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MOTOR DRIVEN LETOFF FOR LOOMS

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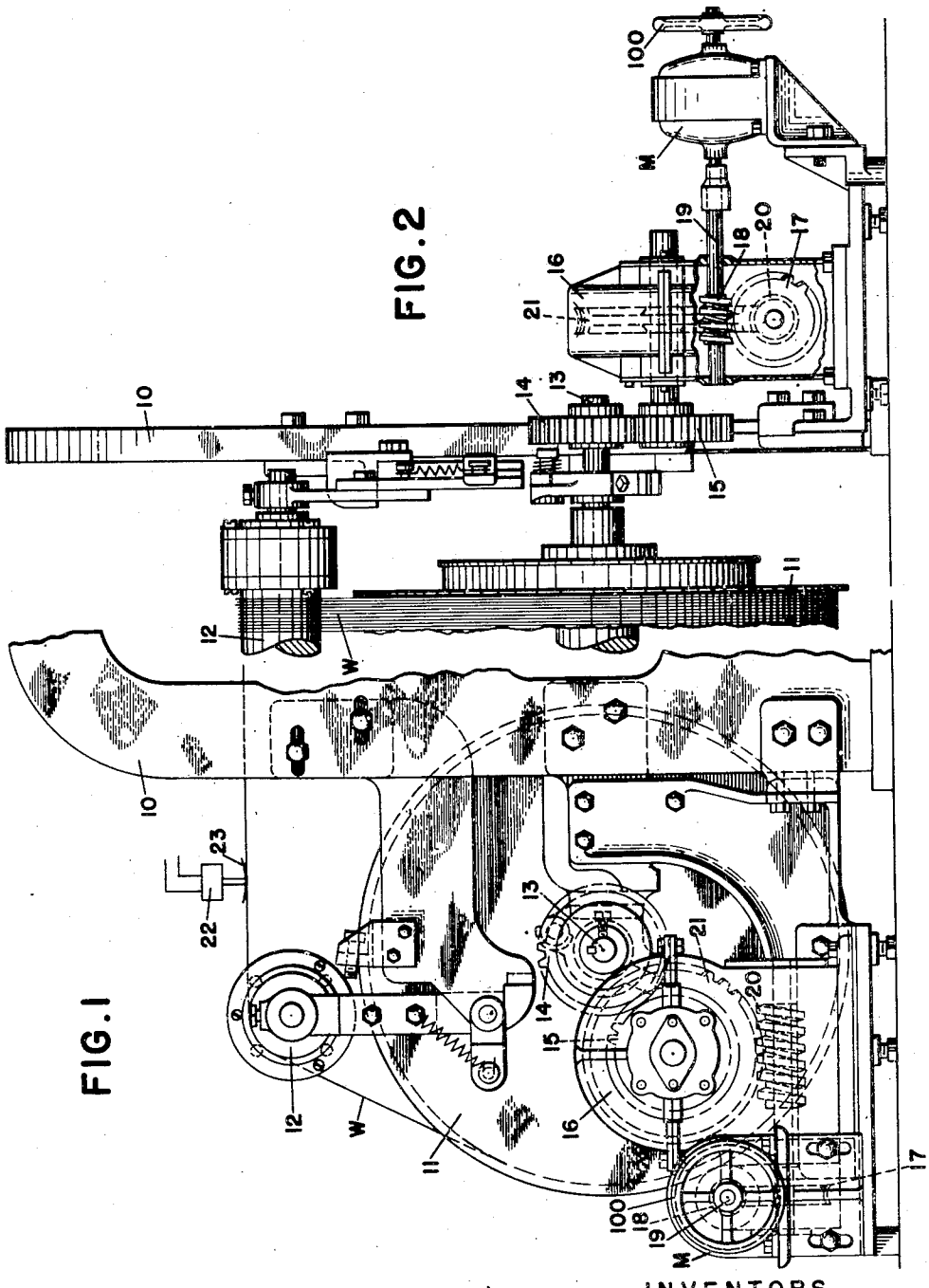


FIG. 2

FIG. 1

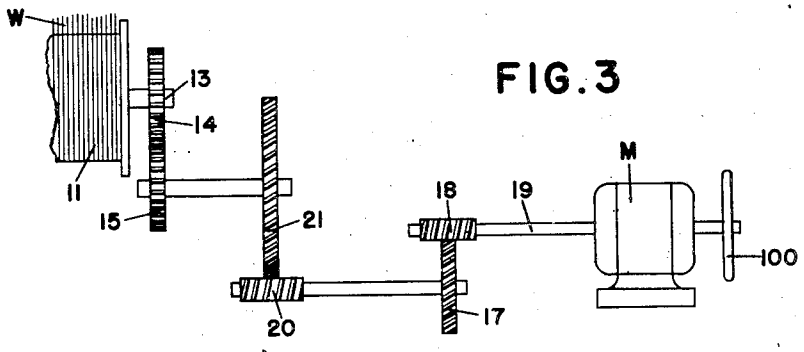
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FIG. 3



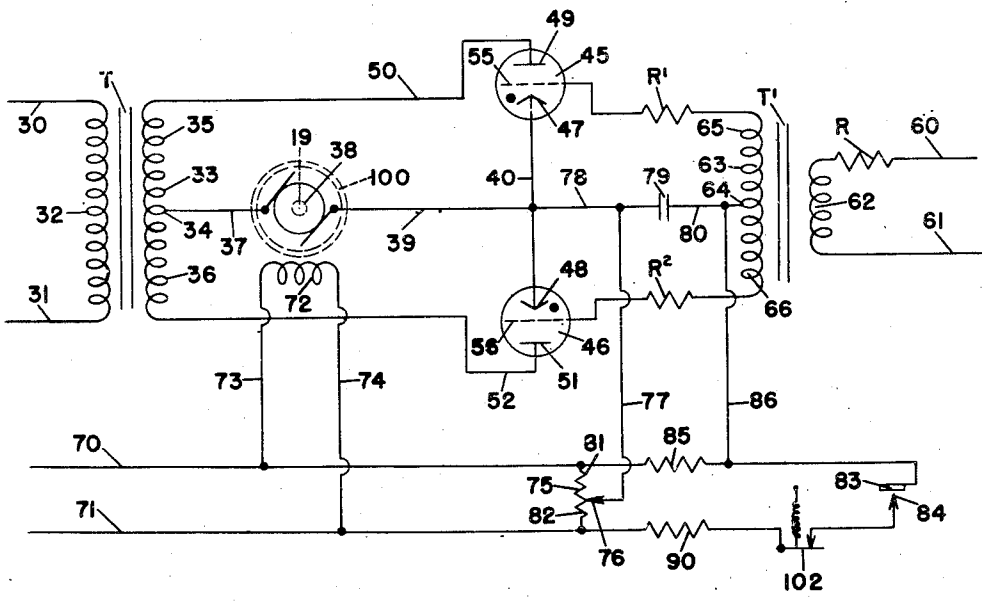


FIG. 4

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MOTOR-DRIVEN LETOFF FOR LOOMS

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4 Claims. (Cl. 139—110)

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This invention relates to improvements in motor driven letoff mechanisms for looms and it is the general object of the invention to provide manual means for reversing the motor during loom stoppage.

It has already been proposed to drive letoff mechanisms by an electric motor responsive to changes in warp tension and effective when the tension attains a given maximum to turn the warp beam. It occasionally happens in such mechanisms that a pickout is necessary, after which the warp beam must be reversed to move the fell of the cloth rearwardly. The motor ordinarily comes into action when the warp tension reaches its maximum whether the loom be running or stopped, but at the end of a pickout operation the warp will be slack due to automatic reversal of the takeup, and for this reason the motor will not run. It is an important object of our present invention to provide manual means by which the motor can be turned reversely to move the fell of the cloth rearwardly until the maximum warp tension has been attained, at which time the motor tries to run forwardly and in doing so produces a counter-torque which is readily perceptible by the weaver and indicates to him that the proper tension has been established.

In carrying our invention into effect we prefer to use a form of electric motor having a field which will be excited during loom stoppage and will therefore be in condition to cause turning of the rotor or armature as soon as warp tension attains the aforesaid given maximum. The same source of power for the field is also utilized for the energization of the signal circuit which controls the armature circuit at the time maximum tension is obtained.

It is a further object of our invention to provide means by which the weaver may manually disable the automatic control of the motor if he so desires and thereby create in warp a tension above the maximum desired tension when reversing the motor manually. The switch can then be closed and the motor will run sufficiently long to bring the tension down into the working range. This procedure compensates for any backlash in the connections between the motor and the warp beam.

With these and other objects in view which will appear as the description proceeds, our invention resides in the combination and arrangement of parts hereinafter described and set forth.

In the accompanying drawings, wherein a convenient embodiment of our invention is set forth.

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Fig. 1 is a side elevation of the rear part of the loom having our invention applied thereto,

Fig. 2 is a rear elevation looking in the direction of arrow 2, Fig. 1,

Fig. 3 is a diagrammatic view showing the driving connections between the motor and the warp beam and indicating the hand wheel by which the motor may be turned manually, and

Fig. 4 is a diagram of a control circuit which may be used with our invention.

Referring particularly to Figs. 1 and 2, we have shown a loom frame 10 on which is mounted for rotation a warp beam 11 supplying a warp W which passes upwardly over a backwardly and forwardly movable whip roll 12. The beam has a gudgeon 13 to which is secured a gear 14 meshing with a second gear 15 operatively connected to the low speed output side of a speed reduction unit 16. The high speed input side of the unit includes a worm gear 17 meshing with a worm 18 on a shaft 19 driven by the motor M, and a second worm 20 turning with gear 17 and meshing with worm gear 21 which turns with gear 15.

An electric contact or mechanism 22 is supported in suitable manner and has a presser foot 23 engaging the warp and the position of which is determined by the tension of the warp. When the warp tension is slack the foot is down and a contact to be described hereinafter within the contactor mechanism is open, but when the warp tension has attained a given maximum the foot 23 is up to close the contact. Whenever the motor turns the driving connections shown diagrammatically in Fig. 3 cause turning of the warp beam in a direction to supply or unwind warp for the weaving process and also to reduce warp tension.

The circuit for operating the motor shown in Fig. 4 includes a source of alternating current and also a source of direct current. The alternating current is supplied by power lines 30 and 31 which are connected to the primary 32 of a transformer T the secondary 33 of which has a center tap 34 which divides the secondary into upper and lower windings 35 and 36. A wire 37 connects the center tap to one side of the motor armature 38 which is connected to shaft 19, while another wire 39 connects the other side of the armature to a wire 40.

The circuit includes two gas filled electronic power tubes 45 and 46 having cathodes 47 and 48, respectively, connected to wire 40. Tube 45 has a plate 49 connected by wire 50 to the upper part of winding 35, while tube 46 has a plate 51 connected by wire 52 to the lower part of wind-

ing 36. The tubes 45 and 46 have control grids 55 and 56, respectively, which determine when electric current can pass through the tubes. Ordinarily, the secondary 33 will tend to cause current to flow through the tubes 45 and 46, but whether such current can flow will depend upon the condition of the grids. When current can flow one of the tubes will pass current which passes through the armature 38 on one alternation of the electric current derived from secondary 33, and the other tube will pass the next alternation of opposite sign. In this way the armature 38 is supplied with uni-directional current whenever the grids permit firing of the tubes 45 and 46.

Wires 60 and 61 are also sources of alternating current and may in fact be connected to wires 30 and 31. Transformer T' has a primary 62 one side of which is connected to wire 61 and the other side of which is connected by resistance R to wire 60. The purpose of resistance R is to cause the transformer T' to be out of phase with the transformer T. The secondary 63 of transformer T' has a center tap 64 between upper and lower windings 65 and 66, respectively. Protective resistances R' and R2 connect the coils 65 and 66 to the grids 55 and 56, respectively.

Direct current is supplied by wires 70 and 71 connected to the motor field 72 by wires 73 and 74. Wires 70 and 71 will ordinarily be alive during loom operation and also during short periods of loom stoppage, although they and also the alternating current lines will be open or dead for extended periods of loom stoppage following the weaving period.

Wires 70 and 71 are bridged by a resistance 75 having a sliding or adjustable contact 76 which is connected by wire 77 to a wire 78 connected at its left end to the wire 40 and at its right end to a condenser 79. The condenser is connected by wire 80 to the center tap 64. Contact 76 divides resistance 75 into upper and lower resistances 81 and 82, respectively.

The contactor mechanism 22 includes a movable contact 83 connected to foot 23 and responsive to warp tension, and has also a stationary contact 84. These contacts are normally separated when the warp tension is below a given maximum, but when the warp attains said maximum these contacts are closed.

When the contacts 83 and 84 are separated the following direct current grid controlling circuit is completed: wire 70, resistance 85, wires 86 and 80, condenser 79, wires 78 and 77, contact 76, the lower resistance 82 and wire 71. In this circuit resistance 82 is in series with resistance 85 and determines the potential of the center tap 64, causing the direct current to be superimposed on the windings 65 and 66 in such manner that the grids 55 and 56 are negative with respect to their cathodes and therefore prevent flow of electric current through the electronic tube.

When warp tension has attained a given maximum the contacts 83 and 84 engage each other, whereupon resistance 90 is placed in parallel with resistance 82 and there is a change in the electric level of the center tap 64 the effect of which is to alter the grids in such manner as to permit current to flow through the tubes. Under these conditions the armature will be energized and the motor will turn, causing a partial rotation of the warp beam in such a direction as to reduce warp tension and ultimately effect separation of contacts 83 and 84.

Much of the matter thus far described is similar to that shown in the copending application Serial

No. 592,986, filed May 10, 1945, by Palmer and Sepavich, now Patent No. 2,450,484, and except as noted hereinafter forms no part of our present invention.

As already stated, it is occasionally necessary to reverse the motor during periods of loom stoppage subsequent to a pickout operation. In order to simplify the electric circuits we prefer to effect this motor reversal manually, as by a hand wheel 100 secured to the motor armature, or to an extension of shaft 19. It will be understood that the pickout operation is usually accompanied by a reversal of the takeup mechanism not shown which slackens the warp tension, and at the end of the pickout operation the contacts 83 and 84 will be separated and the grids will be in a preventive condition which will keep the secondary 33 from operating the motor.

The hand wheel will be turned in a reverse direction to cause the motor and the warp beam to run backwardly for the purpose of moving the fell of the cloth rearwardly and also to reestablish maximum tension in the warp. When turning the hand wheel the weaver will exert a given amount of effort to reverse the motor, but as soon as the warp tension has been restored to its maximum, contacts 83 and 84 will be closed and the tubes will be fired, whereupon the secondary 33 will attempt to run the motor in a forward direction opposite to that in which the weaver is turning the motor and he will immediately sense a difference in the feel of the hand wheel and know that proper warp tension has been reestablished. This forward running of the motor during manual reversal gives the weaver the signal that it is time to stop manual reverse turning of the motor.

It will be observed that during the reverse manipulation of the hand wheel by the weaver the lines 70 and 71 are alive hence the field will be excited and will cause the armature to respond immediately upon closure of contacts 83 and 84 which are also dependent upon energization of wires 70 and 71 to effect a change in the grids of the tubes.

The motor is of the direct current shunt wound type, or at least has an independent field, but we do not wish necessarily to be limited in all applications of our invention to this exact type of motor. We have also shown the hand wheel as connected directly to the shaft 19, but any one of several well-known hand wheel arrangements for warp beams can be utilized if it is desired to make the hand wheel accessible from any particular parts of the loom.

As an alternative to the procedure already described, the weaver may create a tension above the maximum desired tension by opening the manually controlled switch 102 in the line connecting contact 84 to resistance 90. Switch 102 tends to move to closed postion, and when following this procedure the weaver may leave switch 102 closed until he feels the forward motion of the motor as already described, at which time he will open switch 102 to stop operation of the motor and manually effect a slight further reverse movement of the motor and warp beam, thus creating a warp tension above the aforesaid given maximum. The switch 102 is then allowed to close and the motor starts to run forwardly and has an opportunity to take up any backlash which may have resulted from manual reversal before the warp tension is lowered to the working range, or to some value below the maximum desired tension.

From the foregoing it will be seen that we

have provided means for manually reversing the motor of a loom warp beam under such conditions that as soon as maximum warp tension is attained the weaver will be given a readily perceptible signal due to the attempt of the armature to run forwardly and can immediately release the hand wheel. This condition is brought about by the fact that wires 70 and 71 are alive during loom stoppage and therefore maintain the motor field excited, and also enable closure of contacts 83 and 84 to effect the change in the tube grids necessary to cause motor running. It will further be seen that the weaver may disable the contactor mechanism by opening the manual switch 102 if he so desires, in which case he will be able to create a tension above the maximum desired tension and then upon closure of switch 102 rely upon the motor to reduce the tension to a value somewhat less than the desired maximum. This procedure enables the mechanism to take care of any back lash which might exist in the driving connections between the motor and the beam when these connections are reversed manually.

Having thus described our invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and we do not wish to be limited to the details herein disclosed, but what we claim is:

1. In loom letoff mechanism having a warp beam operatively connected to an electric motor which when running forwardly effects forward turning of a warp beam and when turned backwardly effects reverse turning of the warp beam, manual means to turn the motor backwardly when the warp tension is below a given maximum to increase warp tension, electric circuit means effective when the warp tension attains said maximum to cause the motor to run forwardly until the warp tension falls to a given point below said maximum, and switch means controlling said electric circuit means normally closed but when open causing the electric circuit means to be inoperative, whereby opening of said switch when the motor starts to run during backward turning of the motor permits additional backward turning of the motor to create a warp tension above said maximum and subsequent closing of said switch effects forward running of the motor until the warp tension attains said point below said given maximum.

2. In loom letoff mechanism having a warp beam operatively connected to an electric motor which when running forwardly effects forward turning of a warp beam and when turned backwardly effects reverse turning of the warp beam, manual means to turn the motor backwardly when the warp tension is below a given maximum to increase warp tension, a normally closed switch, and electric circuit means controlled by said switch effective when the warp tension attains said given maximum tension due to backward turning of the motor to cause the motor to run forwardly, said switch when open preventing said electric circuit means from causing said motor to run.

3. In loom letoff mechanism having a warp beam operatively connected to an electric motor which when running forwardly effects forward turning of a warp beam and when turned backwardly effects reverse turning of the warp beam, manual means to turn the motor backwardly when the warp tension is below a given maximum to increase warp tension, said motor having a field and armature, a source of electric power for the field alive during loom stoppage to maintain the field energized during loom stoppage, and electric circuit means effective upon attainment of said maximum tension due to backward manual turning of the motor to energize the armature and cause the motor to run forwardly.

4. In loom letoff mechanism having a warp beam operatively connected to an electric motor which when running forwardly effects forward turning of a warp beam and when turned backwardly effects reverse turning of the warp beam, manual means to turn the motor backwardly when the warp tension is below a given maximum to increase warp tension, said motor having a field and armature, a source of electric power maintaining the field energized during loom stoppage, a second source of electric power alive during loom stoppage, and electric circuit means including said armature and second source effective upon attainment of said maximum warp tension during loom stoppage due to backward manual turning of the motor to energize said armature and cause said motor to run forwardly.

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