

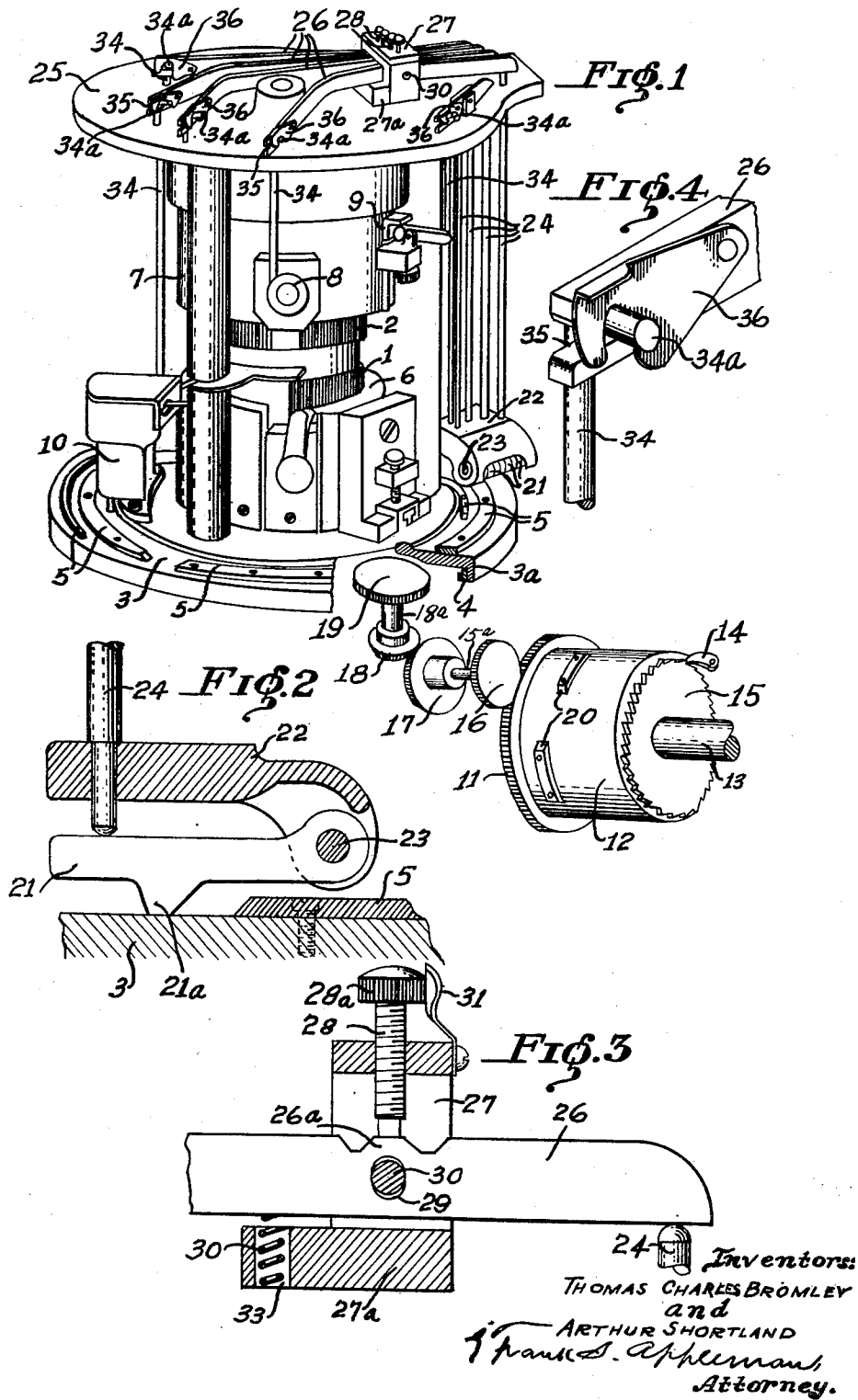
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CIRCULAR KNITTING MACHINE

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CIRCULAR KNITTING MACHINE

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This invention relates to circular knitting machines and has reference more especially though not exclusively to machines of the now well known characteristic type with double axially opposed, e. g., superimposed, needle cylinders.

The invention concerns timing and controlling mechanisms for such machines whereby changes in the operation thereof are initiated or/and effected.

In a circular knitting machine as conventionally constructed the timing and controlling mechanism is usually located some distance from the cam systems and other parts associated with the needle cylinder or cylinders which are to be controlled, thus necessitating intermediate connections of a somewhat extensive character and in some instances comprising several links and levers, especially in a machine of the characteristic type aforesaid, for cams or parts associated with the cylinder which is the further from the timing and controlling mechanism. These intermediate connections also prevent ready access to the cam boxes and needle cylinders without dismantling at least some of them, and, moreover, the remoteness of the controlling means renders precise control of the aforesaid cams or parts difficult to obtain, especially in the event of wear in the said connections.

The main purpose of the present invention is to provide an improved construction and arrangement of timing and controlling mechanism whereby to enable various cams or parts to be actuated in a decidedly more direct manner than heretofore, with a corresponding reduction of intermediate connections and easier access to the needle cylinder or cylinders and associated parts.

According to the present invention there is provided, in combination, timing and controlling mechanism of generally conventional form and arrangement, and auxiliary controlling mechanism arranged about the axis of the needle cylinder, or cylinders as the case may be, of the machine, the said mechanisms being utilised jointly to control the operation of the machine.

Being situated co-axially with the needle cylinder or cylinders, the auxiliary mechanism conveniently serves to control movable cams in the cam system or systems, yarn changing means, picker mechanisms, or/and other parts or attachments usually assembled around the cylinder or cylinders, while the conventional mechanism is conveniently employed to initiate or effect other changes, such as changes in the speed or motion of the machine and variations in the quality of the knitted fabric, the work of con-

trolling the machine thus being shared between the two mechanisms.

For rendering the auxiliary mechanism effective upon the various cams, parts or/and attachments to be controlled there are provided intermediate connections which, in the main, may be constituted by single levers or/and rods, or other simple devices, according to requirements.

In the preferred embodiment of the invention the auxiliary mechanism comprises a controlling member or members adjacent to and co-axial with the needle cylinder or cylinders, and while the said member or each member may take any suitable or convenient form, it is preferably of annular form and furnished with a concentric series of cams or equivalent elements for bringing about, through interposed levers or/and rods or other simple devices, as aforesaid, the desired movement of the corresponding parts or/and attachments which are required to function in the production of the knitted fabric or articles. For example, in a machine of the superimposed needle cylinder type an annular member is mounted at the base of the bottom cam box. If desired, a similar member may be mounted at the upper end of the top cam box. The cams or equivalent elements may be applied to one face of the annular member or each member or/and to the periphery thereof. Alternatively, the said member or members may be grooved concentrically or/and peripherally for the reception of the cams or equivalent elements.

As an alternative, a drum or sleeve furnished with a circumferential series of cams or equivalent elements, or circumferentially grooved for the reception of such cams or elements, may be provided instead of the annular member or each member.

When more than one such controlling member is provided each may be entirely independent of the other so far as its controlling function is concerned. That is to say, each will control its own set of machine cams, parts or/and other attachments without the aid of the other.

In order that the invention may be more clearly understood and readily carried into practical effect, an illustrative example thereof applied to a circular hosiery knitting machine of the superimposed end-to-end rotary needle cylinder type will now be described with reference to the accompanying drawing, wherein,

Figure 1 is a general perspective view of so much only of the said machine as is necessary to illustrate, in more or less diagrammatic fashion, the association of the conventional timing

and controlling mechanism with the auxiliary controlling mechanism aforesaid.

Figure 2 is a detail sectional view showing, more particularly, one of the levers acted upon by a cam on the controlling ring.

Figure 3 is another detail sectional view showing intermediate connections between the said lever and the corresponding part to be controlled, and

Figure 4 is a detail perspective view illustrating further parts of these connections as will be hereinafter described.

Like parts are designated by similar reference characters throughout the drawing.

Referring to Figure 1, it will be seen that the machine is furnished with superimposed end-to-end rotary needle cylinders 1 and 2. In these cylinders are provided double-ended needles (not shown) which are operated by sliders and are transferable from one cylinder to the other for the purpose of varying the character of the fabric produced, e. g., changing from plain to rib or purl and vice versa. The auxiliary mechanism in this example comprises a controlling ring 3 mounted concentrically on the bottom or bed plate of the machine. For this purpose the ring 3 is flanged at 3a suchwise as to enable it to be fitted upon the bottom plate. On the inner face of the flange 3a the controlling ring 3 is fitted with a gear ring 4 which is cut with internal teeth. Both the controlling ring 3 and the gear ring 4 may be made up of a plurality of segments to facilitate assemblage. On the upper face the controlling ring has applied thereto a series of cams such as those indicated at 5. These cams correspond with the machine parts to be controlled and may be removably fixed so as to be interchangeable with others, according to requirements. Any number of cams may be provided on the controlling ring for controlling any existing parts which affect the function of the machine in some way or other well known in the art, such as parts commonly associated with the knitting head to affect the action of the needles or to vary the character or appearance of the fabric produced. For example, the controlling ring 3 may have cams 5 thereon for controlling transfer cams and welt cams in the cam boxes 6 and 7, and picker mechanisms and yarn changing means assembled about the cylinders, it being understood that the particular embodiment described is by way of example only. In Figure 1, three parts to be controlled from the ring 3 are represented at 8, 9 and 10.

The controlling ring 3 is racked round intermittently, to render the cams 5 operative or inoperative upon the parts to be controlled, by spur and bevel gearing between the gear ring 4 and a gear ring 11 or teeth on the controlling drum 12 which forms part of the conventional timing and controlling mechanism, the shaft 13 of which is racked round by pawl and ratchet mechanism 14, 15 under the control of the timing chain as usual. Thus, a shaft 15a is geared by a pinion 16 and a gear ring 11 with the drum 12 and is geared through bevel gears 17 and 18 with another shaft 18a which is in turn geared through a pinion 19 and the gear ring 4 with the controlling ring 3. The drum 12 is furnished with cams or equivalent elements such as those indicated at 20 for adjusting, through appropriate intermediate connections (not shown), the machine cams for varying the stitch length, i. e., the quality of the knitted fabric. Otherwise the timing and controlling mechanism is adapted to op-

erate the change speed gear and the gear for changing the motion of the machine from rotary to rotary reciprocation, as in common practice.

To enable the various cams or equivalent elements of the controlling ring 3 and the drum 12 to operate the corresponding parts to be controlled, simple levers or/and push rods are provided between said parts and the said cams or equivalent elements.

The intermediate connections provided between the cams 5 applied to the controlling ring 3 and the relevant parts to be controlled therefrom will now be briefly described. For actuation directly by the cams 5 there is a series of levers 21 which are pivotally mounted side by side in a bracket 22 attached to the bottom plate at one side of the machine. The levers 21 are mounted upon a common pivot pin 23 fixed in the bracket 22 and, as shown in Figure 2, each of said levers is formed at its lower edge with a toe or foot 21a to oppose the relevant cam 5. The upper edges of the levers 21 near the free ends thereof are disposed beneath push rods 24 which are slidably mounted vertically in the bracket 22. The upper end of each push rod 24 is passed through the top plate 25 and arranged to contact one end of a lever 26 which latter is provided with a fulcrum on one edge constituted by a rounded (or like) formation 26a (see Figure 3). Each lever 26 is also mounted in a bearing 27 by means of a pin and slot connection so as to enable the fulcrum to thrust against a screw 28 in the bearing suchwise that the lever rocks on the fulcrum in contradistinction to turning on a pin as in a connection of conventional form. Conveniently the lever 26 is formed with a transverse slot 29 in the region of the fulcrum 26a and is retained in the bearing 27 by means of a pin 30 passed through the slot. The screw 28 serves for adjustment of the lever, both initially and when wear takes place, and has a serrated head 28a for engagement by a locking spring 31 to hold the screw after adjustment. The fulcrum of each lever 26 thrusts against the corresponding screw 28 under the influence of a small compression spring 32 which is accommodated within a hole 33 formed in the base 27a of the bearing 27 and arranged to impinge on the lower edge of the lever in the manner illustrated in Figure 3. When, as shown, a rod 34 is provided between a lever 26 and the part to be controlled, the said lever is bifurcated at the appropriate end, the rod is bent at one end 34a for insertion into the bifurcation 35, as depicted more clearly in Figure 4, and a pivoted catch 36 is provided on the lever for engagement with the bent end of the rod to retain it in the bifurcation. A similar construction may, if desired, also be adopted for connecting the upper end of a push rod 24 to the adjacent end of the corresponding lever 26. Alternatively, the appropriate end of the lever 26 may be cupped for reception of the upper end of the push rod 24. By the adoption of the described expedients, levers and rods can be readily connected and disconnected. In any event, the rods 34 extend downwards through the top plate 25.

A part to be controlled by the auxiliary controlling mechanism may, if found convenient, be actuated direct from the annular controlling member. Thus, in Figure 1, the part 10 is shown as being operable in a direct manner from the ring 3.

If in a machine of the characteristic type before mentioned an annular controlling member is provided in association with the rib cylinder com-

ponent as well as an annular member in association with the plain cylinder component, a shaft and appropriate gearing may be provided between the two members so that they are racked synchronously but otherwise each member may, if desired, function independently of the other to control cams or parts associated with its own component.

The invention is not to be regarded as restricted to any particular lever construction or arrangement as this may be varied as may be found convenient to effect the required control, such construction and arrangement being as simple as practicable so that the controlling mechanism can act substantially directly upon the parts to be controlled, especially as regards cams or parts associated with cam boxes or cylinders.

By reason of the provision of controlling mechanism as aforesaid, the machine possesses important advantages, such for example as compactness, absence of extensive intermediate connections irregularly arranged, and simplicity of construction and operation. Other advantages are that the machine is economical to produce and to maintain in running order owing to the reduction of the number of parts and corresponding elimination of wear and tear. Moreover, the connections can be easily assembled and disassembled and the cam boxes are readily accessible and consequently removable wholly or in part for inspection and other desired purposes without necessitating extensive disconnection of mechanism adjacent thereto, so that the work of mechanics is simplified and much time and expense is saved in this connection. Furthermore, by reason of the substantially direct action of the control, the functions of the controlled cams or parts can be more exactly regulated.

What we claim then is:

1. In a circular knitting machine, in combination, a bottom needle cylinder, a top needle cylinder axially opposed with respect to said bottom cylinder, a cam box associated with the bottom cylinder, another cam box associated with the top cylinder, a bed plate by which said bottom cam box is carried, controllable parts assembled about the needle cylinders, main timing and controlling mechanism including a rotatable drum furnished with elements for effecting some of the desired changes in the operation of the machine, a gear ring on said drum, means for rotating the drum intermittently, an auxiliary controlling mechanism comprising a controlling ring mounted concentrically on the bed plate, a further gear ring secured on said controlling ring, intermediate connections for rendering the said auxiliary controlling mechanism effective upon the aforesaid parts to be controlled, and spur and bevel gearing arranged between the gear ring on the drum and the gear ring on the controlling ring whereby the latter is racked round intermittently, the work of controlling the machine thus being shared between the said two mechanisms, for the purpose herein specified.

2. In a circular knitting machine, in combination, a needle cylinder, controllable parts associated with said cylinder, main timing and controlling mechanism for effecting some of the desired changes in the operation of the machine, an auxiliary controlling mechanism comprising at least one annular controlling member adjacent to and co-axial with the needle cylinder, said member being furnished with a concentric series of cams, intermediate connections arranged between the cams on the controlling member and the

aforesaid parts to be controlled, said connections comprising levers each formed to be acted upon by a relevant cam, push rods for operation by said levers, other levers for actuation by said push rods, each of said second mentioned levers being provided with a fulcrum on one edge, a bearing in which the second mentioned levers are mounted by pin and slot connections, and screws in said bearings against which the fulcrums thrust, and means for operating the auxiliary controlling mechanism from the main timing and controlling mechanism, the work of controlling the machine thus being shared between the said two mechanisms, for the purpose herein specified.

3. In a circular knitting machine, in combination, a needle cylinder, controllable parts associated with said cylinder, main timing and controlling mechanism for effecting some of the desired changes in the operation of the machine, an auxiliary controlling mechanism comprising at least one annular controlling member adjacent to and co-axial with the needle cylinder, said member being furnished with a concentric series of cams, intermediate connections arranged between the cams on the controlling member and the aforesaid parts to be controlled, said connections comprising levers each formed to be acted upon by a relevant cam, push rods for operation by said levers, other levers for actuation by said push rods, a bearing in which said second mentioned levers are mounted, and further rods provided between the second mentioned levers and the corresponding parts to be controlled, and means for operating the auxiliary controlling mechanism from the main timing and controlling mechanism, the work of controlling the machine thus being shared between the said two mechanisms, for the purpose herein specified.

4. A combination according to claim 2, wherein each second mentioned lever is bifurcated at one end, the rod between this lever and the part to be controlled is bent for insertion into the bifurcation, and a pivoted catch is provided on the said lever for engagement with the bent portion of the rod, for the purpose herein specified.

5. In a circular knitting machine, in combination, a rotary bottom needle cylinder, a rotary top needle cylinder axially opposed with respect to said bottom cylinder, a cam box associated with the bottom cylinder, a bed plate by which the bottom cam box is carried, another cam box associated with the top cylinder, a top plate serving to support said last mentioned cam box, controllable parts assembled about the needle cylinders, main timing and controlling mechanism including a rotatable unit furnished with elements for effecting some of the desired changes in the operation of the machine, a gear ring on said unit, means for rotating said unit intermittently, an auxiliary controlling mechanism comprising a controlling ring which is mounted concentrically on the bed plate and furnished with a concentric series of cams, a further gear ring secured on said controlling ring, spur and bevel gearing arranged between the gear ring on the unit aforesaid and the gear ring on the controlling ring whereby the latter is racked round intermittently, a plurality of levers each formed to be acted upon by a relevant cam on the controlling ring, push rods for operation by said levers, said rods extending up through the top plate, other levers for actuation by said push rods, each of said second mentioned levers being provided with a fulcrum on one edge, a bearing on the top plate in which the second mentioned levers are mounted

by pin and slot connections, screws in said bearings against which the fulcrums thrust, and further rods which are connected with said second mentioned levers and arranged to extend downwardly through the top plate where they are in turn connected with the parts to be controlled.

6. In a circular knitting machine, in combination, a needle cylinder, controllable parts assembled about said cylinder, main timing and controlling mechanism including a rotatable drum 10 furnished with a peripheral series of cams, means for racking around the said main drum inter-

mittently, auxiliary controlling mechanism comprising a controlling member of annular form arranged co-axially with respect to the said needle cylinder, and shafts geared with the respective mechanisms and with each other whereby the auxiliary controlling member is driven from the main drum so as to be racked round synchronously with the latter for controlling the aforesaid parts.

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