Oct. 5, 1954 J. F. EISENBEISS 2,690,724

SEWING MACHINE

Filed Feb. 28, 1950 6 Sheets-Sheet 1

FIG. 1

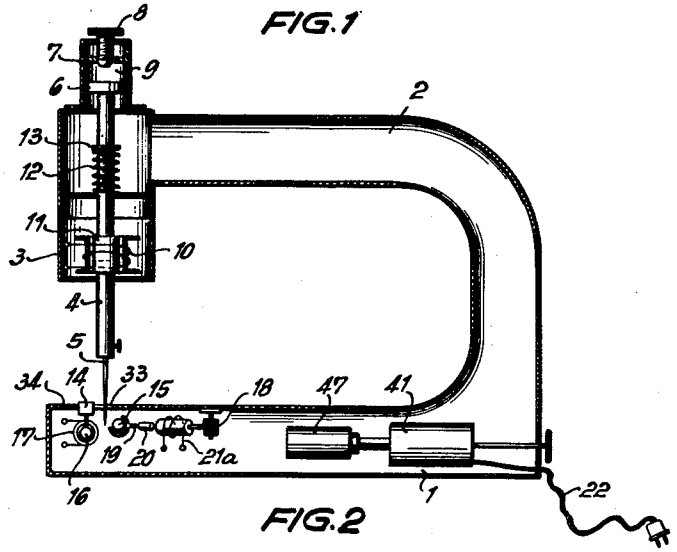


FIG. 2

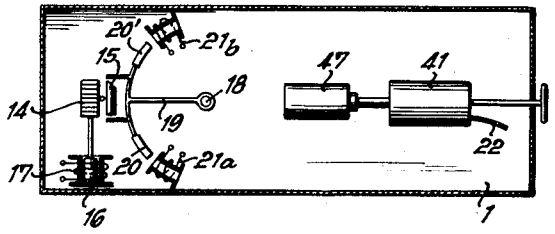
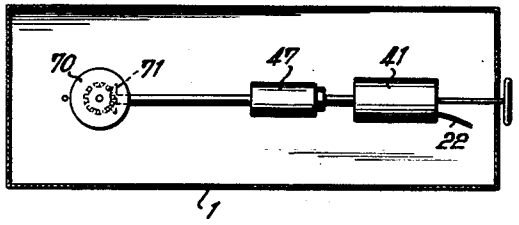


FIG. 3



INVENTOR:

JOHN F. EISENBEISS

BY:

Andrew S. Hagan

Oct. 5, 1954 J. F. EISENBEISS 2,690,724

SEWING MACHINE

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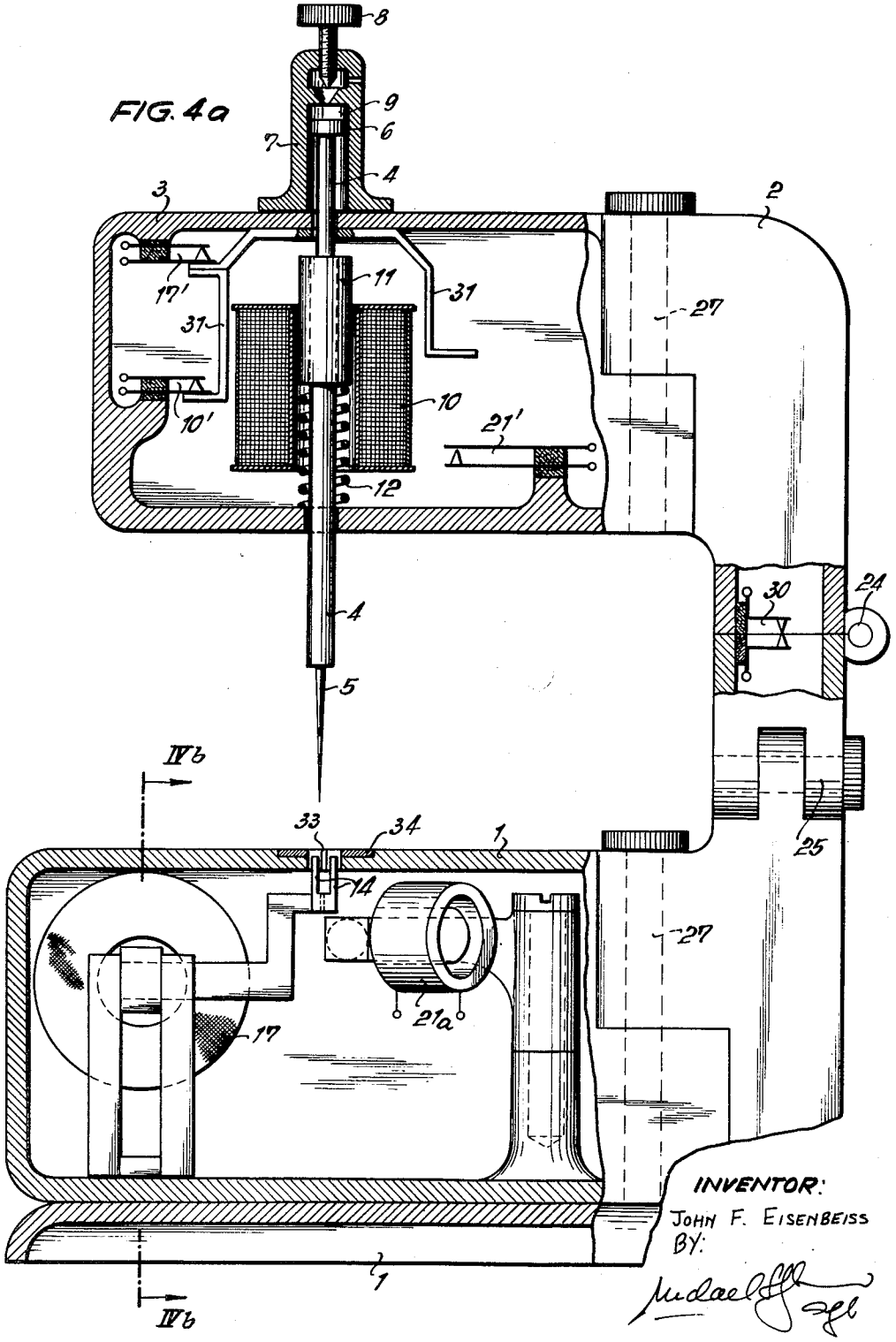
FIG. 4a



INVENTOR:
JOHN F. EISENBEISS
BY:

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SEWING MACHINE

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FIG. 4b

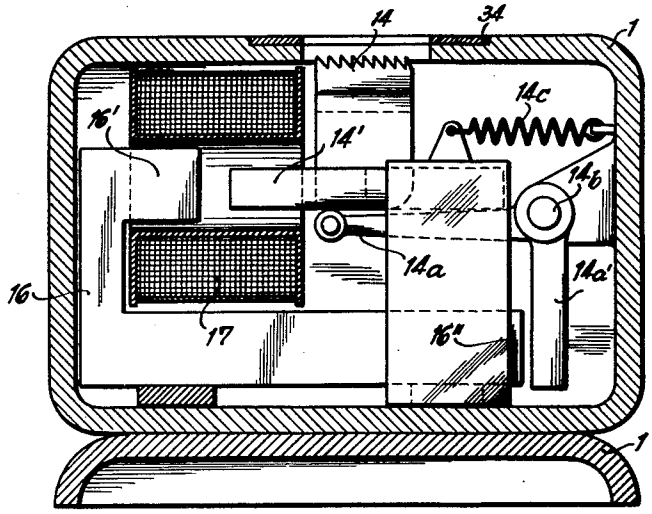
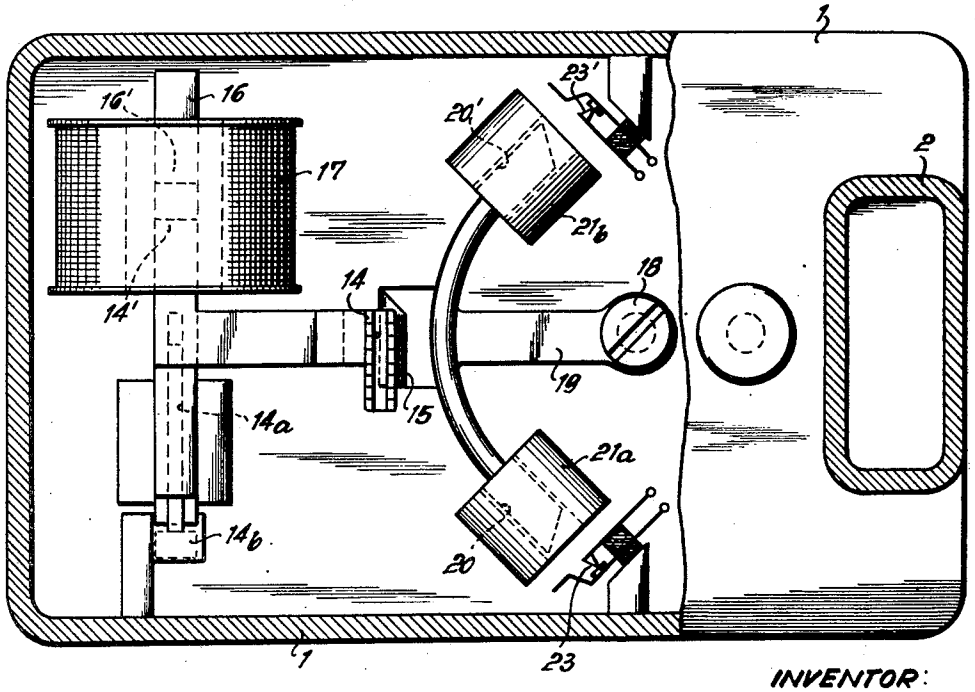


FIG. 4c



INVENTOR:
JOHN F. EISENBEISS
BY:

Oct. 5, 1954 J. F. EISENBEISS 2,690,724

SEWING MACHINE

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FIG. 4

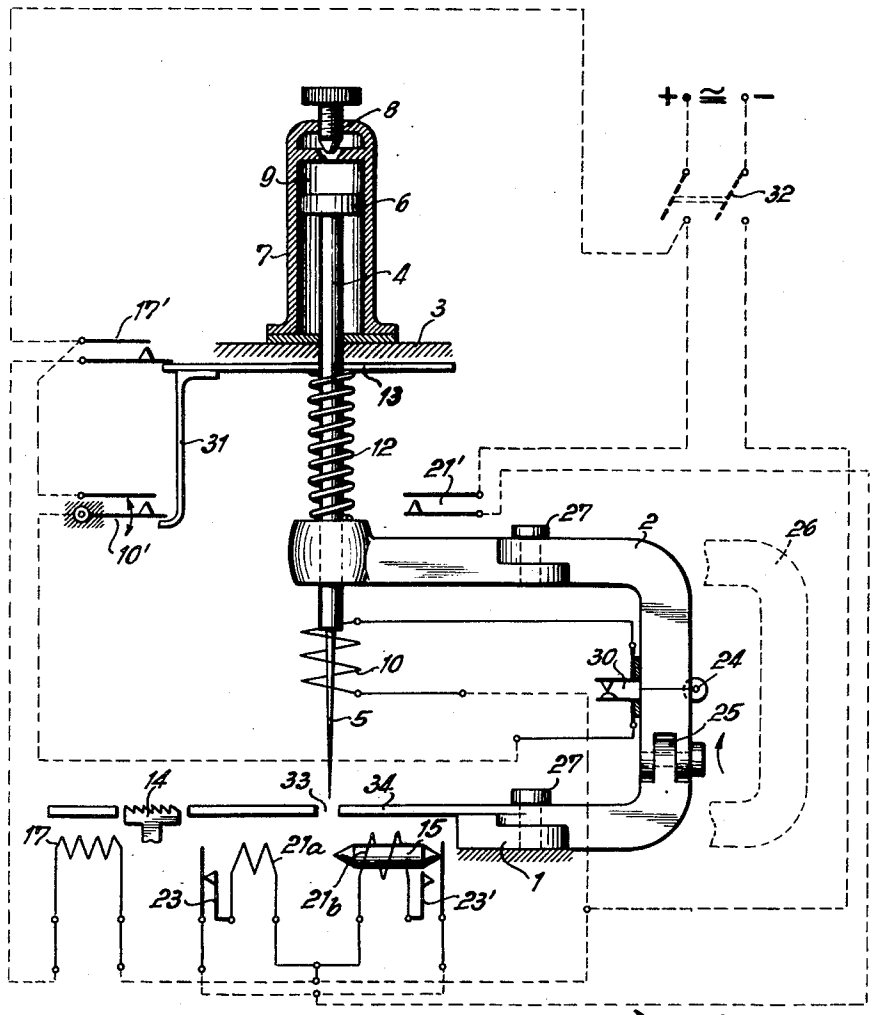
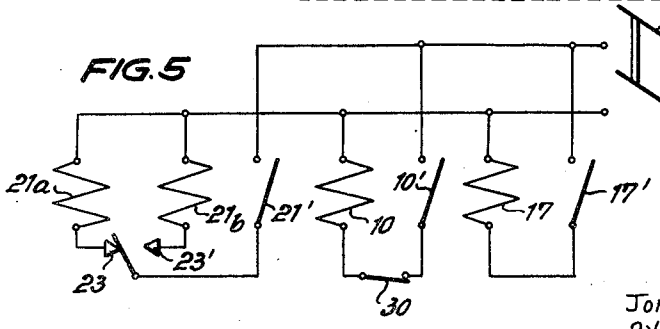


FIG. 5



INVENTOR:
JOHN F. EISENBEISS
BY:

Oct. 5, 1954 J. F. EISENBEISS 2,690,724

SEWING MACHINE

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FIG. 6

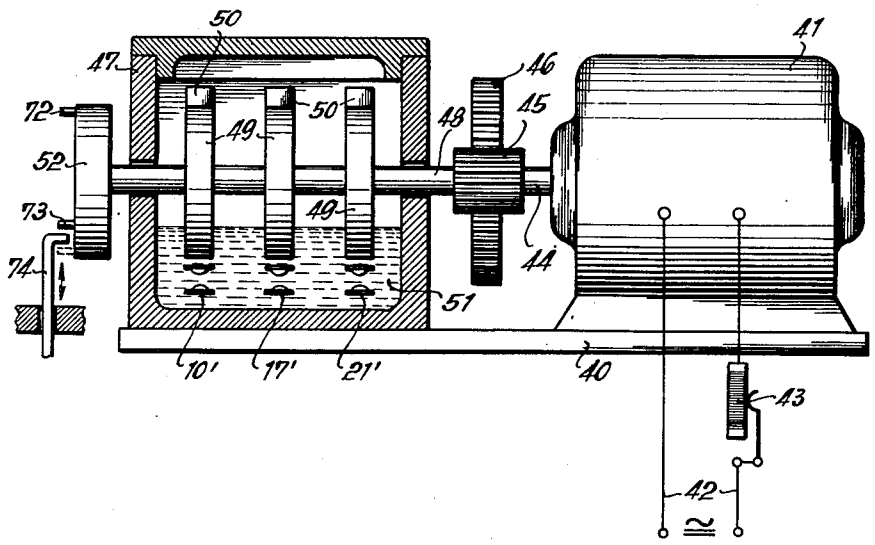
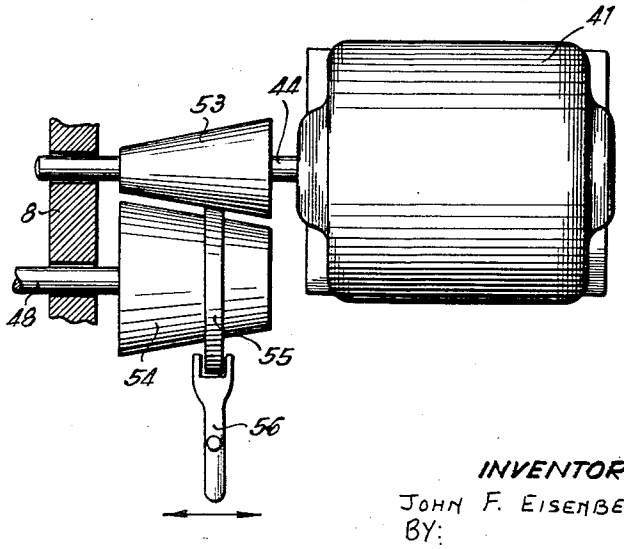


FIG. 7



INVENTOR:
JOHN F. EISENBEISS
BY:

Oct. 5, 1954 J. F. EISENBEISS 2,690,724

SEWING MACHINE

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FIG. 8

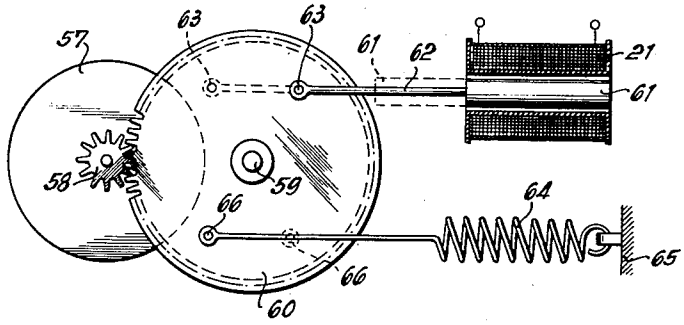


FIG. 9

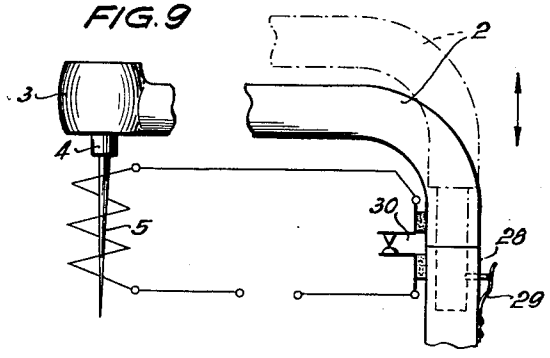


FIG. 11

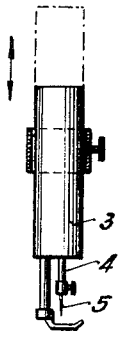


FIG. 10

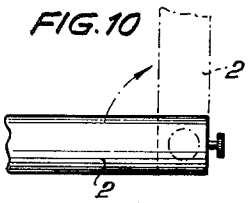


FIG. 12

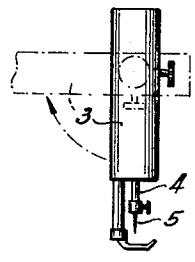
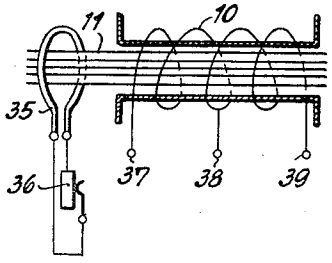


FIG. 13



INVENTOR:
JOHN F. EISENBEISS
BY:

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2,690,724

UNITED STATES PATENT OFFICE

2,690,724

SEWING MACHINE

John F. Eisenbeiss, New York, N. Y.

Application February 28, 1950, Serial No. 146,843

Claims priority, application Switzerland
March 2, 1949

11 Claims. (Cl. 112—181)

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The sewing machines hitherto known usually have a rotary drive which is effected either by a foot actuated treadle, manually by means of a handle, or by means of motors, this drive is connected to the actual sewing members of the machine by means of a number of complicated gears such as spur gearing, combined crank and cam gear, screw gear, etc. The rotary movement must, therefore, firstly be converted by mechanically interacting gears and controlling members into a straight line reciprocating movement for the sewing needle, secondly it must be converted with the aid of cams and the like into the substantially straight line reciprocating movement of the feeder for the material to be sewn, and thirdly, it must be converted either into an oscillating movement of the shuttle which is moved through the loop of the thread on the underside of the material, or into an oscillating movement of the loop forming means which acts on the loop of the thread which is passed through the material for forming a chain-stitch.

These three main kinds of movement have, therefore, scarcely anything in common with the original rotary movement, but are derived from it in a form which is in part complicated. The difficulty is essentially due to the fact that the individual parts to be moved are not directly adjacent to one another in space and consequently must be related to one another in an invariable sequence of operations. This explains the complicated mechanical construction of the known sewing machines.

The object of the invention is to obviate these disadvantages of the known sewing machines and to provide a sewing machine which is considerably simpler as regards its mechanical construction and its mechanical driving members, particularly as regards the members which move the needle carrier, the shuttle, and the material feeder. A further object of the invention is to obtain an appreciable economy in power and, therefore, a better efficiency than the known sewing machines.

Another object of the invention is to provide a sewing machine in which known driving members effect movement of the needle carrier, the shuttle or the loop-forming means, and the material feeder, the driving force of which members acts mainly in a straight line on the said parts of the sewing machine, any rotating masses being to a large extent avoided.

Preferably such driving members comprise electro-magnets or solenoids, the controlling contacts of which are operated by the upwardly and

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downwardly moving needle carrier, or by a cam contact-making device which is driven by an electric motor of small capacity.

The drive of the upwardly and downwardly moving sewing members of the machine is therefore no longer derived as previously from a rotating movement, but from the start a reciprocating driving movement is provided.

Further details of the invention will appear from the following description of the drawings and the claims.

Various forms of sewing machines constructed in accordance with the invention are illustrated diagrammatically and by way of example in the accompanying drawings, in which:

Figure 1 shows in side elevation the construction of a sewing machine according to the invention;

Figure 2 is a top plan view showing the material feeder and shuttle fitted in the base of the sewing machine frame;

Figure 3 shows another method of driving the shuttle;

Figure 4 shows diagrammatically the arrangement of the sewing members;

Fig. 4*a* is a longitudinal sectional view through the machine;

Fig. 4*b* is a sectional view through the machine base on line 4*b*—4*b* in Fig. 4*a* and illustrating the feeder mechanism;

Fig. 4*c* is a plan view of the machine base with the base plate partly broken off;

Figure 5 is a diagram showing the electrical connections for the sewing members;

Figure 6 illustrates diagrammatically and in section, a contact-making device for the electromagnetic driving means for the needle carrier, the shuttle, and material feeder, and the corresponding driving motor in elevation;

Figure 7 is a plan of the driving motor with an interposed stepless gearing connected to it;

Figure 8 is a diagrammatic plan of the electromagnetic drive for the oscillating shuttle;

Figure 9 is a detail view partly in section and broken away, of the arm which is removable from the casing of the sewing machine and is adjustable in height, and has a circuit-breaking contact;

Figure 10 is a plan of the swingable arm which is fixed to the casing of the sewing machine;

Figures 11 and 12 show diagrammatically and in side elevation detail views of the needle carrier which is fixed to the arm which is not further illustrated and is adjustable as to height

in accordance with Figure 11, is swingable and can be fixed according to Figure 12; and

Figure 13 shows diagrammatically an electrical device of a known kind for damping the movement of the needle carrier.

In all the figures like parts are denoted by like reference numerals.

Referring to the drawings, the machine frame comprises a base 1 and an arm 2 which carries the head 3 for mounting the needle carrier 4 in which the sewing needle 5 is clamped. The needle carrier 4 is constructed at its upper end as a piston 6 which is movable upwards and downwards in a cylinder 7 which is fitted on the head 3. The admission of air to the upper cylinder space 8 can be adjusted by a valve 8. The reference numerals 10 indicates the winding of an electro-magnet which is placed around an iron core 11 of the needle carrier 4. A compression spring 12 is disposed between a collar 13 of the needle carrier 4 and the lower end of the head 3 of the needle carrier. The spring 12 serves to press the needle carrier 4 upwardly into its normal or inoperative position.

The base 1 houses material feeder 14 which advances the material to be sewn in known manner by means of a ribbed plate, and also the shuttle 15 (see Figure 2). As shown in Fig. 4b, the feeding member 14 is supported by a knee lever 14a which is pivotally mounted on the pin 14b. Pin 14b is fixed to a bracket in the housing 1. The feeding member 14 has an arm 14' which projects into a magnet winding 17. A core 16 is provided, which has one leg 16' projecting into the winding 17 and another leg 16'' which has an end portion located opposite the vertical arm 14a' of the knee lever 14a. A spring 14c is secured at one end thereof to the feeding means 14 and at the other end to the housing 1 and urges the feeding member 14 into the initial position shown in Fig. 4b.

When the electromagnet winding 17 is excited, the arm 14a' is attracted by the lower leg portion 16'' of the core 16 whereby the lever 14a is turned until it abuts against the core 16. The horizontal arm of the knee lever 14a raises the feeding member 14 during the turning movement of lever 14a so that the feeder is adapted to engage a material placed on top of the housing 1. At the same time the horizontal projection of the feeding member 14 is attracted by the leg 16' to move into the winding 17 so that the feeding member performs a horizontal movement in forward direction for feeding the material.

When the current passing through winding 17 is interrupted by the contact 17', the knee lever 14a drops into its initial position shown in Fig. 4b due to the action of gravity, while simultaneously the spring 14c retracts the feeding member 14 which is now in its lower position and does not engage the material.

An electro-magnet winding 17 is disposed around an iron core 18 which is fixed to the material feeder 14. A shuttle holder 19 which is pivoted at 18, is likewise provided at each of its ends with iron cores 20, 20' for cooperation with magnet windings 21a and 21b respectively. The numeral 22 represents a flexible lead having a plug by means of which the sewing machine can be connected to a convenient source of electric current for operating the several parts of the machine.

The electrical connections to the machine will be seen from Figures 4 and 5, in which also the

essential parts of the sewing machine are diagrammatically illustrated.

The windings 10, 17, 21a and 21b are provided with corresponding spring contacts 10', 17' and 21'. The numerals 23 and 23' indicate a switch-over device comprising two spring-operated contacts which is connected in the circuit of the magnet windings 21a and 21b.

As can be seen from Fig. 4 the current flows through the windings 21a and 21b in opposite directions and the spring operated contacts 23 and 23' each tend to close the corresponding circuit. The magnet cores 20 and 20' are movably mounted on a pivoted member 19 which also carries the shuttle 15 as can be clearly seen from Fig. 2. If for instance the magnet winding 21b is energized by the closed contact 23' the core 20' is attracted to move into the winding 21b, and in doing so opens the respective contact 23'. This position is illustrated somewhat simplified in Fig. 4 in which the shuttle 15 represents also the members 20 and 20'. When the movable element 19, 20, 20', 15 on its way into the winding 21b has released contact 23, the contact 23 closes and energizes the magnet winding 21a, so that the magnet core 20 may be attracted and again moved into the winding 21a for opening the contact 23.

Figure 4 also illustrates that the arm 2 can be arranged on the case so that it can be swung outwardly by means of a hinge 24, or by means of a similar hinge 25 can be swung sideways out of the plane of the paper, or the arm 2 can be replaced by a longer arm 26, which is shown in dotted lines, and can be fixed by means of bayonet fastening 27. The interchangeability of the arm has the advantage that when working on pieces of material which are not easy to handle, a larger arm can be inserted which enables the material to be introduced more easily.

Figures 9 and 10 show a further form of construction for enabling the arms to be swung laterally. In this case the arm is rotatable in a holder 28 on the machine base and is arranged so that it can be fixed and taken out, for which purpose there is used a spring detent 29 which may be of a known kind (Figure 9).

In cases when the arm is arranged to be swingable or tiltable and/or interchangeable on the machine frame, it is preferred that a spring contact 30 (Figure 4) should be interposed in the electric circuit, so that on tilting, swinging or removing the arm, the circuit is automatically broken and when the arm is returned to its position or replaced, the circuit is again automatically connected.

To the needle carrier is fitted a contact actuator member 31 which causes opening and closing of the contacts 10', 17' and 21' during the upward and downward movement of the needle carrier.

The numeral 32 denotes the main switch for the circuit of the sewing machine (Figure 5). When this switch 32 is closed, the electro-magnets 10, 17, 21a and 21b are energized in coordination with the sequence of working operations, by reason of the control of their contacts, so that the machine which is shown in Figures 4 and 5 operates in the following manner.

When the electro-magnet 10 is energized, the needle carrier 4 is moved downwardly from its upper position. The needle passes through the material being sewn and also passes together with the thread loop through the needle hole 33 in the closure plate 34 of the base 1 of the sew-

ing machine. When the needle reaches its lower dead point, the contact actuator members 31 opens the contact 10' and the flow of current in the coil 10 is interrupted, so that the needle carrier is then moved back into its upper position by the spring 12. Shortly before the needle carrier is reaching the lower end of its stroke, the contact 21' is closed by the contact actuator 31 and the electro-magnet 21a is energized. During the following upward movement of the needle carrier contact 21' is opened again because the pressure of the contact actuator 31 upon contact 21' ceases. The electromagnet winding 21a acts on the core 20' of the shuttle 15 which is moved from its right position into its left position, as can be seen from Figures 2 and 4. In this way the shuttle is shot through the loop of the thread carried by the needle. At the end of this movement the core 20 of the shuttle 15 strikes against the switch-over device 23 and interrupts thus the flow of current for energizing the electro-magnet 21a, while permitting closing of the spring-operated contact 23' permitting the flow of current through electro-magnet 21b. The electro-magnet 21b, however, is not yet energized because the contact 21' has been opened again in the meantime. When the needle carrier has approximately reached its upper dead point, the contact 17' is closed for a short time by the contact actuator 31 and the electro-magnet 17 is energized for a short time whereby the feeder 14 is actuated and consequently advances the material to be sewn. After the material has been advanced the contact 10' is closed by the contact actuator 31 and the magnet coil 10 is energized, whereby the needle carrier 4 is again moved downwardly. During this downward movement the point of the needle again penetrates through the needle hole 33.

Shortly before the needle carrier is reaching the lower end of its stroke the contact 21' is again closed by the contact actuator 31, and now the coil of the electro-magnet 21b is energized by means of the closed switch-over contact 23' which had already been released by the shuttle 15. During the following upward movement of the needle carrier contact 21' is again opened because the pressure of the contact actuator 31 on the contact 21' ceases. By means of the energized electro-magnet 21b the shuttle 15 is drawn to the right side. When the shuttle 15 reaches its end position on the right, it shifts the switch-over contact 23' again so that the flow of current for energizing the electro-magnet 21b is opened by the switchover contact 23' while the circuit for the electro-magnet 21a is closed by the switch-over contact 23 so as to be ready for the next operation. The electro-magnet 21a, however, is not yet energized because in the meantime contact 21' is again opened as illustrated in Fig. 4. Then, on the following movements of the needle carrier, the movements of the feeder 14 and the shuttle 15 are also repeated in time with the actuation of the contacts in the manner described.

The regulation of the speed of the needle carrier 4 is effected by the damping action of the piston 6 in the cylinder 7 and the valve 8. By adjusting the effective cross-sectional area of the air passage of the valve by means of the valve screw 8, the damping of the piston movement is reduced or increased as desired and, therefore, the speed of the needle carrier is increased or reduced. When the valve is fully open the apparatus operates approximately at its own frequency of oscillation as determined by the spring tension, the masses and the electromagnetic force.

An electromagnetic damping device may however be used instead of this mechanically acting damping device for adjusting the speed of the needle carrier. Such a damping device which is known per se is illustrated diagrammatically in Figure 13.

In Figure 13 a copper ring 35 is placed around the iron core 11 of the electromagnet 10, the induced current in the ring 35 being adjustable in known manner by means of a variable resistance 36.

The current induced in the ring 35 produces a magnetic field which is oppositely directed to the magnetic field produced by the winding 10. By means of the resistor 36 the force of the field produced by the ring 35 may be adjusted to the desired value.

In order that the upward and downward movement of the needle carrier may take place with certainty when the stroke is long, it may be advantageous to split up the winding of the coil of the electromagnet 10 of the needle carrier, as is also illustrated in Figure 13, by the conductors 37, 38 and 39 which are connected in succession.

The swingable and/or tiltable and/or releasable arrangement of the arm 2 on the machine frame, which has previously been described in connection with Figures 4 and 9, is a particular advantage of the invention because there are no mechanically moved parts in the arm of the sewing machine, such as are present in the known machines which are operated by foot, hand or an electric motor, and consequently a serious disadvantage of the hitherto known sewing machines is avoided. This disadvantage is that it is very often inconvenient for the user to introduce material between the needle and the base plate, because a large amount of material must often be pushed through the space between the sewing needle and the base plate before the part of the material, which is to be sewn, is located in the correct working position. Owing to the swingable, tiltable or removable arrangement of the arm of the sewing machine, the material can now be brought into the desired working position, whereupon the arm can be swung, tilted or replaced back into the sewing position of the machine.

The omission of any mechanical gear parts for the actual sewing process such as are present in the known machine also enables the sewing machine to be further subdivided in such a manner that it can easily be taken to pieces for transport and the pieces can be fitted in a very small space in a container.

In order to protect the operator from injury from the freely projecting needle when the arm of the machine is tilted upwards or swung aside or removed, the contact device 30 (Figures 4 and 11) is provided. On swinging or tilting upwards or removing the arm, the supply of current to the electro-magnet 10 of the needle carrier is interrupted by the contact device 30, so that the needle carrier is pressed by the spring to its upper dead point.

Instead of a contact actuating device comprising a member fixed to the needle carrier as has been described in connection with the example of Figure 4, a cam may be provided for this purpose. Such an arrangement is illustrated, by

way of example, in Figure 6. The operation of the contacts 10', 17', and 21' (schematically illustrated in Fig. 6), which are actuated by the cam means 50 is to be understood in connection with the diagram shown in Fig. 5.

In this figure, the sewing machine is not illustrated, but 40 represents the base plate of the machine and a small capacity electric motor 41 which is required to deliver scarcely any mechanical power is mounted on the base plate. This motor may however also be arranged to drive a rotating or oscillating shuttle and also it may be employed for winding thread on to the shuttle spools.

The numeral 42 indicates the supply current leads and the numeral 43 a series resistance of known kind by which the speed of rotation of the motor is regulated. A pinion 45 fixed on to the motor shaft 44 engages with a spur-wheel 46, which is fixed on a shaft 48 journalled in casing 47. On the shaft 48 are mounted three cam plates 49 the cam surfaces of which are indicated by the numeral 50. Below these cam plates are the electrical contacts 10', 17' and 21', which are disposed in known manner in an oil bath 51 in order to prevent sparking when the circuit is broken.

The numeral 52 indicates an easily accessible hand wheel which is fixed on the shaft 48 for manual adjustment of the sewing needle when desired. This adjustment can be effected because the power of the motor is so small that it does not constitute any danger to the person making the adjustment.

The speed of the motor 41 is reduced by the reducing gear 45, 46. The series resistance 43 enables the speed of the motor and, therefore, the frequency of the stroke of the needle carrier to be regulated as required.

In the constructional example of Figure 7, the gear 45, 46 of the above described form of construction is replaced by an infinitely variable mechanical gear of known kind. A combination of both kinds of gear can also be employed. The gearing shown in Figure 7 consists of two cones 53 and 54 and a belt 55 which can be moved to and fro in the axial direction by means of a lever or fork 56 whereby the speed is regulated.

By using a contact-making device of the kind illustrated in Figure 6 for the electro-magnetic driving means for moving the needle carrier, the shuttle, or the loop forming means and the material feeder means, a mechanical or electro-magnetic damping device for regulating the speed of the needle carrier can be dispensed with and, further, the sewing speed can be regulated to a sufficient extent by the motor 41 which drives the contact-making means, which was not possible with the hitherto known and usual sewing machine driven by an electric motor.

Further, the stopping position of the driving motor 41, the momentum of which is very small, can be so adjusted that at the end of the sewing process the needle is disposed as desired in either its upper or lower position. For this purpose two pins 72 and 73 are provided on the hand wheel 52 at different distances from the centre of the wheel, and an adjustable stop 74 is provided which can be moved to either of two stopping positions and so into the path of one or the other of the pins 72 and 73. According to the adjustment of the stop, the contact 10' is held either open or closed and, therefore, the needle carrier will be retained in either its upper or lower position. Such locating of the needle carrier cannot be obtained with the known sewing machines having an electric drive.

Since the cams 49, 50 close the contact 10' in one position, and open the contact in a position turned 180°, and these positions correspond to the upper, or lower position of the needle carrier, the needle carrier is stopped in the upper, or in the lower position when the cam 49, 50 which actuates the contact 10' is arrested in one of two predetermined positions which are spaced for 180°. The adjustable stop 74 arrests pin 72 in one position, and if moved in a radial direction, arrests stop 73 in the other position of the wheel 52, shaft 48 and cam 49, 50. The second cam 49, 50 operates the contact 21', and the arrangement of the cams is such that during a rotation of the shaft 48 by the auxiliary electric motor 41 the contacts 10', 17' and 21' are opened and closed in the order required for the operation of the sewing machine. The cycle of actuation of these contacts has been described and explained referring to the contact actuating member 31.

When using an oscillating shuttle it is recommended that a driving means which is shown in Figure 8, by way of example, should be used. In this figure the numeral 57 denotes an oscillating shuttle or shuttle carrier having a pinion 58 which engages with a toothed wheel 60 which is rotatably mounted at 59. A rod 62 is fixed to the iron core 61 of an electro-magnet 21 and engages the toothed wheel at 63. The numeral 64 represents a tension spring one end of which is fixed to the sewing machine frame 65 and the other end is attached at 66 to the toothed wheel 60. Thus, in accordance with the impulses which the electromagnet receives during the course of the operating rhythm of the sewing machine, the shuttle 57 swings to and fro. When the winding of the electro-magnet 21 is energized by the contacts previously described, the iron core 61 is drawn into the winding and turns in a certain degree the gear 60 by means of the rod 62 engaging the point 63 of the gear 60. This partial turn is transmitted to the oscillating shuttle by the gear 60 and 58 having a suitable ratio of transmission.

When the energizing of the coil of the electromagnet 21 ceases by means of the action of the contacts previously described, the tension spring 64 engaging the gear 60 at point 66 causes a partial turn in the opposite direction of the gear 60. This partial turn is again transmitted to the shuttle 57 by means of the gear 60 and 58. In this way the oscillating movement of the shuttle 57 is caused.

In Figure 2 the disposition of the motor 41 and the contact-making device is diagrammatically indicated. In Figure 3 the drive of a rotary shuttle 70 of a kind known per se, by means of a simple bevel gear 71 from the motor 41 is diagrammatically illustrated.

Since, as previously described, the arm of the sewing machine is free from any rotary driving members, the parts of which are in the mechanical engagement with one another, it is directly possible, and in many cases desirable, to arrange for the head 3 of the needle carrier (see Figure 11) to be adjustable in height on the arm of the sewing machine, so that it can be adjusted upwardly or downwardly in the direction of the arrow indicated.

In the form of construction illustrated in Figure 12, the head 3 of the needle carrier is pivotally mounted so that it can be swung out in the

direction indicated by the arrow and can be fixed in that position indicated in broken lines, for example, by a locking screw.

I claim:

1. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

2. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; spring means arranged in said sewing head tending to retract said needle carrier; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; adjustable damping means secured to said sewing head and connected with said needle carrier for regulating the speed of the movement of said needle carrier; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

3. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; spring means arranged in said sewing head tending to retract said needle carrier; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means for actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed, said actuating means including electric motor means mounted in said supporting frame, cam means rotated by said electric motor means and engaging during rotation said contact means in a predetermined order, and adjustable transmission means intermediate of said electric motor means and said cam means.

4. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; adjustable clamping means including a cylinder fixedly mounted on said sewing head, a piston fixedly mounted on said needle carrier and movable in said cylinder, and an adjustable valve in said cylinder for regulating passage of air; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and

one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

5. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; adjustable damping means including electric coil means secured to said sewing head, oppositely wound and adapted to counteract the action of said winding of said first electro-magnet means, and a variable electric resistance in series with said coil means for regulating the current flowing through said coil means; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

6. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding comprising at least two coils; a first contact means arranged in series with said coils of said first electro-magnet means and adapted to energize said two coils of said first electro-magnet means, successively; adjustable damping means including cooperating cylinder and piston members, one of said last mentioned members being fixedly secured to said sewing head and the other of said members being fixedly secured to said needle carrier and an adjustable valve on said one member for regulating passage of air; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

7. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; an arm member mounted on said supporting frame and extending substantially parallel to said horizontal base; a sewing head mounted on the end of said arm member; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; adjustable damping means including cooperating cylinder piston members, one of said last mentioned members being fixedly secured to said swing head and the other of said members being fixedly secured to said needle carrier and an adjustable valve on said one member for regulating passage of air; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said windings of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

8. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; projecting means formed with bore means projecting from said supporting frame; a detachable bolt means passing through said bore means; a detachable arm member mounted on said supporting frame and having projecting means formed with bore aligned with said bore means, said bolt means passing also through said bores so that said arm member is to be interchanged with other arm members, and extends

substantially parallel to said horizontal base; a sewing head mounted on the end of said arm member; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; adjustable damping means including cooperating cylinder and piston members, one of said last mentioned members being fixedly secured to said sewing head and the other of said members being fixedly secured to said needle carrier and an adjustable valve on said one member for regulating passage of air; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

9. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; an arm member pivotally mounted on said supporting frame extending substantially parallel to said horizontal base in operative position, and adapted to be pivoted to an inoperative position; a sewing head mounted on the end of said arm member; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first electro-magnet means; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

10. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; spring means arranged in said sewing head tending to retract said needle carrier; first electro-magnet means for driving said needle carrier and including a stationary member secured to said sewing head and a movable member secured to said needle carrier, one of said members being a winding; first contact means arranged in series with said winding of said first eelctro-magnet means; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means for driving said feeding member and including a stationary member secured to said base and a movable member secured to said feeding member, one of said members being a winding; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means and including at least one stationary member secured to said base and one movable member secured to said shuttle means, one of said members being a winding; third contact means arranged in series with said winding of said third electro-magnet means; actuating means for actuation of said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed, said actuating means including electric motor means mounted in said supporting frame, a shaft, cam means fixedly secured on said shaft and engaging during rotation said contact means in a predetermined order, and adjustable transmission means intermediate of said electric motor means and said shaft for rotating said cam means; a wheel fixedly mounted on said shaft of said cam means and provided with two projections arranged in a predetermined position thereon; and manually operated stop means movable between two positions and in each position engaging one of said projections so as to stop said cam means by means of one of said two projections in one of two positions, one position corresponding to open first contact means and the other to closed first contact means, whereby said needle carrier is stopped in an upper end position when said stop means engage one of said projections, and in a lower end position when said stop means engage the other of said projections.

11. In a sewing machine, in combination, a supporting frame including a substantially horizontal base; a sewing head mounted on said supporting frame; a needle carrier vertically movably mounted in said sewing head; first electro-magnet means including a winding secured to said sewing head and a core secured to said needle carrier for driving said needle carrier; first contact means arranged in series with said winding of said first electro-magnet means; adjustable damping means including cooperating cylinder and piston members, one of said last mentioned members being fixedly secured to said sewing head and the other of said members being

fixedly secured to said needle carrier, and an adjustable valve on said one member for regulating passage of air; a feeding member movably mounted in said base underneath said sewing head; second electro-magnet means including a winding secured to said base, and a core secured to said feeding member for driving said feeding member; second contact means arranged in series with said winding of said second electro-magnet means; shuttle means movably mounted underneath said horizontal base; third electro-magnet means for driving said shuttle means including two cores secured to said shuttle means and a winding including two coils, one of said two coils when energized attracting one core of said shuttle means and tending to move said shuttle means in one direction, and the other of said two coils when energized attracting the other core of said shuttle means and tending to move said shuttle means in an opposite direction; third contact means arranged in series with said winding of said third electro-magnet means; a switch-over device including two spring operated contacts actuated by said cores secured to said shuttle means, each of said spring operated contacts being arranged in series with said winding of one of said two coils of said third electro-magnet means in series with said third contact means for energizing each of said two coils separately; and actuating means secured to said needle carrier and during movement of the same engaging and actuating said contact means in a predetermined order so that said needle carrier, said feeding member, and said shuttle means are operated in a predetermined sequence whenever corresponding contact means are closed.

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