

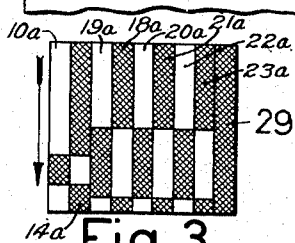
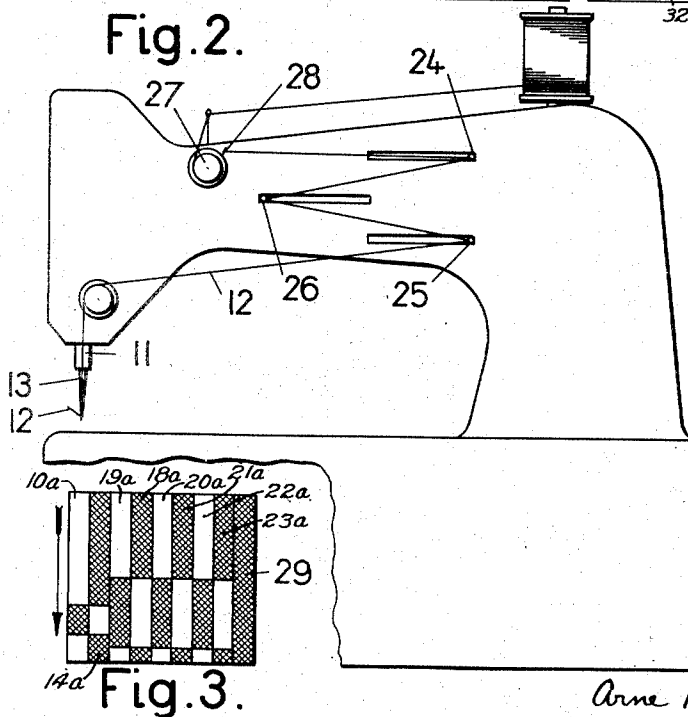
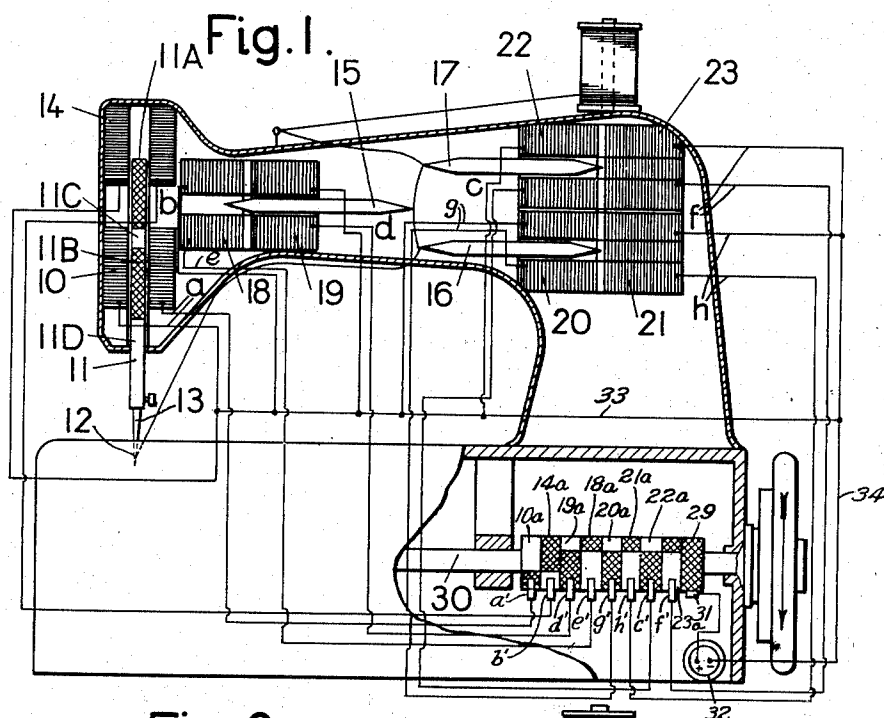
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A. HAGQUIST

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SEWING MACHINE

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Inventor:

Arne Hagquist,

By: Pierce, Scheffler & Parker,
attorneys.

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SEWING MACHINE

Arne Hagquist, Oslo, Norway

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The present invention relates to improvements in and relating to sewing machines.

On ordinary sewing machines all movements are transmitted mechanically. The transmissions are either pinion, gearing, belt transmissions or combinations of these. The movements of the needle-rod and the thread-puller are thus both transmitted from the upper driving shaft of the machine through mechanical members.

In order that the machine may run smoothly, rapidly and quietly all these mechanical members must be accurately made, which renders the machine expensive to produce.

In addition, the output capacity of the ordinary sewing machine is limited by the inertia of these mechanical members, in consequence the shuttle of the sewing machine makes two revolutions while the needle and thread-puller move up and down once. This means that the machine can only sew one stitch while the shuttle rotates twice.

It is an object of the present invention to produce a sewing machine which eliminates the above-mentioned transmission to be needle-rod and thread-puller, thus making the machine cheaper to manufacture, while so constructing it that the machine can sew one stitch for each rotation of the shuttle.

According to the invention there is provided a sewing machine comprising a needle-rod and a thread-puller, one or both of which are moved with the aid of alternating magnetic fields.

The two solenoids which drive the needle-rod up and down are mounted vertically one above the other in that part of the machine body usually occupied by the transmission of the needle-rod and the thread-puller. They are mounted at a distance apart corresponding with the length of stroke of the needle-rod. The upper part of the needle-rod constitutes an iron core and its lower part consists of a non-magnetic material.

The two or more solenoids which actuate the thread-puller are mounted, preferably horizontally, in that part of the machine body occupied by the upper driving shaft in ordinary machines. The distance apart of the solenoids is regulated according to the length of the upper thread running around the spool of the reel-case. The thread-puller, which also constitutes an iron core, is drawn back and forth between the solenoids according as it is magnetized or demagnetized and is fitted with an eye through which runs the top thread. If the machine is fitted with two solenoids the thread is drawn tight when the right-hand solenoid is magnetized and is slackened

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when the right-hand solenoid is demagnetized and the left-hand one is magnetized. When more than two solenoids are used they are so arranged that they cooperate in the tightening and slackening of the thread.

In order to adjust the speed of the needle-rod and thread-puller there is connected in the electric leads which convey current to the solenoids an automatic current-regulating resistance operating to supply more or less current to the solenoids according to whether the speed of the machine increases or decreases.

A preferred embodiment of the invention is illustrated in the drawings in which,

Figure 1 is a section through the upper part of a sewing machine,

Figure 2 is an elevation of the machine showing the slots for the thread-puller eyes, and

Figure 3 is the commutator developed on a flat plane.

When the solenoid 10 is being magnetized by current supplied by way of leads *a*, a needle-rod 11, and the upper thread 12, carried by it, are drawn downwards. In the lowest position of the needle 13 the upper thread 12 is gripped by a shuttle (not shown) which conveys it round the spool or reel-housing (not shown). When the shuttle has gripped the upper thread the solenoid 10 is demagnetized as a result of the current being switched, through leads *b*, to a solenoid 14 which is thus magnetized and draws the needle-rod 11 up again. For this purpose the needle-rod is made up of two magnetizable iron cores 11A 11B insulated from each other by a non-magnetizable intermediate member 11C, of the material of which the lower part 11D of the needle-rod is also made.

When the upper thread 12 has been conveyed round the spool or reel-housing and the needle 13 has passed the lowest point the shuttle releases the thread 12 which is immediately forced up and made taut by thread-pullers 15, 16 and 17 by which the stitch is formed.

The thread-pullers move, in a manner similar to the needle rod, to and fro between pairs of solenoids 18, 19; 20, 21 and 22, 23 respectively which are mounted horizontally in the upper part of the body of the machine. These solenoids are magnetized and demagnetized by supply of current through the leads *c*, *d*, *e*, *f*, *g* and *h*, and the movement of the pullers is so proportioned that they co-operate with the shuttle to release the thread just before it is gripped by the shuttle and tighten it up again when the shuttle releases it after it has passed round the spool or reel-

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housing. In Figure 1 the parts are shown with the needle rod 11 in its lowest position, to which it is moved by energization of the solenoid 10, and the thread-puller is shown in the position to provide a slack thread, the puller core 15 being moved to the right by energization of solenoid 19 and the puller cores 16 and 17 being moved to the left by energization of solenoids 20 and 22 so as to relieve the pull on the thread. In Figure 2 the needle rod 11 is shown in the raised position to which it is shifted by deenergization of the solenoid 10 and energization of the solenoid 14 and the pullers are shown with tightened thread running through thread-puller eyes 24, 25 and 26 and braked by an ordinary thread-brake 27 spring-loaded at 28. In this position the solenoids 18 and 21 and 23 have been energized to move the puller core 15 and its eye 26 to the extreme left and the puller cores 16 and 17 and their eyes 24 and 25 to the extreme right to pull the thread tight.

Appropriate co-operation between the needle-rod, the thread-pullers and the shuttle is effected with the aid of a commutator 29 mounted on the motor driven machine shaft 30 and shown developed on a flat plane in Figure 3. The hatched areas on the commutator represent the current-conducting fields and the plain areas represent insulated fields, these fields being arranged as strips each extending part way around the cylindrical surface of the commutator to be engaged alternately in sequence by suitable contact brushes *a'*, *b'*, *c'*, *d'*, *e'*, *f'*, *g'* and *h'*, engaging the face of the commutator. Each of the brushes is connected to one of the solenoids and the section of the commutator engaged by each brush has its conducting and non-conducting fields disposed in such relation to those of the adjoining sections that as the commutator rotates the respective solenoids are energized and deenergized in proper timed relation to effect the operation of the needle rod and thread puller as above described. The commutator sections 16*a*, 14*a*, 19*a*, 18*a*, 20*a*, 21*a*, 22*a*, and 23*a* control the respective like-numbered solenoids. Direct current supplied to the commutator by brush 31 connected to the positive side of a suitable current supply 32 is conducted through brushes *a'* to *h'*

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and one each of the corresponding leads *a* to *h*, to the several solenoids when the brushes make contact with the respective conductive fields, the other of the leads *a* to *h* being connected through common return leads 32 and 33 to the negative side of the current supply to complete the circuits.

The pressure foot, which in the ordinary sewing machines are driven mechanically, may also be adapted to be driven electro-mechanically in the same way as the needle-rod and the thread-puller.

I claim:

1. An electromagnetic sewing machine comprising a needle rod including a pair of axially aligned iron cores insulated from each other, a pair of axially aligned solenoids spaced from each other and in operative relation to the respective iron cores, a needle thread take up comprising opposed armatures each carrying a thread eye, solenoids associated with said armatures to reciprocate the same in opposite sense with respect to each other, and commutator means to control the operation of all of said solenoids in timed relation to each other.
2. An electromagnetic sewing machine comprising a solenoid, an armature adapted to reciprocate within said solenoid, a needle rod secured to said armature, a needle thread take up comprising opposed armatures each carrying a thread eye, solenoids associated with said opposed armatures to reciprocate the same in opposite sense with respect to each other, and commutator means to control the operation of all of said solenoids in timed relation to each other.

ARNE HAGQUIST.

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