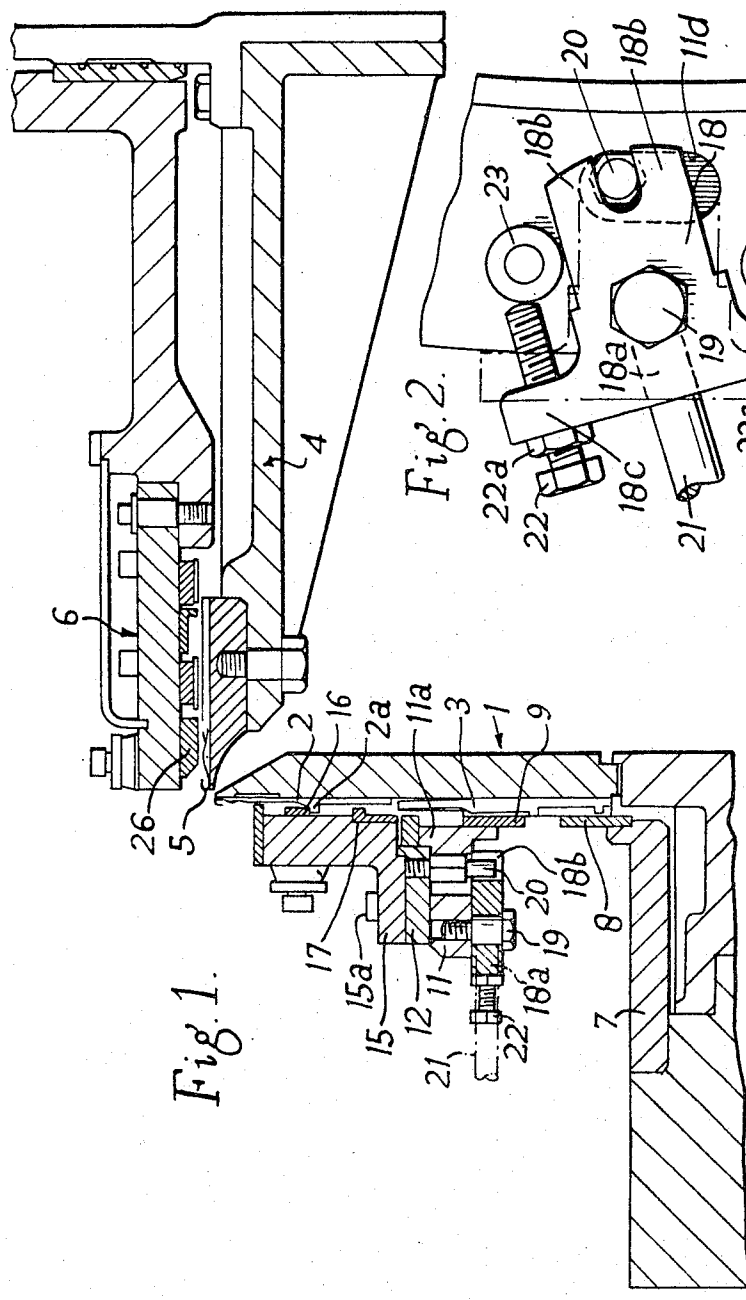


Fig. 1.

Fig. 2.

Fig. 5.

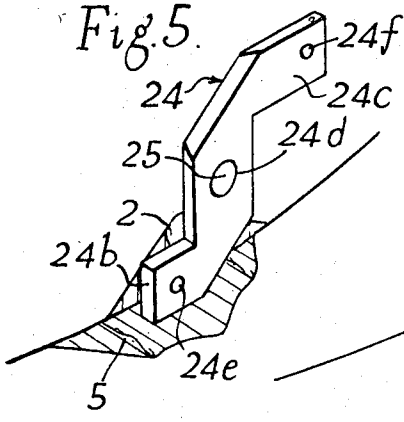


Fig. 6.

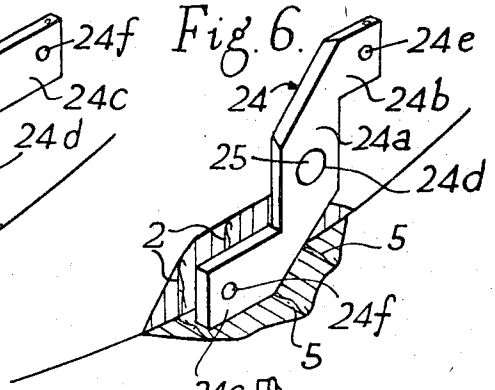
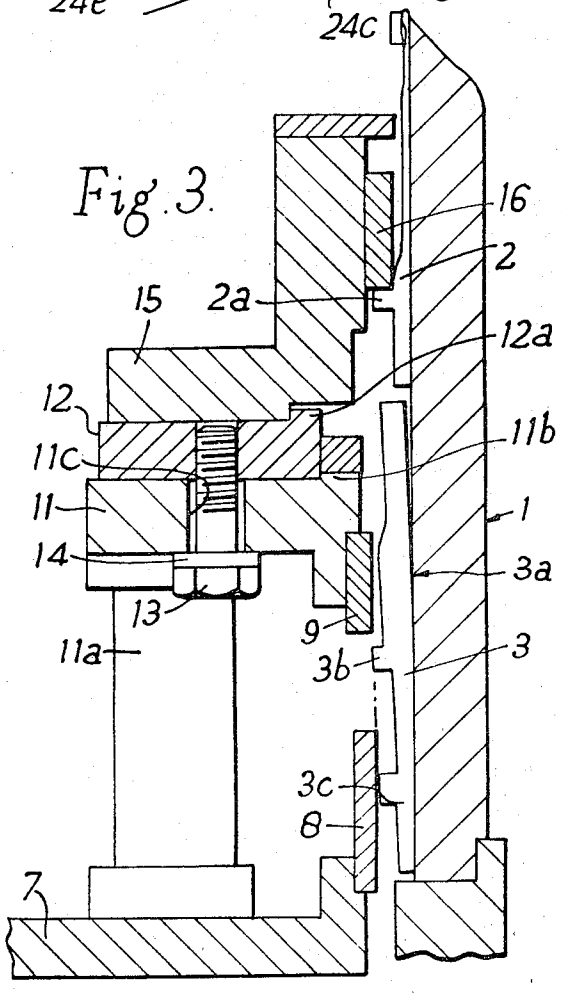


Fig. 3.



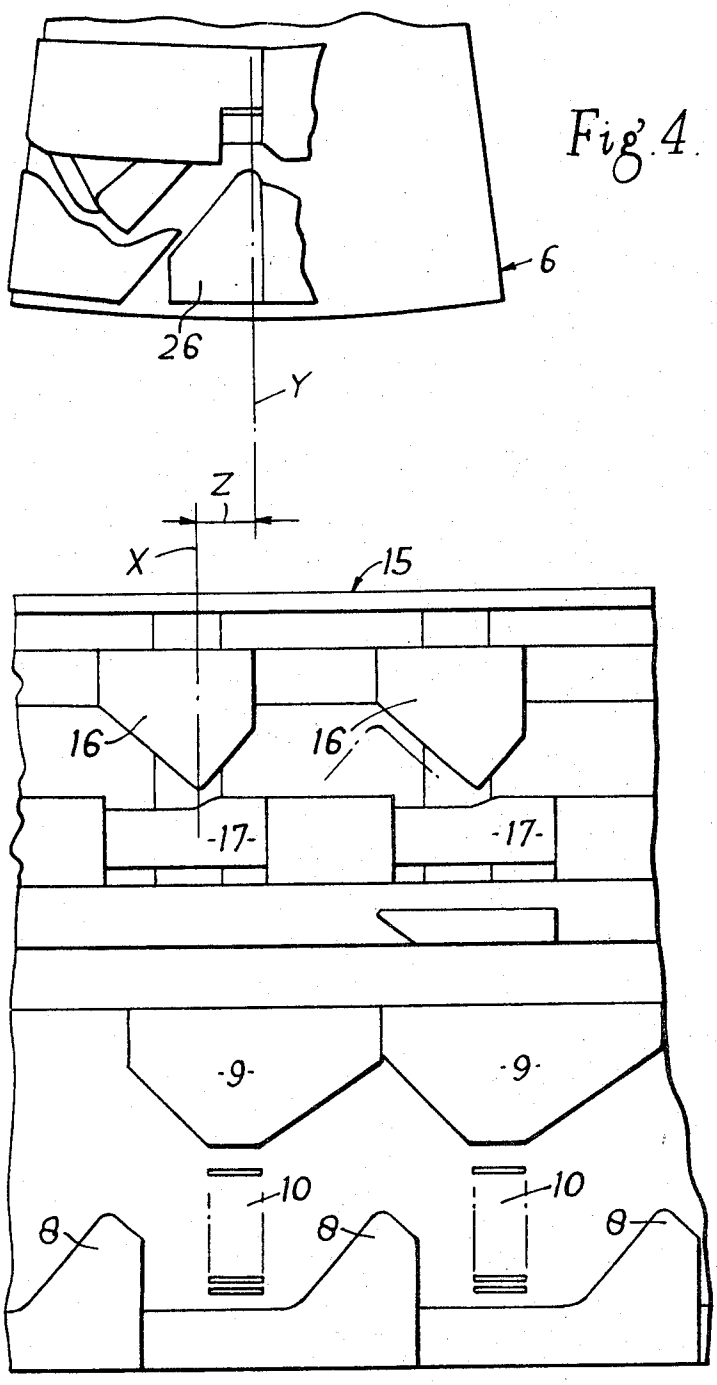


Fig. 4.

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CIRCULAR KNITTING MACHINES

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U.S. Cl. 66—19 4 Claims
Int. Cl. D04b 9/06; D04b 15/48

ABSTRACT OF THE DISCLOSURE

A multi-feed circular knitting machine of the cylinder and dial type. Cams other than stitch cams and guard cams are provided in the conventional cylinder cam box. The stitch cams and guard cams are mounted on an angularly adjustable ring constituting an upper cylinder cam box. By adjustment of this ring the relative positions of the cylinder and dial stitch cams can be varied. Associated with each cylinder stitch cam are alternative combined yarn guides and latch guards extending for different distances circumferentially of the cylinder and adapted to be brought into the operative position selectively depending upon the cam timing.

This invention relates to multi-feed circular knitting machines of the cylinder and dial type. The invention relates primarily to such machines in which the dial cam plate and the cylinder cam box are stationary and the cylinder and the dial rotate relatively thereto, but is also applicable to such machines in which the cylinder and dial remain stationary and the dial cam plate and the cylinder cam box revolve relatively thereto.

The invention has reference to means for effecting adjustments in the timing of the cams in such machines, that is to say adjustments in the relative positions of the cylinder and dial stitch cams at each feed and hence the relative timing of the knocking-over of loops from the cylinder and dial needles by such cams during knitting.

As well known, it is sometimes necessary in such machines that there is synchronised timing, that is to say that the knitting cams on the dial cam plate and in the cylinder cam box at each feed are in alignment with one another so that the cylinder and dial needles are simultaneously actuated by their stitch cams. However, it is also required at times that there is delayed timing according to which at any one feed the stitch cam on the dial cam plate and the stitch cam in the cylinder cam box are relatively offset a short distance angularly about the common axis of the cylinder and dial. For these purposes provision is conventionally made in multi-feed machines of the type concerned for effecting adjustments of the timing of the cams. Such timing is conventionally varied, either by changing the cylinder stitch cams, (i.e. the stitch cams in the cylinder cam box) that is to say replacing them by stitch cams of another form or profile, or by moving the cylinder stitch cams. Alternatively, the dial cam plate is adapted to be moved relatively to the cylinder cam box.

These conventional methods of adjusting the cam timing suffer from disadvantages. The first two methods of respectively changing or moving the cylinder stitch cams are slow and tedious, whilst it is difficult to make provision for the third method, i.e. that of moving the dial cam plate, because more room is required for each knitting cycle, which increases the cost of the machine.

An object of the present invention is to overcome these disadvantages by providing a multi-feed machine of the type concerned furnished with simple and efficient means

for angularly adjusting the positions of all of the cylinder stitch cams in unison relatively to the dial stitch cams, whereby the timing can be readily varied without interfering with the dial cam plate.

The machine constituting this invention is characterised in that the cylinder stitch cams and associated guard cams at all of the feeds are so mounted as to be movable together angularly about the common axis of the cylinder and dial relatively both to the cylinder cam box housing the remaining cams of the cylinder cam system and also to the dial cam plate, whereby the relative positions of the cylinder and dial stitch cams can be varied.

The idea is that the cam timing of the machine can be readily adjusted by varying the angular positions of the cylinder stitch cams.

Preferably, the machine includes, in association with each feed, alternative combined yarn guides and latch guards the latter being of different sizes such as to extend for different distances circumferentially of the needle cylinder, which can be selectively brought into the operative position depending upon the cam timing to which the machine is adjusted.

This is necessitated by the fact that with synchronised timing the latch guard only requires to be quite short to ensure that the needle latch is held open for the requisite time whereas with delayed timing the latch guard requires to extend further circumferentially for holding the needle latch open for a somewhat longer period corresponding to the extent of the delay, i.e. the angular displacement.

Conveniently, the cylinder stitch cams and the associated guard cams at all of the feeds are mounted upon a common component whereby the cam timing can be readily adjusted by varying the angular position of the common component. The component may be adjusted into either the synchronous timing position or the position providing maximum delay or to any intermediate position providing a shorter delay.

The component may be in the form of a ring extending completely around the cylinder of the machine and forming an upper cylinder cam box disposed above a lower cam box housing the remaining cams of the cylinder cam system.

Where the cylinder and dial are stationary and the dial cam plate and cylinder cam box revolve, the ring carrying the cylinder stitch cams and guard cams will require to revolve together with the cylinder cam box but will be adjustable angularly relatively to the latter and to the dial cam plate for adjusting the cam timing.

One specific constructional example of a machine of the type concerned incorporating the invention will now be described with reference to the accompanying drawings, wherein:

FIGURE 1 is a vertical cross sectional view through the upper portion of one side of the needle cylinder and cam boxes and the adjacent portions of the dial and of the dial cam plate,

FIGURE 2 is a detail underside plan view showing the means facilitating turning of the ring angularly and for locking the ring in the adjusted position,

FIGURE 3 is a vertical cross sectional view through one side of the needle cylinder and cam boxes, the section being taken through a plane displaced angularly about the axis of the needle cylinder from the plane along which the section of FIGURE 1 is taken,

FIGURE 4 is a diagrammatic generation of the adjacent portions of the cam systems in the upper and lower cylinder cam boxes for two adjacent feeds and of the portion of the adjacent cam system on the dial cam plate adjusted to a delayed timing,

FIGURE 5 is a diagrammatic perspective view of a part comprising two alternative combined yarn guides and

latch guards showing the shorter latch guard in the operative position adjacent the cylinder and dial needles, and

FIGURE 6 is a diagrammatic perspective view of the part shown in FIGURE 5, but with the larger latch guard shown in the operative position.

The machine of this example is of basically conventional form and only those parts and re-arrangements in accordance with the invention will be discussed in the following description. As will be seen from FIGURES 1 and 3, the machine has a rotatable needle cylinder **1**, equipped with a circular series of needles **2** and, for controlling the latter, a circular series of rocking jacks **3** located below the needles in the same tricks or grooves in the cylinder. The machine includes a rotatable dial **4** equipped with radially extending needles **5** and an associated fixed dial cam plate **6** of conventional form.

A fixed lower annular cam box **7** concentrically surrounds the needle cylinder in alignment with the jacks **3** and is of conventional form except that only a portion of the cam system is housed within this cam box, i.e. no stitch cams or associated guard cams are housed therein. However, jack raising, clearing cams **8**, levelling cams **9** and all other requisite cams (not shown) and selecting mechanism **10** are housed within lower cam box **7** as shown in FIGURE 4.

An annular fixed plate **11** is disposed above lower cam box **7** and is supported upon a plurality of spaced posts **11***a* and extends around cylinder **1**. Mounted upon upper face of plate **11** is an annular ring **12** which can be turned angularly upon plate **11**. Ring **12** is centred upon plate **11** by a narrow annular rib **11***b* on the plate **11** and is retained by means of bolts **13** extending through slots **11***c* in plate **11** (FIGURE 3). The slots **11***c* are of a size to accommodate the angular adjustment of ring **12**. A washer **14** is interposed between the head of each bolt **13** and the underside of plate **11**. Mounted concentrically upon ring **12** is an angle section annular component or ring **15** having a cylindrical portion extending upwardly for a short axial extent co-axially around cylinder **1** and forming an upper cam box housing cylinder stitch cams **16** and associated guard cams **17** for all feeds of the machine (FIGURE 4). Ring **15** is centred on the ring **12** by an annular rib **12***a* on the latter. Rings **12** and **15** are secured together by screws **15***a* (FIGURE 1) and in effect constitute an integral ring-form component.

Each of the cylinder needles **2** is furnished with a single knitting butt **2***a* which is to be operated upon by stitch cams **16** and guard cams **17** in the upper cam box **15**.

The jack raising cams **8** housed within cam box **7** are adapted to raise selected jacks **3**, and hence selected needles **2**, so that these are actuated by stitch cams **16**. Each of the rocking jacks **3** is formed at one edge with a fulcrum **3***a*, and has a presser butt **3***b*, disposed below the fulcrum, which is acted upon by the selecting mechanism **10**, and an operating butt **3***c* disposed below the fulcrum, which is acted upon by cams **8**.

The arrangement is the conventional one in which the lower ends of the rocking jacks **3** selected by the selecting mechanism **10** are pressed by the latter into the tricks of the cylinder **1** so that operating butt **3***c* is out of contact with jack-raising cam **8**, such jacks **3** are not raised and cylinder needles **2** are not raised but are allowed to remain down in a non-knitting cam track. The lower ends of others of the jacks **3**, as determined by the relevant selecting mechanism **10**, at each feed are allowed to remain out of the tricks so as to be contacted by jack-raising cam **8** whereby jacks **3** and associated needles **2** are raised into the knitting track.

The means facilitating the turning of the ring component **12**, **15** angularly in either direction comprise lever **18**, (FIGURES 1 and 2) pivotally mounted by means of a vertical pivot pin **19** upon and at the underside of plate **11**. Pin **19** is constituted by a bolt, the reduced end of which is screwed into a bore in plate **11**. The leading end of lever **18** is recessed to form a forkpiece, the two limbs **18***b* of which straddle a vertical pin **20** depending from ring **12** at a point a short distance from pivot pin **19**. Pin **20** extends through a slot **11***d* (FIGURE 2) formed in plate **11** and of greater width than the diameter of pin **20** and of a length to accommodate the requisite angular adjustment of the ring component **12**, **15**, the movement of the latter being determined by abutment of the pin **20** against the end of slot **11***d*.

Turning of lever **18** in one direction or the other about pin **19** will turn ring component **12**, **15** angularly in one direction or the other for cam timing purposes. Lever **18** is of short length and is formed with a socket **18***a* to receive the end of a detachable turning bar **21** (FIGURES 1 and 2).

The means for locking the rings in an adjusted position comprise two lugs **18***c*, integral with lever **18**, and extending to opposite sides of pin **19**, the lugs being formed with screw tapped holes receiving two screws **22** extending parallel to one another flanking pin **19** and the leading ends of which abut against two pegs or equivalent stops **23** depending from plate **11** (FIGURE 2). When ring **15** has been adjusted, in order to lock it in its adjusted position, screws **22** are screwed into the holes until the leading ends abut against stops **23**. Screws **22** are furnished with locknuts **22***a*.

The timing of the machine can be readily adjusted by simply adjusting the angular position of ring **15** constituting the upper cam box. This can be adjusted into either the synchronous timing position, in which the axes X and Y in FIGURE 4 of the peaks of the cylinder stitch cams **16** and the dial cams **26** are in alignment, or the position providing maximum delay in which the axes X and Y are displaced a distance Z as shown in FIGURE 4, or to any intermediate position providing a commensurately shorter delay.

A part indicated generally at **24**, FIGURES 5 and 6, comprising two alternative combined yarn guides and latch guards of different effective circumferential extents is associated with each feed of the machine. Each part **24** (FIGURES 5 and 6) is in the form of a flat plate comprising a central mounting portion **24***a*; a short portion **24***b* extending transversely at one end of, to one side of, and in the same plane as, the mounting portion **24***a* and constituting a latch guard of short length, i.e. extent circumferentially of the needle cylinder, having a hole **24***e* therein constituting a yarn guide, and a longer portion **24***c* extending transversely at one end of, to the opposite side of, and in the same plane as, the mounting portion **24***a* and constituting a latch guard of longer length and having a hole **24***f* therein constituting a yarn guide. Mounting portion **24***a* is formed centrally with a circular hole **24***d* whereby the part is mounted upon a horizontal pin **25** projecting from a bracket (not shown) secured to the dial cam plate **6**. Manifestly, one yarn guide and latch guard **24***b* or **24***c* or the other may be brought into the operative position by simply turning the part about the mounting pin **25**. The relevant face of each yarn guide and latch guard **24***b* or **24***c* is arranged to guard the latches of the cylinder needles **2** whilst the edge thereof is arranged to guard the dial needles **5**.

Although it has been assumd in the above description that ring component **12**, **15** is adjusted manually it will be apparent that the ring could be adjusted automatically by any suitable power operated means, e.g. either electrically and/or mechanically under suitable control for example on the timing chain of the machine. Moreover, the combined yarn guides and latch guards **24** may be similarly moved selectively into the operative position automatically by power operated means.

We claim:

1. A multi-feed circular knitting machine comprising a needle cylinder; a set of needles operable in said cylinder; a dial concentrically arranged with respect to said needle cylinder; a set of needles operable in the dial; a dial cam plate above the dial; cams on the dial cam plate for operating said dial needles; a cam box associated with said

needle cylinder; cams other than stitch cams and guard cams in said cam box; said needle cylinder, together with the said dial, and said cam box, together with said dial cam plate, being relatively rotatable about the common axis thereof; mounting means adjacent to said needle cylinder, and stitch cams and guard cams mounted on said mounting means in such a way as to be movable together angularly about the common axis of said cylinder and said dial relatively both to said cam box and to said dial cam plate, whereby the relative positions of said cylinder and dial stitch cams can be varied, wherein the improvement comprises, in association with each cylinder stitch cam, alternative combined yarn guides and latch guards (**24**), the latter being of different sizes such as to extend for different distances circumferentially of said needle cylinder, which can be selectively brought into the operative position depending upon the cam timing to which machine is adjusted.

2. A machine according to claim **1**, wherein said mounting means is constituted by a component in the form of an angularly adjustable ring extending completely around said needle cylinder, and forming an upper cylinder cam box disposed above the aforementioned cylinder cam box.

3. A machine according to claim **2**, which includes means for turning said ring component comprising a fixed annular plate associated with said cylinder cam box, a pivot pin upon said fixed plate, a lever on said pivot pin and a pin on said ring component at a point spaced from said pivot pin and engaged by said lever whereby turning of said lever in one direction or the other will turn the ring component angularly in one direction or the other for adjusting the cam timing; and means for locking said ring component in an adjusted position comprising two

lugs integral with said lever and extending to opposite sides of said pivot pin, each of said lugs being formed with screw tapped holes and two screws extending parallel to one another, flanking said pivot pin and engaged in said holes.

4. A machine according to claim **1**, wherein a mounting pin is provided adjacent each cylinder stitch cam, and said alternative combined yarn guides and latch guards associated with each cylinder stitch cam comprise a part mounted on one of said pins, whereby the part can be turned about the pivot pin to bring either one yarn guide and latch guard or the other into the operative position.

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W. CARTER REYNOLDS, *Primary Examiner.*

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