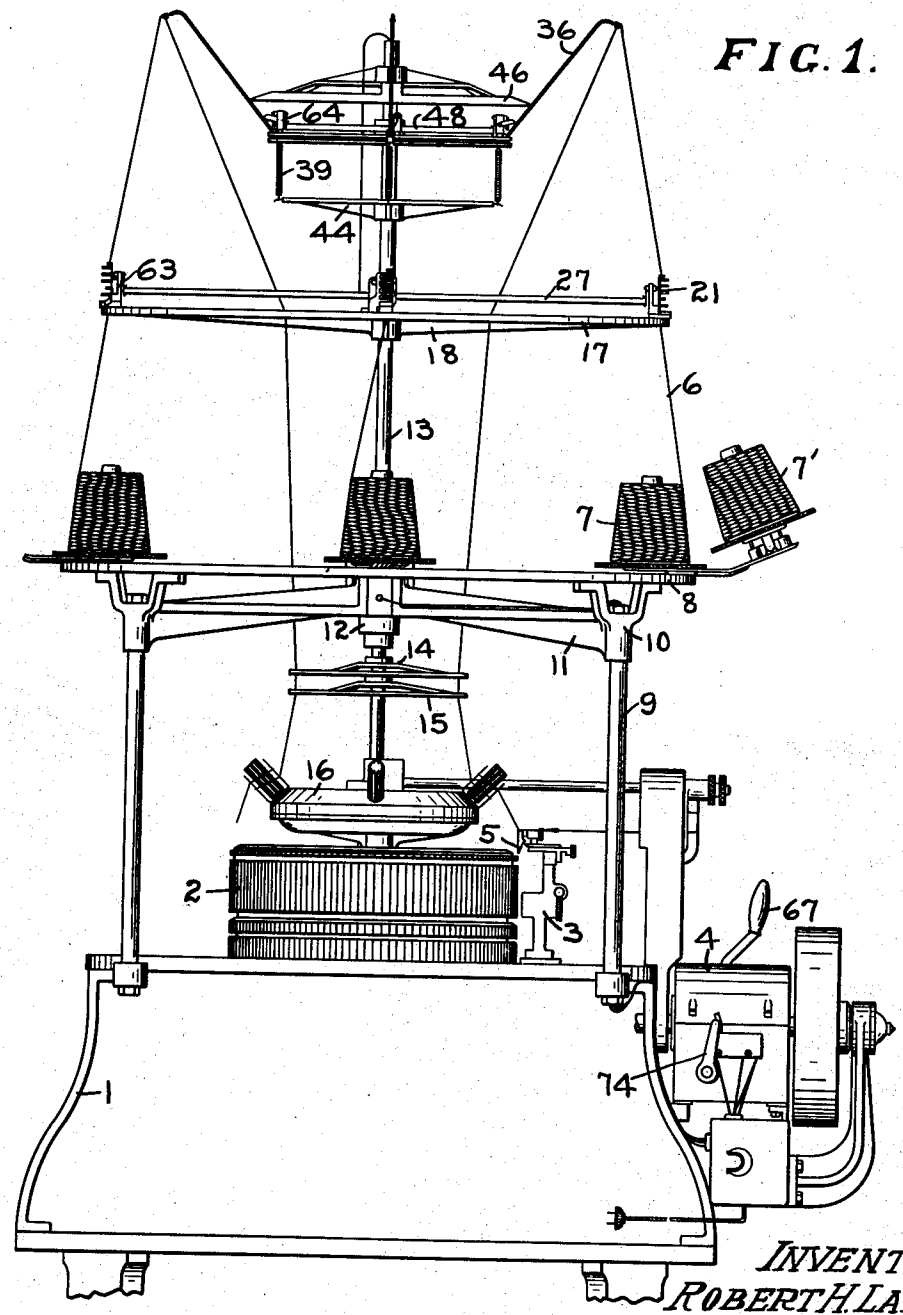
Sept. 17, 1940. R. H. LAWSON ET AL 2,215,220

STOP MECHANISM FOR KNITTING MACHINES

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FIG. 1.



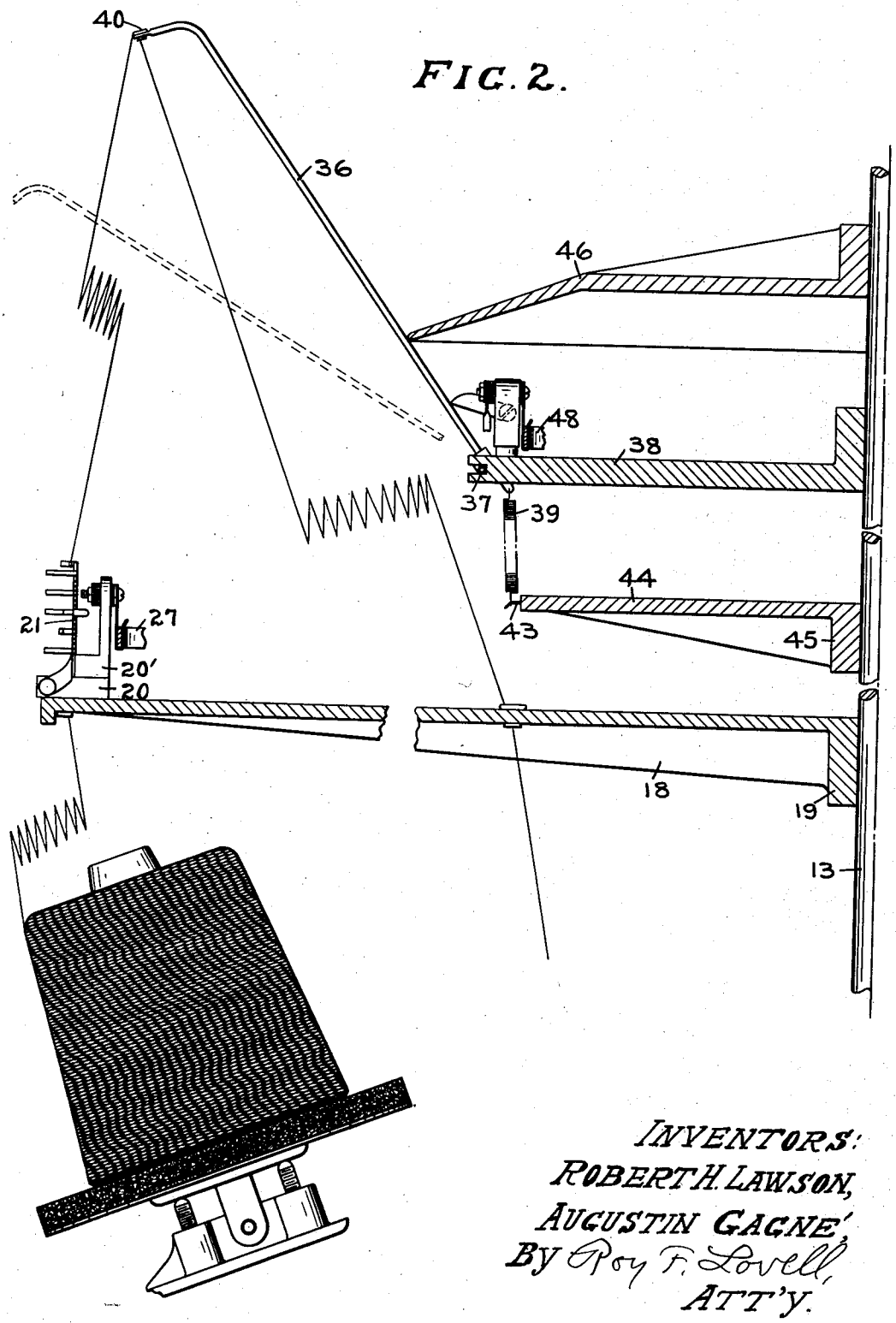
INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN CAGNE',
BY Roy F. Lovell
ATT'Y.

Sept. 17, 1940. R. H. LAWSON ET AL 2,215,220

STOP MECHANISM FOR KNITTING MACHINES

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FIG. 2.



INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE',
By Roy F. Lovell,
ATT'Y.

Sept. 17, 1940. R. H. LAWSON ET AL 2,215,220

STOP MECHANISM FOR KNITTING MACHINES

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FIG. 3.

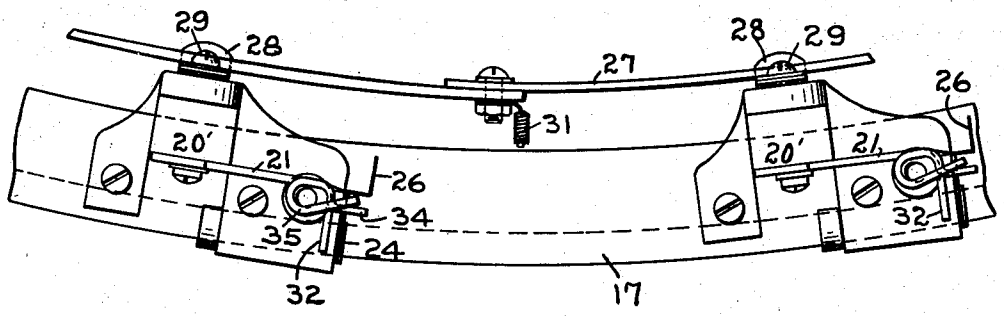


FIG. 4.

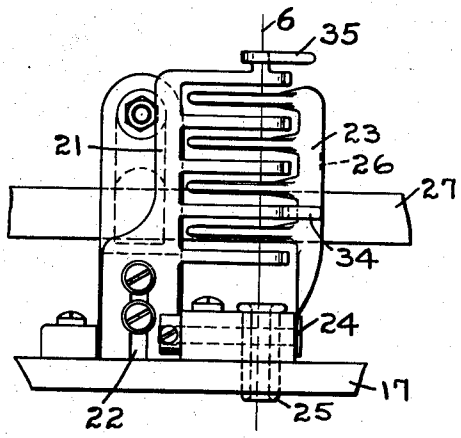


FIG. 5.

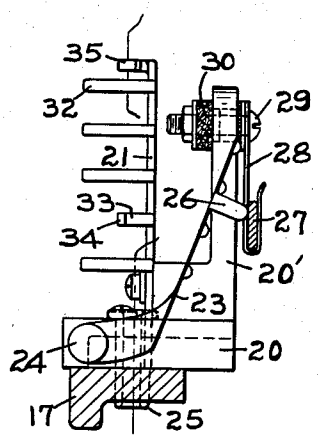


FIG. 6.

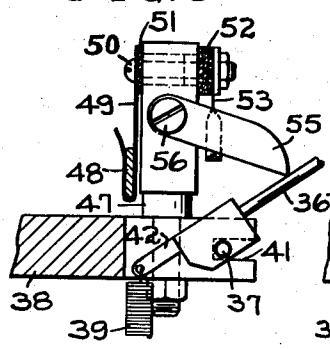
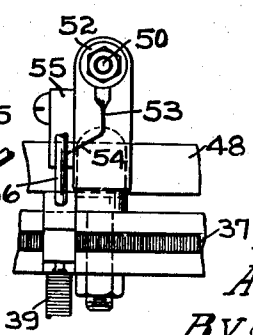


FIG. 7.



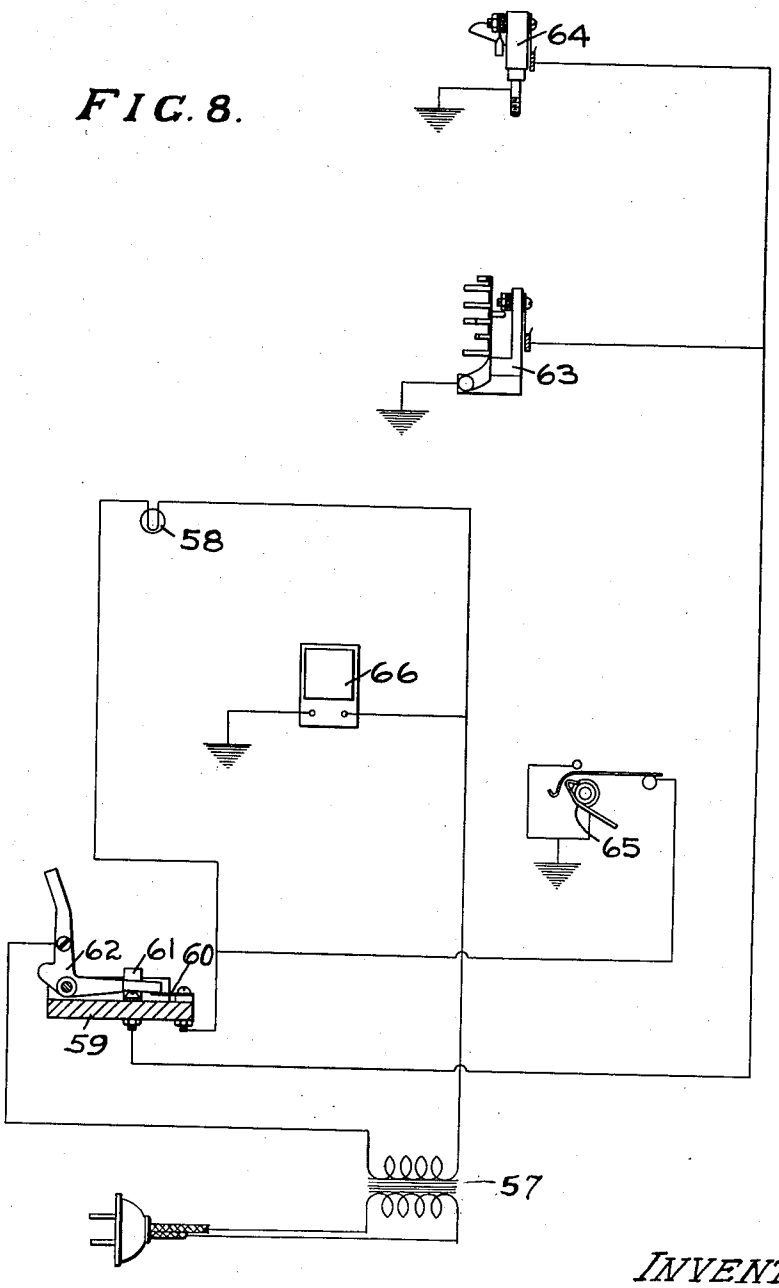
INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE',
BY Roy F. Lovell,
ATT'Y.

Sept. 17, 1940. R. H. LAWSON ET AL 2,215,220

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FIG. 8.



INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE,
BY Roy F. Lovell,
ATT'Y.

Sept. 17, 1940. R. H. LAWSON ET AL 2,215,220

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FIG. 9.

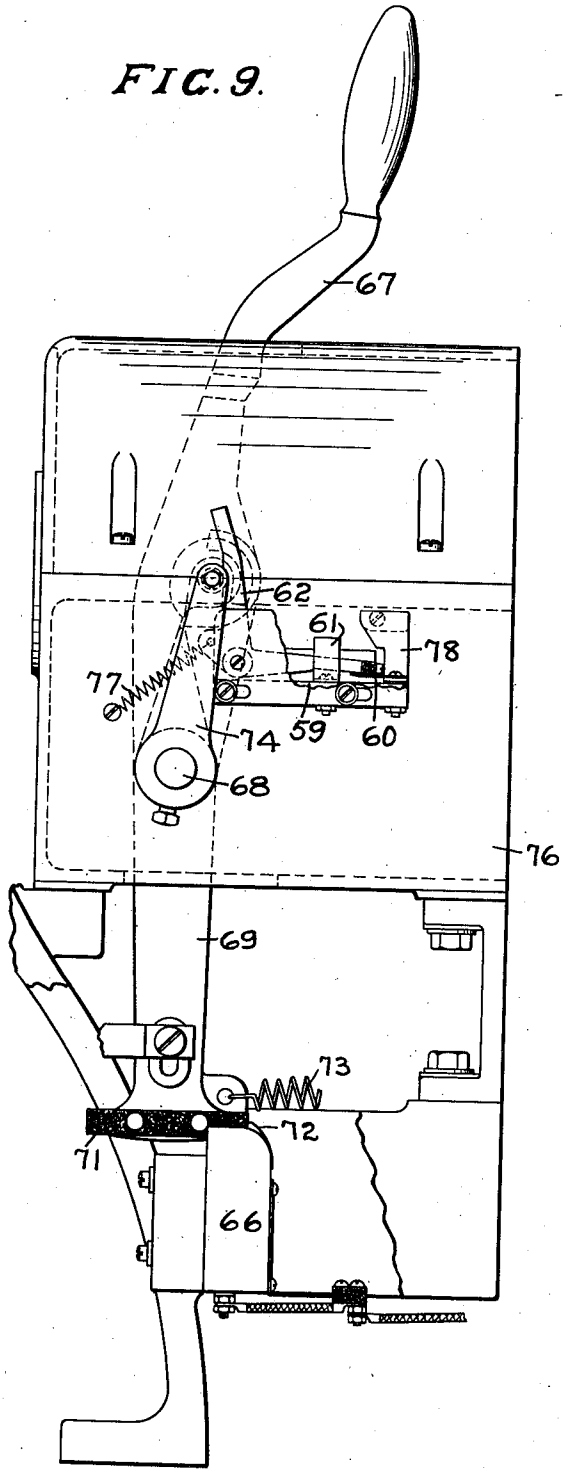
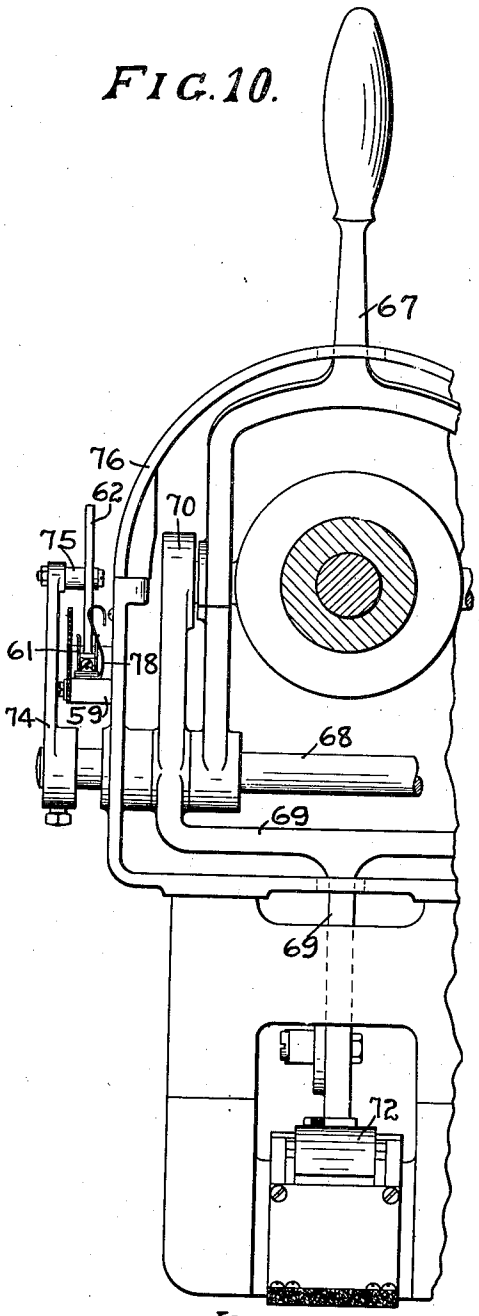


FIG. 10.



INVENTORS:
ROBERT H. LAWSON,
AUGUSTIN GAGNE',
BY Roy F. Lovell.
ATT'Y.

Patented Sept. 17, 1940 2,215,220

UNITED STATES PATENT OFFICE

2,215,220

STOP MECHANISM FOR KNITTING MACHINES

Robert H. Lawson, Pawtucket, and Augustin Gagné, Central Falls, R. I., assignors to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application May 26, 1936, Serial No. 81,897
In Canada June 14, 1935

8 Claims. (Cl. 66—163)

This case deals with stop mechanism for knitting machines and has the special function of relieving tension in the yarn when it becomes excessive. It has certain features novel in itself and also enters into combination with a yarn feeding or furnishing device such as has been illustrated herein or of other known types. While we do not intend to limit our invention to any specific class of knitting machines, we have shown it as applied to a multi-feed knitting machine.

In the drawings:

Fig. 1 is an elevation showing the invention as applied to a multi-feed knitting machine;

Fig. 2 is a sectional view illustrating one yarn supply a stop motion adjacent said supply and the combined tension relieving sweep and stop motion functioning therewith;

Fig. 3 is a plan view of a fragment of the ring supporting a plurality of stop motions;

Figs. 4 and 5 show the stop motion as seen from the side and end, Fig. 5 being partly in section;

Figs. 6 and 7 illustrate the stopping mechanism associated with each tension relieving sweep;

Fig. 8 is a diagrammatic view showing the layout of the electrical circuit associated with the several stopping elements;

Fig. 9 is a view showing in detail the clutch shifter lever, latch, and the testing switch; and

Fig. 10 is a view corresponding to Fig. 9 but showing these elements as seen from the end of the drive gear casing.

Referring to Fig. 1 a multi-feed knitting machine has been illustrated with frame 1, rotary needle cylinder 2, one cam assembly generally indicated at 3 and a power receiving and driving mechanism generally shown at 4. It is not essential that the machine be of the rotary cylinder type since the cylinder may be stationary and the cams arranged to rotate thereabout, also needles may be of the latch type or of the spring beard type wherein suitable pressers will be employed. A plurality of the cam assemblies 3 will be substantially equally spaced about the machine and yarn guides 5 associated with each cam assembly will feed a plurality of yarns, one of which is illustrated at 6 being drawn from cone 7 to the needles. A number of these yarn supplies or cones will be spaced about the platform 8 supported at the upper ends of uprights 9 being attached thereto by means of elements 10 which have inwardly projecting spokes 11 supporting a central bearing 12 in which the column 13 is rigidly secured.

As many of these supplies 7 are to be mounted on this platform as are necessary to supply yarn to the several feeds of the knitting machine, and while it is not absolutely essential, we employ duplicate supplies 7' adjacent each of the original supplies so that when yarn runs out on one, the end may be immediately pieced up to the auxiliary supply 7' so that very little time will be lost due to the running out of yarn cones. Each of the cones 7' is adjustably pivoted to swing in a plane radial to the center line of the machine so that the yarn will be drawn from the top thereof at the proper angle. Cones which have run out will be replaced by fresh supplies while the machine is in operation.

Each yarn 6 is guided downwardly through suitable porcelain or other yarn guiding apertures in spiders 14 and 15, and then may be taken directly to the yarn fingers 5 adjacent the needles, or preferably, may be positively supplied to the knitting instrumentalities of the machine by yarn furnishing means such as has been generally illustrated herein at 16. This yarn feeding device has been thoroughly disclosed and forms the subject matter of the claims of co-pending United States applications 14,492 and 56,363. While we prefer to use yarn furnishing means of the type herein specifically referred to, we may employ other furnishing mechanisms with satisfactory results.

As the yarn is led from the supply cone it first passes through the stop mechanism illustrated in Figs. 3, 4 and 5. A ring 17 is supported by radial arms 18 which terminate at an inner hub 19 fixed to the column 13. Each of these stop mechanisms is made up of a base portion 20 which is attached to the ring 17 by any suitable means and has projecting upwardly from said base portion an extension 20'. A fixed grid 21 is slotted at 22 to be secured at the front side of extension 20' by suitable screws or the like. Another grid 23 is pivoted at 24 to the base element of this stop mechanism and has its center of gravity so disposed relatively to the pivot 24 that it tends at all times to fall in the direction illustrated in Fig. 5. Each grid has a plurality of tooth-like extensions which engage as illustrated in Fig. 4 and when the yarn 6 is threaded through eyelet 25 and upwardly through the grids as shown in Fig. 4, the movable element 23 will be held in such a position that extension 26 thereon will not contact the ring 27 as it does in Fig. 5. Ring 27 is supported in hooks 28.

Each of the hooks 28 is attached by means of a connection 29 passing through suitable materials such as shown at 30 which insulate the connecting elements from the upright extension 20' and frame. Current is carried from some suitable source by means of wire 31 which is connected to the ring 27 but no circuit is completed until the movable grid falls into the position shown in Fig. 5 whereupon extension 26 contacts ring 27 thus completing the circuit.

The yarn 6 is maintained in proper position by means of the bent ends 32 on the tooth-like elements of the fixed grid. One of those bent ends, for example 33, is reversely bent at 34 to form a stop for the movable grid so that it may fall in only one direction, i. e., that illustrated in Fig. 5. A portion of the grid 21 is formed into an eyelet 35, and as the yarn passes upwardly through eyelets 25 and 35 it will also be maintained in proper relationship to the grid members so that it cannot be entangled therein or accidentally become displaced. This sort of mechanism is also very easy for the operator to thread-up after yarn breakage, running out, etc.

Referring to Figs. 1, 2, 6 and 7, we have illustrated the yarn sweeps which function to release strain upon the yarn as it is drawn by the needles or by positive furnishing means. These sweeps and associated means will also function to stop the entire machine whenever strain or tension upon the yarn exceeds certain safe limits. It is a purpose of this tension relieving mechanism to improve the character of knitted fabric which is produced, the fabric otherwise being affected by the catching of the yarn at the cone as sometimes occurs when adjacent convolutions of yarn become tucked under one another, or when knots act to hold the yarn from readily being drawn off the cone.

The yarn sweeps 36 pivoted at 37 upon a supporting ring or disc 38 will be drawn downwardly against the tension of springs 39 to absorb the shock and relieve tension of the yarn which would otherwise be transmitted directly through to the knitting instrumentalities. In the event that yarn furnishing means is employed, this tension relieving device will very effectively prevent undue breakage of the yarn as it is positively drawn from the cones whereupon it may stick for reasons above mentioned.

It is another feature of the mechanism herein being described that the yarn is at all times threaded through the eyelet 40 in the end of sweep 36 and never need be rethreaded except upon breakage at this particular location. This is an exceptional advantage in such machines as we illustrate due to the fact that a great plurality of yarns are being simultaneously knitted and this portion of the machine is inaccessible except to an operator upon a step ladder or to an operator using a special instrument to reach upwardly and insert the yarn within the sweeps as has been the practice in the prior art. Whenever tension on the yarn passes a safe limit for that particular yarn, the sweep 36 will be drawn downwardly to the dotted line position of Fig. 2 and will actuate a second stopping mechanism illustrated in detail in Figs. 6 and 7. It is evident that the machine will continue to run for a short interval after this stop motion has been caused to function, and by employing the particular construction which we have illustrated, the sweeps may be drawn downwardly throughout a considerable angle after the stop motion has been set off, so that the yarn does not have to be disconnected from the ends thereof nor will it be broken when the sweep reaches the end of its stroke as has been the case in some previous constructions. The range of action of the sweep after the machine stop is actuated is more than sufficient to care for the yarn drawn as the machine moves on to come to rest. In operation the knitter has only to examine the cone of yarn 7 or 7' which is within his reach and free the yarn therefrom so that the sweep 36 individual to that particular yarn will swing back to its uppermost position whereupon the machine may be restarted with a minimum loss of time.

Each of the sweeps is pivoted as illustrated and is maintained in position in the slot 41 by means of a coil spring 37. Each sweep has an extending portion 42 at its inner end to which is connected a spring 39. The lower end of each spring 39 is attached to a hook 43 projecting from a spider 44, the hub 45 of which is vertically slidable upon column 13. This hub 45 is clamped in position upon the column by means of a set screw (not shown). By moving the spider 44 up or down the column it is possible to vary the tension which springs 39 will exert against the sweeps 36 being drawn downwardly, this adjustment being necessary and desirable for various kinds of yarn and for yarns having more or less strength.

An element 46 having somewhat the form of an inverted cone is permanently attached to the upper end of column 13, and serves to stop each of the sweeps as it swings upwardly to the position of Fig. 2.

Whenever any one of the sweeps 36 is drawn downwardly to about the position indicated in dotted lines, Fig. 2, the stop motion shown in that Fig. 2 and also in Figs. 6 and 7 will function to stop the entire machine. One of these stopping assemblies is mounted on a stud 47 secured to the annular support 38 in a suitable manner behind each of the sweeps. A ring 48 extends about the machine forming an electrical connection between each of these stop motion units, the ring 48 being connected by suitable wiring to a source of electrical current. At each station the ring is supported in a hook 49 depending from a screw 50 which passes through the upper end of stud 47 but is electrically insulated from the same by means of washers 51, 52 and a suitable insulating sleeve extending within the drilled hole of the upper end of stud 47. A contact piece 53 is connected at the other end of the screw 50 and projects downwardly being bent at an angle at the lower end 54. A detent 55 is pivoted at 56 and normally bears at its outer end on sweep 36. When the sweep is in its uppermost position or has been pulled downwardly throughout a reasonable extent as indicated in Fig. 2, the detent 55 will not contact the element 54 to complete the electrical circuit and stop the machine. When the sweep has been pulled downwardly throughout a predetermined extent, the said detent will make a very suitable electrical contact with the angularly disposed portion of the element 53 and stopping of the machine will be initiated at this point, but the sweep then leaves the detent and may be drawn downwardly throughout a considerable angle thus allowing the machine to come to a stop without breaking the yarn or necessarily releasing it from the eyelet 40 in the end of the sweep as has been the case in the prior art. The length of the arm 36 and the angle through which it is allowed to swing have been found satisfactory for taking

care of the yarn drawn by such a machine as has been illustrated herein after power has been discontinued and before the machine stops, the motion therebetween being due to inertia of the moving parts. The proportions may be varied for other applications.

The mechanism hereinbefore described has utility when used in machines where the needles alone function to draw yarn and knit the same into a fabric, and it will be found that a better grade of fabric will be knitted, also that the machine may be run with much less attention due to the infrequent stops and the ease with which the machine may be restarted without threading the yarn through guides after a stop. In the event that a positive yarn feeding mechanism is applied to the knitting machine, either of the type herein illustrated or of any other conventional design, it will be found that the machine may be run with a great many less stops and also with much less attention by the operator in remedying the difficulty at these stops so that the machine may be restarted. The positive feeding means will relieve the strain of the yarn being drawn at the needles so that better fabric will be knitted by them, and it will also be possible with the use of positive feeding mechanism to adjust the tension on the springs **39** so that the yarn may be drawn from the supplies with the sweeps so controlled that the machine will only stop when the yarn being knitted has almost reached the breaking point in case of difficulty in being drawn off the cone. The combination not only makes it possible to knit fabric under a minimum of tension on the yarn being drawn at the needles, but also to pull the yarn from the cone with as much force as that yarn can stand without actually allowing the strain on the yarn to become critical. It may thus be seen that the stop mechanism will not be set to operate very sensitively, a condition which would result in too frequent stops, but at the same time the strain on the yarn will always be relieved well before it reaches the breaking point.

Referring to Figs. 8, 9 and 10 we have shown the general wiring diagram for the electrical stopping apparatus and a manually operated testing switch. This testing switch is shown in detail in its relationship to the other parts of the clutch engaging lever and the automatic stop control. In Fig. 8 a transformer is indicated at **57**, and although we prefer to plug into any convenient line to obtain current for operating the electrical stopping mechanism, we may employ batteries or other convenient sources of current with equally satisfactory results. The current normally flows through a circuit including a light bulb **58** and through a switch which includes a base **59**, a contact **60**, a second contact **61** and a lever **62** pivoted on the base and which is normally in the position shown in Fig. 8 wherein it contacts both elements **60** and **61** to complete the circuit from the transformer to the light and also to connect said circuit to the upper stop motions indicated at **63** and **64**. These upper stop motions herein generally referred to by numerals **63** and **64** have been shown in detail in Figs. 4–7 and were described above. The stop motion device which has been located at the yarn guides adjacent the needles is generally indicated at **65**, and is connected with the circuit which includes light **58**, contact element **60** and also the electrically operated latch generally designated at **66** which serves to release the clutch shifter lever whenever one of the stop motion detents functions to make a ground; and further, acts as a warning buzzer whenever the machine operator attempts to engage the clutch when one of these detents is still making a ground.

The upper stop motions **63** and **64** are connected within the circuit by means of contact element **61**, lever **62**, etc. Whenever one of these upper detents falls to engage either of the rings **27** or **48**, a circuit will be completed through the ground to the latch **66** thereby operating a solenoid and a catch to release the clutch shifter lever and thus stop the machine.

By means of the particular system of connecting up these stopping devices which we have herein illustrated, the lower stop motion **65** may be segregated from the upper motions **63** and **64** by causing lever **62** to engage contact element **61** but not **60**. In the position in which lever **62** has been shown in Fig. 8 both are being engaged, and it is in this position that the parts would be held when the clutch shifter lever **67**, Figs. 9 and 10, is moved to engage the clutch.

This lever **67** is pivoted on a shaft **68** and also has another forked lever **69** engaging therewith at **70** so that movement of either lever will rock the other and also shaft **68**. Lever **69** projects downwardly having a fiber block **71** at its lower end, this fiber block being engaged by a catch **72** which is capable of being released therefrom whenever any one of the stop motions functions as previously described. A spring **73** will pull lever **69** to a position in which the clutch will be disengaged whenever this catch **72** is caused to release lever **69**. A short arm **74** is permanently fixed to the outer end of shaft **68** and carries a fiber roller **75** at its free end. A base **59** attached to the side of the casing **76** has a lever **62** pivoted thereon, which lever is engaged by roller **75** in such a manner that the lever will be moved to contact both elements **60** and **61** whenever the clutch is engaged, that is, when levers **67** and **69** are in the position shown in Fig. 9. A spring **77** is attached at one end to the casing and at its other end to lever **62** so that whenever the catch **72** is disengaged and elements **69** and **74** move about the pivot on shaft **68**, the spring will withdraw lever **62** from contact with elements **60** and **61**. This means that whenever any one of the detents in stop motions **63**, **64** or **65** completes a ground the solenoid which disengages catch **72** will be energized whereupon light **58** will go out, and as lever **62** is withdrawn from its contacts **60** and **61**, the complete circuit will be disconnected. A hook shaped contact piece **78** is attached to the same terminal at which element **60** is attached, and this element **78** is formed in such a manner when lever **62** is moved against the tension of springs **77**, its outer end will first engage said element **78**, then upon further motion, will engage the forked contact element **61**, and then as it is pushed farther down into **61** will also engage element **60**. However, it is quite essential that the outer end of lever **62** move away from element **78** before any contact is made at **61**.

After the machine has stopped due to the functioning of any one or more of the detents, it has been found quite essential to provide some means for determining at what level the trouble is, or to fix as nearly as possible the location of the difficulty which has caused the machine to stop. This is particularly true on machines having a

great number of feeds. By means of using lever 62 manually, the operator may move said lever until a contact is made at 78 thus bringing into the circuit the lower stop motion 65. In case the trouble is at this lower level, bulb 58 will be lighted but the buzzer will show that there is a break and the operator will proceed to repair such difficulties as he finds at that level. The lever 62 may then be moved in until it engages at 61 thus connecting the upper stopping mechanisms 63 and 64. If the only trouble was in the lower level, no buzzing will be heard and the machine may be started at this point. In case any one of the detents at the upper level has been released for various reasons, a buzzing will be heard and the operator must proceed to repair the cause of the trouble at the upper level. The bulb will also fail to be lighted. It may thus be seen that an operator may quickly determine at which level the stopping of the machine has been caused and will repair a break, replace an exhausted cone or release the yarn holding down one of the sweeps to the exclusion of searching for any trouble at other points. The machine will not be started until lever 62 can be moved in to contact both elements 60 and 61 without failing to light the bulb 58 and without causing the buzzer at 66 to be heard. It has been common occurrence without this testing mechanism to remedy only one source of trouble when there have been more than one source, and the machine being started has just continued to add to the damage before it could be stopped a second time. With this mechanism there is no excuse for an operator to start the machine without being certain that all yarns are complete and freely running to the needles. A great deal of time is also saved by isolating the trouble to a particular portion of the machine before attempting to discover just which of the yarns has been broken, etc.

It is obvious that the stopping devices might be further divided into groups and isolated, and other possible contacts added thereby the operator might more definitely locate trouble before being compelled to search for the particular yarn which was not running to the needles properly. The invention has been described with relation to one particular embodiment of the same and while more or less specific terms have been used, many variations may occur to one skilled in the art and we do not intend to be limited except by the claims appended hereto.

We claim:

1. A knitting machine having therein instrumentalities for drawing yarn and knitting it into a fabric and a supply of knitting yarn, means for relieving tension on said yarn interposed between said instrumentalities and supply including a sweep resiliently urged in one direction, a stop mechanism associated with said sweep and having a detent supported by said sweep when the sweep is in one extreme position but provided for making contact with an element connected to a source of electric current whenever said sweep has been moved throughout a definite predetermined extent, said sweep being movable throughout about one-third of its swing before contact is made and after contact is made, then movable for the rest of its swing to allow yarn to be drawn as the machine comes to rest.

2. A knitting machine having in combination knitting instrumentalities for drawing yarn and knitting it into a fabric and a supply of knitting yarn, means for relieving tension upon said knitting yarn including a pivoted sweep through which the yarn is permanently threaded, spring means for urging said sweep in a direction to draw the yarn away from said supply, stopping means associated with said sweep comprising a support, a contact element connected to a source of electric current and a detent supported in a position wherein it will not contact said element when the sweep is in inactive position, but so constructed that it will contact said element to stop the machine whenever the sweep is drawn through a predetermined angle by said yarn, said sweep being movable throughout about one-third of its swing before contact is made and after contact is made, then movable for the rest of its swing to allow yarn to be drawn as the machine comes to rest.

3. In a multi-feed knitting machine, a plurality of yarn supplies and instrumentalities for knitting yarn from said supplies into a fabric, means for stopping said machine including a clutch throw-off lever, an electrically controlled latch for holding the same in one position and an electric circuit including said latch mechanism, stopping devices adjacent said supplies, other stopping devices adjacent said instrumentalities and a switch in said circuit connecting either one or both of the stopping devices within the circuit at will.

4. In a multi-feed knitting machine, a plurality of yarn supplies and instrumentalities for knitting yarns from said supplies into a fabric, means for stopping said machine including more than one series of yarn controlled detents functioning in electrical circuits capable of being isolated from each other and means for isolating said circuits when desired, said means also being so constructed that the series of detents may be connected to a common circuit.

5. In a multi-feed knitting machine, a plurality of yarn supplies and instrumentalities for knitting yarn from said supplies into a fabric, means for stopping said machine including an electrically controlled latch for releasing a power throw-off means and a plurality of individual yarn controlled stopping devices located in close proximity to said supplies and another series of individual stopping devices located close to said instrumentalities, a switch having two terminals, one of which is connected to one of these series of stopping devices and the other of which is connected to the other series, and means within said switch for selectively connecting a source of electrical current to either or to both series of stopping devices through said terminals.

6. In a multi-feed knitting machine, a plurality of yarn supplies and instrumentalities for knitting yarn from said supplies into a fabric, means for stopping said machine including a clutch throw-off lever and an electrically controlled latch for maintaining said throw-off lever in one position, an electrical circuit having a switch therein and to which are connected two series of electrical stopping devices and signal means for indicating when said series of stopping devices are all inactive, and two terminals on said switch either one of which will close said circuit for the flow of current but which are selectively capable of bringing into the circuit either one or both of the series of individual stopping devices.

7. In a knitting machine the combination of a spring tensioned yarn sweep through the end of which a yarn is permanently threaded and a stop mechanism operated thereby, said stop mechanism including a detent held in an inactive posi-

tion by means of said sweep but so constructed that when the sweep is moved throughout about one-third of its swing, the detent will make contact to render effective the stopping means, the sweep then being movable throughout the rest of its swing to allow yarn to be drawn while the knitting machine rotates throughout a part of a turn while it is coming to rest after stopping has been initiated by the said stopping mechanism.

8. A knitting machine having a spring tensioned yarn sweep through the end of which a yarn is permanently threaded, in combination therewith a supply of knitting yarn and means for drawing yarn from the supply and for knitting the same to form a fabric, means adjacent to the supply for stopping the machine when a yarn breaks or becomes exhausted, said means including a detent held in an inactive position by means of said sweep but so constructed that the sweep may be moved through a considerable portion of the swing without the detent making contact to render effective the stopping means, further movement of said sweep initiating stopping of the machine, said sweep being movable thereafter to a considerable extent and sufficient to allow yarn to be drawn from the source of supply, without breakage, before the machine comes to rest.

ROBERT H. LAWSON.
AUGUSTIN GAGNÉ.