Sept. 29, 1953 E. GERBER 2,653,556

EMBROIDERING MACHINE

Filed July 28, 1951 4 Sheets-Sheet 1

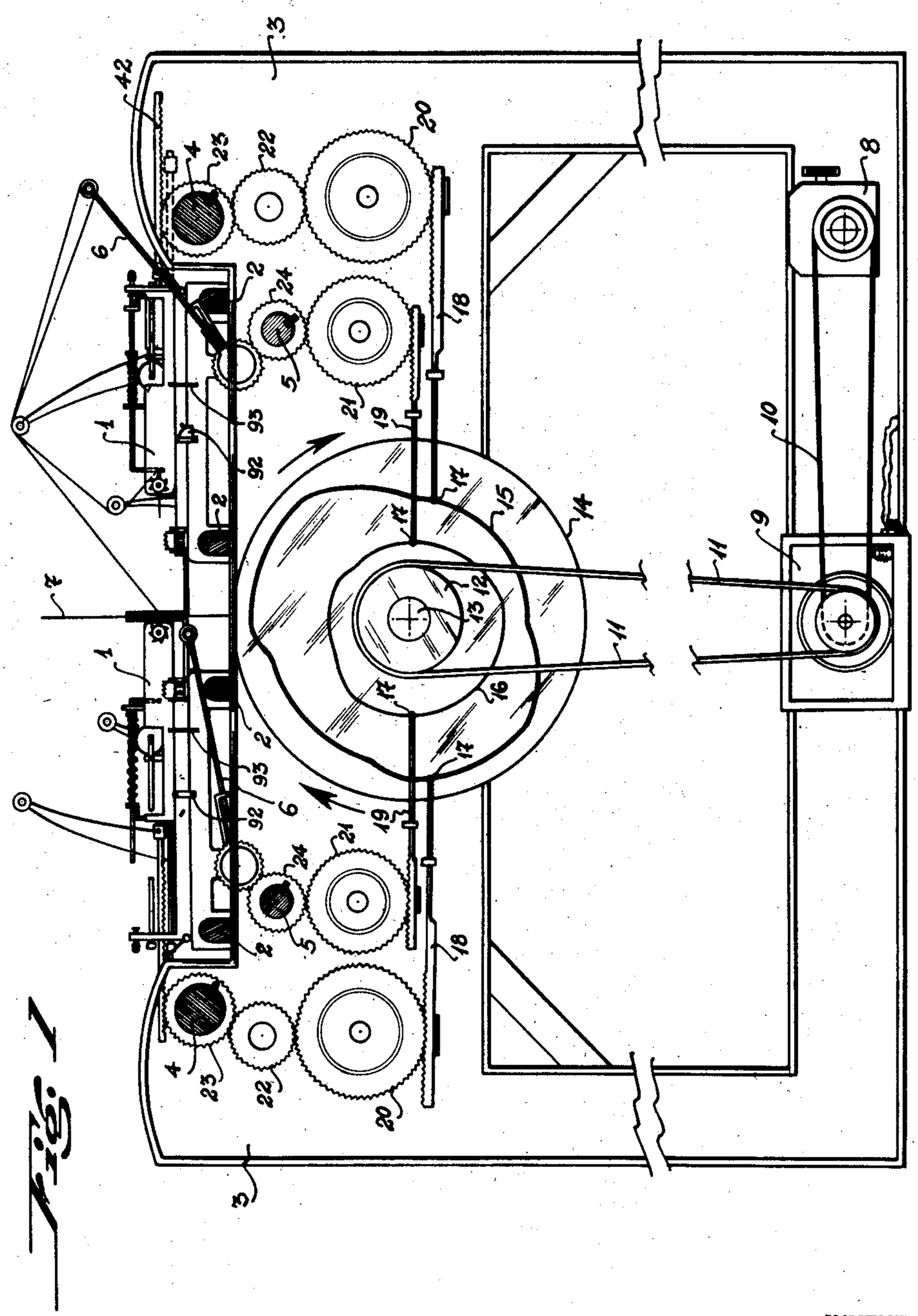

Fig. 1

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EMBROIDERING MACHINE

Filed July 28, 1951 4 Sheets-Sheet 2

Fig. 2

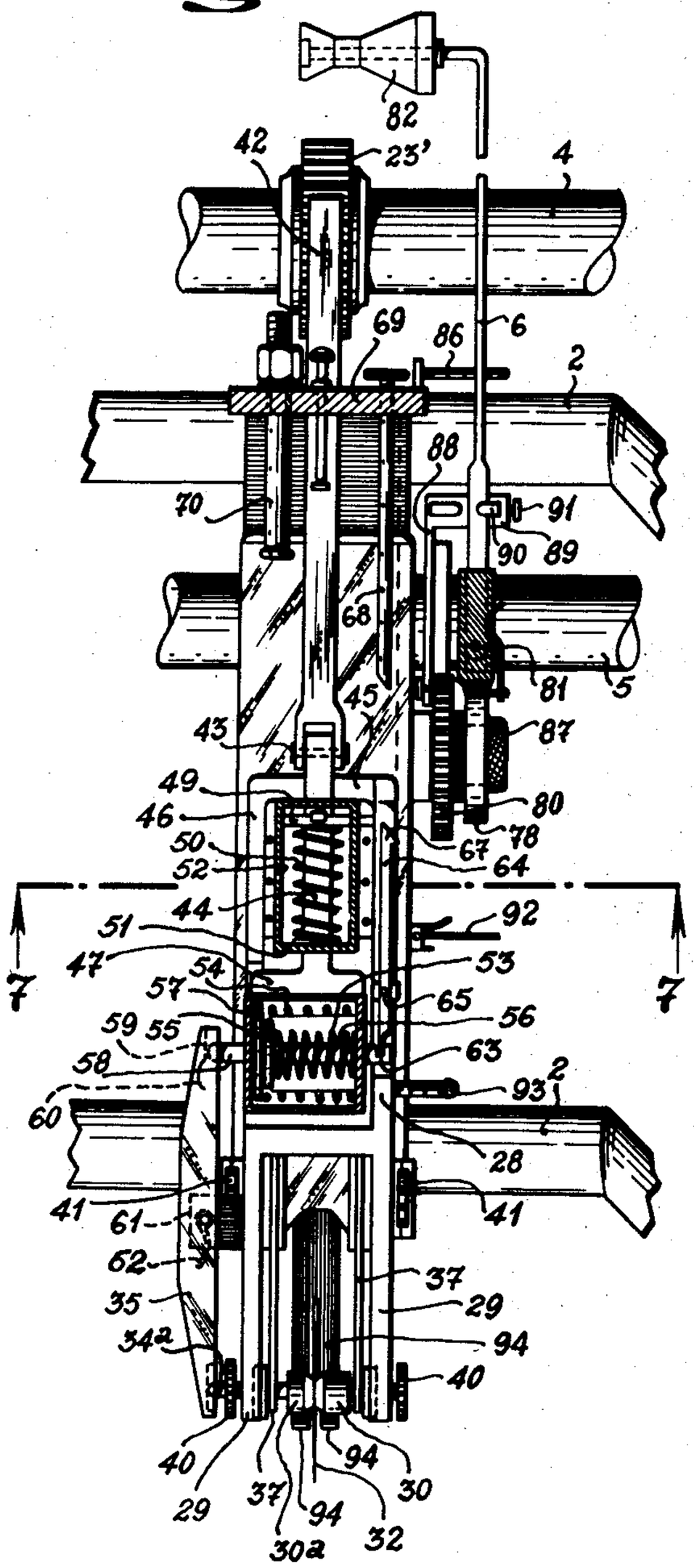
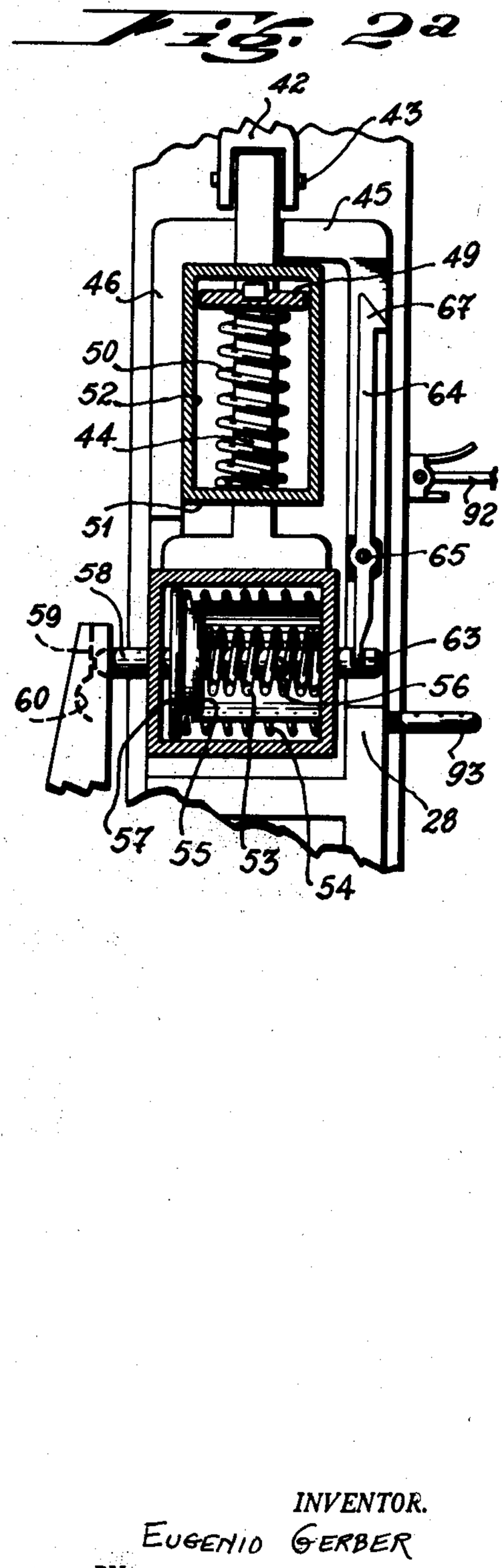


Fig. 2a



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EMBROIDERING MACHINE

Filed July 28, 1951 4 Sheets-Sheet 3

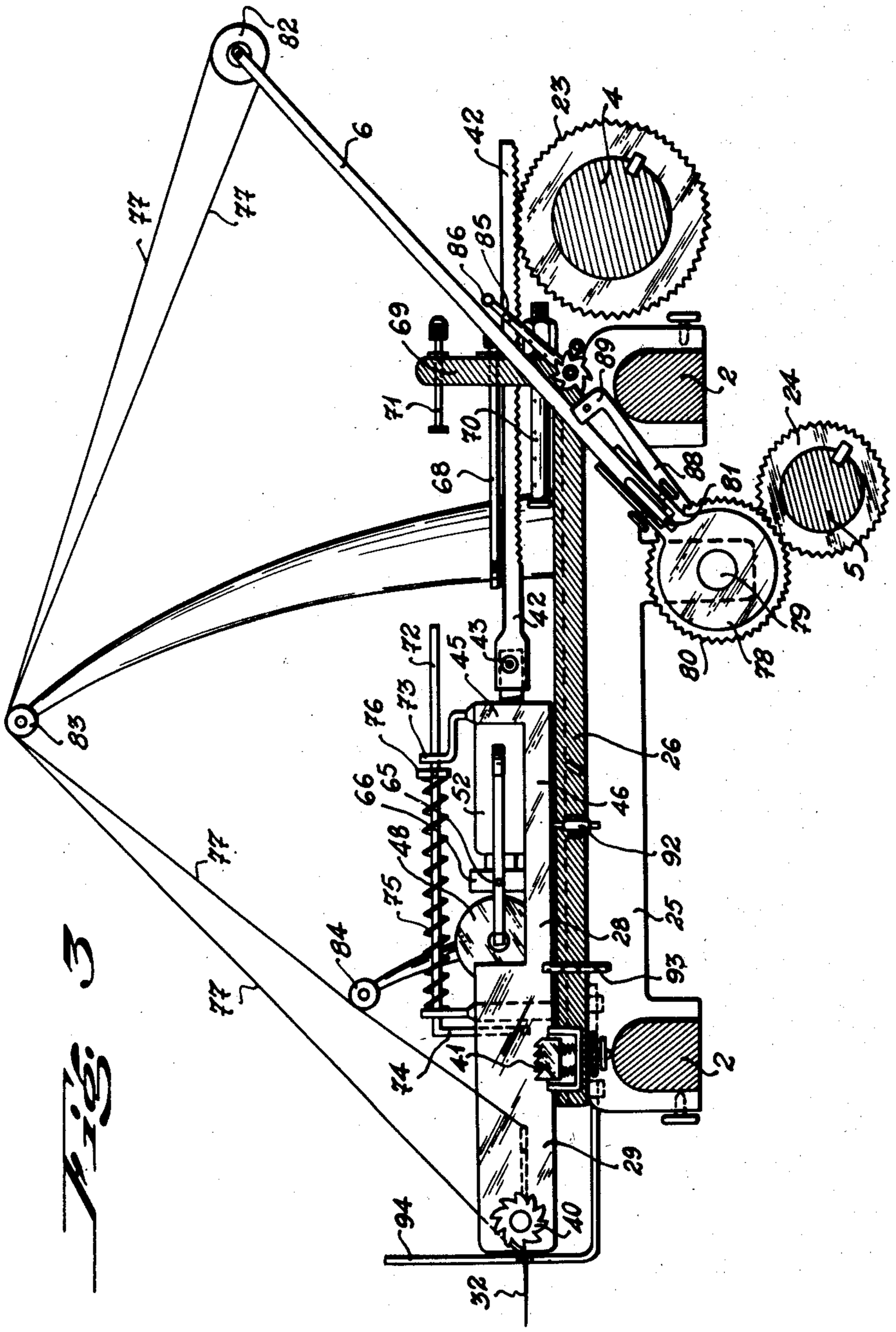

Fig. 3

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EMBROIDERING MACHINE

Filed July 28, 1951 4 Sheets-Sheet 4

Fig 5

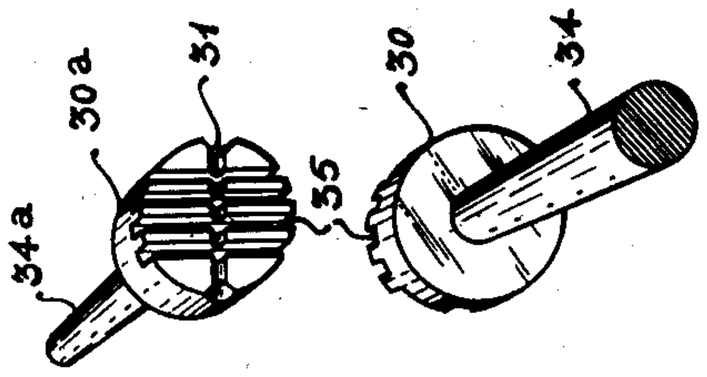


Fig 7

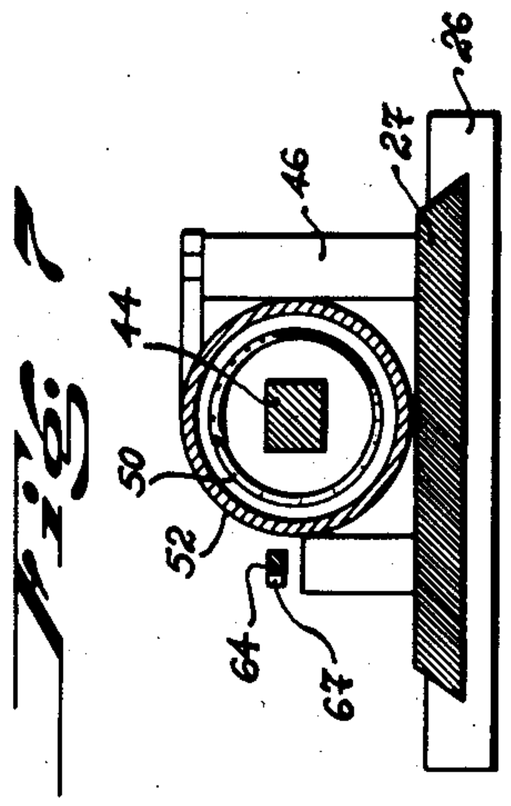


Fig 4

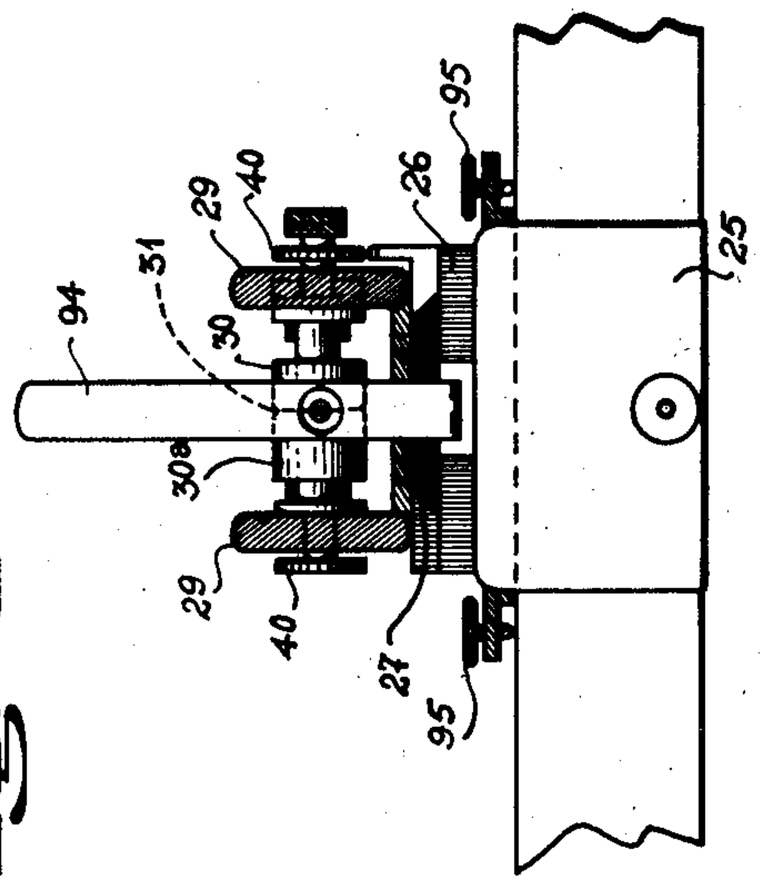
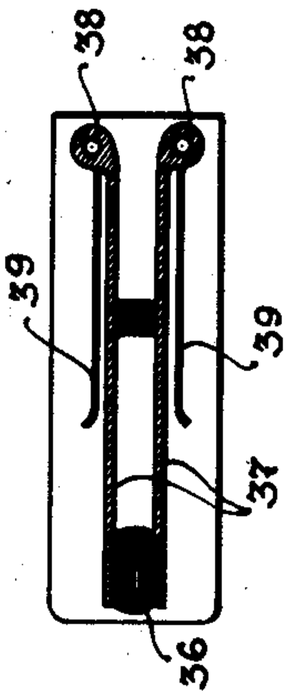


Fig 6



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Patented Sept. 29, 1953

2,653,556

UNITED STATES PATENT OFFICE

2,653,556

EMBROIDERING MACHINE

Eugenio Gerber, Buenos Aires, Argentina; Marcelo Sanchez Sorondo, curator of the estate of said Eugenio Gerber, deceased, assignor to Gerber, Sociedad de Responsabilidad Limitada, Buenos Aires, Argentina

Application July 28, 1951, Serial No. 239,065

18 Claims. (Cl. 112—84)

1

My present invention relates to certain new and useful improvements in embroidering machines, and more particularly refers to an improved mechanically operated embroidering machine capable of employing usual sewing or embroidering needles for mechanically executing embroidery works in the same manner as hand-worked embroideries are made by women.

In my co-pending application Serial No. 135,923 I have described an embroidering machine of this nature wherein, however, mechanical embroidering hands are operated by electro-magnetic means and wherein the electro-magnetic coils and their movable core structures may be incorporated in said embroidering hands. Such an arrangement is not always advantageous not only in as far as the construction of the embroidering hands is concerned, but also with regard to the operation of the machine for depending entirely upon the electric current supplied and upon the voltage uniformity of the latter.

The main object of my present invention now is to provide an improved embroidering machine, wherein at least one pair and conveniently a number of pairs of cooperating embroidering hands are mechanically operated in every respect by means of a driving mechanism and controlled by a hand-operated clutch provided in said driving mechanism, with the advantageous result that all movements of the movable parts of the machine and more particularly of the embroidering hands are at any time under perfect control of the operator.

Another object of the invention is to provide an improved embroidering machine, wherein the co-operating mechanical embroidering hands are slidably mounted as units on removable and adjustable support and guide members, the arrangement being such that the co-operating embroidering hands in any case may be positioned in accordance with a given pattern size to be embroidered and are nevertheless always in perfect working conditions so as to produce an exact embroidery work.

Another important object of the invention is to provide in the improved embroidering machine pairs of improved co-operating mechanical embroidering hands which comprise a rotative needle holder formed by two co-operating short shafts, of which only one is axially slidable, and spring-loaded lever means acting upon said slidable short shaft so as to permit for opening and closing of the needle holder. The feature of the slidable arrangement of but one the short

2

shafts which form the needle holder considerably simplifies the structure of the embroidering hands.

Still another object of the invention is to provide an improved mechanical embroidering hand, wherein the needle holder has the abutting surfaces of the short shafts forming the same provided with coinciding transverse grooves capable of forming together a channel for receiving the embroidering needle and with not coinciding vertical grooves in such an arrangement that the teeth formed between adjacent grooves of one shaft surface engage the grooves of the opposite shaft surface, with the advantageous results that not only a sure grip of the needle in the said channel, but that also needles of different thickness may be efficiently handled by the needle holder.

Another important object of the invention is to provide an improved mechanical embroidering hand comprising a spring device for operating the control lever of the needle holder, said device being operatively connected with a rack bar of the driving mechanism of the embroidering machine, with the advantageous result that the operation of the said control lever is made dependent upon the operation of the driving mechanism and that opening and closing of the needle holder is perfectly synchronized with the reciprocating movements of the embroidering hand.

An additional not less important object of the invention is to provide an improved mechanical embroidering hand as set forth in the preceding paragraph, wherein the said spring device comprises a strong pressure spring and a weak pressure spring, these two springs operating together for causing the needle holder to firmly grasp the embroidering needle, whereas the weak pressure spring is operating alone to loosely grasp said needle and to permit the latter to be adjusted in said needle holder for a new stitch, the suppression of the action of the strong pressure spring being automatically effected in the correct moment in dependence from the reciprocating movements of the embroidering hand and therewith from the operation of the driving mechanism of the embroidering machine.

A further object of the invention is to provide an improved mechanical embroidering hand as set forth, wherein the said spring device is slidably mounted and operatively connected with the afore-mentioned rack bar of the driving mechanism, so that it may be moved by the latter to a position wherein the two coil springs of said

spring device are ineffective and the control lever of the needle holder is caused by a third spring to permit opening of said needle holder, and withdrawal of the embroidering needle therefrom.

Still another object of the invention is to provide an improved embroidering hand as set forth, wherein the said spring device is slidably mounted and operatively connected through a coil spring with the afore-mentioned rack bar of the driving mechanism, with the advantageous result that the open needle holder as soon as it receives the embroidering needle and as soon as the driving mechanism of the machine is going to move the embroidering hand backwards, said needle holder will be instantaneously closed by the said coil spring i. e. in a moment in which the needle did not yet leave the co-operating embroidering hand, this feature being of particular importance in as far as a correct grasping of the embroidering needle by the needle holder is always ensured.

A further object of the invention is to provide an improved mechanical embroidering hand as set forth, having associated therewith a thread-pulling lever which is operated by the driving mechanism in perfect synchronism with the operation of the embroidering hand by means of a friction clutch and in such a manner that said thread-pulling lever may be stopped by the pulled thread at any position in accordance with the length of said thread.

An additional object of the invention is to provide an improved embroidering hand as set forth having associated therewith a thread-pulling lever which in addition to the said friction clutch in its backward or thread-pulling movement is operated by an oscillating arm provided with an elastic or elastically mounted pawl member, which advantageously increases the security of service of the thread-pulling device.

Another object of the invention is to provide an improved embroidering machine which for operating a number of pairs of co-operating mechanical embroidering hands comprises but one driving mechanism including a disk having two cam grooves cut into the material of the same and so arranged that by means of rack bars provided each with a pin for engaging said cam grooves both the embroidering hands and the thread-pulling devices at opposite sides of a cloth to be embroidered are duly operated, with the advantageous result that the different simultaneous and/or successive operations of the co-operating embroidering hands and their associated thread-pulling levers are effected automatically without any personal attention.

With these objects and advantageous features in view, the present invention comprises the arrangement, combination and construction of parts as will be hereinafter fully explained with particular reference to the accompanying drawings, which by way of example only illustrate a preferred embodiment of the invention and on which:

Figure 1 is a partly schematic side elevation of the improved embroidering machine with one pair of co-operating embroidering hands;

Figure 2 is a partly sectional plan view on a larger scale of one of the embroidering hands with the associated thread pulling device;

Figure 2*a* is a fragmentary plan view showing on a larger scale the spring device of the embroidering hand according to Fig. 2;

Figure 3 shows the embroidering hand of Figure 2 seen in the direction indicated by the arrow of Figure 2;

Figure 4 is a front view of the embroidering hand as shown in Figures 2 and 3;

Figure 5 is a perspective detail view of the needle holder of the embroidering hand;

Figure 6 is a detail view illustrating a pair of spring-loaded levers co-operating with a cam member of the needle holder;

Figure 7 is a detail sectional view along the line 7—7 of Figure 3.

Referring to the accompanying drawings, the embroidering machine according to my present invention is intended to comprise a number of pairs of co-operating mechanical embroidering hands 1 (Figure 1) which are removably and adjustably mounted on pairs of cross bars 2 carried by a pair of side frames 3, of which only one is shown on the drawing. These side frames also carry in suitable bearings (not shown) two pairs of driving shafts 4 and 5. The two shafts 4 operate the embroidering hands 1 at both sides of the cloth to be embroidered 7, whereas the shafts 5 operate the thread-pulling levers 6 associated with the co-operating embroidering hands 1. The side frame 3 shown in Figure 1 further carries an electric motor provided with a reduction gearing indicated at 8 which, for instance, by means of an electro-magnetic clutch or the like indicated at 9 and corresponding belts 10, 11 and pulley 12 operates a cam shaft 13. This shaft, which is suitably mounted in bearings (not shown) secured to the frame 3, carries a disk 14 of sufficient thickness so as to permit a pair of cam grooves 15, 16 to be cut into the disk material. At laterally opposite points from the cam shaft 13, the cam grooves 15, 16 are engaged by pins 17 secured to pairs of racks 18, 19 meshing with corresponding toothed wheels 20, 21. The toothed wheels 20 by means of pinions 22 operate the driving shafts 4 which carry the pinions 23, one for each embroidering hand 1, whereas the toothed wheels 21 by means of the respective pinions 24 operate the driving shafts 5 of the thread-pulling levers 6 as will be explained later on.

The embroidering machine according to the invention comprises at least one pair of co-operating mechanical embroidering hands, details of which have been clearly shown in Figures 2 to 7 of the accompanying drawings. With reference to these figures, each embroidering hand is slidably mounted on a support 25 and a guide member 26 which may be secured to or form part of said support and which is provided with a dovetail groove for receiving a corresponding part of guide plate 27 (Figure 4) of a frame 28 (Figure 3) which carries the component parts of the embroidering hand and of which form part a pair of arms 29. These arms at the free ends carry a needle holder formed by two short shafts 30, 30*a* rotatively mounted in suitable bearings provided in said arms. The abutting ends of the short shafts 30, 30*a* are each provided with a transverse groove so arranged that the two grooves form a small channel 31 (Figure 4) capable of receiving a usual sewing or embroidering needle 32 (Figures 2 and 3). In order to firmly grasp needles 32 of different thickness, the abutting end surfaces of the short shafts 30, 30*a* may be provided with vertical grooves 35 (Figure 5) in such an arrangement that the teeth formed between adjacent grooves of one shaft surface engages the grooves of the abutting shaft surface, thereby reducing the width of the channel 31 and enabling

the same to firmly grasp smaller needles. For opening the needle holder, the short shaft **30** is axially slidable and the free end of its gudgeon **34***a* (Figure 2) is in contact with a lever **35** controlling the needle holder as will be described later on.

The gudgeons **34**, **34***a* of the two short shafts **30**, **30***a*, respectively, carry on the inner surfaces of the arms **29** a cam member **36** (Figure 6) each acted upon by a pair of spring-loaded levers **37** pivoted at **38** and pressed by the springs **39** against the cam member **36**, and on the outer surfaces of the arms **29** a ratchet wheel **40** (Figures 2–4). The ratchet wheels **40** co-operate with spring-loaded rack members **41** in such a manner that when the embroidering hand moves backwards—in Figure 3 from the left to the right—the stationary racks **41** cause the wheels **40** and therewith the two short shafts **30**, **30***a* of the needle holder to rotate over an angle of more than 90°. This rotation is completed to one half of a rotation by the co-operation of the spring-loaded levers **37** with the cam members **36**. Thus each time the embroidering hand moves away from the cloth to be embroidered **7** (Figure 1), the needle holder is caused to move the embroidering needle **32** longitudinally over an angle 180°.

During the reciprocating movements and more particularly during the rotation of an angle of 180°, which takes place during each backward movement of the needle holder **30**, **30***a*, the needle **32** has to be firmly grasped thereby i. e. the axially movable short shaft **30** has to be firmly pressed against the short shaft **30***a*. On the other hand, the needle **32** has to be loosely grasped by the needle holder at the end of the backward stroke of the latter for permitting an adjustment of the position of the needle in said holder in such a manner that the same is pushed forward between the shafts **30**, **30***a* as has been shown in connection with the right embroidering hand in Figure 1. Finally, the needle holder has to be entirely released in its foremost position adjacent the cloth to be embroidered **7** in order to permit the removal of the needle by means of the needle holder of the co-operating embroidering hand operating at the opposite side of said cloth. The corresponding operations to be performed by the axially movable short shaft **30** of the needle holder are effected by the lever **35** in combination with a lever-operating spring device in dependence from the driving mechanism of the embroidering machine as will be hereinafter described.

A toothed wheel **23** on the driving shaft **4** meshes with a rack **42** which at **43** is connected to a rod **44**. This rod is slidably mounted in a corresponding hole of the cross member **45** of a frame **46** secured to the guide plate **27** of the embroidering hand and by means of a cross member **47** is secured to a casing **48**. Within the frame **46** the rod **44** carries a fixed washer **49** and is surrounded by a coil spring **50** which at one end abuts against said washer, whereas its opposite end abuts against the cross wall **51** of a casing **52** secured to the frame **46**, said cross wall **51** having a central hole for the passage of the rod **44**. The casing **48** which is secured to the cross member **47** of the rod **44** and which is guided by adjacent portions of the frame **28**, contains a strong pressure spring **53** and a relatively weak pressure spring **54** (Figure 2*a*). The coil spring **53** acts upon a disk **55** provided with a central rod **56**, whereas the coil spring **54** acts in the same direction upon a disk **57** provided with a central rod **58**, the free end of this rod being in contact with an abutment **59** of the lever **35** (Figure 2) and this abutment comprises a curved portion **60** capable of suppressing the pressure exerted by the springs **53**, **54** upon the lever **35** when the casing **48** is moved slightly to the left (Figure 3) so that the free end of the rod **58** is in alignment with the curved portion **60** of the abutment **59**. The lever **35** which is pivotally mounted on a bracket **61**, is further acted upon by a spring **62** in such a manner that the front end of said lever is disengaged from the gudgeon **34** as soon as the pressure of the springs **53**, **54** is suppressed as aforesaid.

As has been previously pointed out, for the purpose of adjusting the needle **32** in the needle holder **30**, **30***a*, the pressure upon the axially movable short shaft **30** has to be released. This is performed by suppressing the action of the strong pressure coil spring **53** and by causing the weak pressure spring **54** to act alone upon the lever **35**. For this purpose the free end of the rod **56** is provided with a groove **63** which is engaged by the front end of a lever **64** pivoted at **65** in a supporting member **66** secured to the guide plate **27** of the embroidering hand. The rear end of the lever **64** comprises a chamfered end portion **67** which co-operates with a chamfered stop rod **68** fixedly mounted in a rear cross portion **69** of the stationary guide member **26** (Figure 3). As will be readily understood from the Figure 2, as soon as the embroidering hand i. e. guide plate **27**, frame **28**, arms **29**, needle holder **30**, **30***a*, casing **48** with the springs **53**, **54**, cross member **47**, rod **44**, casing **52** with the spring **50**, and frame **46**, in its backward movement brings the end portion **67** of the lever **64** into contact with the free end of the stop rod **68**, said lever **64** will be moved so as to shift the rod **56** and disk **55** and to thereby suppress the action of the strong pressure spring **53**.

The afore-mentioned cross portion **69** carries an adjustable rod **70** for counteracting a possible extension of the spring **50** during the backward stroke of the embroidering hand, and another adjustable rod **71** (Figures 1, 2, 3) which cooperates with a needle-adjusting rod **72** movably mounted in suitable supports **73**, and provided at its front end with a bent portion **74**. This rod **72** is surrounded by a coil spring **75** arranged between an adjustable stop member **76** and the front support **73**. When the embroidering hand moves backwards, the rod **72** making contact with the rod **71** is pushed forward and is caused to act upon the needle **32** in the needle holder **30**, **30***a*. When the embroidering hand moves to its foremost position, the spring **75** reestablishes the normal position of the normal positions of the rod **72**.

Each embroidering hand **1** is associated with a thread-pulling lever **6**, by means of which the embroidery thread **77** is pulled through the cloth **7** after each stitch of the needle **32**. The lever **6** is secured to a friction disk **78** mounted on a short shaft **79** in friction contact with a toothed wheel **80**. This toothed wheel meshes with a pinion like that **24** of the driving shaft **5** (Figure 1) so that the rotation of the latter is imparted by friction to the disk **78** and lever **6**. The connection between the lever **6** and the friction disk **78** includes a spring-loaded articulation as shown at **81** in Figure 3 and capable of permitting the lever **6** an oscillatory movement in addition to its rotary movement, as will be explained later on. The free end of the lever **6** carries a loose roller

82 for engaging the embroidery thread 77, for which guide rollers 83, 84 are provided at suitable points as shown in Figures 1 and 3 for avoiding the thread to become entangled during the operation of the machine. An adjustable lever 85 provided at its free end with a projecting arm 86 (Figures 2 and 3) limits the backward stroke of the lever 6. A screw 87 (Figure 2) serves for regulating the friction between the disk 78 and the wheel 80. The friction between these members 73 and 80 is so adjusted that the same is insufficient to move the lever 6 beyond a point determined by the length of the embroidery thread. Due to this feature, the lever 6 is enabled to stop its backward movement at any point in accordance with the decreasing length of the embroidery thread, whereas during the forward movement of said lever i. e. when the thread is pulled by the lever 6 associated with the opposite co-operating embroidering hand, the friction between the members 78 and 80 assists in moving the lever to its foremost position and thereby avoids a tension being produced in the embroidering thread. It will be understood that in the co-operation of two opposite embroidering hands and of their associated thread-pulling levers the friction between the members 78 and 80 of one lever will practically compensate the friction between the same members of the opposite lever, and that for this reason there must be an additional force for moving the lever of each embroidering hand during its backward or thread-pulling stroke. For this reason a driving lever 88 is provided in combination with each thread-pulling lever 6 and is fixedly secured to the toothed wheel 80. The free end of the lever 88 is provided with a laterally projecting forked portion 89 including an elastic pawl 90 (Fig. 2), which is adjustable by means of a screw 91 or in another manner and by which the thread-pulling lever 6 is engaged—as seen on the left hand side of Figure 1—and withdrawn until this lever 6 reaches its position determined by the length of the thread 77, in which moment the resistance of this thread causes the pawl 90 to disengage the lever 6 so that the latter may stop its backward movement. It will be understood that the energy of the elastic pawl 90 must be just sufficient to pull the embroidery thread, but insufficient to tear the thread 77.

In Figure 1 the thread-pulling levers 6 associated with the two co-operating embroidering hands 1 are shown in their end positions, and as will be seen in said figure, the thread-pulling lever of the left embroidering hand has its guide roller 82 situated below the needle holder. For being brought into this position while the needle holder is situated adjacent the cloth 7, it is necessary that the thread-pulling lever 6 during its movement from the rear to the front position be laterally deviated so that the guide roller 82 may pass by the supporting arms 29 of the needle holder. For this purpose a spring-loaded plate 92 having a curved edge is pivotally mounted on the support 25 or guide member 26 and by its spring is normally held in a position at an angle of 90° to said support and guide member, so that the lever 6 sliding along the curved edge thereof due to its spring loaded link 81 (Figure 3) moves outwards and thereafter inwards and that thus its guide roller 82 moves past the supporting arms 29.

During the backward movement of the embroidering hand, a hook member 93 secured to the frame 28 moves the plate 92 to a position parallel to the parts 25, 26 so that the lever 6 may execute its thread-pulling stroke without contacting said plate and without being swung outwardly.

Each embroidering hand is completed by a guide member 94 secured to a stationary part such as support 25 or guide member 26 in such a manner that its upright portion is situated adjacent the cloth 7 to be embroidered. The upright portion of the member 94 is provided with an eye for the passage of the embroidering needle 32. It will be understood that the eyes of the guide members 94 of co-operating embroidering hands have to be in correct alignment, and with regard hereto each embroidering hand is provided with a pair of set screws 95 (Figure 4).

The operation of the embroidering machine according to the invention and as hereinbefore described is as follows:

For simplifying the description, to the reference numerals of the parts belonging to the left embroidering hand I have added the character "L" and to those of the parts belonging to the right embroidering hand I have added the character "R." Referring to Figure 1, the embroidering hand 1L is shown in its advanced position i. e. adjacent the cloth 7, whereas the embroidering hand 1R is in its withdrawn position; the same refers also to the respective thread-pulling levers 6L and 6R. During the backward movement of the embroidering hand 1R the needle 32 has been inverted and has been adjusted in its position in the respective needle holder by the adjusting rod 72R, so that this embroidering hand 1R is in conditions for producing the next stitch, while the embroidering hand 1L adjacent the cloth 7 is waiting for the needle 32.

The cam disk 14 now starts rotating in clockwise direction from the position as shown. The cam groove 15 first moves the rack 18R outwardly and by means of the gearing 20R, 22R, 23R and the rack 42R moves the embroidering hand 1R to its advanced position adjacent the cloth 7, while the thread-pulling lever 6R remains in its withdrawn position until the pin 17R of the rack 19R reaches the point 16A of the cam groove 16. At this moment the lever 6R receives a sudden small forward push causing the same to release the embroidering thread 77 and thereafter the rack 19R is slowly moved outwardly, whereby said lever 6R is gradually moved to its advanced position. During this movement of the lever 6R the cam grooves 15 and 16 move the racks 18L and 19L inwardly which in turn by means of the gearings 20L, 22L, 23L and 21L, 24L move the embroidering hand 1L and the thread-pulling lever 6L to their withdrawn positions. The continuous rotation of the cam disk 14 due to the special form of the cam grooves 15 and 16 impart to the racks 18L, 19L and 18R, 19R reciprocating movements which cause the driving shafts 4L, 5L and 4R, 5R to rotate in one and the opposite direction, thereby producing the reciprocating movements of the embroidering hands and their thread-pulling levers.

As has been already explained, during the backward movement of each embroidering hand, the needle holder 30, 30*a* due to the co-operation of the ratchet wheels 40 with the rack members 41 and of the cam members 36 with the spring-loaded levers 37 is caused to make one half of a revolution and to move the needle 32 longitudinally over an angle of 180° so as to invert its position. It has been further explained that at the

end of this backward stroke of the embroidering hand, the pressure of the strong pressure spring **53** upon the lever **35** is suppressed by the co-operation of the lever **64** with the stop rod **68** and that at this moment the needle **32** in the needle holder is pushed forward by the adjusting rod **72**. The pressure of the spring **53** upon the lever **35** is re-established as soon as the embroidering hand moves to its advanced position. But immediately after this advanced position has been reached, by means of the rod **44**, cross member **47** and casing **48**, the spring-loaded rod **58** is still slightly advanced so that its free end is in alignment with the curved portion **60** of the abutment **59** of the lever **35**, in which moment the springs **53**, **54** do not act anymore upon the lever **35** and the latter is disengaged by the spring **62** from the gudgeon **34** of the axially movable short shaft **30**, with the result that now the needle holder is entirely released and does not exert any pressure upon the needle **32**.

As soon as the needle holder of the embroidering hand **1R** has been effected as hereinbefore explained, the driving shaft **4L** starts the return movement of the embroidering hand **1L**. This return movement begins with a slight withdrawal of the spring-loaded rod **58** effected by the spring **50** in the casing **52**, with the result that the full pressure of the springs **53**, **54** is applied to the lever **35** before the proper return movement of the embroidering hand **1L** starts and that now the needle is firmly grasped by the needle holder of said embroidering hand. Thus it will be understood that the operations of closing and releasing the needle holders of the embroidering hands are not directly effected by the driving mechanism of the embroidering machine, but by the intervention of the spring **50**, and that due to this feature closing of the needle holder is instantaneous with the advantageous result that the threaded needle **32** is firmly grasped before the proper return movement of the needle holder starts.

It will be understood that the present invention is by no means restricted to the specific embodiment as described and shown, but that alterations and amendments may be made therein, and that such alterations and amendments have to be considered as falling within the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, a thread-pulling lever associated with each embroidering hand, and a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

2. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, a thread-pulling lever associated with each embroidering hand, and a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

3. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided each with a transverse groove to form between the two shaft ends a small channel for receiving said embroidering needle; a thread-pulling lever associated with each embroidering hand, and a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

4. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted co-axial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided each with a transverse groove to form between the two shaft ends a small channel for receiving said embroidering needle and being additionally provided with vertical grooves which on one shaft surface are laterally displaced with regard to the grooves of the opposite shaft surface so as to provide for a mutual engagement of the shaft ends; a thread-pulling lever associated with each embroidering hand,

and a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

5. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided with groove means for grasping said embroidering needle; a thread-pulling lever associated with each embroidering hand and provided with a guide roller for engaging the embroidery thread, a friction disk for mounting and oscillating said lever and a driven toothed wheel in friction contact with said friction disk, an oscillatory arm secured to said driven toothed wheel for assisting said friction disk in moving said lever in its thread-pulling operation; a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

6. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided with groove means for grasping said embroidering needle; a thread-pulling lever associated with each embroidering hand and provided at its free end with a guide roller for engaging the embroidery thread, a rotative friction disk for mounting and oscillating said lever and a driven toothed wheel in friction contact with said friction disk, an oscillatory arm secured to said toothed wheel for assisting said friction disk in moving said lever in its thread-pulling operation, said oscillatory arm being provided at its free end with a forked portion including an elastic pawl for engaging said thread-pulling lever during its thread-pulling operation, and screw means in connection with said friction disk for adjusting its friction contact

with said driven toothed wheel; a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

7. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided with groove means for grasping said embroidering needle; a thread-pulling lever associated with each embroidering hand and provided at its free end with a guide roller for engaging the embroidery thread, friction means and an oscillatory arm for operating said thread-pulling lever from a driven toothed wheel; a mechanically operating driving mechanism in operative connection with said driven toothed wheel of each thread-pulling lever and with a rack means on each embroidering hand, said driving mechanism including a cam disk with two cam grooves cut into the same, rack means provided with pins for engaging said cam grooves and meshing with toothed wheels which form parts of gearings for operating two pairs of driving shafts, one pair for the embroidering hands arranged at opposite side of the said cloth and the other pair for the thread-pulling levers associated with said embroidering hands; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

8. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided with groove means for grasping said embroidering needle; a thread-pulling lever associated with each embroidering hand and provided at its free end with a guide roller for engaging the embroidery thread, friction means and an oscillatory arm for operating said thread-pulling lever from a driven toothed wheel; a mechanically operating driving mechanism in operative connection with said driven

toothed wheel of each thread-pulling lever and with a rack means on each embroidering hand, said driving mechanism including a cam disk with two cam grooves cut into the same, rack means provided with pins for engaging said cam grooves and meshing with toothed wheels which form parts of gearings for operating two pairs of driving shafts, one pair for the embroidering hands arranged at opposite side of the said cloth and the other pair for the thread-pulling levers associated with said embroidering hands; transmission means provided in each embroidering hand for imparting to its needle holder one half of a revolution derived from the linear movement of the reciprocating embroidering hand, said transmission means comprising a ratchet wheel and a cam member provided on each short shaft of the needle holder and for co-operating therewith a pair of spring-loaded rack members and two pairs of spring-loaded levers, respectively; and a spring device incorporated in each embroidering hand for operating a lever capable of controlling the needle holder in said embroidering hand.

9. Embroidering machine comprising at least one pair of co-operating mechanical embroidering hands each provided with a pair of rotative members for providing a needle holder capable of handling a usual threaded embroidering needle between abutting ends of said rotative members and of inverting the direction of the same after each stitch through a cloth to be embroidered, said needle holder being formed by a pair of rotatively mounted coaxial short shafts and having one of these shafts arranged for an additional axial displacement for opening and closing the needle holder, the abutting ends of said two shafts being provided with groove means for grasping said embroidering needle; transmission means provided in each embroidering hand in connection with said two short shafts for imparting to the needle holder with the embroidering needle engaged thereby one half of a revolution derived by the linear movement of the embroidering hand; a thread-pulling lever associated with each embroidering hand and a mechanically operating driving mechanism in operative connection with both the embroidering hands and the thread-pulling levers for reciprocating said hands and oscillating said levers; a spring device incorporated in each embroidering hand for operating a control lever in contact with the free end of the said axially displaceable short shaft of the needle holder of said embroidering hand, said spring device comprising a strong pressure spring and a weak pressure spring acting upon abutting individual rods, the free end of the rod of the weak pressure spring being in contact with said control lever and the free end of the rod of said strong pressure spring being engaged by a lever capable of suppressing the pressure of said strong pressure spring for causing said control lever to release the pressure upon the said axially displaceable short shaft.

10. Embroidering machine, according to claim 9, wherein the said spring device comprises a slidable casing containing said strong pressure coil spring and said weak pressure coil spring and wherein the said individual rods are provided with individual disks of different diameter, the smaller disk being contacted by said strong pressure spring and the larger disk by said weak pressure disk.

11. Embroidering machine, according to claim 9, wherein the said spring device comprises a slidable casing containing said strong pressure spring and said weak pressure spring and individual rods as referred to acted upon by said springs, said casing being connected by a cross member and a spring-loaded connecting rod to a driving rack of the embroidering hand in which said spring device is incorporated.

12. Embroidering machine, according to claim 9, wherein the said control lever comprises an abutment for being engaged by the rod of the weak pressure spring as referred to of the said spring device and said abutment includes a curved portion for the disengagement of said rod when the said casing containing the strong and weak pressure springs is displaced from its normal position.

13. Embroidering machine, according to claim 9, wherein the said pressure-suppressing lever is disposed in alignment with a stop rod capable of operating said lever when the embroidering hand in which the said spring device is incorporated is moved to its withdrawn position.

14. Embroidering machine, according to claim 9, wherein the said control lever is provided with an additional spring for its disengagement from the said axially displaceable short shaft of the needle holder.

15. Embroidering machine, according to claim 9, wherein an adjustable rod is provided for limiting the backward stroke of each embroidering hand.

16. Embroidering machine, according to claim 9, wherein each embroidering hand comprises a spring-loaded adjusting rod for adjusting the embroidering needle in the needle holder.

17. Embroidering machine, according to claim 9, wherein for each thread-pulling lever an adjustable arm is provided for limiting the backward movement of said thread-pulling lever.

18. Embroidering machine, according to claim 6, wherein each embroidering hand is provided with a spring-loaded plate having a curved edge for causing the thread-pulling lever associated with said embroidering hand to be swung outwardly when moving from its rear to its front position.

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