J. A. GROEBLI.

COUNTERBALANCING MECHANISM FOR EMBROIDERING MACHINES.

APPLICATION FILED JULY 11, 1911.

1,024,892. Patented Apr. 30, 1912.

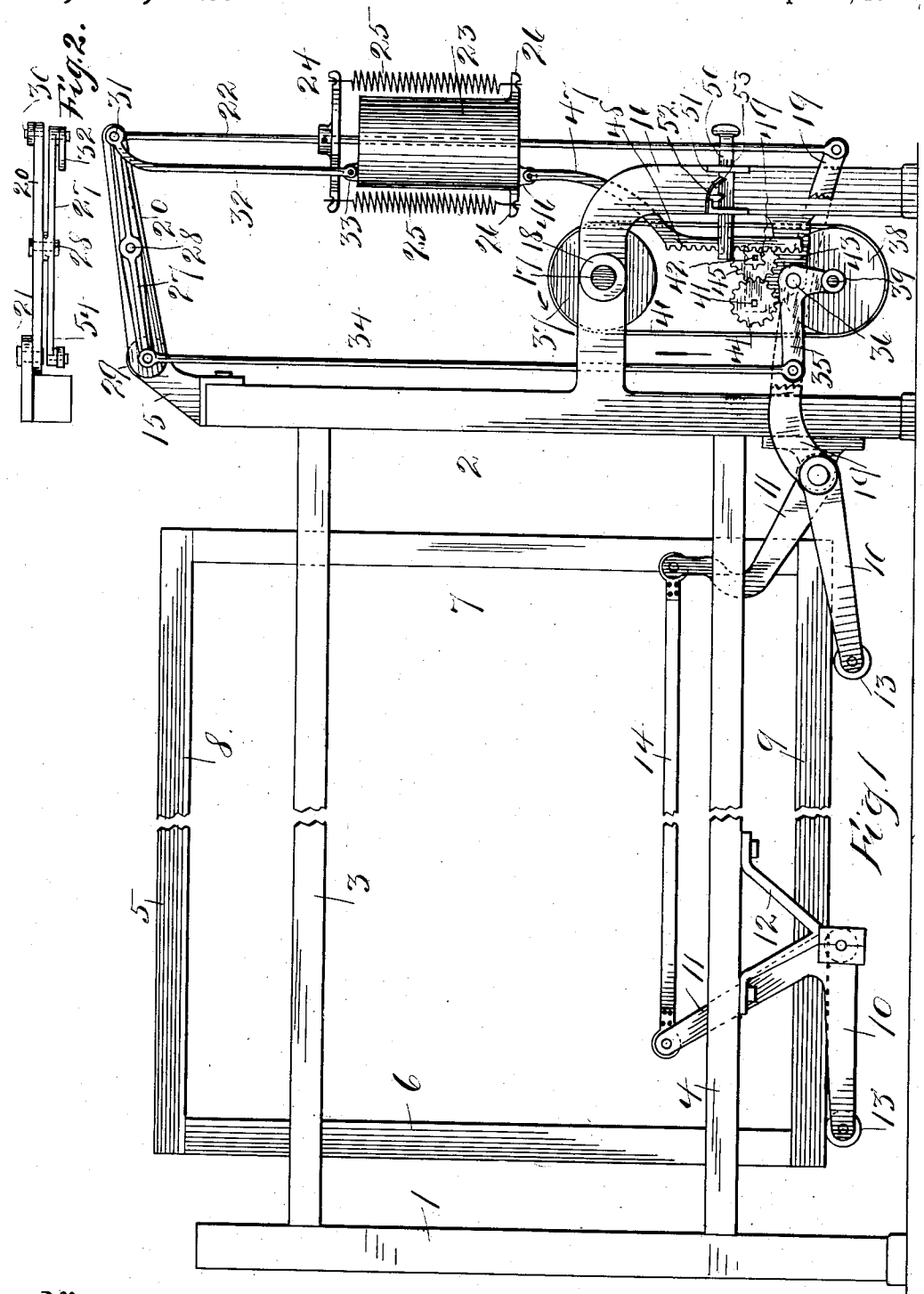

Fig. 2.

Fig. 1.

Witnesses:

Edward D. C. Sperry.

Inventor

Joseph A. Groebli

By his Attorneys

Charles G. Hensley.

UNITED STATES PATENT OFFICE.

JOSEPH A. GROEBLI, OF NEW YORK, N. Y.

COUNTERBALANCING MECHANISM FOR EMBROIDERING-MACHINES.

1,024,892. Specification of Letters Patent. Patented Apr. 30, 1912.

Application filed July 11, 1911. Serial No. 638,011.

To all whom it may concern:

Be it known that I, JOSEPH A. GROEBLI, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a new and useful Counterbalancing Mechanism for Embroidering-Machines, of which the following is a specification.

My invention relates to a mechanism for counterbalancing the weight of the tambour frame of an embroidering machine.

It is well known in the large embroidering machine art, that the tambour frame which supports the large sheets of fabric and which is moved at each stitching operation, must be counterbalanced, in order that it may be moved easily, smoothly and evenly and various devices have been employed for counterbalancing the tambour frame which have been successful to certain extents, but such devices are not perfect. The counterbalancing force must be so applied as to permit freedom of movement and it must not increase the tendency to vibrate, caused by the rapid change of the positions of the tambour frame, if the device is to be successful. The devices heretofore used have been constructed on several distinct lines, all of which have had their individual weaknesses.

The object of my present invention is to overcome the difficulties in each and all of the above.

My present invention is more nearly related to that system in which springs are employed in connection with a compensating device.

My object is to counterbalance the weight of the tambour frame by means of a spring and a compensating device and for the purpose of equalizing the strain on the spring, I insert a weight between the spring and the compensating device.

In U. S. Patent No. 593206, I describe a parallel motion device for the tambour frame of an embroidering machine and counterbalancing mechanism. The weight of the fabric frame was balanced either by a weight or by springs. In the latter case there was provided a mechanism for automatically maintaining the counterbalancing springs under a certain normal tension. For small movements of the tambour frame the springs were allowed to operate without affecting the operation of the device for maintaining the normal tension: but when the tambour frame was moved over greater distances the counterbalancing springs became so much extended or contracted that they no longer balanced the tambour frame properly and the compensating device had to be used. A compensating mechanism was shown in said patent, which would automatically maintain the counterbalancing springs at a certain tension which would counterbalance the weight of the tambour frame and such compensating device became active upon undue extension or contraction of the counterbalancing springs. In Patent No. 685421 I described an improved compensating mechanism which accomplished the purpose with greater accuracy. In both cases however it was found that when the tambour frame had been moved in the direction which allowed the springs to contract so that the compensating mechanism was brought into action to expand the springs the compensating mechanism had to exert a considerable force in expanding the springs: while in the other case, when the springs had been expanded by the movement of the tambour frame beyond the normal tension, so that the compensating mechanism was brought into action to restore the springs to normal tension, the compensating mechanism in this action practically exerted no force, but merely regulated the action by stopping the movement of the springs at the proper time. To remedy this I have now made that part of the compensating mechanism which connects with the springs of sufficient weight to approximately balance the weight of the fabric frame. In the preferred form this is shown as a weight with a rack attached to it. The compensating mechanism is set into operation by the expansion or contraction of the counterbalancing springs beyond the normal and is thrown out of action when equilibrium is restored. The result of this arrangement is that the compensating mechanism has about the same force to exert in either action. When the counterbalancing mechanism has to restore the tension after the springs have been contracted the force is exerted in opposition to the springs but not the weight: while when it has to restore the tension after the springs have been expanded it has to exert a force equal to the inertia of the weight and not in opposition

to the springs. Since the weight and the springs may be made substantially equivalent the force required of the compensating mechanism in each operation may be made substantially equal.

It will be apparent from a clear understanding of my invention that it embodies broad and basic principles, new to this art, and while my invention is here shown embodied in a concrete, specific form it will be also apparent that my invention is not limited in its application and scope to a single specific structure.

A complete description of one embodiment of my invention will appear hereinafter.

In the drawing forming a part of this application, Figure 1, is an elevation of an embroidering machine having my invention in the preferred form, applied thereto and Fig. 2, is a plan view of a portion thereof.

I prefer to apply the counterbalancing force through the parallel motion device, that is, the device which causes the tambour frame to move in parallelism throughout, and I will so describe my invention.

In the drawings I have shown a stationary frame of an embroidering machine consisting of end standards 1 and 2, and longitudinal beams 3 and 4, which is the construction in general use. Supported upon this is a tambour frame 5, consisting of end bars 6 and 7, and longitudinal bars 8 and 9, which is the usual construction. It is the movement of this tambour frame, and its counterbalancing, with which my invention has to do. I have shown angle levers 10, 11, journaled in brackets 12, on the stationary frame, to rock in a vertical plane. This lever is duplicated as many times along the machine as the length of the tambour frame may require; and the arm 10 of each lever has a roller 13, which contacts with the lower bar 9, of the tambour frame; and through these levers the tambour frame is supported. A longitudinal rod 14, connects the ends of the arms 11, and causes all the levers to move equally; and as the tambour frame is mounted upon these levers it will move the same extent throughout its entire length. Upon the end standard 2, I have shown a bracket 15 on the top and an arched supporting leg or strut 16, near the bottom, which I utilize for supporting the improved mechanism. I have shown the main shaft 17, of the embroidering machine journaled in the socket 18, and extending at right angles to the length of the machine, as such arrangement is customary on some machines. One of the levers 10, 11, preferably the one at the end of the machine where the jacquard or pantograph is attached, has an extended arm 19. Between this arm and an arm 20, which I have fulcrumed at 21, to the bracket 15 I have connected a rod 22, which is fulcrumed at one end to the arm 19, and at the other end to the arm 20. Upon this rod 22, I have mounted the counterbalancing means, which consists of springs which are attached to a cross arm 24, the latter being secured to the rod 22. The spiral springs 25 extend downwardly and are connected to the ears 26 on the lower part of a weight. The weight itself is connected to the compensating mechanism, by a rack.

The weight of the tambour frame is transmitted through its supporting levers and the arm 19, to the rod 22, and is counterbalanced by the springs, the other end of which are held in place by the rack 47 holding the weight. If the tambour frame is moved up or down, the levers and the rod will move therewith and the cross arm 24, will either move from or toward the weight. If there were no other mechanism the movement of the cross arm relative to the weight would cause the springs to either elongate or close thereby increasing or decreasing the tension of the springs, when the cross arm rose or went down. To restore the equilibrium, so that the springs will balance after either movement up or down has taken place, I employ means for mechanically operating to restore the equilibrium of the springs, which will be set into operation automatically by the abnormal expansion or contraction of the springs. Equilibrium is restored without removing the counterbalancing effect of the springs upon the tambour frame, while the operation of restoring is taking place. I have fulcrumed a lever 27, upon a stud 28, which I have arranged intermediate the point 29, where the arm 20 fulcrums and the point 30, where the rod 22, is fulcrumed to the arm 20; and the lever 27, is therefore carried by the arm 20. To one end of this lever I fulcrum at 31, a rod 32, which is also fulcrumed to an ear 33 on the weight 23. To the other end of this lever and in line with the point of fulcrum of the arm 20, I have fulcrumed a rod 34 which extends downwardly, and is fulcrumed to a lever 35 which fulcrums on a stud or shaft 36.

On the main shaft 17, which is the source of power for the machine, and which revolves continuously during the operation of the machine; I have arranged a pulley 37, and preferably below the pulley 37 is arranged a second pulley 38 which is journaled upon a shaft 39, carried upon one arm of the lever 35. An endless belt 40 travels over the pulleys 37 and 38. Upon the studs 41 and 42, on a cross arm 43, of the stationary frame, I have mounted the gears 44 and 45 which mesh with each other. To an ear 46, on the weight 23, I have fulcrumed a rack bar, 47, the rack 48 of which meshes with a small gear 49 connected with

the gear 45. It will thus be apparent that the rack bar is subject to the movements of the gears 44 and 45 and that the movements of the rack bar effect the movement of the weight 23.

I have provided a connecting and disconnecting device for throwing the mechanism into or out of operation, and this consists of a bar 50, which is seated in guides 51, on the main frame and its end surrounds the rack bar 47. A spring 52 engages in notches 53, in the bar 50, to hold the latter in different positions; and one end of the latter is shaped as a handle. The position of the gears 44, 45 are such that the belt may be thrown into contact with either, by the movement of the lever 35.

Operation:—The weight of the tambour frame is always counterbalanced by the springs. Let it be assumed that the tambour frame is moved downwardly, to position it for a stitching operation. This will cause the several angle levers to rock, and the movement will be transmitted through the arm 19 and rod 22, to the cross arm 24, and also to the arm 20. In consequence of the movement of the cross arm 24 upwardly, and the interposition of the springs, there will be a separation between the cross arm and weight, and the springs will be extended and placed under additional or abnormal tension, until the weight moves to its new position. When the bar 22, moved upwardly and the arm 20, consequently rocked on its fulcrum, the stud 28, on which the lever 27 is fulcrumed went with the arm 20. This caused the lever 27 to rock from the point 31, as its fulcrum, and the end 54, moving upwardly, carried the rod 34, therewith. The rod 34 rocked the lever 35 and moved the pulley 38, to the left in Fig. 1. If the movement be sufficient, the inner face of the belt 40, will be brought into contact with the gear 45, and since the belt is moving in the direction indicated by the arrow, the gear 45, and the gear 49, will be revolved, counter clockwise; the rack bar 47, will be moved upwardly, and the weight 23, will move at the same rate. Its movement is thus controlled, and if the contact between the belt and gear, and the speed of the latter, are properly regulated, the weight will be moved by the mechanical means. When the weight has moved up sufficient to restore the springs to the proper equilibrium the lever 27, will have been rocked, through the rod 32, to throw the pulley 38, over to its normal position and take the belt out of contact with the gear 45. The weight has now been moved, and has come to rest, and the same condition of equilibrium exists before the movement took place. During this operation the mechanical compensating or restoring device was not resisted by the springs but was resisted by the inertia of the weight. This upward movement may be repeated. But if the tambour frame is moved upwardly, the reverse operation will take place. In that event the arm 19, will move downwardly, and the rod 22 and arm 20 will do likewise. The cross arm 24 will approach the weight and the springs will be under less tension. When arm 20 swung downwardly, the stud 28, carried thereon, caused the lever 27, to rock from the point 31, as its fulcrum, but in a reverse direction to that first described. The rod 34, moved downwardly, and rocked the lever 35, in a direction reverse to its first movement. The pulley 38, was carried to the right, and the inner surface of the belt 40, will be placed in contact with the gear 44; when the latter will be revolved and the motion will be transmitted through gears 44, 45 and 49 to the rack bar. Since the latter, in this operation moved downwardly the downward movement of the weight was affected. When equilibrium of the springs has been restored, action of the weight through the rod 32, will cause the lever 27, to assume its previous position and the pulley 38, will be in its intermediate position; and the parts will be at rest with the weight in its new position and the springs 25, under normal tension. During this operation the mechanical restoring means was resisted by the springs, but not by the weight as the latter moved in the same direction as if responding to gravity. If the inertia of the weight be substantially equal to the tambour frame and therefore to the tension of the springs the restoring mechanism will have practically the same work to perform in either action. It will thus be apparent that the springs permit an easy movement of the tambour frame; and by controlling the movements of the weight, the springs will be maintained under normal tension the device herein shown the tambour frame is counterbalanced at all times and its movements are free, easy and smooth.

The device herein described will be operative, and effective and will properly counterbalance the tambour frame, when the latter is in any position, within the extreme limit of its movement. Whenever it is desired to throw the mechanism out of operation the bar 50, is drawn outwardly and it will carry the rack bar out of mesh with the gear 49 and thus disconnect the mechanism. This is done when the frame is being set by hand when placing it in proper position for the embroidery.

While I have shown the counterbalancing mechanism operating through the parallel motion device, this is only preferable and it is to be understood that I am not limited to such application.

I do not wish it to be understood that in describing in detail one form of my inven-

tion, my invention can be embodied only in such form, but I refer to the broad character of my invention as set forth herein.

In referring to the counterbalancing springs in plural form I do not wish to limit my invention thereby, as it will be obvious that one, or any number of springs may be used.

Having described my invention what I claim is;

1. In an embroidering machine, the combination of a movable tambour frame and means for counterbalancing the same, comprising a spring for counterbalancing the weight of the tambour frame, compensating mechanism adapted to restore the tension of the spring upon the movement up or down of the tambour frame, and means operated by said compensating device and requiring greater force to operate it in one direction than another, and arranged whereby it will have the effect of equalizing the burden on the said compensating device in its different movements when restoring the tension of the spring.

2. In an embroidering machine the combination of a movable tambour frame, means for causing the tambour frame to move in parallelism throughout, and means for counterbalancing the tambour frame through said parallel motion device, comprising a spring for counterbalancing the weight of the tambour frame, compensating mechanism adapted to restore the tension of the spring upon the movement up or down of the tambour frame, and means operated by said compensating device and requiring greater force to operate it in one direction than another, and arranged whereby it will have the effect of equalizing the burden on the said compensating mechanism in its different movements when restoring the tension of the counterbalancing spring.

3. In an embroidering machine, the combination of a movable tambour frame and means for counterbalancing the same, comprising a spring for counterbalancing the weight of the tambour frame, compensating mechanism adapted to restore the tension of the spring upon the movement up or down of the tambour frame, and means operated by said compensating device and requiring greater force to operate it in one direction than another, and arranged whereby it will have the effect of equalizing the burden on the said compensating mechanism in its different movements when restoring the tension of the spring, said compensating mechanism, being adapted to be automatically controlled by the movements of the tambour frame.

4. In an embroidering machine, the combination of a movable tambour frame, and means for counterbalancing the same, comprising a spring for counterbalancing the weight of the tambour frame, a compensating device adapted to expand and contract the spring, reversely to the expansion and contraction caused by the movements of the tambour frame, whereby the compensating device will restore the equilibrium of the counterbalancing spring, and a weight adapted to be raised by the compensating device when the latter operates to contract the counterbalancing spring, whereby the burden on the compensating device in its different movements will be more equal.

5. In an embroidering machine the combination of a movable tambour frame, and means for counterbalancing the same, comprising a spring for counterbalancing the weight of the tambour frame, a compensating device adapted to expand and contract the spring reversely to the expansion and contraction caused by the movements of the tambour frame, whereby the compensating device will restore the equilibrium of the counterbalancing spring, a weight adapted to be raised by the compensating device when the latter operates to contract the counterbalancing spring, means for operating the compensating device from a source of power, and means whereby the compensating device will be automatically thrown into operation upon the movement of the tambour frame and thrown out of operation upon the restoration of the counterbalancing spring to its normal tension.

6. In an embroidering machine, the combination of a movable tambour frame, and means for counterbalancing the same, comprising a counterbalancing spring, a weight and a rack connected with the weight and means for operating the rack to move the weight up and down for the purpose of restoring the said spring to a normal tension, and adapted to be made operative by the movement of the tambour frame.

7. In an embroidering machine, the combination of a movable tambour frame, a spring for counterbalancing the tambour frame, and means for expanding and contracting said spring to restore the spring to equilibrium, embodying a lever having a movable fulcrum, means whereby the movement of the tambour frame will move the fulcrum of said lever, and means initiated by said lever for causing the restoration of the spring and means whereby said latter action will stop the restoring device.

8. In an embroidering machine, the combination of a movable tambour frame, a spring for counterbalancing the tambour frame, means for expanding and contracting said spring to restore the same to equilibrium, a weight raised by said restoring device in contracting said spring, said restoring device embodying a lever, means where-

by the movement of the tambour frame will change the fulcrum of said lever, and means initiated thereby for moving the said weight and means whereby the movement of the weight will rock said lever and thereby stop said restoring device.

9. In an embroidering machine the combination of a movable tambour frame, a spring for counterbalancing the tambour frame, an arm swinging with the tambour frame, a lever fulcrumed to said arm, means for expanding or contracting said spring, and means for operating the same, said lever being adapted to set the expanding and contracting device into operation and the expanding and contracting device being adapted to operate through said lever to throw itself out of operation.

10. In an embroidering machine, the combination of a movable tambour frame, means for causing said tambour frame to move in parallelism throughout, a link connected with the parallel motion device, an arm fulcrumed on a support and connected with said link, a spring connected with said link, a weight connected with said spring, a rack bar connected with the weight, a pinion for operating the rack bar, a driving pulley and an oscillating pulley over which a belt is arranged to travel, means with which the said belt may be engaged to revolve the said pinion in either direction, a lever fulcrumed to said arm and movable therewith, a link connecting the said lever and weight and another link connected with said lever and adapted to oscillate said second pulley, whereby said belt may be caused to revolve the pinion in either direction.

Signed at the city, county, and State of New York, this 30th day of June 1911.

JOSEPH A. GROEBLI.

Witnesses:

A. W. KINSHEED,

HENRY EGLI.