This invention relates to circular knitting machines for knitting fine gage sheer hosiery and the like, and more particularly to the sinkers and the stitch ring structure which supports the sinkers in radial angularly spaced relation to each other and with respect to the axis of the knitting cylinder.

The principal object of the invention is to provide a fabricated stitch ring embodying individual interchangeable partition walls and complementary component elements which will afford adequate support and retain the sinkers in true vertical planes radiating from the axis of the needle cylinder, whereby uniformity of stitch throughout the whole of the product knitted on the machine will prevail.

Another object of the invention is to construct the interchangeable partitions in a manner to afford smooth surfaces thereof adjacent the intervening sinkers to discourage accumulation of lint, etc., between the sinkers and the partitions.

In the accompanying drawings:

Fig. 1 is an enlarged fragmentary vertical sectional view through the needle cylinder and sinker mechanism of a circular knitting machine as constructed in accordance with the present invention;

Fig. 2 is a still further enlarged fragmentary plan view of a portion of the mechanism shown in Fig. 1, with the sinker cam ring removed, as would be viewed along the line 2—2, Fig. 1;

Fig. 3 is a vertical cross-sectional view taken on the line 3—3, Fig. 1;

Fig. 4 is a detached and enlarged perspective view of one of the sinkers;

Fig. 5 is a detached and enlarged perspective view of one of the stitch rings or sinker partition walls;

Fig. 6 is a fragmentary detached perspective view of a portion of the sinker retaining ring;

Fig. 7 is a fragmentary detached perspective view of a portion of the stitch ring wall or partition clamp, and

Fig. 8 is a fragmentary plan view of a modified form of the invention.

As shown in Fig. 1, the needle or knitting cylinder 1 is provided with circumferentially spaced grooves or channels 2 formed in or otherwise provided on the outer peripheral surface of the cylinder parallel to the axis thereof, for the reception of longitudinally reciprocable needles 3, 3 respectively, said cylinder including an annular flange 4 at its upper end through which the grooves 2, 2 pass.

Supported on and by the flange 4, through radial arms 5, 5 is a stationary sinker ring 6 having radial grooves 7, 7 for slidably supporting the outer blade-like ends 8 and the cam lugs 9 of the sinkers 10, 10.

The inner blade-like ends 11, 11 of the sinkers 10, 10 rest upon and are supported by the upper surface of a stitch ring 12, which is diametrically reduced and externally threaded at its lower end 13 to fit within and cooperate with internal threads of a counterbore 14 formed in the upper end of the needle cylinder 1.

The sinkers 10, 10 are disposed in radial vertical planes by and between vertically extending partitions or walls 15 each of which is mounted in a vertical radial slot 16 formed in an annular flange 17 of the stitch ring 12.

Each of the partitions 15 is provided with a toe 18 underlying an overhanging solid portion 19, which forms an annular shoulder on the flange 17, at the inner end or base of each of the slots 16, to keep the partitions 15 from moving upwardly, i.e. axially of the needle cylinder.

Each of the partitions 15 is also provided with a rectangular recess 21 at its lower outer corner to receive a clamp ring 20 which encircles the entire complement of partitions and holds them against radially outward displacement in the slots 16, with respect to the axis of the needle cylinder.

Each partition 15, in addition to the aforesaid toe and recess, is provided with an inwardly extending nose 22 which overhangs the upper end of the stitch ring 12, in vertically spaced relation thereto, and rests in a radial groove 23 formed in the top side of a sinker retaining ring 25, the lower side of which rests on the top edges of the inner blade-like ends 11, 11 of the sinkers 10, 10, whereby these inner blade ends of the sinkers are kept from rising, in operation, while they are permitted to slide freely in and out radially with respect to the axis of the knitting cylinder.

The outer blade-like ends 8, 8 of the sinkers 10, 10 are similarly held against rising from the bases of the grooves 7 of the sinker ring 6 by the under side of the horizontal top portion 28 of the sinker cam ring 30 which is provided with a cam groove 29 into which the cam lugs 9 of the sinkers 10 project, and by which the sinkers are moved in and out radially with respect to the axis of the needle cylinder.

The sinker cam ring 30 is provided with a depending annular flange 27 which encircles the outer peripheral face of the sinker ring 6, on which the cam ring 30 is concentrically mounted for relative rotation and oscillation during the knitting on the machine, for example, of a leg and foot.
and toe and heel, respectively of a full length lady's stocking or man's sock.

Each sinker 10 is in its outer or back edge, provided with an undercut recess 31 for reception of an encroaching elastic band, such as an endless coil spring 32, by which the sinkers 10, 10 are constantly urged radially inward.

Each sinker 10 is provided on its inner edge with a yarn sinking and fabric holding horizontal notch 33 which cooperates with the needles 2 in the formation of the stitch wales and courses of the knitted fabric; and below this notch each sinker has a fabric supporting edge 34, 34, between the lower edge of which and the upper edge of the blade end 11 the sinker is recessed horizontally at 35 to span the sinker retaining ring 25.

In order to enter the spaces between adjacent knitting needles 2, 2 of fine gauge machines which produce sheer fabrics, the inner portion 10a comprising approximately one half of the full length of each sinker 10, is of minimum thickness; and in order to give the sinker sufficient structural stability the outer half 10b of each sinker 10 is of relatively increased thickness 10b.

In order to provide support for the thin inner ends of the sinkers, one (Fig. 8) or both (Fig. 5) of the opposite side faces of the outer vertical marginal edge of each partition 15 is provided with a raised pad portion 15a, 15a which transversely tucks these marginal portions of the partitions 15 with respect to the inner plate portions 15b of said partitions to an extent where in the thickened marginal edges 15a substantially fill the spaces between, and function to act as guides for, adjacent thin portions 10b of the sinkers 10, from the back faces of the needles to a radial depth substantially equal to the thickness of the clamp ring 20, as shown in Fig. 2. When the two pads 15a, 15a are employed the opposite side faces 15c, 15c of the marginal portions 15a, 15a are preferably convergent to make flat full-width sliding contact with the adjacent parallel side faces 10c, 10c of the thin plate portions 10b of the sinkers 10.

Due to the radial convergency of the partitions 15 and sinkers 10, the inner ends or edges of the noses 22 of the partitions 15 are spaced apart laterally to just a sufficient distance to permit the noses 35 of the sinkers 10 to slide comfortably therebetween and thus the inner ends of the partition noses 22 function as stabilizing guides for the sinkers during radial reciprocation thereof to prevent deflection of the thin portions of the sinkers from their prescribed paths of movement.

It will be noted that the thickened marginal portions 15a of the partitions 15 lie directly behind and are parallel and adjacent to the backs of the needles 3, 3; and that they engage the thin portions 10a of the sinkers immediately adjacent the needles 3, 3 along substantially the full lengths of those portions of the needles which project above the top surface of the needle cylinder substantially up to the horizontal plane of the yarn sinking and fabric holding notches 33 of the sinkers, so that the sinkers are maintained against lateral flexing and in parallel relation to the needles, and that the needles are prevented from being excessively deflected radially inward, thus these cooperating stitch forming instrumentalties are held in definite operating relationship at all times which insures uniformity of stitch in the knitted fabric throughout the whole of the knitted structure.

Preferably the partitions 15 are finished to provide a smooth surface all over said partition, as by tumbling, to remove all tool marks and excessively sharp edges, etc., which would tend to collect lint, thus the spaces between the sinkers and the partitions are always substantially free of lint, thus avoiding the formation of lint which normally arises from accumulations of lint between the sinkers and their guides.

In the drawing it has been necessary to exaggerate the clearances between the partitions and sinkers for the sake of clarity of illustration, thus it will be understood that the drawing is for illustrative purposes only and should not be considered as placing any limitations on the scope of the appended claims insofar as dimensions, tolerances and clearances are concerned.

I claim:

1. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a radially slotted ring on the upper end of said cylinder, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles and mounted at their lower ends in the radial slots of said ring, and a clamp ring concentric to said grooved ring and engaging said lower ends of said partitions to secure said partitions rigidly in said radial slots against radial displacement thereinfrom.

2. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a radially slotted ring on the upper end of said cylinder, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles and mounted at their lower ends in the radial slots of said ring, a clamp ring concentric to said grooved ring and engaging said lower ends of said partitions to secure said partitions rigidly in said radial slots against radial displacement thereafterfrom, an annular shoulder on said slotted ring adjacent the bases of the slots therein, and a toe on each partition underlying said shoulder to prevent axial displacement of said partitions relative to said ring.

3. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a radially slotted ring on the upper end of said cylinder, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles and mounted at their lower ends in the radial slots of said ring, a clamp ring concentric to said grooved ring and engaging said lower ends of said partitions to secure said partitions rigidly in said radial slots against radial displacement thereafterfrom, an annular shoulder on said slotted ring adjacent the bases of the slots therein, and a toe on each partition underlying said shoulder to prevent axial displacement of said partitions relative to said ring, a blade-like end on each sinker extending between adjacent partitions, a retaining ring resting on the upper edges of
the blade-like ends of said sinkers, and noses on said partitions overhanging and contacting the upper side of said retaining ring.

4. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a radially slotted ring on the upper end of said cylinder, a plurality of interchangeably mounted said sinkers in radial planes coincident with said needles and mounted at their lower ends in the radial slots of said ring, a clamp ring concentric to said grooved ring and engaging said lower ends of said partitions to secure said partitions rigidly in said radial slots against radial displacement therefrom, an annular shoulder on said slotted ring adjacent the bases of the slots therein, a toe on each partition underlying said shoulder to prevent axial displacement of said partitions relative to said ring, a blade-like end on each sinker extending between adjacent partitions, a retaining ring resting on the upper edges of the blade-like ends of said sinks, and noses on said partitions overhanging and contacting the upper side of said retaining ring, said noses being disposed in circumferentially spaced grooves formed in said upper side of said sinker retaining ring.

5. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a radially slotted ring on the upper end of said cylinder, a plurality of interchangeably mounted said sinkers in radial planes coincident with said needles and mounted at their lower ends in the radial slots of said ring, a clamp ring concentric to said grooved ring and engaging said lower ends of said partitions to secure said partitions rigidly in said radial slots against radial displacement therefrom, an annular shoulder on said slotted ring adjacent the bases of the slots therein, a toe on each partition underlying said shoulder to prevent axial displacement of said partitions relative to said ring, a blade-like end on each sinker extending between adjacent partitions, a retaining ring resting on the upper edges of the blade-like ends of said sinks, and noses on said partitions overhanging and contacting the upper side of said retaining ring, said noses being disposed in circumferentially spaced grooves formed in said upper side of said sinker retaining ring.

6. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a plurality of interchangeable partitions between said sinkers in radials planes coincident with said needles, and thickening pads along the marginal edges of said partitions adjacent said needles and arranged to make sliding contact with said sinkers.

7. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles, and thickened marginal edges on said partitions adjacent said needles, and radially converging bearing faces on said thickened edges and making flat sliding contact with adjacent faces of said sinkers.

8. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of interchangeably mounted said sinkers in radial planes coincident with said needles, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles, said sinkers being of predetermined thickness throughout an outer portion thereof lying radially outward beyond said needles and of a relatively lesser thickness throughout an inner portion radially inward of said thicker portion and extending between said needles and said partitions, means slidably supporting said thicker outer portions of said sinkers outwardly beyond said needles, and means supporting said thinner inner portions of said sinkers inwardly of said needles.

9. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles, said sinkers being of predetermined thickness throughout an outer portion thereof lying radially outward beyond said needles and of a relatively lesser thickness throughout an inner portion radially inward of said thicker portion and extending between said needles and said partitions, means slidably supporting said thicker outer portions of said sinkers outwardly beyond said needles, and means supporting said thinner inner portions of said sinkers inwardly of said needles.

10. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles, said sinkers being of predetermined thickness throughout a major portion of its total area, and a relatively thicker portion on each partition adjacent one vertical marginal edge portion thereof.

11. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles, and thickening pads along the marginal edges of said partitions adjacent said needles and arranged to make sliding contact with said sinkers.

12. A knitting machine structure comprising a knitting cylinder, a plurality of needles circumferentially spaced around and operable axially of said cylinder, a plurality of sinkers operable in planes radial to the axis of said cylinder between said needles, a plurality of interchangeable partitions between said sinkers in radial planes coincident with said needles, and thickened marginal edges on said partitions adjacent one vertical marginal edge portion thereof, and provided with converging opposite side surfaces for contact with adjacent sinker surfaces respectively, and an extended toe on said partition along an opposite side edge thereof and included on the thinner portion of said partition adjacent one end of said thicker marginal edge portion of the partition.
13. A sinker partition for use in a circular knitting machine between adjacent sinkers thereof, said partition being of predetermined thickness throughout a major portion of its total area, and a relatively thicker portion on each partition adjacent one vertical marginal edge portion thereof, and provided with converging opposite side surfaces for contact with adjacent sinker surfaces respectively, an extended toe on said partition along an opposite marginal edge thereof and included on the thinner portion of said partition adjacent one end of said thicker marginal edge portion of the partition, and an extended nose portion on the second said marginal edge also included in said thinner portion of the partition in spaced relation to said extended toe thereof.

WALTER LARKIN.