

[54] **YARN-FEEDING MEANS FOR KNITTING MACHINES**

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[58] Field of Search66/125, 129, 133, 142

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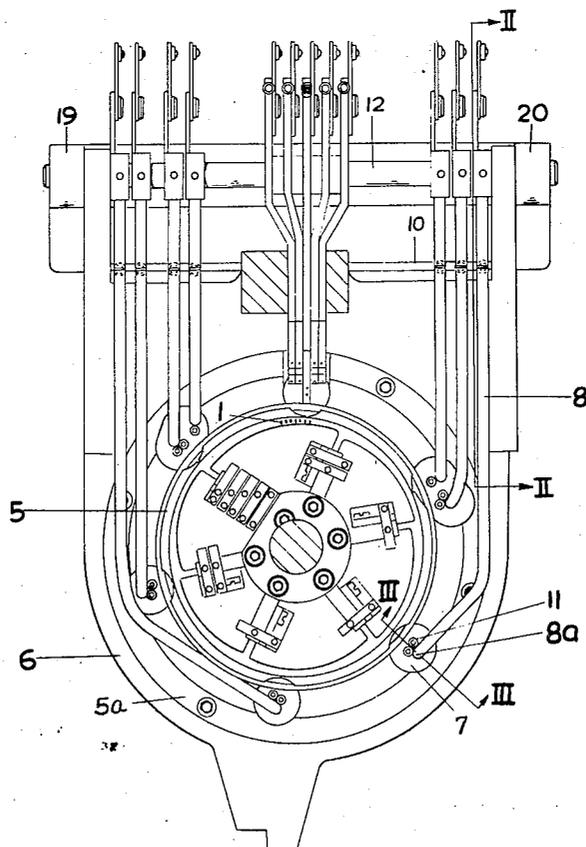
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[57] **ABSTRACT**

A circular knitting machine is provided with a yarn feeder to be positioned in the neighborhood of the needle circle, and an arm carrying the yarn feeder pivoted at a distance from the needle circle for movement to bring the yarn feeder into and out of an active yarn-feeding position, and locating means to restrain the yarn feeder against undesired movement when in active position. In a machine having a multiplicity of knitting stations, all the feeder arms are pivoted about a common axis and the yarn feeders having long arms are provided with each locating means in the vicinity of the needle circle.

13 Claims, 7 Drawing Figures



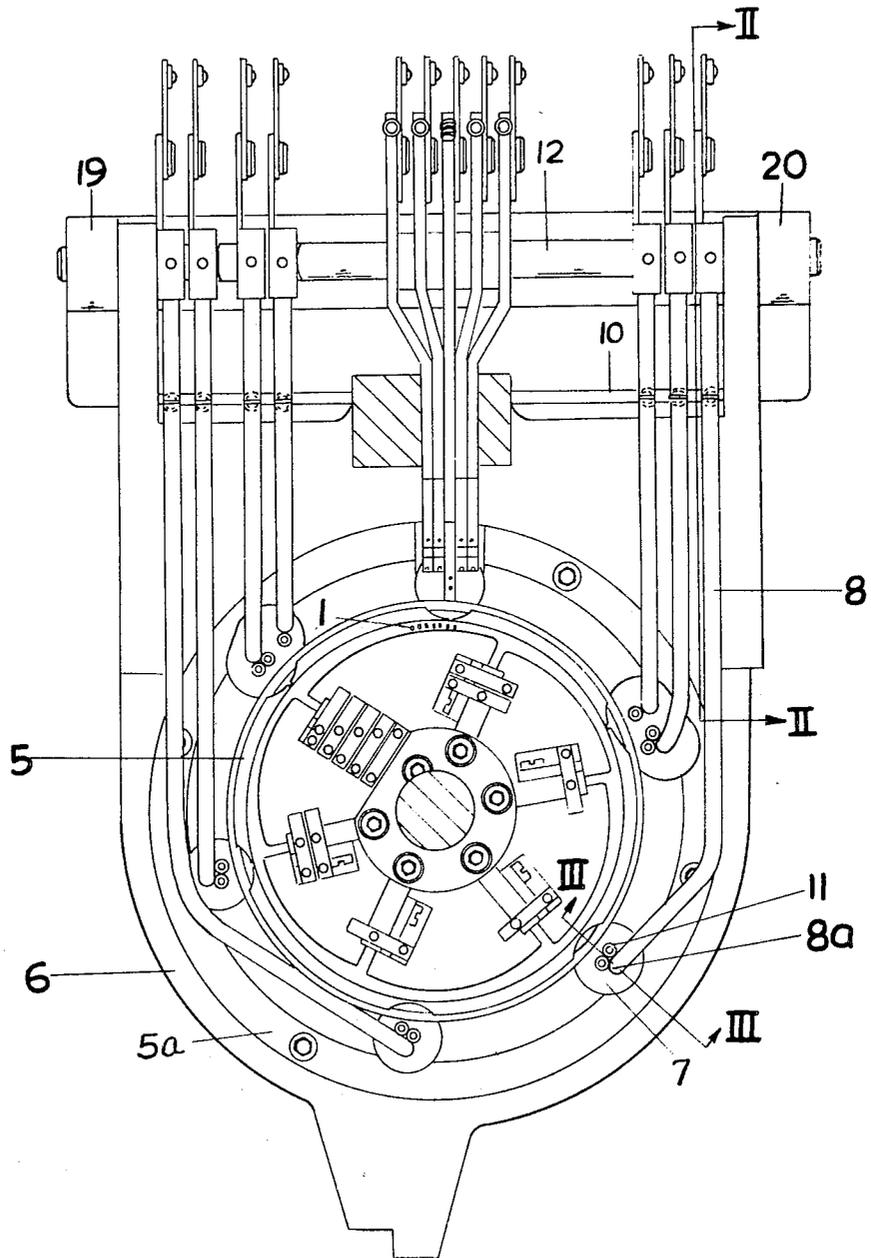
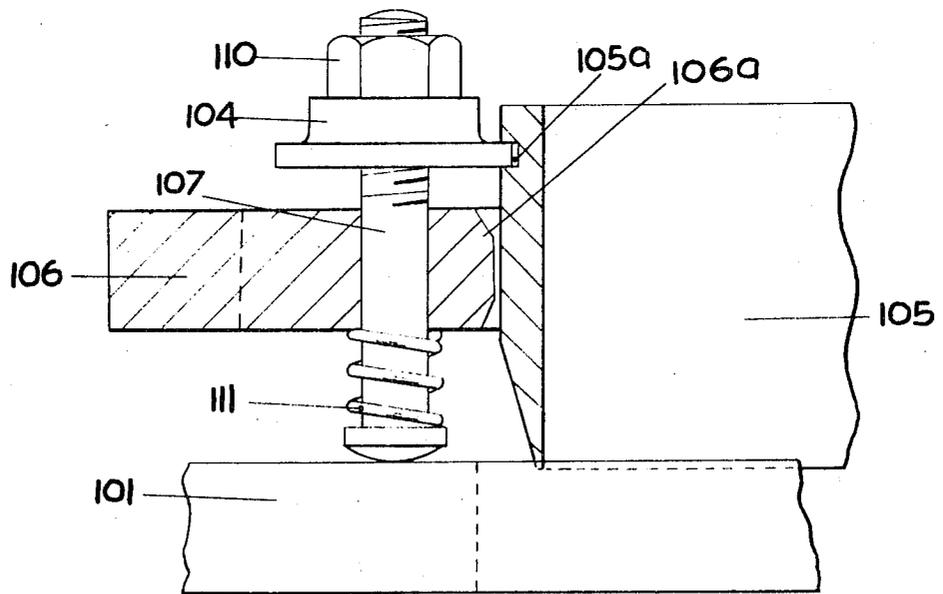
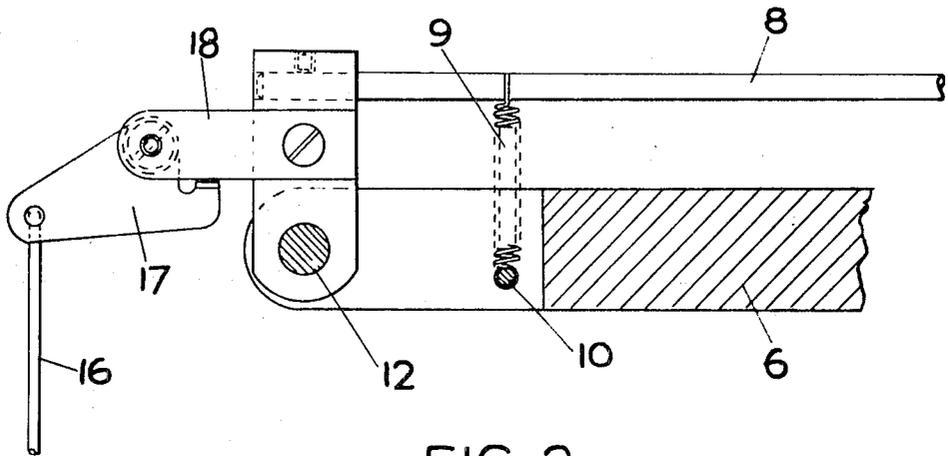


FIG. 1.



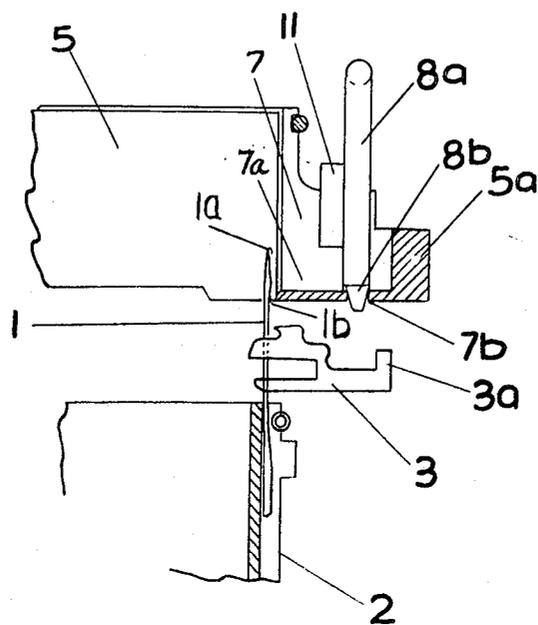


FIG. 3

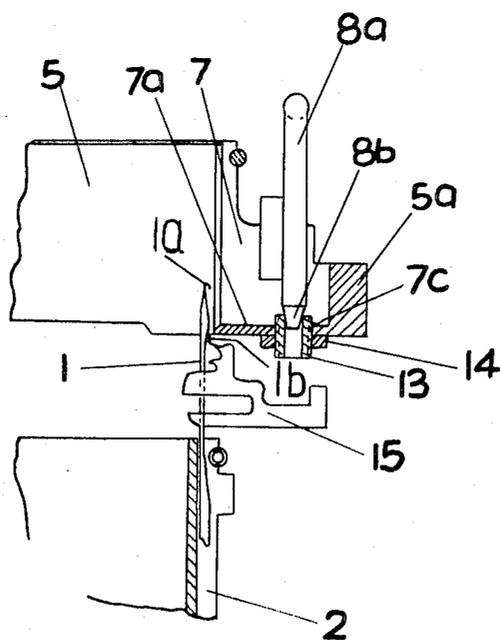


FIG. 4.

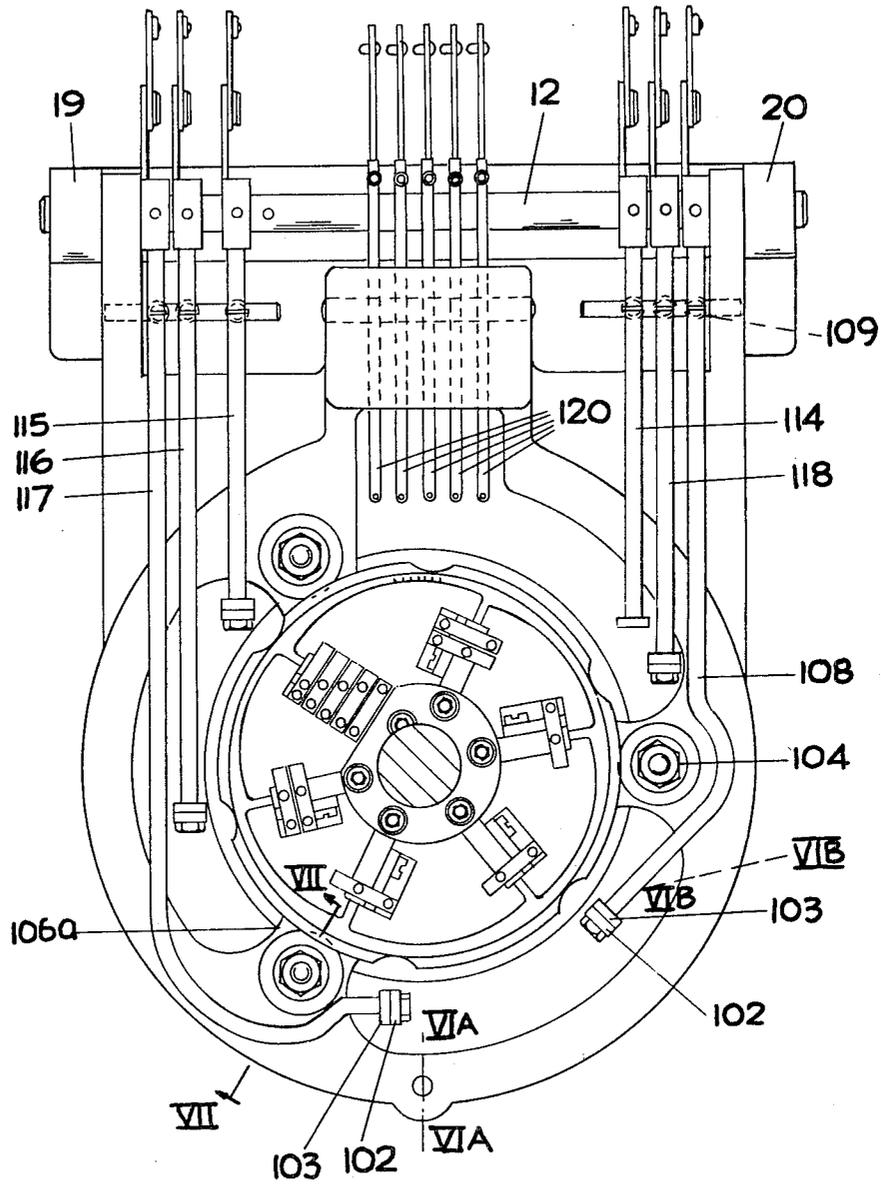


FIG. 5

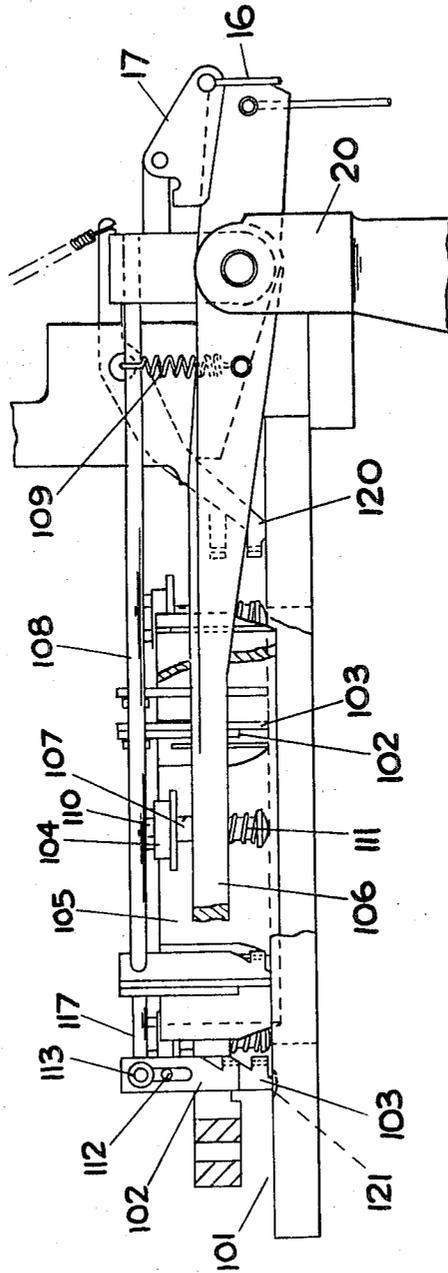


FIG. 6.

YARN-FEEDING MEANS FOR KNITTING MACHINES

This invention relates to an improved yarn-feeding means for knitting machines and is particularly concerned with the control of a feeder of a circular knitting machine in a case where the feeder is on a carrier mounted at a position displaced at a distance from the needle circle.

Heretofore on circular knitting machines, and particularly machines of the single cylinder type, it has been arranged that each knitting position is provided with at least one feeder arranged on a mounting adjacent to the knitting circle with the feeder or feeders pivoted on an axis which is approximately tangential to the knitting circle, i.e., is not displaced therefrom to any substantial extent. With a machine having a plurality of knitting stations this system of feeder mounting becomes more complex the greater the number of knitting stations and involves complex linkages or other multiple controls to operate the feeders at the several knitting stations. Other types of feeder control have been used in which all the feeders are pivoted and operated from one and the same side of the machine. This system however has the disadvantage of requiring long unstable feeders by means of which correct feeding of the yarn to the needles cannot be ensured, and the invention seeks to provide a feeder mounting and control means by which some or all of the disadvantages of the known arrangements can be circumvented.

In accordance with the invention there is provided in a circular knitting machine a yarn feeder positioned in the neighborhood of the needle circle and carried by an arm which is mounted at a distance from the needle circle and movable to bring the feeder into and out of action, in combination with locating means (conveniently positioned in the vicinity of the needle circle) whereby the feeder is restrained against undesired movement when it is in an active yarn-feeding position. The locating means may conveniently serve also as a means for accurately positioning the feeder in relation to the needles when in its yarn-feeding position. Advantageously the locating means may serve to restrain the feeder against undesired movement both heightwise and laterally.

The invention is conveniently applied to a machine having a plurality or multiplicity of knitting stations spaced apart around the needle cylinder, the yarn feeders at the several stations being carried on arms which are pivoted to rock about a common axis displaced from the needle cylinder at one side of the machine and appropriate ones of said feeders (for example, those feeders which are at stations other than that positioned closest to said axis) having locating means as aforesaid associated with their feeders.

Conveniently the locating means as aforesaid cooperates with a depending end portion of the associated feeder arm or a depending portion of the feeder itself. There may be tapered end to that depending portion which is arranged to engage in a hole accurately positioned heightwise and laterally in relation to the needle cylinder and provided in an adjacent part of the machine. Alternatively a portion of the feeder may be urged to bear frictionally against or in a recess in, a stationary plate which may be a sinker cap.

In applying the invention to a machine having a multiplicity of knitting stations, say four or more in number, the yarn feeders for all of the knitting stations may be carried on arms which are pivoted to rock about a common axis as aforesaid and feeder arms which are related to knitting stations on the more distant side of the cylinder may have their end parts offset angularly as viewed in plan from the main parts of such arms to enable them to reach partly round the cylinder and carry a feeder at a required position in relation to the related knitting station.

Advantageously, means may be provided for accurately adjusting the operative height of a yarn feeder at which it is positively located in its operative yarn feeding position. This may be arranged by having a heightwise adjustable member formed with an opening cooperative with a depending tapered end portion of the related feeder arm, or arranged to engage with a portion of the feeder, in the manner aforementioned. The lo-

cation of the end of the feeder arm can thus be varied by adjusting the adjustable member up and down as required and fixing it in its adjusted position.

Certain convenient forms of construction in accordance with the invention are illustrated by way of example, in the accompanying drawings in which:

FIG. 1 is a plan view of the top of a single cylinder circular knitting machine having six circumferentially spaced knitting stations, showing feeder means associated therewith;

FIG. 2 is an enlarged detailed sectional view of certain parts taken on the line II—II in FIG. 1;

FIG. 3 is an enlarged detailed partial elevation in cross section taken on the line III—III in FIG. 1;

FIG. 4 is a view corresponding to FIG. 3 but showing a somewhat modified arrangement;

FIG. 5 is a plan view corresponding to FIG. 1 but illustrating a modified machine with feeders of a different form;

FIG. 6 is a view in side elevation of parts shown in FIG. 5, partly broken away between lines VI A—VI A and VI B—VI B of FIG. 5, to expose two feeders; and

FIG. 7 is an enlarged view in cross section taken on line VII—VII of FIG. 5.

As shown in FIGS. 1 and 3 the machine of the first embodiment illustrated has a circular series of needles 1 located in a needle cylinder 2, and rotatable past operating cams (not shown) which impart the various knitting movements. Cooperating with the needles 1 to form knitted stitches are sinkers 3 controlled from a cam track (not shown) operating on rearwardly located butts 3a of the sinkers 3. The control and operation of the knitting elements, the sinkers 3 and needles 1, are well known and need not be described here.

Around the periphery of the top of the circular row of needles 1 is a latch guard ring 5 which helps to guard and control the needle latches 1b and through which the yarn is fed into the needle hooks 1a to be knitted in a conventional manner. The latchguard ring 5 is supported, as is conventional, by its own circumferential flange 5a fitting into a support plate 6. At each feeder position the latchguard ring flange 5a is recessed locally as shown at 7 (FIGS. 1 and 3) in such a way as to provide a feeder-locating surface 7a (FIG. 3) low down at the outside of the latchguard ring 5. In this surface 7a and extending out through the bottom of the latchguard ring 5 there is formed a feeder locating hole 7b.

All the feeders of the machine are carried on arms or levers 8 pivoted at one side of the machine on a common spindle 12 supported between fixed bosses 19 and 20 on upstanding supports (not shown) which also provide a mounting for the support plate 6. The feeders are operated by links 16 or cables from a main or auxiliary control drum as provided conventionally on such machines and not shown here. The links 16 or cables may operate the feeder arms 8 through abutment levers 17 pivoted to lugs 18 on holders of the arms 8. The feeder arms 8 serving the auxiliary feed positions are all of a similar design and the invention will now be more specifically explained with reference to one of such feeder arms, the explanation being applicable to all the feeder arms in general.

As shown in FIGS. 2 and 3, a feeder arm 8 in its operative position has a main part which is roughly horizontal and a bent over vertical end part 8a which terminates in a conical tip 8b located in the hole 7b. A spring 9 anchored to a rod 10 in the support plate 6 retains the feeder arm tip 8b engaged in the hole 7b. Appropriately positioned on the feeder arm end part 8a is at least one yarn feeder tube 11. Such a feeder tube is generally made of ceramic or other hard wearing material and is fixed to the end part 8a by an adhesive such as that sold under the trademark "Araldite." Because of the location of the feeder arm end close to the feeding position, the yarn is consistently fed through the yarn feeder tube 11 and through the latchguard ring 5 to the knitting elements. The spring 9 holds the feeder tube 11 at a constant height by pulling the feeder tip 8b into steadying engagement with the hole 7b, the latter serving to restrain the feeder tip 8b, and therefore the feeder tube 11, against undesired horizontal and downward vertical movement.

An alternative locating means permitting a height adjustment of the yarn feeder in its yarn-feeding position is shown in FIG. 4. In this construction, a screw-threaded hole 7c, larger than the hole 7b, has screwed into it a short tube 13 which is thereby vertically adjustable up and down and is fitted with a locknut 14 to releasably lock it in its adjusted position. The feeder tip 8b is located in the top of the tube 13 which can be vertically adjusted to obtain precise control of the height of the feeder tube 11.

The location height control of FIG. 4 is more particularly applicable to the knitting of fancy fabric, such as a terry fabric, for which two yarns are fed to the knitting elements at one knitting position. When knitting terry fabric, two feeder tubes 11 are attached to the feeder end 8a at different heights and serve respectively to feed a main or ground yarn at normal height to the needles and a terry yarn at a higher level to the needles over the top of terry instruments shown at 15. By adjusting the height of the feeder tubes 11 by the threaded tube 13, the best feeding level of the ground and terry yarns can be found and held, allowing for variations between one knitting position and another. In certain circumstances it may be preferable to employ separate feeder arms for the feeders for the ground and fancy yarns and then each feeder may be positively located and adjusted to the required height independently of the other.

The modified construction shown in FIGS. 5 to 7 is particularly suitable for use when a terry fabric is being made using terry instruments. It is usual to provide as much separation as possible between the two yarns being used to make this fabric, so that the terry instruments can be more easily inserted. Because other factors influence the lay of the yarns, this separation varies and makes the setting of the terry instruments more critical. The yarns pass through a yarn feeder and then through a slot in the latchguard ring to the needles in the knitting cylinder. The terry yarn which is uppermost in the slot in the latchguard ring, passes directly from its feeder through the slot over the terry instrument and so to the needle, but the ground yarn passes from its feeder over the base of the slot and then to the sinker and needle. With the two yarns being fed from fixed positions, any rise or fall of the knitting cylinder due to quality changes will influence the separation of the yarns.

In the construction of FIGS. 5 to 7 there are feeder arms 108, 114, 116, 117, and 118 pivoted on the spindle 12 as in the previously described construction and operated similarly. A sinker cap 101 corresponds to the support plate 6 shown in FIG. 1. Plate like feeders 103 for main yarn and 102 for terry yarn are fitted in a manner later described to appropriate ones of the feeder arms. A latchguard ring 105 (FIG. 7) without an out-turned flange has vertical double-ended slots at the positions of the feeders and is mounted in a modified latch ring 106 which has returned lugs 106a, by means of flange nuts 104 engaging in notches 105a in the ring 105. The flange nuts 104 are adjustable on studs 107 positioned in holes in the lugs 106a are releasably locked in an adjusted position on the studs by locknuts 110. The studs 107 have rounded heads resting on the sinker cap and carry springs 111 which are held slightly in compression between the latch ring 106 and the heads of studs 107 when the latch ring is locked in its lowered (i.e. operative) position. Thus the latchguard ring 105 is resiliently or yieldably held at the required level in relation to the needles and the sinker cap 101 and is raised and lowered with the latter for "quality" (i.e., stitch length) control.

Other feeders of a more orthodox construction are provided at the feeding station nearest to the spindle 12 and indicated at 120.

The feeders 102 and 103, see FIG. 6, take the form of plates, feeder 103 being used for the ground yarn and feeder 102 for the terry yarn. Advantageously, the feeder 103 is screwed on to the feeder arm 108. Similarly other feeders 103 are screwed on to the ends of feeder arms 115 to 118. When in the feed position each of the feeders is caused to bear down on the upper face of the sinker cap 101 through the action of a spring 109 located on the feeder arm. The feeder 102 has a

slot which can locate on a peg 112 projecting from the face of feeder 103 and the same slot locating over the end of the feeder arm 108 or 115 to 118 allows accurate adjustment heightwise of the terry feeder 102. Locknut 113 is used to lock the feeder ends together and fix them on the feeder arm when final adjustment to the terry feeder 102 has been made.

The construction just described provides a means of feeding main and terry yarns so that after the initial setting of the feeders and the latchguard ring, the heightwise separation of the main and terry yarns being fed to the needles will remain the same regardless of the rise and fall through quality changes of the knitting cylinder. With the feed angle and separation of the yarns being constant, the terry instruments can be more easily timed and set in the correct position relative to the two yarns.

As can be seen in FIG. 6, the feeders 103 are located when in the active yarn feeding position on the upper face of the sinker cap 101 and are restrained against undesired movement by frictional engagement with the upper face and are pressed thereagainst by the action of the springs 109. The bottom ends of the feeders 103 may for this purpose be caused to have good surface contact with the upper face of the sinker cap 101. Alternatively the bottom ends of the feeders 103 may engage in parallel sided keylike recesses or countersinks, as indicated at 121 in FIG. 6, to restrain the feeders against lateral movement.

Because the sinker cap 101 is located on the upper end of the cylinder and provides the new location for the feeders, it will be seen that any upward or downward movement of the cylinder is imparted to the feeders carrying the yarn. With the ground yarn feeder 103 located on the upper face of the sinker cap and the terry yarn feeder 102 adjusted to correct height to feed the terry yarn over the nebs of the terry instruments, the most effective yarn separation is obtained, giving the appropriate angle of feed of the terry yarn to the terry instrument and the ground yarn to the sinker. This separation will remain constant regardless of any up or down movement of the cylinder, thus allowing the terry instruments to be more easily timed and set relatively to the two yarns. Furthermore, with the initial setting of the latch guard completed by adjustment of the flanged nuts 104, up or down movement of the cylinder will be transmitted through the studs to the latchguard ring 105. This ensures that the ground yarn passing over the base of the slot in the latchguard will remain in the same relative position to the sinker and terry instrument regardless of the rise and fall of the cylinder and associated sinker cap.

What we claim is:

1. In a circular knitting machine, the combination comprising: a yarn feeder to be positioned in the neighborhood of the needle circle, an arm carrying said yarn feeder, means mounting said arm at a distance from the yarn feeder for movement to bring the yarn feeder into and out of an active yarn feeding position, and locating means to restrain the feeder against undesired movement when the feeder is in an active yarn feeding position.

2. A combination according to claim 1, wherein said locating means is positioned in the vicinity of the needle circle.

3. A combination according to claim 1, wherein said locating means includes means for restraining the yarn feeder against undesired movement both heightwise and laterally.

4. A combination according to claim 1 wherein the locating means includes means to position the yarn feeder accurately in relation to the needles when in a yarn-feeding position.

5. In a circular knitting machine having a multiplicity of feeding stations spaced apart around a needle cylinder, a combination according to claim 1 having a yarn feeder at each of said feeding stations, feeder-carrying arms one for each of said feeders means pivoting said arms to rock about a common axis displaced from the needle cylinder, and feeder locating means for at least each of those yarn feeders which are displaced to a substantial extent from said common axis.

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6. A combination according to claim 1, wherein the feeder-locating means comprises a plate and means yieldably urging a part carried by the feeder arm at the feeder end yieldably towards said plate when said yarn feeder is in an active yarn-feeding position.

7. A combination according to claim 6 comprising spring means urging said part carried by the feeder arm against said plate to retain the yarn feeder frictionally against undesired displacement.

8. A combination according to claim 6 wherein said plate is provided with means defining a recessed seating into which said part carried by the feeder arm is urged to locate it.

9. A combination according to claim 5 wherein the feeder arms related to feeding stations on the side of the needle cylinder more distant from the pivotal axis of the feeder arms have their end parts offset angularly as viewed in plan from the main parts of said arms to reach partly round the needle cylinder to carry a yarn feeder at the required position.

10. A combination according to claim 1 including means for adjusting the operative height of a yarn feeder at which it is located in its active yarn feeding position.

11. A combination according to claim 10, wherein said adjusting means comprises a heightwise adjustable member having means therein defining an opening cooperative with a depending part of the feeder arm.

5 12. A combination according to claim 1 comprising two yarn feeders, one for a main yarn and the other for a terry yarn, carried by said arm and means mounting the yard feeder for the terry yarn against the other yarn feeder to feed terry yarn at a higher level than the main yarn and permitting adjustment of the terry yarn feeder heightwise in relation to the yarn feeder for the main yarn.

10 13. A combination according to claim 1 comprising a latchguard ring, flanged nuts engaging the latchguard ring to anchor same at spaced intervals, an outer latch ring having spaced inturned lugs, bolts mounted in said inturned lugs and carrying said flanged nuts and a supporting plate below the latch ring engaged by said bolts, and wherein the yarn feeder depends when in an active yarn feeding position through the space between the latchguard ring and the latch ring to engage and be located on the supporting plate.

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