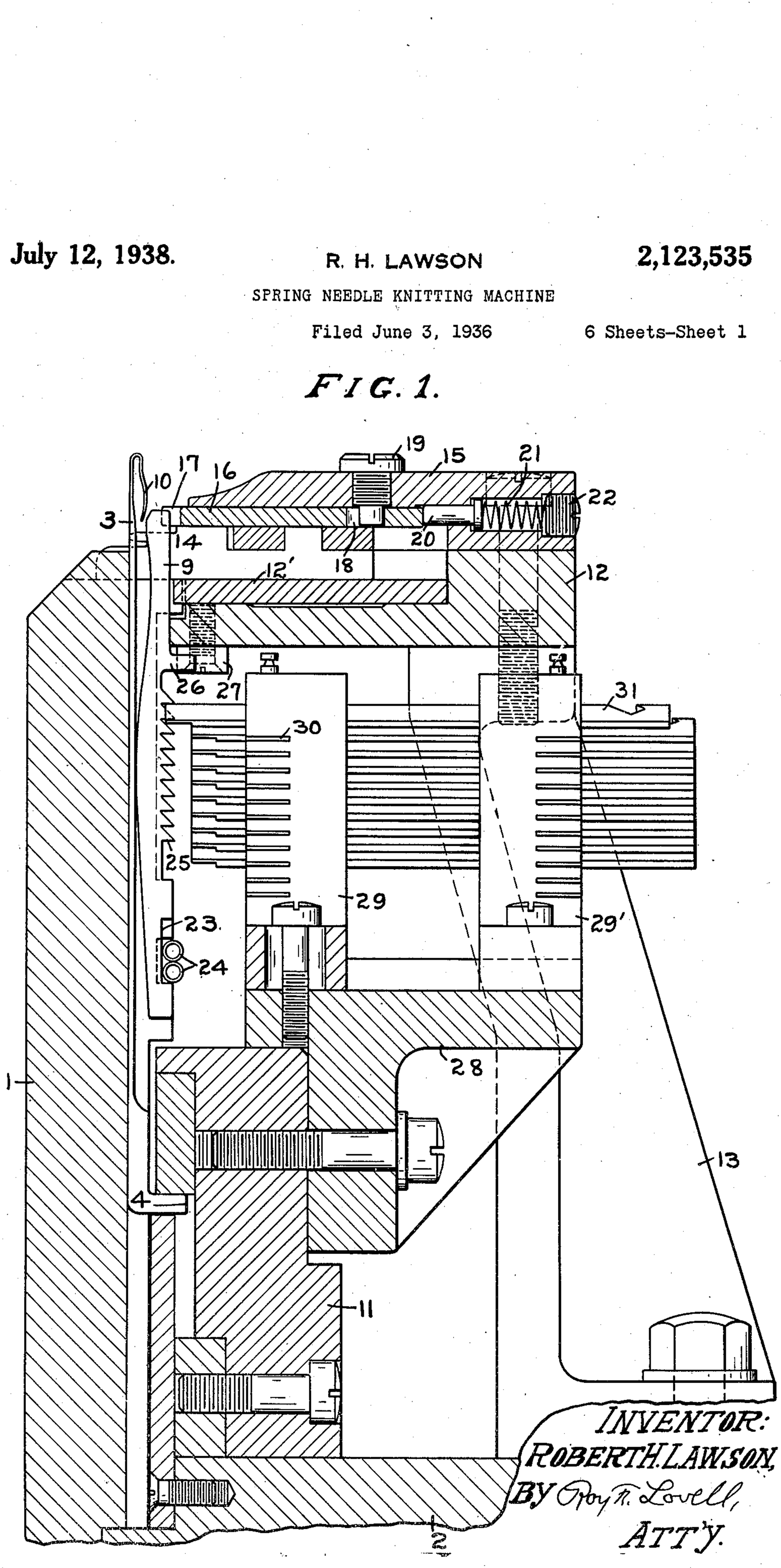
July 12, 1938. R. H. LAWSON 2,123,535

SPRING NEEDLE KNITTING MACHINE

Filed June 3, 1936 6 Sheets-Sheet 1

FIG. 1.



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SPRING NEEDLE KNITTING MACHINE

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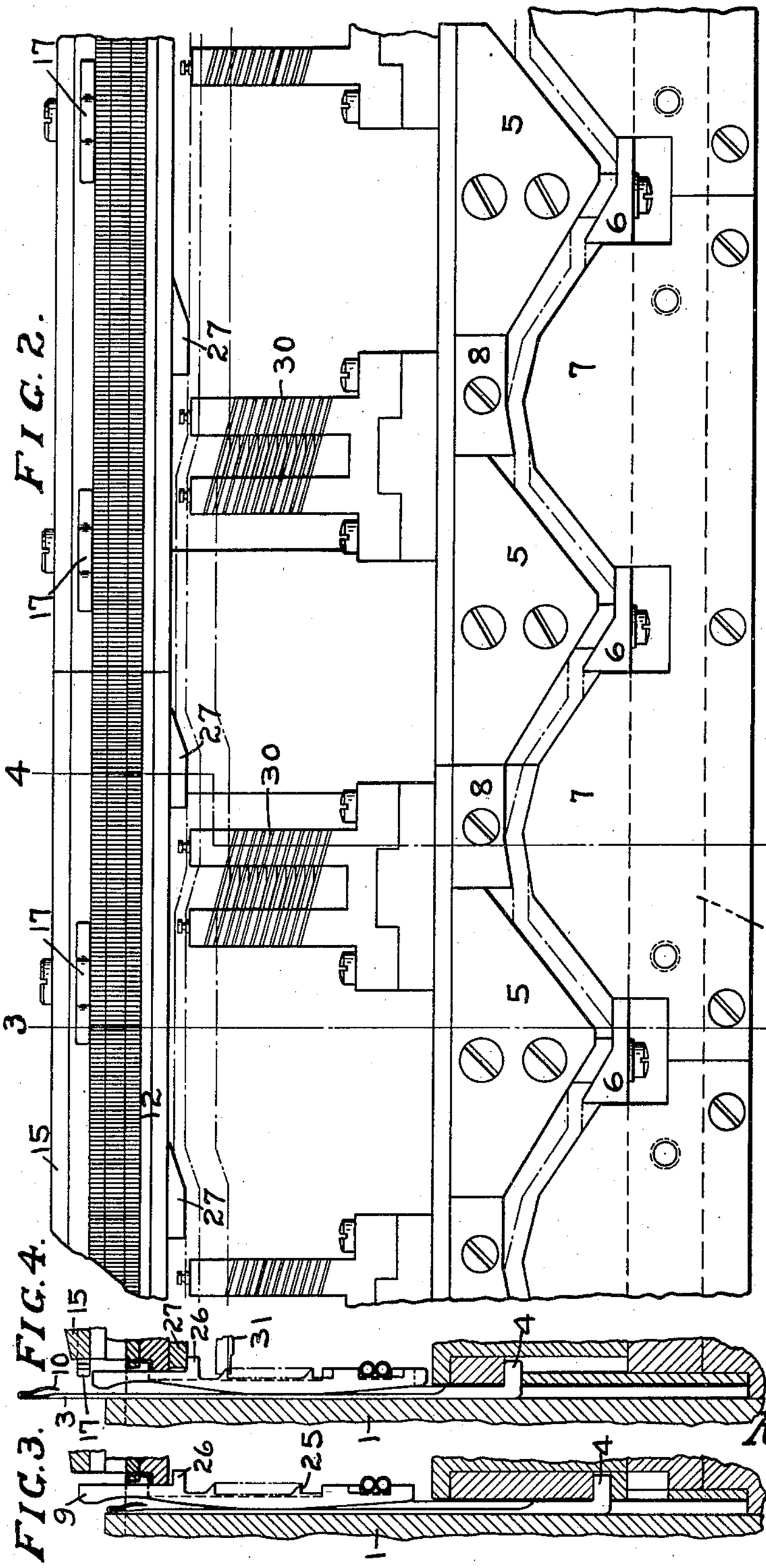

FIG. 2.

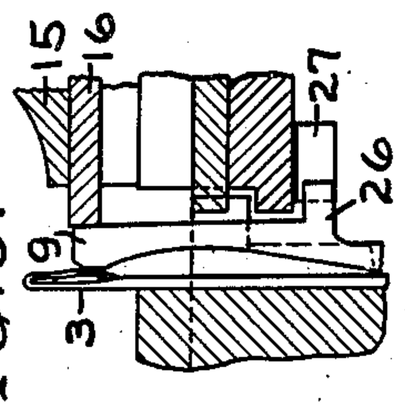

FIG. 6.

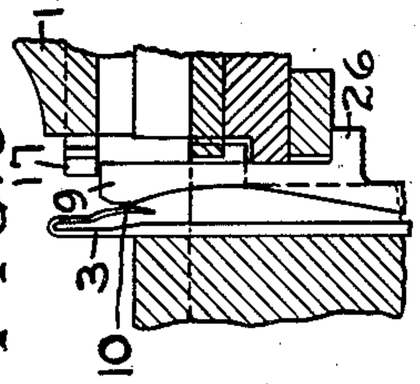

FIG. 5

FIG. 4.

FIG. 3.

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SPRING NEEDLE KNITTING MACHINE

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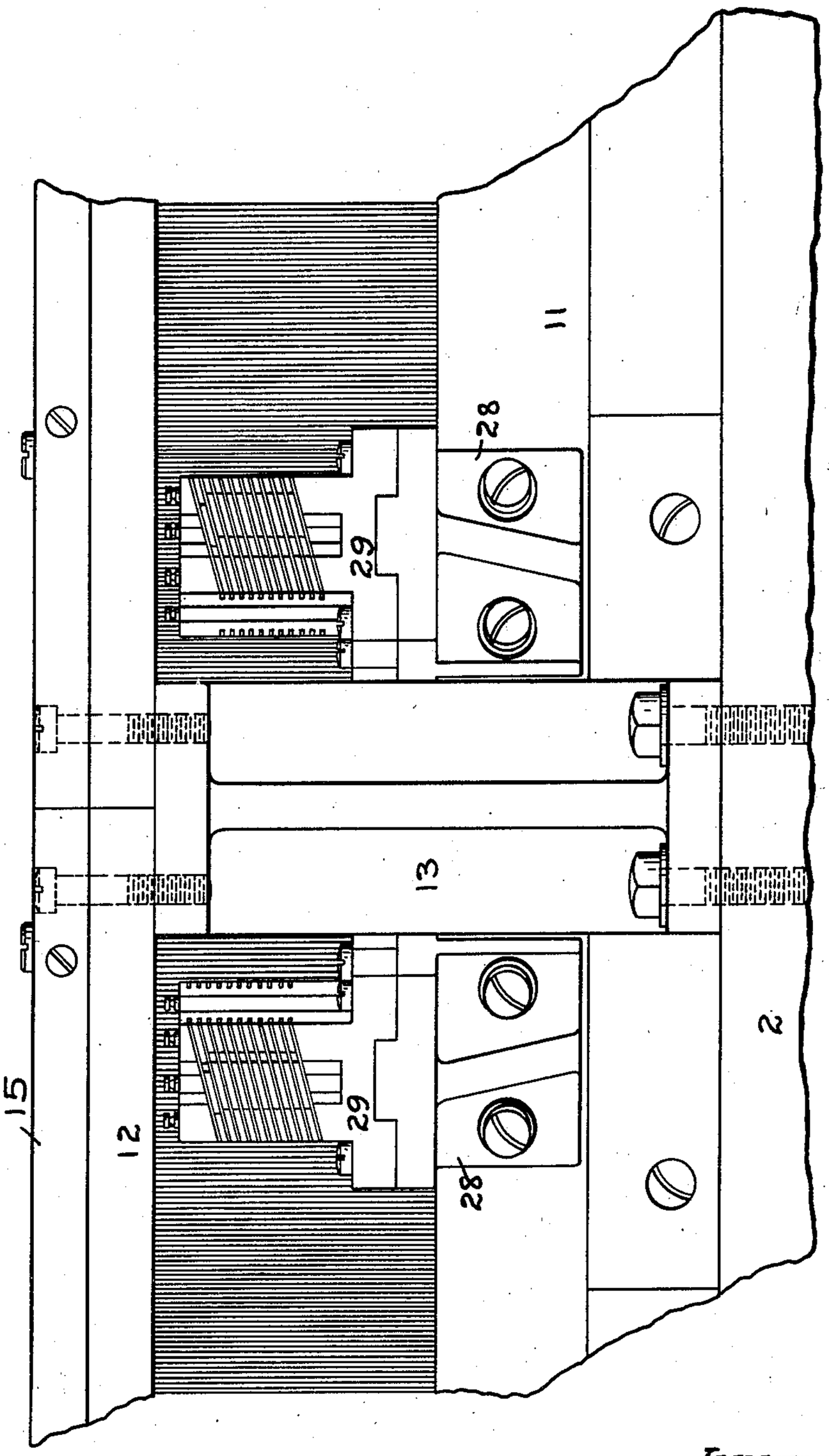
FIG. 7.



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SPRING NEEDLE KNITTING MACHINE

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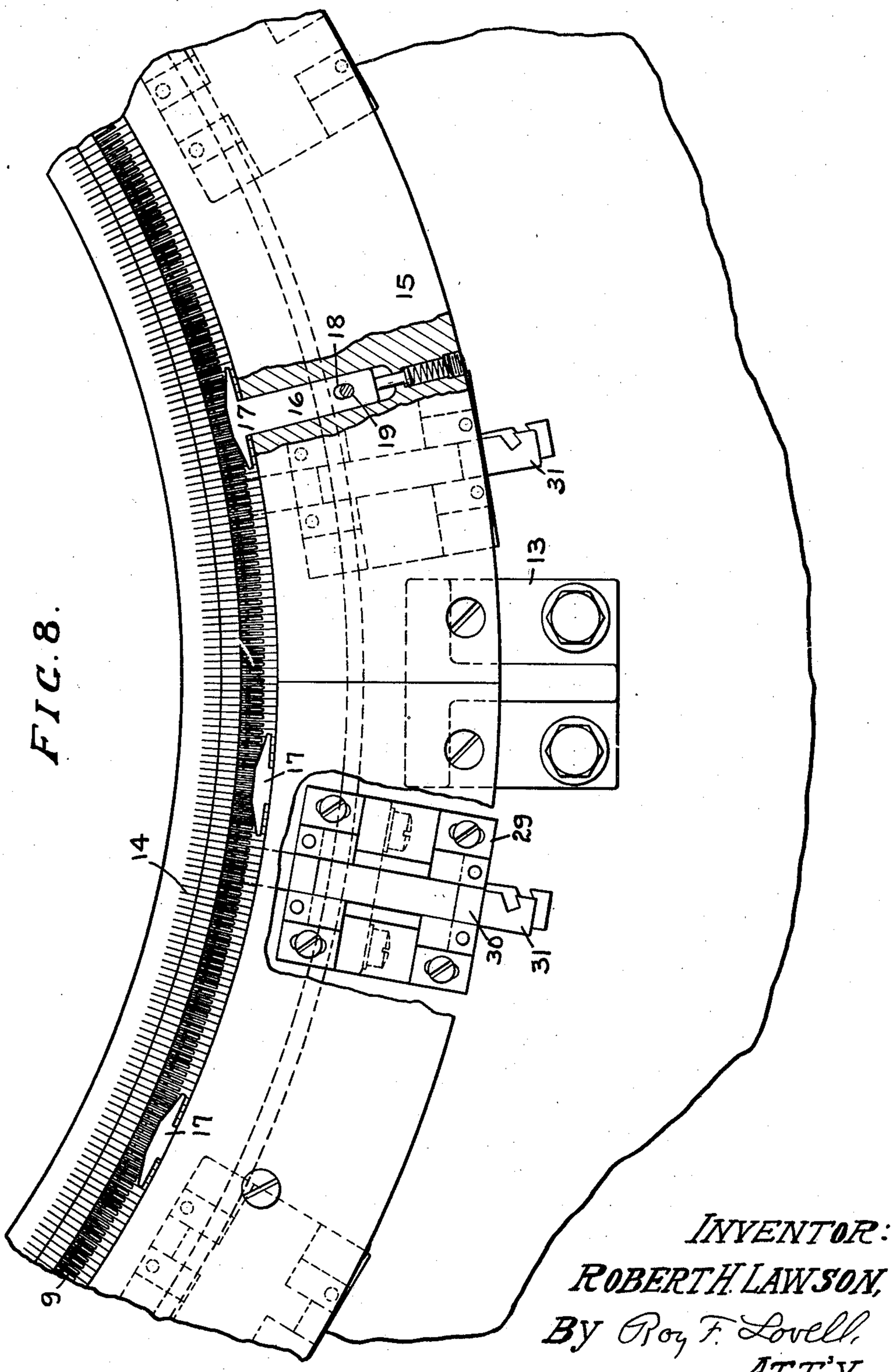

FIG. 8.

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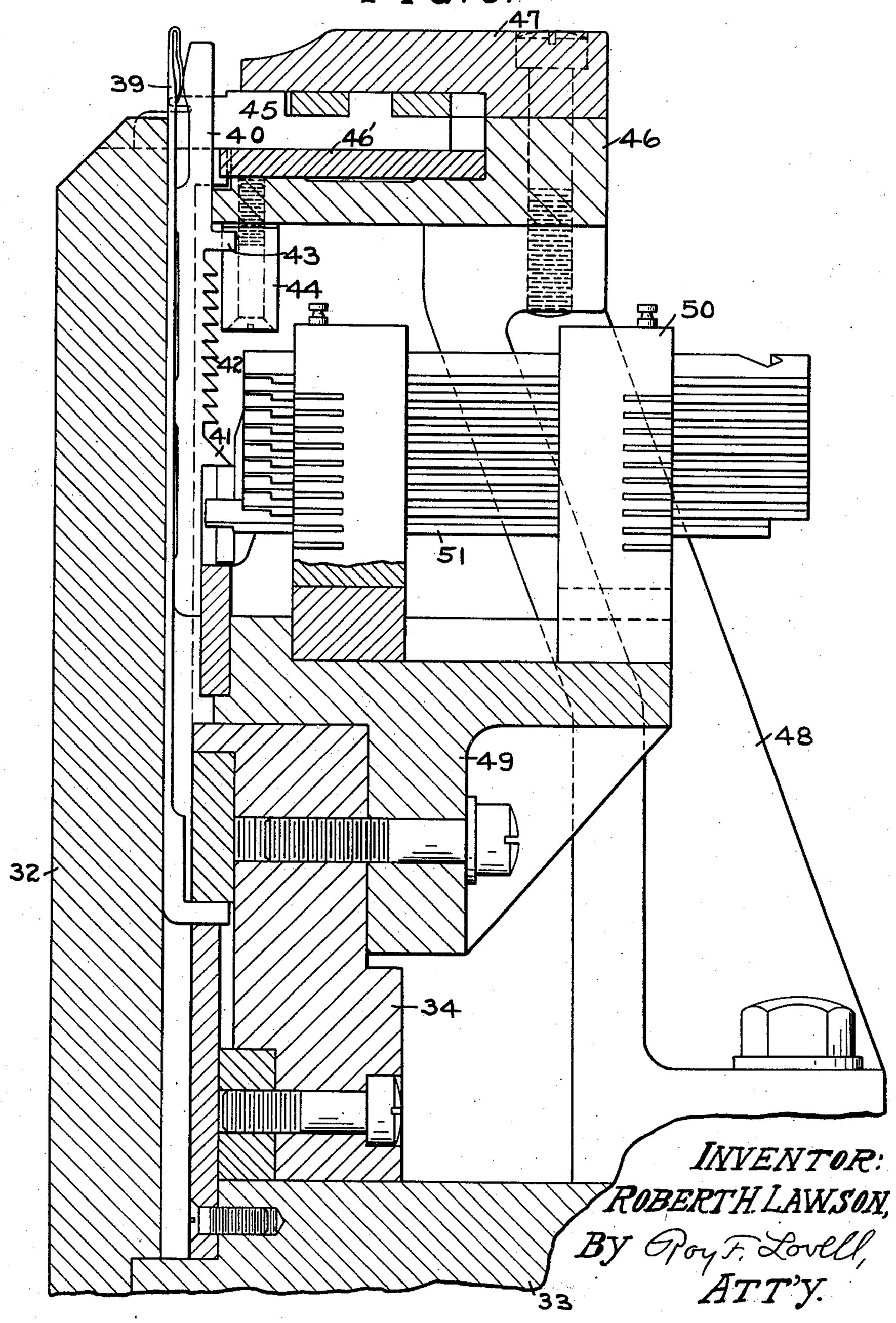
FIG. 9.



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SPRING NEEDLE KNITTING MACHINE

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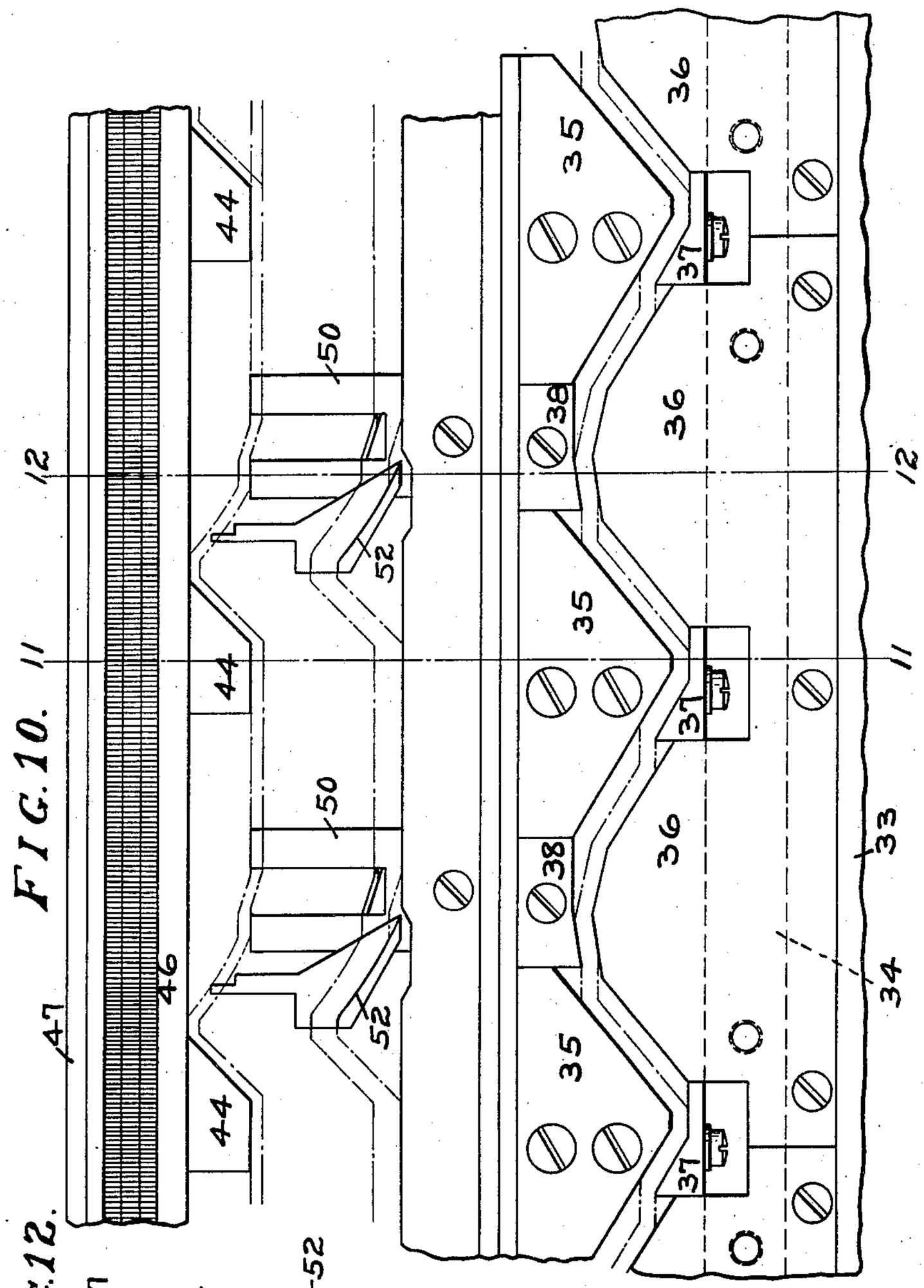

FIG. 10.

FIG. 12.

FIG. 11.

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Patented July 12, 1938 2,123,535

UNITED STATES PATENT OFFICE

2,123,535

SPRING NEEDLE KNITTING MACHINE

Robert H. Lawson, Pawtucket, R. I., assignor to Hemphill Company, Central Falls, R. I., a corporation of Massachusetts

Application June 3, 1936, Serial No. 83,322
In Canada July 15, 1935

14 Claims. (Cl. 66—102)

The invention herein disclosed is concerned with means for selectively forming pattern work in circular, independent needle knitting machines of the spring beard type, the pattern means acting upon pressers which control the knitting function of the needles. The invention has for one of its purposes the application to spring needle pressers of manually controlled selecting mechanism such as has been disclosed in United States Patent Number 2,067,877. While selecting mechanism of that type is especially advantageous when used with multi-feed knitting machines, it is within the scope of the invention to employ other selecting devices which may function to control pressers in performing their usual beard pressing motions or in so controlling them that they fail to press beards of needles whereby ornamental stitches may be produced in a fabric.

In the drawings:

Fig. 1 is a sectional view showing the invention as it is applied to pressers of the rocking type;

Fig. 2 is a development illustrating several cams in a multi-feed knitting machine and selecting devices mounted for operation upon pressers;

Fig. 3 is a section illustrating a needle in lowermost position, the presser being shown after having performed its pressing function and prior to being returned for another selection;

Fig. 4 is a section corresponding to Fig. 3 but showing the needle in uppermost position for taking yarn and the cooperating presser being illustrated in a position wherein it is about to be selected for pressing the beard of its needle as that needle draws a stitch;

Fig. 5 is a fragmentary view showing in section part of a needle and presser just after the presser has returned to a non-selected position;

Fig. 6 is a view corresponding to Fig. 5 but showing the presser actually performing its function of pressing a needle beard;

Fig. 7 is an elevation showing two adjacent selecting devices in position on a multi-feed knitting machine;

Fig. 8 is a plan view of the multi-feed knitting machine illustrated, certain parts being broken away and shown in section for better illustrating selecting plungers and presser cams;

Fig. 9 is a sectional view corresponding to Fig. 1 but showing a modified form of the invention wherein the same selecting means is employed to control beard pressers of the sliding type;

Fig. 10 shows in a development the path of needle butts, needle cams, the path of presser butts and the cams for selecting their controlling pressers according to this form of the invention;

Fig. 11 shows in a sectional view a needle in lowermost position and a presser which has been returned to its non-selected position ready to be selected for performing its function at the next knitting station, there being no interference between needle beard and pressers at this position; and

Fig. 12 is a corresponding view illustrating a needle in its upper yarn taking position and the cooperating presser after being selected, but just prior to being moved by its raising cam to perform its usual function.

It has been the practice to form ornamental fabric knitted upon spring needle machines with so-called tuck stitches by pressing certain needle beards in some courses of the fabric and by failing to press those beards in other courses whereby an accumulation of loops will be accomplished which gives the desired appearance when said accumulation of loops is drawn through another loop and then cast off. The means for accomplishing this ornamentation on spring needle machines has been either of the type wherein very intricate automatic devices were employed or of the nature of pattern wheels such as illustrated in Patent 1,609,346. For use in multi-feed machines the automatic pattern controlling means are practically prohibited due to their cost and the excessive amount of mechanism which it is necessary to provide at each feeding station of the multi-feed machine. It is well known that the simple pattern or presser wheel will form only one pattern of the simplest nature, and for purposes of ornamentation as required at the present time, can not be considered to fulfill the requirements. By means of the invention herein disclosed it is quite possible to furnish each of the feeds of a multi-feed knitting machine with individual selecting means for controlling pressers at that feed, a plurality of removable butts being formed on each presser which will make possible any pattern desired. Each of these selecting devices is of a type wherein selecting elements or plungers are manually set in butt engaging position or are withdrawn and locked out of that position, it being possible to reset all of these plungers about a multi-feed machine in a very few minutes thereby completely changing the pattern without replacing any of the parts of the machine or of the pattern devices associated therewith.

Referring to Figs. 1–8 the first form of the invention will be disclosed. The invention has been illustrated as applied to a multi-feed knitting machine and is especially advantageous when employed in that manner, but it is to be understood that I am by no means limited to such an application of the invention but may employ it on hosiery machines or other machines of a single feed type. Within a needle cylinder 1, herein to be considered as rotating within a machine

frame 2 but not necessarily of the rotary type since the cylinder may be held stationary while cams and pattern discs rotate relatively thereto, have been mounted for reciprocation in their tricks a series of spring beard needles 3 having butts 4 thereon which are guided by stitch drawing cam 5 and other cams 6, 7 and 8 for taking yarn and drawing that yarn into knitted loops provided the cooperating pressers 9 are controlled to press the beards 10 of the needles at the proper time. The cams 5—8 are fixed to a cam ring 11 formed in sections about said machine and are attached to the base of the machine by means of suitable connecting elements.

A ring 12 also formed in sections is supported upon a series of columns 13 fixed to the base of the machine having a recess therein. In the recess is mounted the usual sinker support 12' having slots therein within which sinkers are slidable. This ring is driven in a known manner by interconnection with the needle slots of the cylinder. These sinkers cooperate with the needles in the formation of stitches in a manner well known in the art. Sinker cams are formed in a cap 15 attached to the top surface of the ring 12. This cap is also slotted for the reception of stems 16 of presser cams 17. These stems have slots 18 within which the reduced end of screws 19 project for limiting the movement of the said presser cams in a radial direction. Plungers 20 each having a spring 21 bearing against the outer end thereof tend to maintain said presser cams in active position but provide for outward radial movement in the event that any presser can not be rocked against its beard in a normal manner, thus preventing damage. The spring 21 is retained in a drilled hole at the outer edge of cap 15 and is held under compression by a threaded plug 22.

The pressers 9 are formed in such a manner that they are retained within the needle slots and pivot against their respective needles so that cams 17 may rock them inwardly whenever relative movement causes the upper ends of said pressers to sweep past said cams. This pressing movement is dependent upon selecting of each individual presser so that it will be raised to the position shown in Figs. 1 and 6. If a presser is not selected it will travel at a low elevation as indicated in Fig. 5 wherein cam 17 does not engage the upper end of the said presser, and in such case, the cooperating needle will not cast off its stitch at that knitting station. Each of the pressers will preferably have its surface which bears against the needle within the slot flattened for a slight extent so that when moved lengthwise of the slot, the pressure will not be rocked to cause interference between the upper end of the same and the beard of the needle. The lower portion of each presser is cut out as indicated by numeral 23 so that springs 24 may engage within this cut out portion and resiliently maintain the pressers within the needle slots, also maintaining the upper ends outwardly. These springs 24 are maintained in a definite position upon the cylinder since they are held within a narrow annular groove cut in the outer surface thereof. The portion 23 which has been cut out of each presser is of such a length that the pressers may be moved lengthwise of and within their slots for the necessary extent but will not move beyond definite limits. Each of the pressers is originally provided with a number of butts of saw-tooth shape indicated at 25, these butts being removable by any convenient means or method such as by breaking or cutting. While I have shown 10 butts on each presser thus giving 10 stages or steps of selection, it is to be understood that I may employ any number of steps depending upon the pattern which is desired and upon the length of pressers and/or number of selecting plungers employed. The principles of the invention are all it is intended to illustrate in the mechanism shown and described in this case.

A butt 26 is provided above the frangible selecting butts 25, this butt engaging a cam 27 for the purpose of returning each presser to a non-selected position after passing each separate feeding station in case the machine is of multi-feed type, or after the feeding station if the machine is to knit at only one station. From the construction of the elements so far described, it may be seen that each presser is capable of being selected when in a lower or non-selected position, this selecting movement consisting of a slight vertical motion imparted to those pressers desired to function and this vertical movement merely being for the purpose of presenting a presser to its presser cam in such a way that it will be actuated positively by that cam. If any presser is not selected it will pass along at a low level and will fail to be engaged by its presser cam and will thus have no effect on its cooperating needle. The two movements, that of selection and that of pressing, are entirely separate and individual movements thus making the device more positive in its action and also allowing more simple selecting means to be employed since the selecting means does not enter into the function of pressing.

It is my intent to employ selecting means of the type shown in United States application 706,082, above mentioned, and I will not go into detail in describing such selecting means nor in illustrating the same in this case. Each selecting unit has been mounted upon a support 28 suitably attached to cam supporting segments 11, and, as shown herein, comprises upright elements 29 and 29' adjustably mounted on support 28, a series of spacing and guiding strips 30 between which suitable plungers 31 are placed. Each of these plungers is preferably held inwardly by means of springs (not shown) but may be engaged by a suitable hooked instrument or the like and pulled outwardly to be locked in an outer or inactive position by means of notches in each plunger which engage other means (not shown). These plungers are to be set for any given pattern, and in the event the pattern is to be changed, it is only necessary for the machine operator to reset the plungers at each station about the machine so that the desired pressers will be lifted by means of active plungers at those courses and wales wherein the corresponding needles are to knit, and at courses the wales wherein beards of needles are not to be pressed, no plungers will be in active position in alignment with a butt left on the corresponding pressers to raise the same. The selecting means which I have illustrated is that which I choose to employ with the preferred form of the invention, but it is to be understood that many other selecting means might be used in conjunction with the pressers herein shown to carry out the method of selecting and thereafter pressing without departing from the original spirit of the invention. It is within the scope of the invention to use plungers or other selecting instrumentalities which may be controlled by trick wheels, jacquard mechanisms or other automatic

means for varying the pattern which is to be formed.

To review the operation of this form of the invention, I refer to Figs. 2, 3 and 4 wherein is shown the pathway which needle butts and presser butts follow. After passing any station of selecting and knitting, one of the cams **27** will lower all pressers to a level in which their upper ends would pass beneath presser cams **17** and at which level the butts **25** will be in alignment with the selecting plungers **31** in case a plunger is in active position opposite a butt remaining on a presser. As the presser passes the series of plungers **31** and if the needle is to knit at the next approaching station, a plunger will be in active position opposite some butt which has been left on that presser. That plunger will then elevate the presser throughout a sufficient extent to bring the upper end of the presser to a level at which the presser cam at that next station will force that selected presser inwardly against the beard of its needle at the proper time to cast off the old loop as the new stitch is drawn. This pressing is accomplished at such a time relative to needle movement and in a manner well known to those skilled in the art. Before reaching the next knitting station another cam **27** will return all selected pressers to non-selected position whereupon the operation will again be repeated. In the event that a needle corresponding to some particular presser is to retain its stitch previously drawn and to cast it off at a subsequent knitting station thereby forming a tuck stitch, no plungers will be in position to contact any butt remaining on that presser as the presser passes the selecting station. Depending upon the number of stations at which the needle draws yarn but does not cast off, i. e. its beard is not pressed, tuck stitches of varying lengths and number of accumulated loops may be formed.

Referring to Figs. 9–12 an alternate form of the invention will be described wherein sliding pressers are used and in which the possibilities of selection are the same as in the modification first described, the only difference being that of adapting the selecting principles I employ to sliding pressers rather than to pressers of the first described type. In Fig. 9 I have shown a needle cylinder **32**, base **33**, cam supporting segment **34** and cams **35**, **36**, **37** and **38** being retained thereon all for the purpose of controlling the action of spring beard needles **39** in a manner corresponding to that in which these same parts were controlled in the first form of the invention described. Pressers **40** are so constructed that they seat in the same slots in which the needles are guided, these pressers being adapted to slide in the slots and upon the needles. Each presser has a butt **41** and a series of small sawtooth butts **42** which are removable in the same manner butts **25** were to be removed in the form of the invention described above. Another butt **43** is provided for engagement with cams **44** for purposes of returning the pressers to a lower non-selected position whenever they have been selected and raised to press beards on their respective needles.

Sinkers **45** are retained within a movable sinker ring **46'** driven by the cylinder and bearing in sinker head **46** and are controlled by means of suitable cams in the cap **47**. This sinker head and cap are maintained in proper position by supporting columns **48**. Brackets **49** are secured to the segments **34** at each of the knitting stations and carry selecting units herein designated by numeral **50**, these selecting units being similar in form and function to those which have been described relative to control of the rocking pressers.

These units **50** have a series of plungers **51** which are preferably of the same construction as plungers **31** and when in their operative positions, will engage any of the butts **42** which have been left on pressers in alignment therewith to raise that presser throughout a slight extent this movement being a movement of selection only. Cams **52** are provided, one for each selecting unit, and are of such a construction that they will raise selected plungers by means of butts **41** so that those pressers will be guided by the cams **52** and **44** to move in a proper manner to press beards of needles in a way well known to those skilled in the art. Each cam **52** is mounted for swinging movement so that in the event of any butt **41** passing through at an improper level so that it would run into the leading edge of the cam **52**, that cam will swing outwardly away from the cylinder thereby preventing a smash. These cams **52** are preferably of the same type as have been described and claimed in applicant's copending application 56,991 but of proper contour to control beard pressing. Of course, slight modifications of the structure shown may be resorted to without departing from the spirit of the invention.

It may be seen that both forms of the invention herein disclosed provide means for selecting pressers for knitting or failing to select certain pressers to form tuck stitches in a fabric, which selecting means performs its function entirely independent of other separate, positively acting means which causes the pressers to go through the necessary movements incidental to pressing of beards. While 10 stages of selection have been indicated, I am not to be limited to any particular number of butts or steps since the number might be greatly increased without detracting from the efficiency of the construction herein shown either regarding selection or the pressing function both of which are performed entirely independent of one another. There is no need for complicated automatic pattern control, although the same might be used, since I am able to knit fabrics which are satisfactorily ornamented by the use of manually controlled selecting plungers, these plungers being positive in their engagement of selecting butts and causing practically no trouble in their operation. The setting up of new patterns requires very little skill on the part of the machine operator and consumes only a few minutes of his time, whereas other devices known in the prior art require a great deal of time on the changeover as well as the expense of providing new tricks, pattern discs or the like.

While the invention has been described with relation to more or less specific forms of the same, this is given merely as examples of constructions which follow the spirit of the invention, and I do not intend to be limited except by the scope of the appended claims.

I claim:

1. In a knitting machine the combination of spring beard needles and cooperating pressers associated therewith for selectively pressing needle beards, a cam for causing said pressers when selected to press beards of their respective needles, a plurality of removable butts on said pressers and selecting means for functioning on said pressers through said butts in accordance with a predetermined pattern requirement.

2. In a knitting machine the combination of spring beard needles and pressers cooperating therewith for selectively pressing the beards of said needles, said pressers having a plurality of removable butts thereon, a plurality of selectors each manually controllable for engagement or non-engagement with respective butts on the pressers and constructed to impart longitudinal movement to them, and means for causing a selected presser to be moved to press the beard of its respective needle.

3. In a knitting machine of the type described the combination of spring beard needles and pressers cooperating therewith, means for causing the pressers to press needle beards when selected, said means being ineffective to act on pressers not selected and selecting means functioning directly upon said pressers and constructed to be manually set for selecting said pressers according to a predetermined pattern requirement.

4. In a knitting machine of the type described, the combination of spring beard needles and pressers cooperating therewith, a series of selecting butts on said pressers, selecting means for engaging said butts according to predetermined pattern requirements, said pressers being normally held in a position in which they would pass by a presser cam without engaging the same but movable by said selecting means to be engaged by said presser cam.

5. In a knitting machine of the type described, the combination of spring beard needles and pressers cooperating therewith, means for engaging the upper ends of said pressers to cause them to press cooperating needle beards, a series of selecting butts on said pressers and a butt for returning the pressers to non-selected position, a cam for engaging said last mentioned butt and selecting means for engaging said selecting butts whereby pressers may be caused to engage their pressing means in accordance with a predetermined pattern requirement.

6. In a knitting machine of the type described the combination of spring beard needles and pressers cooperating therewith, said pressers being provided for rocking movement to press cooperating beards and further provided with a series of removable selecting butts, a series of selecting instrumentalities movable to and from butt engaging position and capable of being secured in either position, said selecting instrumentalities being capable of raising pressers to a position wherein they will be engaged by a presser cam and a separate butt on said presser for engagement with a cam for returning them to non-selected position after engagement with said presser cam.

7. A presser for pressing beards of spring beard needles including an upper portion for engagement with needle beards and a shank portion about which the entire presser is to be rocked, said shank portion also being provided with a series of removable selecting butts for raising the same and a butt for engagement with a fixed cam to return the presser to a non-selected position after being raised by said selecting butts.

8. A presser adapted to function with spring beard needles including an upper portion provided for engagement with needle beards and a shank portion flattened at one side for sliding vertically upon the shank of a cooperating needle but capable of being rocked about one extent of said flattened portion, a series of removable selecting butts and a butt for engagement with a fixed cam by means of which the presser is to be returned to initial position after being engaged by selecting means functioning upon said selecting butts.

9. In a knitting machine of the type described, spring beard needles and pressers cooperating therewith, said pressers being provided with a series of selecting butts, a single butt for returning said pressers to lowermost position, and an upper portion one side of which is adapted to engage needle beards and the other side of which is adapted to contact a presser cam, a presser cam located above the normal pathway through which the upper portion of said pressers travel, a series of selecting instrumentalities for engagement with said selecting butts for raising pressers so that the upper ends thereof will engage said presser cam and a fixed cam for engagement with said single butt for returning raised pressers to their lowermost position.

10. In a knitting machine, of the type described, the combination of spring beard needles and sliding pressers cooperating therewith, a series of selecting butts on each presser, another butt on each presser for engagement with a presser raising cam and still another butt for engagement with a presser lowering cam, a cam for raising and another cam for lowering pressers, a series of selecting instrumentalities for engagement with selecting butts to raise pressers so that their raising butts engage said raising cam whereupon they will be moved to beard pressing position and will then be moved downwardly to an inactive level.

11. In a knitting machine of the type described, the combination of spring beard needles and pressers cooperating therewith, said pressers having thereon a plurality of selecting butts, means for selectively engaging certain ones of said butts to move pressers longitudinally for purposes of selection, said means being manually movable from an operative to an inoperative position and being held in either position desired.

12. In a knitting machine of the type described, the combination of spring beard needles and cooperating pressers said pressers being provided with removable butts determining a plurality of selections for causing them to engage or not to engage and press their respective needle beards, a series of selecting instrumentalities capable of functioning upon said presser butts and moving pressers longitudinally, said instrumentalities being manually movable from one position to another and being held in either position.

13. In a knitting machine of the type described, the combination of spring beard needles and sliding pressers cooperating therewith, a series of selecting butts on each presser and another butt on each presser for engagement with a presser raising cam, a series of selecting instrumentalities equal in number to the number of selecting butts originally on each presser for moving a presser throughout an extent whereby the second mentioned butt will engage the presser raising cam whereupon said presser will be moved to engage its needle beard.

14. Mechanism of the type described in claim 13, wherein each presser has another butt positioned above said selecting butts and cams are provided at each feeding station about the machine, said cams functioning upon selected pressers through said butts to return each selected presser to its non-selected position.

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