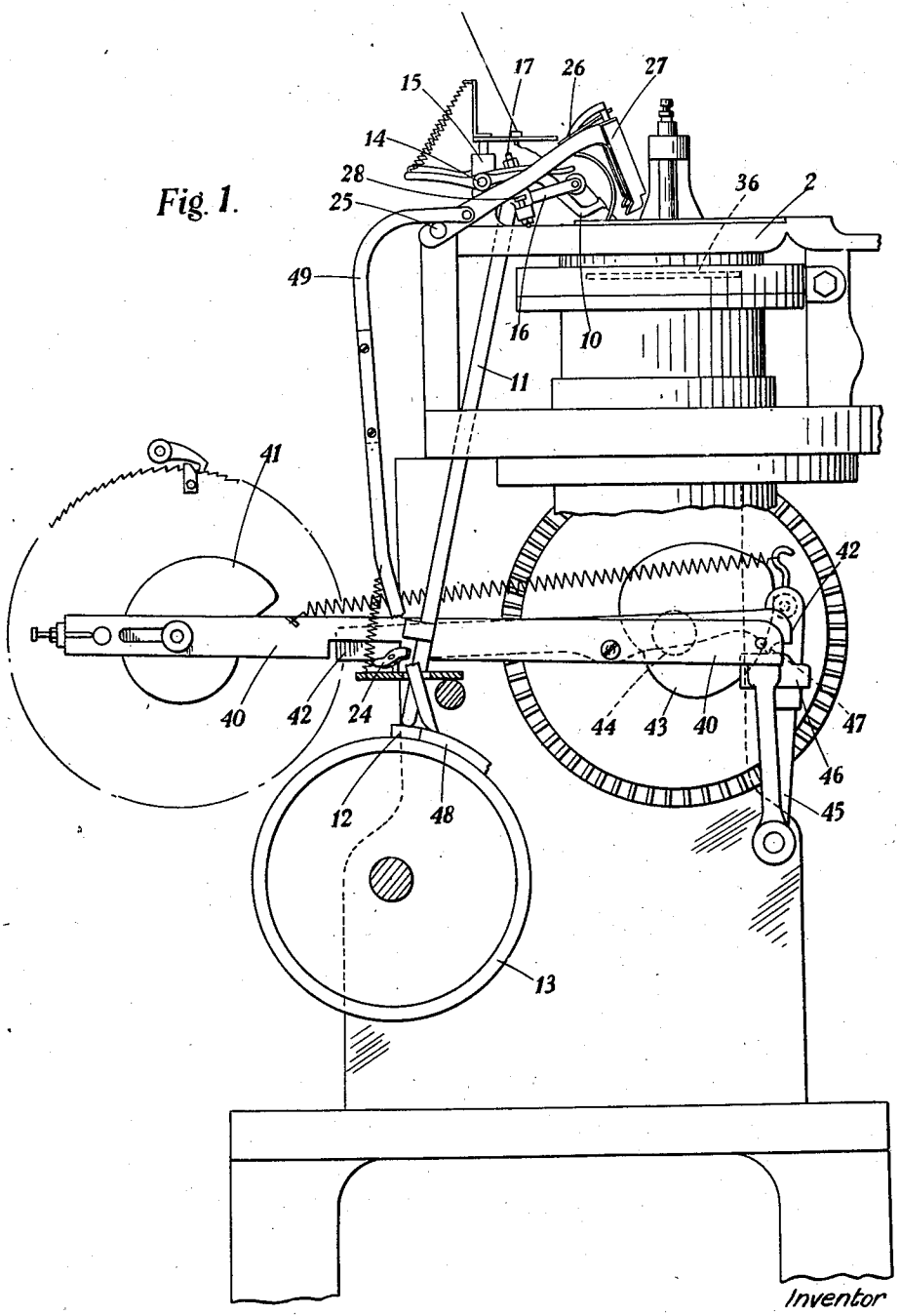
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KNITTING MACHINE

Filed June 21, 1940 6 Sheets-Sheet 1

Fig. 1.




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KNITTING MACHINE

Filed June 21, 1940 6 Sheets-Sheet 2

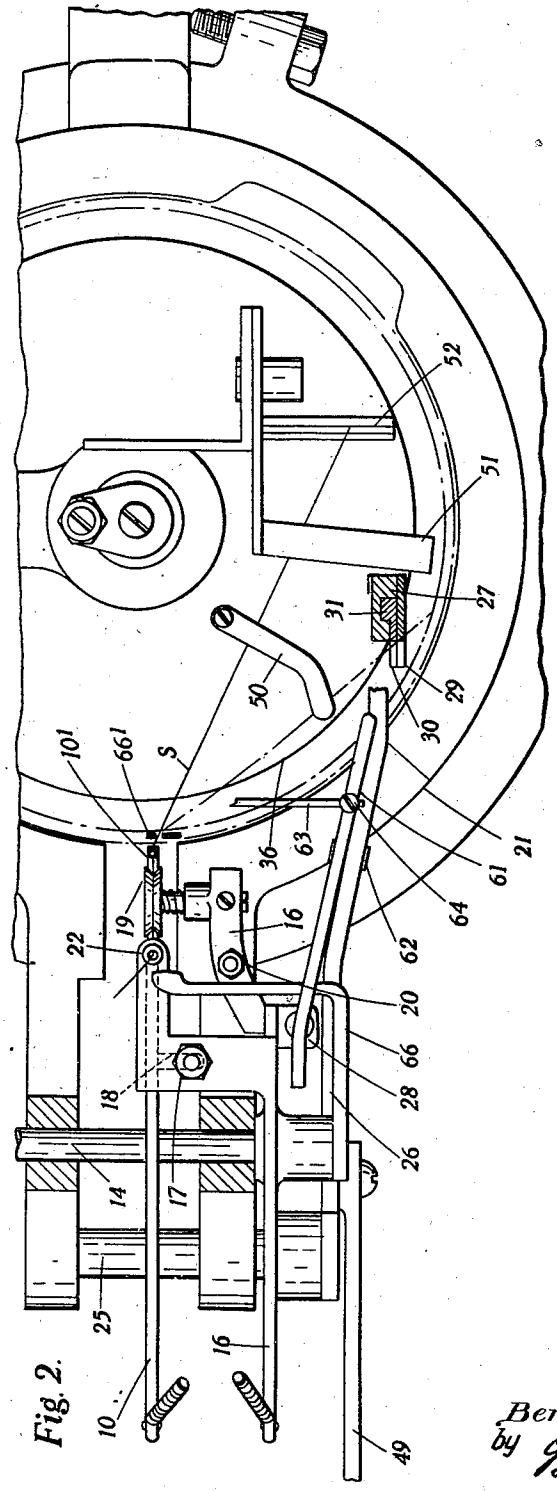



Fig. 2.

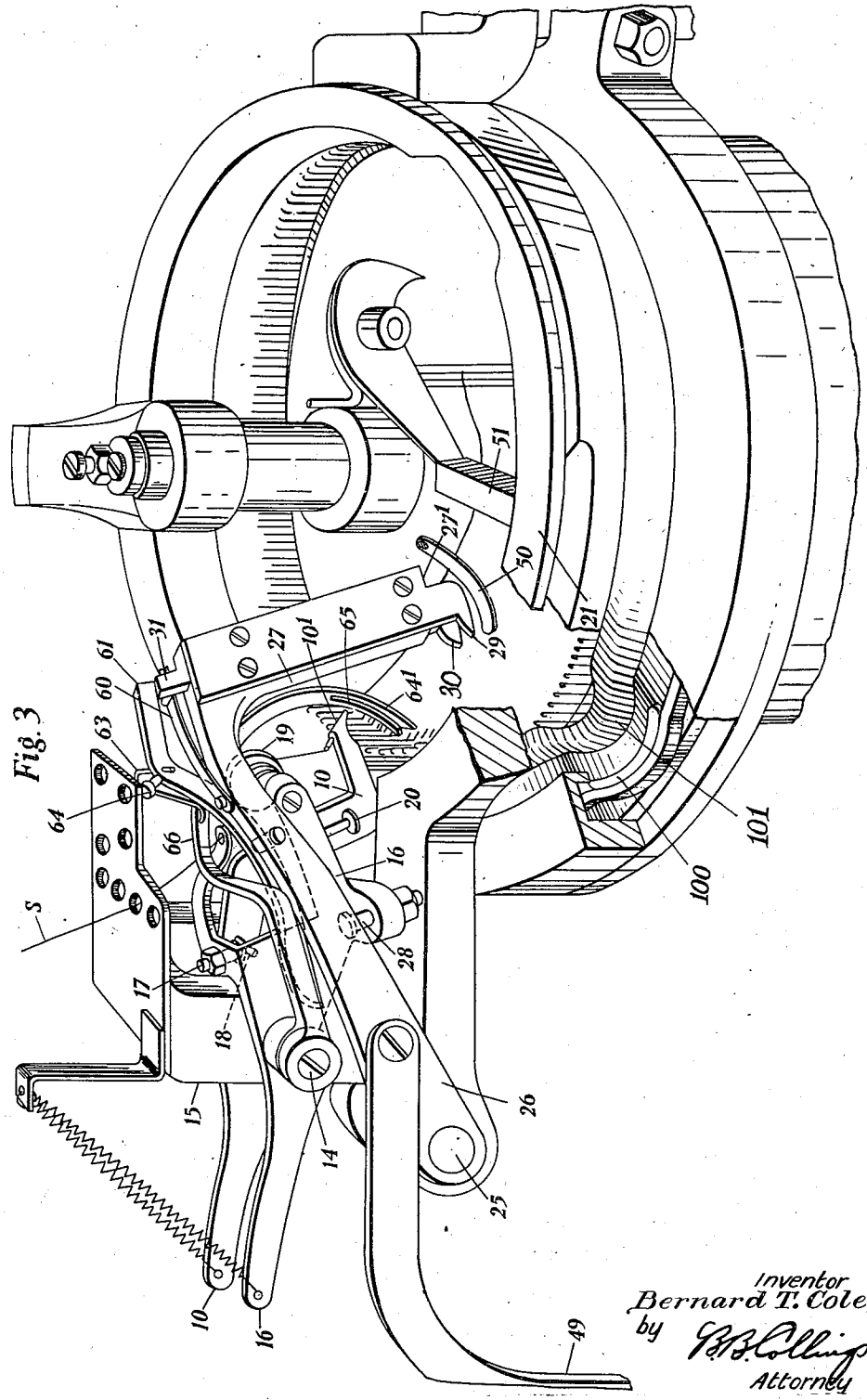
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Filed June 21, 1940 6 Sheets-Sheet 3

Fig. 3




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Sept. 8, 1942. B. T. COLE 2,295,450

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Filed June 21, 1940 6 Sheets-Sheet 4

Fig. 4.

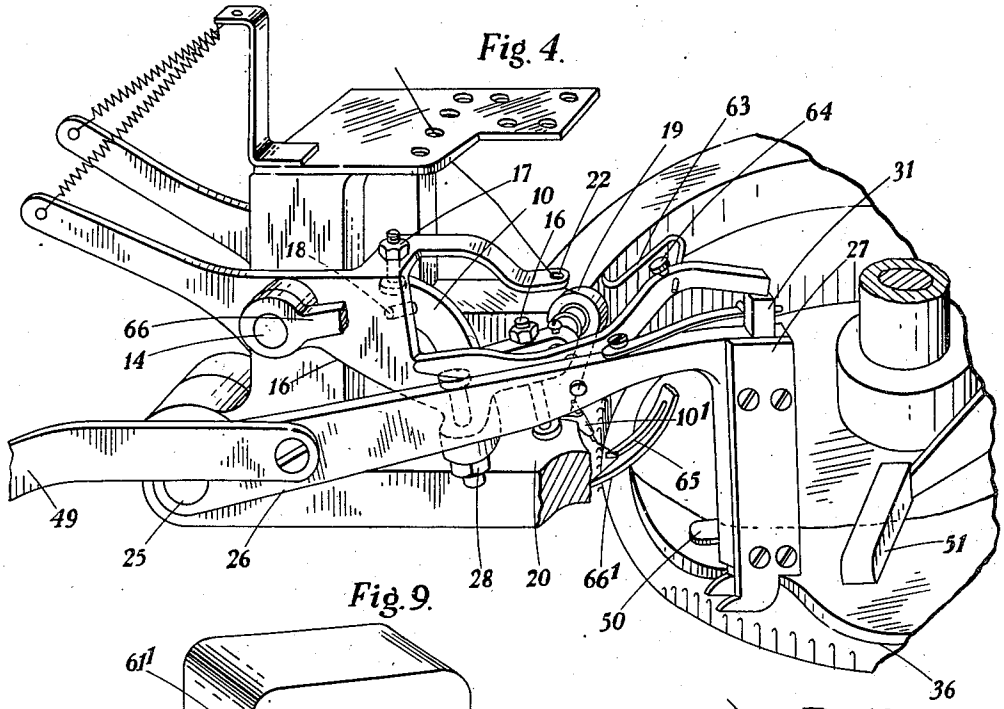



Fig. 9.

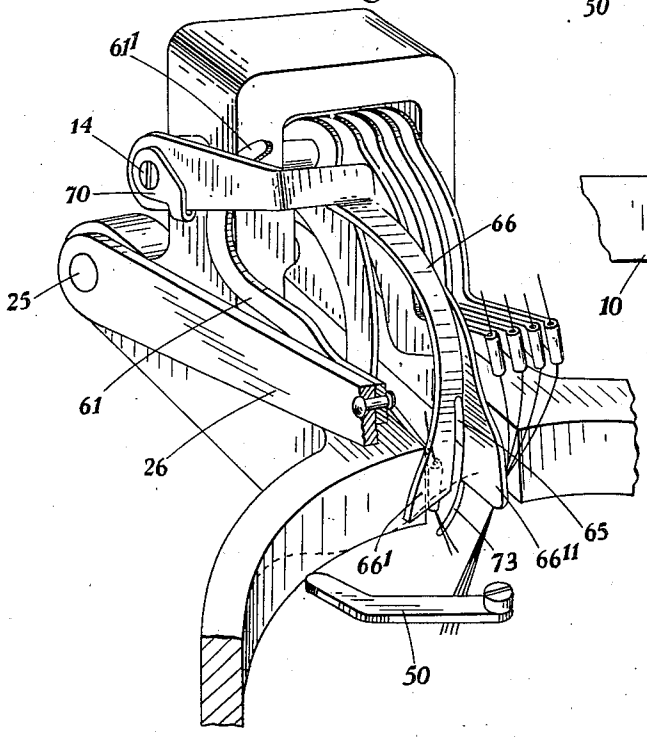
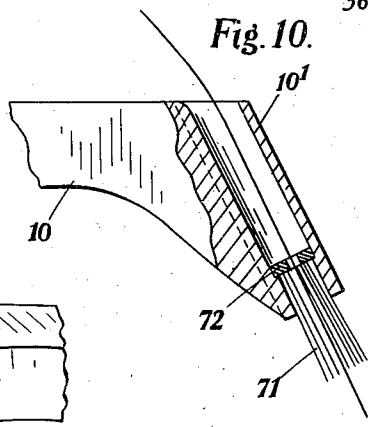



Fig. 10.




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Filed June 21, 1940 6 Sheets-Sheet 5

*Fig. 5.*

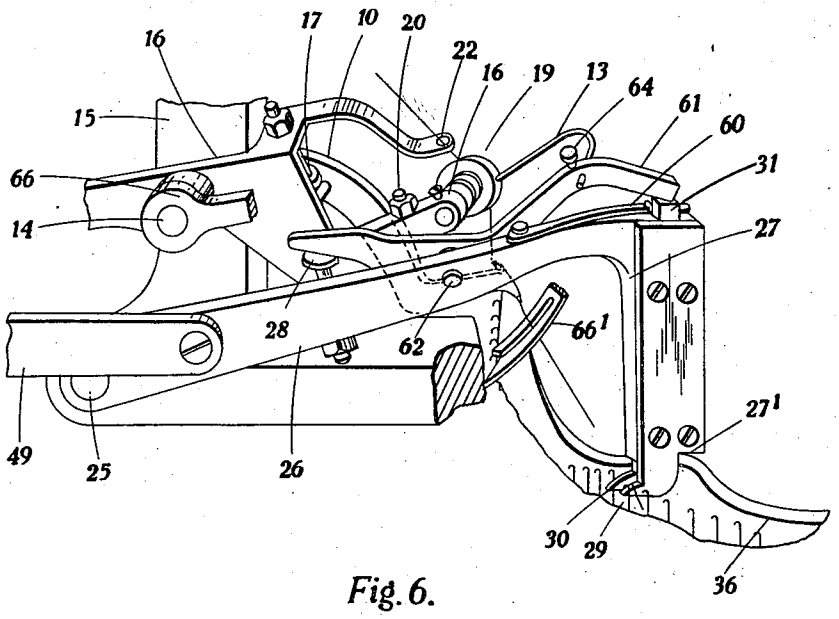
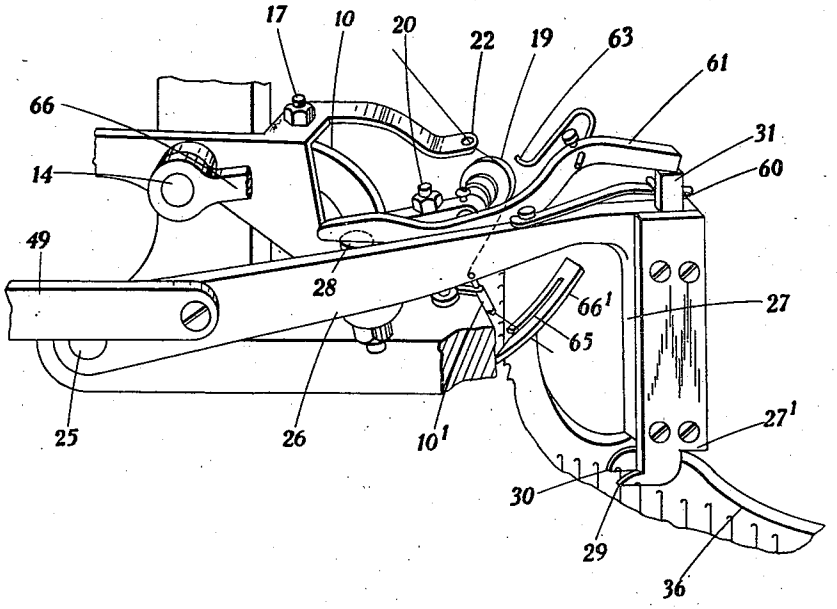



*Fig. 6.*




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Filed June 21, 1940 6 Sheets-Sheet 6

Fig. 7.

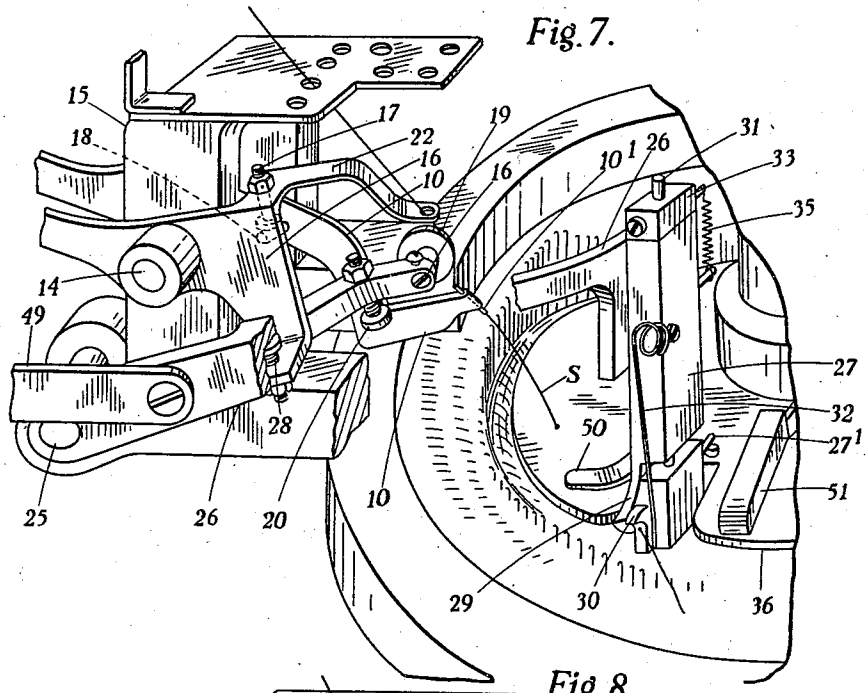
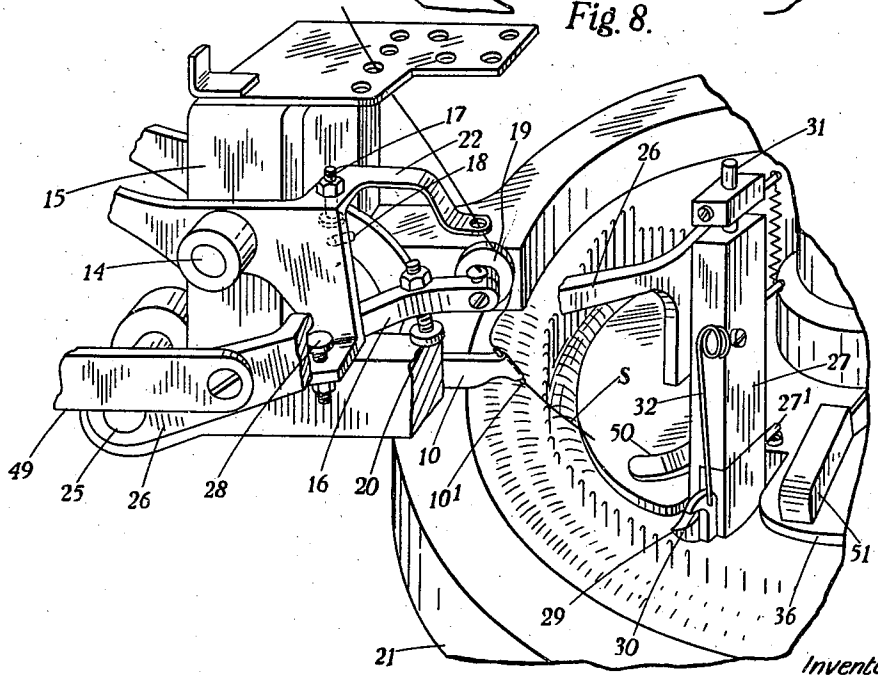



Fig. 8.




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2,295,450

# UNITED STATES PATENT OFFICE

2,295,450

## KNITTING MACHINE

Bernard Thornton Cole, Burbage, England, assignor to B. Toone (Nottingham) Limited, Nottingham, England

Application June 21, 1940, Serial No. 341,771
In Great Britain June 23, 1939

20 Claims. (Cl. 66—134)

This invention is for improvement in or relating to knitting machines, and is particularly but not exclusively, concerned with splicing mechanism in seamless hose and half hose machines. In producing splicing on a circular knitting machine it is usual to introduce the splicing thread into knitting activity for a predetermined portion of each course, the splicing thread floating chord-like in the interior of the needle circle for that portion of each course during which it is not knitted. These floats are subsequently cut out by hand. A specific object of the invention is to provide splicing mechanism wherein the formation of floats, to be cut subsequently, is obviated.

The invention is, however, broadly applicable to the case in which two yarns are fed to the needles, one of them (e. g. a splicing yarn) being fed to a restricted number of needles for incorporation in a restricted area of fabric, and the other being also fed to the needles and knitted thereby beyond the area incorporating the first yarn. It will therefore be appreciated that while in the said area both yarns may be knitted, as in splicing, the invention is also applicable to the production of split work. As hereinafter appears the invention provides for the regulation of the length of the loose end that protrudes from the fabric at the leading edge of the splicing or the like, and for the shortening of the end yarn which is introduced to the needles by the splicing feeder or the like.

Although the invention is not restricted in its scope to splicing mechanism except as hereinafter defined in the appended claims, in order that it may be better understood its application to the splicing mechanism of a seamless hose or half hose machine will now be described in detail by way of example with reference to the accompanying drawings, in which—

Figure 1 is an elevation of the machine, showing the relevant parts;

Figure 2 is a plan, to some extent diagrammatic, disclosing the relative positions of the feeders and the aforesaid cutter;

Figure 3 is a perspective view, on a scale larger than that of Fig. 1, showing the top of the needle cylinder, with the splicing feeder and the cutter in the inoperative position prior to the commencement of splicing;

Figure 4 is a view somewhat similar to Fig. 3, but showing the position of the various parts at the first introduction of the splicing thread;

Figure 5 is a similar view but showing the cutting of the splicing thread at the end of the first splicing course; while

Figure 6 is a similar view but showing the reintroduction of the splicing thread for a splicing course other than the first.

Figures 7 and 8 are views similar to those of Figs. 5 and 6, but illustrating a modified construction.

Figures 9 and 10 illustrate further modifications.

The said machine is provided at an appropriate point in its diameter with a plurality of interchangeable yarn feeding fingers which are adapted to be raised selectively from positions in which their feeder eyes lie outside the needle circle to non-feeding positions in which said eyes lie inside the needle circle. This upward movement is effected by push rods in known manner. One of the feeders is employed to feed a splicing thread and said feeder is therefore lowered to the feeding position during a portion of each revolution. In the accompanying drawings, for the sake of convenience only this splicing feeder 10, and its push rod 11, are shown, since the other feeders are similar in construction and arrangement. The commencement and termination of the splicing is determined by a cam (part of which is shown at 12 in Fig. 1) on the main drum 13 of the machine, but the period of dwell of the splicing feeder 10 in the feeding position during each course is variably determined by splicing control mechanism hereinafter referred to.

The aforesaid feeders are mounted on a horizontal spindle 14 carried in a feeder bracket 15. On the said spindle 14 there is also an arm 16, which carries a feeding eye 22, an adjustment screw 17 bearing on a pin 18 on the splicing feeder 10. The said arm 16 also carries a yarn-engaging and retarding device here shown as a cymbal device 19 consisting of two adjustable spring-pressed tension discs between which the splicing thread S in its passage from the supply to the eye 10' of the splicing feeder 10 is arranged to run. The lowered position of the device 19 is determined by an adjustable tappet screw 20 in the arm 16, which screw then rests on a part of the feeder bracket 15. As the splicing feeder 10 is raised to non-feeding position the arm 16 is also raised either immediately, or after a slight lag, according to the adjustment afforded by the said screws 17 and 20. Conversely, when the splicing feeder is introduced the device 19 is brought to rest by the screw 20 before the feeder reaches its feeding position, so that during the remainder of the movement of the splicing feeder 10 the feeding eye of the latter moves down the splicing thread (assuming that the thread has a

loose end as shown in Figs. 5 and 6) which is held in the device 19. In effect then, upon the introduction of the splicing feeder 10 in any course other than the first splicing course, the loose end is drawn back through the feeding eye. The extent of this draw back determines the length of the loose end of thread that projects from the fabric at the commencement of a splicing course, and this is governed by the extent of the feeder movement after the device 19 is brought to rest by screw 20. Hence the adjustment of screw 20 governs the length of said loose end.

The feeder bracket 15 is secured to a suitable support on the machine and carries a horizontal pin 25 located at the rear of the spindle 14 aforesaid and it may be here mentioned that the feeder bracket and associated mechanism, and the latch ring 21 and cutter arm 26, may be capable of being swung up about this pin 25. On this pin 25 a cutter arm 26 is pivoted and the said cutter arm extends inwards across the needle circle, and at its inner end carries a cutter block 27 which in the operative position, rests with a part 27' (which may have an adjusting screw associated with it) on the usual trapper plate 36.

The cutter block 27 carries a fixed cutter blade 29 and a vertically movable cutter blade 30. In the operative position these blades are located below the level of the plate 36 and are preferably located at an angle to the radial (as is best shown in Fig. 2) so that they may cut as close to the interior of the needle circle as is practicable. The movable cutter blade 30 is attached to a rod 31 which extends slidably up the interior of the cutter block and is biased in an upward direction, to open the knife blades 29, 30, by a leaf spring 60 secured to the cutter arm 26. The said blade 30 is arranged to be lowered, to cut, by means of cutter-operating lever 61 pivoted to the cutter arm 26 at 62. The outer end of this cutter-operating lever 61 overlies the top end of an adjustable tappet screw 28 in the arm 16. Therefore when the splicing feeder 10 rises at the termination of splicing in each course it raises the arm 16 (either immediately or after a short lag according to the adjustment of the tappet screws 17 and 20) and the trapper arm eventually rocks the cutter-operating lever 61 to effect severance of the withdrawn thread at a time when said thread has (as is indicated by a chain dotted line in Figure 2) been carried between the knife blades by the rotation of the needle cylinder. The withdrawn thread is thus cut at a point in close proximity to the interior of the fabric. The lag between the withdrawal of the thread and the operation of the cutter, and therefore the distance between the cutter and the last splicing needle at the moment of severance, is determined by the adjustment of the tappet screw 28. The upward movement of the lever 16 and the adjusted position of the tappet 28 may or may not be sufficient to cause a slight upward movement of the cutter block 27.

The cutter-operating lever 61 also carries an opening finger 63 in the form of a piece of bent wire adjustably secured to it by means of a screw 64. This wire 63 is so shaped and disposed that when the lever 61 is operated to cut the withdrawn splicing thread its free end enters between the two discs constituting the cymbal device 19 and releases the friction and/or twist on the splicing thread. Conversely when the splicing feeder 10 is lowered to introduce the thread there comes a stage when the downward movement of the tappet screw 28 permits the cutter-operating lever 61 to rock on its pivot 62 under the influence of the spring 60 so that the end of the wire 63 is lifted from between the tension discs of the device 19. Therefore at this stage the cymbal device 19 grips the splicing thread and thereafter continued downward movement of the feeding eye 10' of the splicing feeder produces a "draw back" of the free end of the splicing thread through said eye, by which draw back the length of the projecting free end at the commencement of splicing in each course is minimised. Although in the main the extent of this draw back (and of the length of the loose end) is governed by the adjustment of screw 20, yet it may also be controlled by adjustment of the wire 63. For example, if the wire 63 is so adjusted for position that it lifts from between the discs of the device 19 at a comparatively early stage, the gripping of the splicing thread by the device 19 will occur earlier, with the result that a greater draw back will be produced and the loose end will be further shortened. An important object of this opening finger 63, however, is to release the twist in the yarn at frequent intervals in order to effect the introduction of the splicing thread with reasonable certainty at a predetermined needle in each course. If the twist in the yarn, which is acquired by constant frictional engagement between the cymbals, is not released frequently, it becomes so strong as to cause the loose end of yarn when cut to fly about in such manner as to be missed by some of the needles required to knit it. This method of releasing the twist, however, may be dispensed with if there is mounted on the shaft 14 a suitably curved lever 66 having its end 66' located in proximity to the needle circle and formed with a vertical slot 65. When the splicing feeder 10 rises to withdraw the splicing thread from the needles the said thread is carried into the slot 65 and after severance the loose end remains therein, and is thereby prevented from flying about. This slot being substantially opposite the feeding eye 10', when the feeder is introduced the splicing thread is positioned by said slot and is accurately laid across the needle circle. When in use during splicing, the lower extremity of said curved arm 66 rests on the latch ring 21 just above the heads of the descending needles. When the splicing feeder 10 is withdrawn permanently from activity (as contrasted with the temporary withdrawal effected course after course when part-round splicing is being produced) the upward movement of the cutter arm 26 raises said arm 66 to an inoperative position since said arm 66 for a portion of its length overlies the cutter arm 26.

In the modified construction illustrated in Figure 9 the arm 66 is provided with an integral guard plate 66'' alongside the slot 65. This guard plate prevents yarns other than the splicing yarn from entering the slot 65 or fouling the end of the splicing yarn. In addition a curved finger 73 extends from the base of the guard plate 66'' and in effect provides between it and the base of the arm-extremity 66' a curved laterally-directed continuation of or entry mouth to the slot 65. A support 70 is provided for taking the weight of the arm 66 when the latter is in the operative position. The cutter arm 26 may be swung by hand to an upper position in which it affords free access to the needles and other parts. In this upward movement the arm 66 is likewise raised to a position beyond dead centre. In this inoperative position it rests against the curved part 61' of the cutter-operating lever 61.

Instead of the eye of the splicing feeder being afforded by an elongated tube of metal it may, as shown in Figure 10, be afforded by a resilient tube 71. This tube may consist of a ring of bristles of hair, rubber or the like set in a washer 72 in the end of the feeder 10, or it may consist of a flexible tube of solid material such for example as rubber. If a flexible feeding arrangement such as that just described is adopted the outlet end from the feeder 10 may be located much closer to the needle when in the feeding position, because in movement to and from said position the flexible end of the feeder may pass between the needles without damaging them.

The splicing control mechanism is substantially similar to that commonly employed on Scott & Williams machines and consists of a horizontally-guided bar 40 extending fore-and-aft of the machine and adjustable lengthwise by a splicing cam 41 at the rear of the machine, this cam being stepped round at appropriate intervals. As will be understood, the shape of the spliced area is determined by the shape of this cam 41 and by the manner in which it is stepped round, this latter movement being effected and controlled (e. g. controlled from the pattern chain) in known manner. On this bar 40 a substantially horizontal lever 42 is pivoted intermediate its ends, which lever 42 when rocked upon its pivot (as it is at each revolution) serves by means of a cross lever 24 to raise the splicing feeder push rod 11 to withdraw the said feeder. In order to rock this lever 42 there is an operating cam 43 on the main shaft 44 of the machine which operates a substantially vertical rock arm 45. This rock arm 45 engages, by means of a lift plate 46 which is secured to it, with a nose 47 on the front end of the rock lever 42. Obviously, according to the position of endwise adjustment of the slide bar 40, said rock lever 42 is thus engaged and raised earlier or later in the forward stroke of the rock arm 45. As shown in Fig. 1, the lift plate 46 is provided with two levels one of which provides the first portion of the lift of the splicing feeder 10 and the other of which provides the second portion which is accompanied by closure of the cutter.

It is within the scope of the invention to operate the cutter in each course by means of a control separate from the splicing feeder control, for example by means of mechanism similar to that described in the preceding paragraph. In the illustrated example, however, there is merely a separate control which operates at the commencement and termination of a spliced area. On the drum 13 there is a cam part of which is shown at 48 which co-operates with a push rod 49 attached to the cutter arm 26. Obviously, in exactly the same way that the splicing feeder 10 cannot be operated unless push rod 11 is off cam 12, the cutter cannot be dropped to operating position unless push rod 49 is off cam 48.

Prior to commencement of a spliced area the push rods 11 and 49 rest upon their respective cams 12 and 48 and the splicing feeder 10 and the cutter 27 etc. are held raised as shown in Figures 1 and 3. The splicing thread S extends at this time from the eye 10' of the splicing feeder underneath a spring finger 50 on the trapper plate 36 and into the ordinary trapper and cutter 51, 52. Continued rotation of the drum 13 removes the cams 12, 28 from beneath the push rods so that the splicing feeder 10 and the cutter 27 are permitted to drop to the operative position. In this movement, as is shown in Figures 2 and 4, the eye 10' of the splicing feeder moves outwards and downwards across the line of the needles. Therefore the splicing thread is taken and knitted by the needles and its loose end is drawn by the rotation of the needle cylinder out of the ordinary trapper and cutter 51, 52 and from underneath finger 50. At the termination of splicing in each course the splicing feeder is raised by means of cam 43 so that its thread is withdrawn from the needles. Rotation of the cylinder carries the withdrawn thread into the knives 29, 30 which are operated with a suitable lag to cut said thread as hereinbefore described and as shown in Figure 5, and it has already been ponted out that the extent of said lag determines the length of the loose end projecting at the end of the spliced part of the course. At the commencement of splicing in the next spliced course the splicing feeder 10 is again moved into feeding position to carry its thread across the line of needles as shown in Figure 6. The thread is therefore taken by the needles and knitted and it has already been pointed out that the adjustment of screw 20 determines the extent to which said loose end is drawn back by the grip of the cymbal device 19 and determines the length of the loose end and that projects from the fabric at the commencement of this spliced course. At the termination of a spliced area the cams 12, 48 again pass underneath their push rods. As a result not only is the splicing feeder rendered inoperative but the cutter is raised as shown in Figures 1 and 3. Therefore the thread extending from the feeder eye 10' to the last spliced loop will not be cut by the knives 29 and 30, but will be carried by the rotation of the needle cylinder under the spring 50 and into the trapper and cutter 51, 52.

The operating cam 43 is preferably a constant lift cam; that is to say, the major part of its rise is so arranged that for equal angular movements equal lifts are provided.

A modified construction is illustrated in Figures 7 and 8. In this modified construction the cutter-operating lever 61 is dispensed with and the tappet screw 28 is arranged underneath a projecting portion on the cutter arm 26. Therefore when the arm 16 rises upon the withdrawal of the splicing thread at the end of the spliced portion of a course the cutter arm 26 is raised slightly, after the appropriate lag, and lifts the cutter block 27. This upward movement of the cutter block 27 causes the cutters 29, 30 to operate. The said block 27 is formed with a vertical central hole in which the spindle 31 of an upper knife-blade 30 is rotatably and slidably housed. The two said knife-blades 29, 30, which extend outwards towards the needle circle, are urged into face engagement by a leaf spring 32 which presses against the upper blade 30. The spindle 31 to which said upper blade 30 is attached has an abutment 33 at its upper end, between which abutment 33 and a lower abutment 34 on the cutter block a tension spring 35 extends. This tension spring 35 therefore tends to lower the upper knife-blade 30 and to close the cutter. The cutter is opened in the following manner: As the cutter block 27 is lowered, concurrently with the introduction of the splicing feeder 10 to feeding position, the lower end of the aforesaid knife spindle 31 is brought down into contact with the trapper plate 36 of the usual trapping and cutting mechanism provided in the interior of the needle circle. Continued downward movement of the cutter therefore causes the upper blade

30 to rise, relatively to the lower blade 29, against the influence of the tension spring 35. Conversely, when the splicing feeder 10 is raised to non-feeding position, and the cutter arm 26 rises also, the two blades 29, 30 close under the influence of said tension spring 35.

The cutter block 27 does not commence to rise until some short time after the splicing feeder 10 has started to rise. This lag ensures that the eye of the splicing feeder 10 has passed to the inside of the needles and the splicing thread S has been withdrawn from knitting, while the cutter is still open. Continued rotation of the needle cylinder thereupon carries the withdrawn splicing thread S extending from the splicing feeder 10 to the last splicing needle into the open cutter. The cutter thereupon makes an upward movement (accompanied by a further upward movement of the splicing feeder) and the knives close to cut the withdrawn yarn.

This lag between the withdrawal of the feeder and the operation of the cutter is in part determined by the position of the adjusting screws 17 and 28 and/or may be in part determined either by appropriate arrangement of the splicing control mechanism (giving a two stage upward movement to the splicing feeder). It may be pointed out that the adjustment provided by screws 17 and 28 may be regarded as variably determining the spacing between the cutter, at the moment of its operation, and the last splicing needle.

Obviously the lag determines the length of the loose end of splicing yarn projecting from the interior of the fabric at the point of withdrawal and it will readily be appreciated that if the screw 17 is screwed down and/or the screw 28 is screwed up, the cutter will operate at an earlier stage in the withdrawal of the cutter and the loose end will be shorter.

Instead of operating the cutter from the feeder, or providing an entirely separate control, the cutter may derive its movements from a member in the mechanism that operates the feeder.

In both constructions illustrated, the eye of the splicing feeder 10 is preferably constituted by a small bore tube 10', since such a tube directs the end of the splicing thread in a straight line and in a substantially rigid manner across the needles when the splicing feeder is dropped to feeding position.

It will be appreciated that the mechanism may be pre-set to give a certain length of loose end at each edge of the spliced area and that the shape or circumferential extent of the spliced area may thereafter be varied by the variable splicing mechanism, without any appreciable change in length in the loose ends which are produced, as knitting proceeds down the spliced area. This result follows because the cutter 29, 30 always operates at the same distance from the last needle in a course to take the thread S so that the length of the loose ends produced at the last knitted edge of the spliced area is constant, and because for each course there is produced and presented to the needles at each re-introduction of the severed yarn a substantially constant length of loose end of yarn projecting from the feeder eye 10'. This constant length of projecting yarn end is produced by the "draw back" hereinbefore described. Whether the feeder 10 is re-introduced early or late the length of loose end presented to the needles is always constant, and therefore the length of the loose ends projecting from the resultant fabric at the first formed edge thereof is constant also.

The cutter 27 is placed at an appropriate point in the circumference of the needle circle, and fairly close to the interior of the needle circle, a suitable position being shown in Fig. 2. When the splicing thread S is cotton, shorter ends may be obtained than with silk or artificial silk, by virtue of their respective frictional properties. Therefore, for cotton, an additional sinker cam 100, Fig. 3, may be fitted at the radial position occupied by the cutter 27 to retract the sinkers 101 at that position and to allow the cutter to be located closer to the needles.

The invention is applicable to a machine having a plurality of feeding positions and a plurality of knitting cams.

I claim:

1. In a knitting machine, the combination with needles, means for operating them to knit, means including a feeder for feeding a knitting yarn to the needles for a portion of successive courses and for withdrawing it at the end of said portion in each said course, and a severing device for severing the withdrawn yarn at each withdrawal, of means for shortening, subsequent to severance, the length of the severed end of yarn protruding from the feeder for re-introduction to the fabric.

2. In a knitting machine, the combination with needles, means for operating them to knit, means including a feeder for introducing a yarn to the needles for a predetermined period and for then withdrawing it, and means for severing the withdrawn yarn, of means for reducing, subsequent to severance and while the end of the yarn is free, the length of yarn extending from the feeder to the severed end.

3. In a knitting machine, the combination with needles, means for operating them to knit, means including a feeder for introducing a yarn to the needles for a predetermined period and for then withdrawing it, and means for severing the withdrawn yarn, of means for subsequently reducing, for re-presentation to the needles, the length of said yarn extending from the feeder to the severed end at the time of severance, and means for presenting said reduced length to the needles with its end free.

4. A machine according to claim 2, wherein said shortening means comprises means for effecting relative movement between the yarn and feeder.

5. In a knitting machine, the combination with needles, means for operating them to knit, means including a feeder for introducing a yarn to the needles for a predetermined period and for then withdrawing it, and means for severing the withdrawn yarn, of means for subsequently effecting relative movement between the yarn and the feeder, with the severed end of yarn free, and for thereby reducing, for re-presentation to the needles, the length of yarn extending from the feeder to the severed end.

6. In a knitting machine having needles, means for operating them to knit, and means including a feeder for repeatedly presenting a yarn to the needles for inclusion in portions of courses in the production of an area of fabric incorporating said yarn, said yarn being withdrawn from the needles between successive portions, the combination of a cutter for cutting the yarn at each withdrawal thereof to leave a free end protruding from the feeder, and a shortening device for shortening the length of said free end for re-presentation to the needles.

7. A combination according to claim 6, where-

in the shortening device comprises yarn-engaging means movable relatively to the feeder for effecting relative movement between the yarn and feeder.

8. In a knitting machine having needles, means for operating them to knit, and means including a feeder movable between feeding and non-feeding positions for repeatedly presenting a yarn to the needles for inclusion in the fabric, said yarn being withdrawn from the needles between successive inclusions, the combination of means for severing the yarn at each withdrawal thereof to leave a free end protruding from the feeder for re-presentation to the needles, a yarn-engaging and retarding device through which the yarn runs to the feeder, means for displacing said device shortly after the feeder commences movement from feeding position and for restoring it as the feeder moves into feeding position, and a stop for determining the position of said device while the feeder is feeding and for terminating said restoring movement slightly before the termination of movement of the feeder into feeding position.

9. A combination according to claim 8, including a connection for releasing said device from the yarn as the severing means operates.

10. A combination according to claim 8, including an adjustment for the said position of said device.

11. In a knitting machine having needles, means for operating them to knit, means including a feeder at a feeding position for introducing yarn to the needles at intervals, and means for varying said intervals, the combination of a cutter for cutting the yarn between successive introductions to leave loose ends of uniform length protruding from the fabric, and means for reducing to a uniform extent, prior to each re-introduction, the length of yarn extending from the feeder to the cutter at the time of severance, the reduced length being introduced to the needles.

12. A combination according to claim 11, wherein the cutter occupies a fixed location with respect to the feeding position, and having adjustable means for determining the time of operation of the cutter with respect to the end of each introduction.

13. A combination according to claim 11, wherein the cutter occupies a fixed location with respect to the feeding position, and having adjustable means for determining the time of operation of the cutter with respect to the end of each introduction, and adjustable means for controlling the length of yarn presented to the needles at each introduction.

14. In a circular knitting machine having needles and means for operating them to knit, a yarn feeder for feeding yarn to an arc of the needles at successive revolutions in the production of an area of fabric incorporating said yarn and for presenting a free end of said yarn to the first needle of said arc, a cutter for cutting the yarn extending at each revolution from the feeder to the last needle of the arc and for thereby producing a loose end of yarn projecting from the fabric and a loose end of yarn projecting from the feeder, and means for reducing last said loose end, from its length at the moment of severance, for presentation to the first needle of the arc.

15. In a circular knitting machine having needles and means for operating them to knit, a yarn feeder for feeding yarn to an arc of the needles at successive revolutions in the production of an area of fabric incorporating said yarn and for presenting a free end of said yarn to the first needle of said arc, a cutter for cutting the yarn extending at each revolution from the feeder to the last needle of the arc and for thereby producing a loose end of yarn projecting from the fabric and a loose end of yarn projecting from the feeder, means for subsequently shortening the last-mentioned loose end for re-presentation to the first needle of the arc with its end free, and means for varying the needles comprised in the arc.

16. In a circular knitting machine having a circle of needles, and means for operating them to knit by rotation; a feeding eye movable across the line of needles between a raised non-feeding position in the inside of the circle and a lowered feeding position outside the circle, means for operating the eye to occupy the feeding position for portions of successive revolutions, a cutter inside the needle circle for cutting the yarn extending from the feeder eye each time the latter is raised to non-feeding position, means for operating said cutter, a yarn-engaging and tensioning device through which the yarn runs to the feeder eye, a support for said device permitting of its being raised and lowered, a stop for determining its lowered position, and a member, in the means for operating the feeder eye, for raising said device with a slight lag in respect of the raising of the feeder eye.

17. In a circular knitting machine having a circle of needles, and means for operating them to knit by rotation; a feeding eye movable across the line of needles between a raised non-feeding position in the inside of the circle and a lowered feeding position outside the circle, means for operating the eye to occupy the feeding position for portions of successive revolutions, a cutter inside the needle circle for cutting the yarn extending from the feeder eye each time the latter is raised to non-feeding position, a yarn-engaging and tensioning device through which the yarn runs to the feeder eye, a support for said device permitting of its being raised and lowered, a member, in the means for moving the eye, for raising and lowering the said device as said eye is raised and lowered, a stop for bringing the device to rest before the eye reaches its lowered feeding position, and means, including a member in the means for moving the eye, for operating the cutter as the eye is raised.

18. In a combination according to claim 17, means for releasing said device from the yarn as the cutter operates and for restoring it prior to the downward movement of said device.

19. In a knitting machine having needles and means for operating them to knit, the combination of means for repeatedly presenting a yarn to the needles, with its end free and of substantially unvarying length at each presentation thereby to produce uniform length loose ends of said yarn projecting from the resultant fabric at the points of introduction of said yarn to the latter, and for excluding said yarn from the needles after it has been taken by a number thereof, a severer for severing the yarn at each exclusion to form a loose end thereof projecting from the fabric, means for varying the needles taking said yarn at successive presentations thereof, means for operating the severer at each exclusion, and means for varying the operation thereof in accordance with variation in the

needles taking the yarn at successive presentations.

20. In a knitting machine having needles for knitting, means including a feeder for feeding yarn to a number of the needles, less than the whole number, in each of successive courses in the production of an area of fabric incorporating said yarn, which area has one edge whereat the yarn is withdrawn from, and another edge whereat the yarn is introduced to, the fabric in each said course, said yarn being excluded from the fabric beyond said area, and means for varying the needles taking said yarn thereby to vary one of said edges; the combination of means for severing the yarn, at each exclusion, between the feeder and the first said edge thereby to produce loose yarn ends at said edges; means for operating the severing means to maintain at constant length the loose ends of the first said edge; and means for effecting, after each severance and prior to the next reintroduction, a reduction of the length of yarn end protruding from the feeder, thereby maintaining constant the length of the loose ends at the second mentioned edge.

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