SEWING MACHINE DRIVING ARRANGEMENTS

Fig 8
Fig. 10

Fig. 14

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Fig. 21

Fig. 22

Fig. 23
Fig. 33

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The present invention relates to driving arrangements. More specifically the invention relates to driving arrangements of the clutch-and-brake type such as for instance used in sewing machines of the manufacturing type without, of course, being confined to sewing machines.

This is a continuation-in-part application of my application Serial No. 277,896, filed March 21, 1952, now abandoned, based on application in Denmark filed March 30, 1951, under Serial No. 974/51.

In sewing machines for private or domestic use the velocity of the machine does not play an important role. In the use of sewing machines for the ready made clothing industry it is necessary, however, to run the machine at a high speed and this high speed must be obtained instantaneously with the start of the machine. Therefore, in such sewing machines the driving spindle runs continuously and a clutch mechanism is used for coupling the sewing mechanism to the continuously rotating driving spindle. Thus, the sewing machine will run at full speed immediately after shifting of the clutch to the driving position.

In order to stop the sewing machine as instantaneously as it is started, the clutch is arranged to be shifted to engage a brake member. The machine will therefore also stop substantially instantaneously.

It is, however, incidental what the position of the movable parts of the sewing machine will be when it is stopped. This is a disadvantage because in some cases in order to turn the work about the needle, the latter must be in its down position, whereas the machine is stopped, while in other cases the needle must be in its raised position, as, for example, in order to remove the work from the machine.

The usual way of correcting for the wrong position of the needle when the machine is stopped is to rotate the balance wheel of the machine by hand. Such a manual correction is, however, irrational and time wasting. It requires the operator to remove one hand from the work to manipulate the balance wheel. A time analysis will show that the waste of time due to such manual needle adjustment may run up to approximately 25 percent or more of the total working time.

It is therefore an object of the present invention to provide a driving arrangement of the clutch-and-brake type, which will enable the operator to have full control of the driven machine, such as a sewing machine, coupled with possibility of selectively stopping the latter when the movable parts thereof are in the predetermined desired position.

It is a further object of the invention to provide a clutch-and-brake driving arrangement which enables a further movement of the driven machine after having shifted the clutch and spindle to the driving position.

It is still a further object of the invention to provide a driving arrangement of the type specified which will enable the driving arrangement to be automatically stopped when the movable part of the machine such as, for instance, the stitch forming mechanism of a sewing machine, is in at least one predetermined position. A further object is to provide a driving arrangement of this kind in which the machine can be selectively stopped with the movable parts in one of a plurality of predetermined positions selected in advance by the operator.

The invention further aims to provide simple and reliable arrangements and operating devices to fulfill the purposes specified hereinabove and other purposes which will appear from the following detailed description thereof.

The term "sewing machine" as used in the following specification is to be interpreted in its broadest sense so as to include not only ordinary sewing machines having a reciprocating needle, for instance, upwardly and downwardly moving needle, but any kind of sewing machines designed for special purposes such as, for example, a padding machine.

In order that the invention may be more clearly understood, some preferred embodiments thereof will now be described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a sewing machine having a motor arrangement according to one embodiment of the invention.

FIG. 2 is an axial section, on enlarged scale, through the motor and the clutch-and-brake arrangement.

FIG. 3 is a schematic diagram showing the motor arrangement in connection with an automatic control for stopping the sewing machine with the needle in a predetermined position.

FIG. 4 is a detail of the arrangement shown in FIG. 3.

FIG. 5 is an arrangement like that shown in FIG. 3 with a half automatic control for stopping the sewing machine with its movable parts in two different predetermined positions.

FIG. 6 is a schematic diagram showing the circuits in an embodiment where the auxiliary drive is reversible.

FIG. 7 is an embodiment of a treadle designed for operating the machine.

FIG. 8 is a modified embodiment of an arrangement corresponding to that shown in FIG. 5.

FIG. 9 is an embodiment of the auxiliary drive having a mechanical transmission.

FIG. 10 is a modification of the arrangement shown in FIG. 3.

FIG. 11 is a modification of the treadle arrangement shown in FIG. 7.

FIG. 12 is a modification of the arrangement shown in FIG. 5.

FIG. 13 is a modification of the arrangement shown in FIG. 11.

FIG. 14 is a modification of the treadle arrangement shown in FIG. 11.

FIG. 15 is an arrangement similar to that shown in FIG. 13 with a treadle arrangement as shown in FIG. 14.

FIG. 16 is another embodiment of a switch arrangement comprising mercury switch tubes.

FIG. 17 is a cross section of the embodiment shown in FIG. 16.

FIG. 18 is a plan view of a switch arrangement comprising a switch as shown in FIG. 16.

FIG. 19 is an end view of the arrangement shown in FIG. 18.

FIG. 20 is a diagram showing an arrangement comprising a switch as shown in FIG. 16.

FIG. 21a through e are diagrammatical views of the mercury switch tubes shown in the arrangements of FIG. 20 to illustrate the operation of this arrangement with one angle between the two mercury tubes.

FIG. 22a through e are diagrammatical views of the mercury switch tubes shown in the arrangements of FIG. 20 to illustrate the operation of this arrangement with another angle between the two mercury tubes.

FIG. 23a through e are diagrammatical views of the mercury switch tubes shown in the arrangements of
FIG. 20 to illustrate the operation of this arrangement with a third angle between the two mercury tubes, FIG. 24 is a modification of the arrangement shown in FIG. 20, in which the machine is able to stop in one or two alternative positions.

FIG. 25 is a further modification of the arrangement shown in FIG. 21 in which the machine is also able to be reversed.

FIG. 26 is a further modification of the treadle arrangement shown in FIGS. 7 and 11, and FIG. 27 is a perspective view similar to the view of FIG. 9 showing a modified embodiment of the auxiliary drive.

FIG. 28 is a longitudinal section through the embodiment shown in FIG. 27.

FIG. 29 is a cross-sectional view taken along line 29—29 in FIG. 28.

FIG. 30 is an enlarged cross-sectional view through the lower part of the cross section of FIG. 29.

FIG. 31 is a perspective view of the auxiliary clutch members used in the embodiment of FIGS. 27 through 30 with the parts drawn out to show details of the construction.

FIG. 32 is a simplified diagram of a circuit arrangement incorporating the mechanical structure of FIGS. 27 through 30, and

FIG. 33 is a schematic diagram illustrating the manner of which the different parts of the diagram in FIG. 32 are composed from various units which are plugged in to form an operating unit in accordance with the invention.

Though, in the following description, the invention will be explained specifically with reference to a sewing machine it will be understood that the invention is not limited hereto. As explained the problem of obtaining an instantaneous start and stop of the machine is an important problem in connection with sewing machines for the ready made cloth industry, but it will be understood that the invention may be used also in connection with other machines in which the same problem is present.

It will further be understood that though the invention, in the following description, is explained in connection with sewing machines having a single driving unit, viz. a machine having a separate driving motor, this is not essential to the invention. The coupling arrangement may equally well be used in connection with machines which are driven from a common driving motor feeding a plurality of machines. The term driving motor when used in the following description should therefore be interpreted in its broadest sense so as to include any sort of power drive comprising a rotatable driving spindle.

In FIG. 1, reference numeral 10 designates a table for a sewing machine 12 having a driving wheel or balance wheel 14. The table is supported by frames or the like 16 and 18 which at their lower ends are connected by means of a cross bar 20. The sewing machine is driven from a motor 26 suspended beneath the table 10. The driving means is a driving cord or belt 22 driven by a pulley 60 on the motor. The coupling between the motor 26 and the pulley 60 is controlled by means of the treadle or pedal 148, which by means of a pull-rod or the like 146 is connected with a pivoted member 66 by means of which clutch element 62 (FIG. 2) located within the motor housing is shiftable between two positions.

By means of a further treadle or pedal 152 which is connected through a pull-rod or the like 150 with a switch arm 151 extending from the housing 149 containing a switch, the operator can, after having decoupled the motor by means of the treadle 148, as will be more fully explained below, control the further movement of the sewing machine in such a manner that the machine can be stopped with the needle in a predetermined desired position.

The motor, which is shown in greater detail in FIG. 2, may be of any suitable construction having a stationary part 27 and a rotor 29. The rotor 29 is arranged on a spindle 38 supported in bearings 36 and 37 respectively. The right hand bearing 36 is arranged in an interior partition 35 and the left hand bearing 37 is arranged in an end cover plate 33. Another cover plate 34 is arranged at the opposite end of the motor 26 within which the clutch mechanism is supported. The right hand end of the driving spindle 38 carries a flywheel 40 having in its surface remote from the cover plate 33 a driving clutch element in the form of an annular groove 42 in which is arranged an annular ring or disc 44 of a suitable frictional material such as fibre.

The end cover plate 34 is provided with a centrally disposed, inwardly extending tubular member 48 which forms a guide or housing for a tubular bushing 50. The tubular bushing 52 is provided in its interior adjacent the ends thereof provided with bearings 52 and 54 supporting a rotatable driven spindle 56.

The cover 34 is recessed at 58 for accommodating a small auxiliary motor 59 (FIG. 1). This auxiliary motor 59 is secured in any convenient manner (not shown) to the main motor in the recess 58.

The spindle 56 extends outwardly beyond the right hand end of the bushing 50 and is provided with a pulley 60. The left hand end of the spindle 56 extends into the motor housing 26 and is provided thereon with a clutch element 62 in the form of a suitably shaped clutch disc (FIG. 2). The right hand end of the bushing 50 also extends beyond the cover plate 34 and is provided therein with an arm or lever 64. This arm 64 may either be an integral part of the member 66 (FIG. 1) or, alternatively, the connecting rod 146 between the treadle 148 and the motor may be connected directly to the end of the arm 64.

In the bushing 50 there is provided a helical groove 70 cooperable with the end of a pin 72. This pin 72 is arranged in a bore 73 provided in the end cover 34 and is secured in any convenient manner, for instance, by means of a set screw 75 extending into an annular groove 77 in the pin 72.

An annular member 76 is rotatably mounted on the exterior cylindrical surface of the tubular member or housing 48. This member 76 is prevented from being axially displaced at its right hand side by a shoulder 79 of the housing 48 and at its left hand side by a ring 81 received in an annular groove in the housing 48 and retained therein, for instance, by resilient action. The annular member 76 is provided with a fanage 82 having in its left hand surface an annular groove 86 in which is arranged an annular ring or disc 88 of a suitable frictional material such as fibre. Preferably the ring 88 is of the same diameter as the ring 44 in the flywheel 40. The clutch disc 62 is provided with annular ribs 74 and 90 respectively to engage either of the two rings 44 and 88. The annular member 76 is further provided at its circumference with a worm gear 92 meshing with a worm 94 the shaft 96 of which (FIG. 1) extends outside the housing and is provided at the extension thereof with a pulley 98, which is connected by means of a driving belt 99 with a similar pulley 101 on the spindle of the auxiliary motor 58. It will be understood that instead of arranging the auxiliary motor 59 and the worm 94 on opposite sides of the main driving motor the auxiliary motor 59 may as an alternative, be directly connected with the two positions of the coupling.

The circuit of the auxiliary motor 59 can be closed or opened by means of the switch 149 controlled by the treadle 152 (FIG. 1).

The operation of the arrangement so far described is as follows:

The main motor 27, 29 is maintained in continuous rotation. By operating the treadle 148 the arm 64 is swung by means of the pull-rod 146. This will rotate the bushing 50 and due to the engagement between the pin 72 and the helical groove 70 in the bushing 50 the rotation of the bushing 50 will be translated into simul-
The spindle 56 will participate in this axial displacement and the clutch disc 62 will thereby be shifted between the two extreme positions. In its extreme left hand position the clutch disc 62 is in frictional engagement with the friction ring 44 on the flywheel 40, which will couple the driven spindle 56 directly to the motor spindle 38. The sewing machine will thereby be started instantaneously. In its extreme right hand position the clutch disc 62 will be in frictional engagement with the ring 88 on the brake member 76. This will result in an instantaneous stopping of the sewing machine. If the position of the movable parts, primarily the cam member 216, the sewing machine is then stopped instantly, is not in the desired position, a correction or adjustment can be made by means of the auxiliary motor 59. This motor 59, as shown in FIG. 1, may be started at will by operating the trestle 152 and thereby operating the switch 149 in the auxiliary motor circuit. The auxiliary motor 59 when started will, via the belt 99, drive the worm shaft 96 which in turn will rotate the worm wheel or brake member 76 and will thereby, at a relatively slow speed, rotate the clutch element 62 which is in frictional engagement with the worm wheel or brake member 76. Thus a relatively slow movement will be imparted to the sewing machine. The speed is so adapted that the operator is able to stop the machine by operating the trestle 152 when the needle is in the desired position by breaking the circuit of the auxiliary motor 59.

Instead of the above described method of control of the selective closing and breaking of the circuit of the auxiliary motor 59, the invention can be modified to provide an automatic control by means of which the sewing machine can be automatically stopped with the needle in one or more predetermined positions, for instance, in the top position or in the down position thereof.

One embodiment in which the needle is automatically stopped in a predetermined position is shown in FIGS. 3 and 4. In FIG. 3 a three-phase main motor having feed leads A, B and C is shown. The auxiliary motor 59 may, for instance, in a manner which will be more fully described with reference to FIG. 6, be inductively supplied from the stator of the main motor 26. It will be understood that by feeding the auxiliary motor 59 inductively from the stator of the main motor 26 it is possible to feed the auxiliary motor 59 with low tension so as to use more simple switches in the circuit of the auxiliary motor and avoid any danger. The supply leads of the auxiliary motor 59 are designated a, b and c. The breaking of the auxiliary circuit for the auxiliary motor 59 is effected in two or the phases, for example, in phases b and c by means of switches of which, in order to simplify the drawing, only one switch 202 arranged in the phase b, is shown. This switch consists of a fixed contact spring 204 and a movable contact spring 206, the latter being carried by a pivoted arm 208. The contacts are arranged in a housing, shown schematically only, in which the contact spring 204 is firmly secured, for instance, on a support 205. The arm 208 is pivoted in a bracket 212 in the housing 210. The arm 208 projects through an aperture in the housing 210 and the end 209 of the arm 208 extends in the path of a cam member 216 which may be arranged within the periphery of the flywheel 218 of the sewing machine. This cam member 216 will constitute means for operating, for example, opening the switch during a certain part of its path, namely, in a certain position of the actuating mechanism of the machine.

To prevent the said cam member 216 from engaging the end 209 of the arm 208 during each revolution of the flywheel 218, which would give rise to a noise during the operation of the machine, the cam member 216, as shown in FIG. 4 may be pivoted on a pin 220 and be influenced by a spring 222, which is usually held in the cam member 216 against a stop 224. By and c are arranged in the cam member 216 a suitable weight it will be possible by means of the centrifugal force to keep the cam member 216 in the position shown in dotted lines during the normal full-speed operation of the sewing machine. In this position the cam member 216 will no longer be in the path of the end 209 of the arm 208.

The arrangement shown in FIG. 2 operates in the following manner:

The auxiliary motor 59 will be running continuously during the operation of the main motor 26, the motor circuit being closed through the switch 202. When the main motor 26 is decoupled and the clutch member 62 is brought, by means of the trestle 148, into engagement with the brake disc 76, the sewing machine is then driven by means of the auxiliary motor 59 but at a relatively slow speed. At this stage the spring 222 will press the cam member 216 inwardly into engagement with the stop 224, and in this position the cam member 216 will cooperate with the end 209 of the arm 208 and thereby raise this arm to open the switch 202 to break the driving circuit for the auxiliary motor 59. The position of the cam member 216 in the wheel 218 is such that the breaking of the circuit takes place with the needle of the sewing machine in a predetermined position, for example, in the high position.

It will also be possible to arrange the circuit in such a manner that the needle of the sewing machine can be stopped automatically at will both in the high position or in the down position. An arrangement for this purpose is shown in FIG. 5 in which a four line double pole switch generally referred to as U is inserted in the two phase leads b and c. The switch U may be operated, directly or indirectly as indicated, by the trestle arrangement of the machine or by a manually operated device. At the right hand side of this switch the phase leads are divided, each phase lead being divided from the double poles of the switch U and designated c, c', b, b' etc. The leads c and b' are connected as the switches in FIG. 3, to a switch 202a, 202b operable by a cam member 216 like the corresponding cam member in FIG. 3.

The leads c" and b'" are connected in a similar manner to a similar switch 202a', 202b', which is also arranged to be operated by the member 216, but located diametrically opposite the switch 202a, 202b. It will be understood that the switch U constitutes means for selecting 202a', 202b' or 202a", 202b" of the other two switches which will break the auxiliary motor circuit.

In this embodiment the switches are of the type used in telephone or like installations. One of the contact springs, in the embodiment illustrated, the top spring of switch 202a and the bottom spring in the switch 202b' are provided with extensions 209 and 209' respectively. The switches are constructed in such a manner that lifting of these extensions 209' and 209' of the springs will not only lead to the opening of either of the two switch portions 202a' and 202b', but will also effect a simultaneous closing of the other switch portions 202b' or 202a'.

It will be understood from FIG. 5 that in the top or raised position of the switch U as illustrated the lower double switch 202a, 202b is inserted in the feed circuit of the auxiliary motor 59 so as to enable the sewing machine to be automatically stopped with the needle in the lower position, for example, by shifting or changing the switch U over, the top switch 202a, 202b is substituted in the auxiliary motor circuit for the previously mentioned switch 202a', 202b' so as to enable the sewing machine to be automatically stopped with the needle in the opposite position.

In FIG. 6 is shown a diagram of an alternative arrangement, which may be either automatically or manually operated. As in FIGS. 3 and 5 the supply leads for the main motor are designated by A, B and C. The motor is a three-phase motor having stator coils A1, B1 and C1. Further coils A2, B2 and C2 are inductively coupled to the main motor stator coils so as to inductively feed the auxiliary motor through supply leads a, b and c. The
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stator of the auxiliary motor is designed by a', b' and c'. Preferably the voltage for the auxiliary motor is transformed down to a low voltage, for instance, 24 volts.

In the phase leads a and c a double pole reversing switch O is inserted having three positions. The intermediate position of the switch corresponds to breaking the two phase leads and thereby breaking the auxiliary motor supply circuit to stop the auxiliary motor. The two end positions of the switch O correspond to direct or reversed connection of the two phase leads a and c to enable the auxiliary motor either to run forwardly or to be reversed.

With the arrangement shown in FIG. 5 as well as with that shown schematically in FIG. 6 a treadle arrangement similar to that shown in FIG. 7 might be used.

In this treadle arrangement the main operating treadle similar to treadle 148 is combined with the corresponding switch operating treadle 152. More specifically the switch operating treadle of FIG. 7 is split up into two parts each of which is arranged like a subsidiary treadle on the main operating treadle and each is adapted to switch on or off that part of the auxiliary motor circuit which will either stop the machine with the needle in one or the other predetermined position or reverse the motor, eventually with a subsequent stop in a predetermined position.

The main operating treadle, which by way of example is shown in the form of a rectangular frame, is designated by reference numeral 300. This frame 300 is pivoted on a spindle 302 carried by bearings in brackets 304 and 306 secured to the lower cross bar 20 (FIG. 1) of the sewing machine rack. This treadle is connected in any convenient manner with the pull-rods or chain 146 leading to the main motor operating arm 64. It will be understood that by rocking this main treadle the main motor is stopped and started in the same manner as by means of the single treadle 148 in the various embodiments shown herein.

Individual treadle plates P5 and P6 are provided on frame 300 which are individually pivotally mounted on a common shaft 308 extending within the frame 300 and supporting the side walls thereof.

A spindle 310 is arranged between the two treadle plates P5 and P6, which extends through the end walls of the frame 300 and is rotatably arranged in bearings therein.

On one end of this spindle 310 there is arranged a two armed lever 312 having upwardly bent ends 312a and 312b and adapted to be engaged by one of the two ends of the treadle plates P5 and P6, with the ends extending above that end wall of the frame 300 in which the lever 312 is carried.

At the other end of the spindle 310 there is secured a laterally extending arm 314 adapted to operate a two position switch used in the auxiliary motor circuit, viz. either the switch O in FIG. 6 or the switch U in FIG. 5.

In the arrangement shown in FIG. 7 the switch is arranged on a bracket 316 extending from the rear end of the frame 300. The switch operating arm is provided with a bifurcated portion 318 in which the arm 314 is received.

The switch is not shown in details and may be of any convenient construction, preferably of the type comprising a tiltably arranged mercury switch tube. Switches of this kind are, however, commonly known and the proper type of switch can readily be selected by those skilled in the art.

The arrangement shown and described with reference to FIG. 7 operates in the following manner.

By way of example with reference to FIG. 5 it is assumed that the sewing machine should be automatically stopped with the needle in its top position. The switch shown in FIG. 7 corresponds to the stop-in-top position.

The operator will then operate the main treadle by means of the right foot pressing on the right treadle plate P6. This will keep the switch U in the proper position so that when the main treadle 300 is tilted about its spindle 302 to stop the main motor 26, the auxiliary motor 59 will remain energized until it is stopped with the needle in the top position.

Correspondingly, if the needle has to be stopped in its lower position the operator will use the left treadle plate P5. By operating the main treadle by means of this treadle plate P5, it will tilt the lever 312 and thereby change over the switch U so as to result in stopping the sewing machine with the needle in the lower position.

Correspondingly if in the reverse case the reverse motion of the sewing machine is wanted after decoupling or disconnection of the main motor 26, the treadle arrangement may be included in the arrangement shown in FIG. 6 so that by operating either of the two extra treadles the auxiliary motor will drive the sewing machine in the normal direction or in the reverse direction.

Also a slow continuous motion of the sewing machine can be obtained by the treadle arrangement shown in FIG. 7.

When the treadle is used, for instance, in the arrangement of FIG. 5 it will be understood that after having decoupled or disconnected the main motor 26, an alternative operation of the two treadle plates P5 and P6 in the way like cycling will result in a slow movement of the sewing machine with stoppage thereof in either top or bottom position of the needle depending on which of the two extra treadles has been last depressed, because each of the two treadle plates will constitute means for selecting that portion of the auxiliary motor circuit which will effect driving the machine half a revolution.

Instead of using a centrifugally operated cam, as shown in FIGS. 3 and 5, to control the breaking of the electric circuit for the auxiliary motor 59, the arrangement may be that shown schematically in FIG. 8 in which the same parts as in FIGS. 3 and 5 are referred to by the same reference numerals.

In FIG. 8 there is provided on the spindle of the sewing machine flywheel 218 a member, which in FIG. 8 is shown as a cylinder, but which within the scope of the invention might be a plane disc. On this member 218 there are provided two contact strips 230 and 232 respectively. These strips are interrupted at 231 and 233 respectively along part of the cylinder surface so as to provide insulating portions between the ends of the contact strips. The leads c' and b' are connected by means of contact brushes to the contact strips at one point of the drum surface and leads c" and b" are in a similar manner connected to the strips at a point diametrically opposite.

In operation it will be understood that in one position of the switch U the phases will be broken in the position of the parts of the sewing machine in which the insulated segments 231 and 233 will be in alignment with the contact brushes connected to the leads c' and b', corresponding to stopping the sewing machine, for instance, with the needle in high position, while the sewing machine will be stopped with the needle in the lowest position by changing over the switch U.

While in the foregoing embodiments of the auxiliary motor in the form of an electric motor has been described, it will be understood that mechanical driving means may be substituted such as will now be described with reference to FIG. 9.

In FIG. 9 there is a plate 100 situated adjacent the end cover 28 of the motor 26. The end of the motor spindle extending through this cover is provided with a conical head 30. At each end of the plate 100 there are provided brackets 102 and 104 respectively in which is supported a spindle 106, which is both axially displaceable and rotatable in bearings in the two brackets. On this spindle there are provided at each end a conical head 30 coned 108 and 110 respectively. The spindle 106 is extended beyond the bracket 104 and carries thereat a pulley 112 which by means of a belt
114 is connected with a pulley 98 mounted on the lower end of the spindle 96. Pivoted on pin 116 on the plate 100 is one arm 118 of a bow 120 the other right arm 122 of which is pivotally supported on the other end cover of the motor in any appropriate manner (not shown). The left hand arm 118 of the bow 120 has a projection 124 carrying at its end a roller or the like 126 engaged between a shoulder 128 and a ring 130 on the spindle 106. The motor is carried by a base plate 132 by means of which it is secured under the sewing machine table. Springs 134 and 136 are provided between this base plate 132 and the plate 110. These springs will tend resiliently to draw both bows 66 and 120 in an upward direction. Furthermore, in a bracket 138 on the plate 100 is a spring 140 acting on a longitudinally displaceable rod 142 and lower end of which is connected with arm 118 by means of a bracket 144 secured to the latter.

The bow 120 is intended to be connected with the treadle 152 of FIG. 1. In this embodiment of FIG. 9 only a selective operation of the auxiliary driving mechanism at the operator's will is possible. The operation is as follows:

If the sewing machine has been stopped with the needle in an unwanted position the operator will use the treadle 152. By operating this treadle, which is connected to lower the bow 120, the roller 126 is raised with the result that the spindle 106 is displaced axially upward. Thus the cone 110 is brought into operative driving connection with the cone 30. The latter being secured to the shaft 38 which is in continuous rotation will impart rotation to the spindle 106, which rotation is transmitted through belt 114 and spindle 96 to the worm such as 94 (FIGS. 2 and 3), and, in the manner already described in connection with the previous embodiments, will drive the sewing machine. The transmission ratio is so adapted that the speed of the sewing machine when driven by the auxiliary drive is so slow that the machine can be stopped with the needle in the desired position.

By operating the treadle 152 to raise the bow 120 the cone 108, in a corresponding manner, will be brought into driving connection with the cone 30, which will produce a slow motion of the sewing machine in the other direction.

It will be understood that the spring 140 in connection with a stop on the rod 142 serves the purpose in the position of rest to keep the bow 120 in such a position that the rotation of both cones 108 or 110 will be in operative connection with the cone 30.

Instead of the automatic control for the switches in the auxiliary motor circuit as shown in FIGURES 3, 5 and 8 a modification may be used as indicated in FIG. 10. Only the sewing machine is shown in FIG. 10, the circuit being omitted. It will be understood, however, that the arrangement of FIG. 10 can be used as well in connection with the circuit of FIG. 3 as in connection with that of FIG. 5, and also in connection with any of the circuits to be described hereafter in connection with FIGS. 12, 13 and 15.

In FIG. 3, only one contact 202 is shown having contact springs 204 and 206 as in FIG. 3. One end of the contact 204 is extended outside the housing 210 and is provided thereat with a magnetic armature 330. On the sewing machine flywheel 218 there is provided a small permanent magnet 332 in such(5,9),(993,991)
within the scope of the invention may be magnetic as shown in FIG. 10 or communicator-type contacts as shown in FIG. 8, opens the switch $m_1$ this will not stop the auxiliary motor $M_9$, because the switch $m_1$ is short circuiting the contacts $274_a$-$274_b$. When, however, after a predetermined rotation of flywheel 218 the switch operating member 216 opens the switch $m_2$ this will break the relay circuit with the result that the relay contacts $a_{1-3}$ will open the motor circuit for the auxiliary motor $M_9$, stopping the latter with the needle in the selected position, the bottom position.

Conversely, when the left hand treadle plate $P_r$ is depressed, the contacts $274_d$-$274_e$ will short circuit the switch $m_2$, opening the contacts $274_{d-1}$. This means that opening of the switch $m_2$ by the switch operating member 216 will have no influence on opening of the auxiliary motor circuit. The relay AR will, however, drop out when the switch $m_1$ is opened by the switch operating member 216 corresponding to a stop of the sewing machine with the needle in the other position, for instance, the top position.

As further shown in FIG. 11 there may be a switch 276 incorporated in the treadle and having an operating pin 278 extending into a bifurcated portion of the left hand lever arm 268 so as to throw over the switch 276 by pressing the left hand treadle plate $P_r$. A treadle arrangement as shown in FIG. 11 and incorporating such a switch may be incorporated in the circuit arrangement shown in FIG. 13.

This arrangement corresponds to that shown in FIG. 12 with the exception that the switch 276 is inserted in the two phase leads $b$ and $c$ at KR and is operable in such a manner that these two phase leads are directly connected with the right hand treadle plate $P_r$ in the bottom position, while the two phase leads are cross-connected when the left hand treadle plate $P_r$ is in the bottom position. If it is assumed that operation of the treadle by means of the right hand plate $P_r$ corresponds to stoppage of the sewing machine with the needle in bottom position, while operation of the treadle with the left hand plate $P_r$ corresponds to stopping the sewing machine with the needle in the top position, it will be understood that the sewing machine by the arrangement shown in FIG. 13 can be operated in the following manner:

This will as in the case of FIG. 12 stop the machine when the switch $m_3$ is opened corresponding to the needle in bottom position. Hereafter the left hand treadle plate $P_r$ is operated. This will close the auxiliary motor circuit through the relay AR, and now the contacts $274_a$ are interconnected, thereby short-circuiting the open switch $m_2$. Simultaneously therewith, however, the switch 276 will be operated crossing the phase leads. This means that the auxiliary motor $M_9$ will be started again but in reverse direction, will thereafter make half a revolution until the switch $m_1$ is opened, and be stopped with the needle in the top position. This arrangement is useful, for instance, when locking a certain stitch chain in the work.

Instead of incorporating in the treadle arrangement a special switch 276 the arrangement may be as shown in FIG. 12 which only differs from what is shown in FIG. 11 in that instead of the switch 276 the left hand contact set $274_a$ is provided with three contact pins and in FIG. 14 designated by $275_{a-1}$. This arrangement may, for instance, be used as shown in the wiring diagram of FIG. 15. This differs from the diagram shown in FIG. 12 only in that between the points $x$ and the third of the three pins $275_{a-1}$ there is inserted a further relay BR having contacts $b_{1-3}$ inserted in the phase leads $b$ and $c$ operable either to connect the two phase leads directly or to cross-connect those phase leads.

The arrangement as shown in FIG. 15 operates in the following manner:

By operating the treadle in the right hand treadle 112 plate $P_r$ the circuit is closed through the relay AR. The relay BR is energized and assumes a position corresponding to a "straight" connection of the two phase leads $b$ and $c$. As in the case of FIGS. 12 or 13 the auxiliary motor $M_9$ is stopped with the sewing machine needle in the bottom position upon opening of the switch $m_2$.

By thereafter depressing the left hand treadle plate $P_r$ the auxiliary motor $M_9$ is again started, because the open switch $m_2$ is short-circuited by the two left hand contact pins $275_{a-2}$. Simultaneously a circuit through the relay BR is formed by means of the third contact pin $275_{a-3}$. When this occurs the relay BR throws over the switch $b_{1-2}$ cross-connecting the phase leads $b$ and $c$, whereas the sewing machine motor, as in the case of the operation of the switch 276 in FIGS. 11 and 13, is reversed and then again stopped when the needle is in top position.

While in the foregoing description the means for synchronizing the breaking of the auxiliary motor circuit with the position of the sewing machine needle has been described with reference either to the centrifugal member shown in FIGS. 3 and 4 or to the magnetic means shown in FIG. 10, it will be understood that the invention is not restricted to the use of these specific means, but that other means can be used within the scope of the invention.

As an example of other means there is shown in FIGS. 16 and 17 an embodiment comprising a plurality of switch tubes. A substantially cylindrical housing 350 is mounted on a rear wall 352 and a front wall 354. In the front wall there are arranged three circular concentric contact rings designated $R_1$, $R_2$ and $R_3$. A plurality of switch tubes are further accommodated within the interior of the housing. In the embodiment shown there are four switch tubes designated $S_1$, $S_2$, $S_3$ and $S_4$ and kept in a position extending radially, with a suitable angle such as an angle of 90° between each pair of tubes by means of partitions $P_1$, $P_2$, $P_3$ and $P_4$. The tubes may be small glass bulbs containing a liquid body such as mercury. From the exterior end of each tube there extends into the interior thereof two electrodes marked $E_1$ and $E_2$ as illustrated in connection with the end of the tube $S_2$. The mechanical arrangement may be as more specifically shown in FIGS. 18 and 19. A bracket 356 is secured by screws or the like 358 on the surface of the sewing machine frame 360. The other figures is denoted by the reference numeral 12. The bracket arm 362 is pivotally mounted on a shaft 360, where it can be adjusted and secured in position. The outer end of this arm 362 carries the housing shown in FIGS. 16 to 19. The arm 362 is arranged on a spindle 364. This spindle 364 is rotatably journaled in a bearing 366 (FIG. 18) supported at the end of the arm 362. At the other end of the spindle 364 there is secured a bushing 368 having a radial arm 370. A hole in the latter receives a pin 372 which is secured eccentrically to the sewing machine flywheel 14. From the bearing 366 there also extends an arm or the like 374 carrying a brush holder 376 having three carbon or other brushes $B_1$, $B_2$ and $B_3$ cooperating respectively with the three contact rings $R_1$, $R_2$ and $R_3$. An electric lead with three conducting wires connects the arrangement with the electric circuit to be more fully described hereinafter.

By mounting the arrangement described herein care should preferably be exercised to ensure that the axis of the rotating housing 350 is exactly in axial alignment with the axis of the main sewing machine spindle carrying the flywheel 14.

It will be understood that during the rotation of the sewing machine the housing 350 will be rotated, the movement being transmitted through the pin 372 to the arm 370.

A diagram of the motor drive, in which the arrangement shown in FIGS. 16 to 19 is utilized, is schematically shown in FIG. 20 in which $A_1$, $B_1$, and $C_1$ constitute the...
main motor stator, and \( a_1, b_1, c_1 \) are the feeding coils for the auxiliary motor, which is inductively fed from the main motor as in FIG. 6.

Instead of connecting the three auxiliary motor stator windings directly in \( Y \)-connection as shown in FIG. 6, the interior ends of the stators \( a' \) and \( c' \) are connected through leads \( d \) and \( e \) with top electrodes \( D \) and \( E \) in a mercury relay \( A_2 \). The bottom electrode \( F \) of which is connected through a lead \( f \) with the interior end of the auxiliary motor stator \( b' \).

The relay is of the kind comprising an exterior relay winding \( A_3 \) containing a cylindrical core \( C_2 \) normally floating on the mercury but which, upon energization of the relay, is drawn downward to raise the mercury which thereby to bridge the three electrodes. Relays of this kind are so well known that a further detailed description of the relay is not believed necessary herein.

In the circuit shown in FIG. 20 there is assumed the use of an arrangement along the lines described with reference to FIGS. 16 to 19 but comprising only two mercury switch tubes \( S_1 \) and \( S_2 \) with two contact rings \( R_1 \) and \( R_2 \) connected respectively with a brush \( B_1 \) and \( B_2 \). The brush \( B_1 \) is connected with the phase lead by an extension thereof \( b_2 \) while the brush \( B_2 \) is connected through the relay winding \( A_3 \) with the phase lead \( a \) through an extension \( a_2 \) thereof. The two electrodes \( E_{11} \) and \( E_{12} \) of the switch tube \( S_1 \) viz. \( E_{21} \) and \( E_{22} \) of the switch tube \( S_2 \) are connected with the two contact rings.

The operation of the arrangement shown in FIG. 20 is as follows: Under normal speed, i.e., with full velocity of the main motor, the centrifugal force will keep the mercury in the two switch tubes at the outer ends of the tubes bridging the electrodes in the two tubes and thereby short-circuiting the connection between the two contact rings. In FIG. 20, the direction of rotation of the sewing machine described will be that indicated by the arrow in FIG. 20. The relay winding \( A \) is therefore connected into the circuit comprising the leads \( a_2 \) and \( b_2 \) and accordingly the core \( C_2 \) will be in the down position with the mercury interconnecting the three electrodes \( D, E, F \) and thereby connecting the three auxiliary motor windings \( a', b', c' \) so that the auxiliary motor will also be running.

When the main operating treaderle is operated and the main motor decoupled as described hereinbefore, the sewing machine will be further driven by the auxiliary motor but at reduced speed insufficient to produce a large enough centrifugal force to break the bond between the two ends of the mercury tubes. This means that when the mercury tube \( S_2 \) arrives slightly above the horizontal position, the mercury in this tube will flow back to the inner end of the tube. The same applies to the switch tube \( S_1 \) in which upon inward flow of the mercury in this tube will then break the connection between the two contact rings \( R_1 \) and \( R_2 \), which again means that the circuit through the relay winding \( A_3 \) will be broken with the result that the \( Y \)-connection of the motor \( M_3 \) is broken.

In FIGS. 21a through 21e the influence of the angle between the two mercury tubes \( S_1 \) and \( S_2 \) is illustrated as per the following explanation:

In the general case, the needle of the sewing machine will be in either the top position or the down position within a certain angle of the main spindle of the sewing machine. As previously mentioned the synchronization device is arranged on the spindle wheel so as to follow the angular movements of the main spindle of the sewing machine. Generally speaking there is no sharply defined angular position of the main spindle which corresponds to needle top or needle down position so that it is understood that within a certain range of angular positions of the main spindle the needle will be in top position and within a certain range of angular positions diametrically opposite thereto the needle will be in down position. These angular positions have to be considered in the design of the synchronization device. In the ideal case, of course, the needle will be in either the top or the down position. It is assumed that the purpose of the synchronizer is to keep the tip of the sewing machine needle free of the work piece or embedded therein. Another purpose of the synchronizer is to stop the sewing machine spindle in either of those two positions with the minimum number of rotations after the operator's heel has stopped on the treadle and switched over the driven clutch element to engage the rotating brake member. In other words, a purpose of the synchronizer is to avoid any superfluous number of rotations of the main sewing machine spindle.

Assuming that only one single mercury switch tube is used in series with this circuit of the auxiliary drive circuit, it will be appreciated that if this mercury switch tube incidentally was in a position above the horizontal level, when the operator's heel steps on the treadle, the machine would stop. In contrast thereto, a position of the mercury switch tube below the horizontal level at the moment of starting the slow motion brake action will result in at least half a revolution of the main spindle.

It is therefore a fundamental principle of the synchronizer to use a two-pole mercury switch incorporating two switch tubes shunted in the auxiliary drive circuit and forming a suitable angle.

In practice a single tube would give an angle of 70° but there is a possibility for incorrect stop position. By means of two parallel shunted mercury switch tubes it is possible to secure the correct stop position within an angle of 0°-180° as will now be more fully explained.

In FIG. 21a through 21e the two mercury switch tubes \( S_1 \) and \( S_2 \) come therebetween at an angle of 90°. The rotation is in the direction of the arrow shown in FIG. 21a. When the tube \( S_1 \) arrives at the horizontal position as shown at FIG. 21b, the tube will start to leave the electrodes which for the sake of clarity are not shown in these schematic views. The tube \( S_2 \) will, however, still maintain the circuit for the auxiliary drive circuit through the position shown at FIG. 21c, until the mercury switch tube \( S_2 \) is slightly above the horizontal position as shown in FIG. 21d. The circuit will then remain interrupted, until the tube \( S_1 \) arrives at the position shown in FIG. 21e. As evident from these views there exists between FIG. 21d and FIG. 21e a free angle of 90° corresponding to the angle of 90° between the tubes. In practice this means that there will be a small angle of approximately 20° within outer edge of the mercury tubes. This will have to make an extra revolution if incidentally the auxiliary drive is applied with the mercury switch tubes in very specific position. In all other positions, the spindle will be stopped after not more than half a revolution.

In FIGURES 22a through 22e the angle between two mercury switch tubes \( S_1 \) and \( S_2 \) is 120°. It will be appreciated that the angle of interruption in accordance with this description will be

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\beta = 180° - 2\alpha = 120°
\]

which in accordance with the above explanation will correspond to an angle of interruption of \( \beta = 60° \). When applying the rotational brake member within an angle of 60°, it will, however, be necessary to allow the spindle to make one whole revolution.

In FIGS. 23a through d, \( \alpha = 70° \), which in many cases will be the optimum condition, because many sewing machines have a rotational angle of 110° of the main spindle between the extreme top and the extreme down position of the needle.

From the formula \( \beta = 180° - 2\alpha \) it will be understood that if in a sewing machine \( \beta = 110°, \alpha = 70° \) will be the correct angle between the tubes to assure that in any position of the main spindle, the spindle will make only maximum half a revolution, until the spindle is stopped.
In some of the following figures, separate pairs of shunted switch tubes are used for selectively stopping the sewing machine with the needle either in top or down position. The theoretical explanation given hereinabove will not be repeated in connection with the following example, but it will be understood that the angle between the shunted pairs of mercury are designed for stopping the machine with the needle in top or in down position.

In practice and in view of the fact that the synchroniza-

tor is universally applicable when allowing the machine to be stopped with the needle in either of the two positions, an angle of 90° between the two tubes in either of the pairs of tubes will in general be allowable and sufficient for all general purposes.

The arrangement shown in FIG. 20 enables the needle to be stopped in a single position, for instance, in top position.

FIG. 24 shows an embodiment similar to that shown in FIG. 20, but further incorporating a double plate treadle as shown in FIG. 11 and four switch tubes as shown in FIGS. 16 to 19. The extension $a_2$ of the phase lead contains the relay winding $A_2$ and is connected to the brushes $B_1$ and $B_2$ respectively. The other phase lead extension $a_2$ is connected to the third brush $B_3$.

The four contact tubes are interconnected and connected with the three contact rings in the following manner:

Electrodes $E_{13}, E_{14}, E_{21}$ and $E_{12}$ are all connected to the interior contact ring $R_3$, the electrodes $E_{23}$ and $E_{24}$ are interconnected and also connected with the exterior contact ring $R_1$, while the electrodes $E_{12}$ and $E_{22}$ are interconnected and also connected to the intermediate contact ring $R_2$.

It will be understood that by pressing the right hand treadle plate $P_3$, the circuit will be completed through the relay winding $A_2$, the right treadle contact pins $274_{41-2}$, exterior contact ring $R_1$, switch tubes $S_5$ and $S_6$ and interior contact ring $R_3$.

This will, in the manner described with reference to FIG. 20, keep the auxiliary motor circuit running until the mercury in these two tubes $S_5$ and $S_6$ under the reduced driving speed, is no longer held in the outer position in the tubes. The auxiliary motor circuit will therefore be interrupted with the sewing machine needle in one position, for instance, in the bottom position.

Pressing the left hand treadle plate $P_1$, the circuit is completed through the phase lead $a_1$, left hand treadle plate contacts $274_{41-2}$ to intermediate contact ring $R_2$ through the mercury switch tubes $S_1$ and $S_2$ to the interior contact ring $R_3$ and further through contact brush $B_3$ and the phase lead $a_1$.

This means that the switch tubes $S_1$ and $S_2$ will now take over the control of the position in which the auxiliary motor circuit is broken, and since these tubes are arranged diametrically opposite to the tubes $S_5$ and $S_6$ it will be the opposite position, viz. the top position of the needle.

It will further be understood that the arrangement shown in FIG. 24 can be modified so as to include also the possibility of reversing the auxiliary motor, for instance, by including a reverse switch in the circuit as schematically shown in FIG. 25. Here the reverse switch $KR$ is only shown schematically inserted in the phase leads and is operable for example by the treadle plate in the form of a separate switch as shown in FIG. 11.

It will be understood, however, that the arrangement according to FIG. 25 may also be modified to include a further relay to operate the reverse switch in the manner already shown and described with reference to FIG. 15.

It will be understood that in the foregoing specification, many different embodiments have been shown and described.

Although in order to simplify the description, several of the embodiments are shown as incorporating the centrifugally operated cam member, viz. that type of switch in which the switch itself is stationary and is operable by a member, which, when the machine is driven at reduced speed, will lie in a path oblitating the switch operating member, it is to be understood that in these embodiments the centrifugal switch can be replaced by a rotating switch according to FIGS. 16 to 19, if desired.

While in the foregoing embodiments of the treadle arrangement species have been shown and described in which the pivotable treadle operatively connected with the driven clutch element is provided with treadle plate portions, which are individually pivotable to operate the switch selecting means in order to effect stopping of the auxiliary motor in either of two different predetermined positions, it will be understood that the same can be effected by means of the treadle arrangement shown in FIG. 26.

Here only one treadle plate is used, the two half parts of which are equivalent with each of the two treadle plate portions of the foregoing species. To facilitate the survey of FIG. 26 the front half part of the treadle plate is cut away and only shown in dotted lines. As also shown in FIG. 11 the treadle is supported in brackets $258$ and $260$ secured to the lower transverse bar 20 of the sewing machine. In these brackets there is rotatably arranged a shaft 400 extending at one end beyond the bracket 260 and provided thereat with a radially extending arm 402 to the end of which at 404 there is linked a ring or bushing 406 connected to the pull rod 146 shifting the driven clutch element between the driving clutch ele-

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stopped, for instance, in the top position. In a similar manner operation of the treadle plate in FIG. 23 with the left foot tilting the plate in the opposite direction of that shown will enable the sewing machine auxiliary drive to be operated to stop the machine with the stitch forming mechanism in the opposite direction.

While in the foregoing the majority of the species has been illustrated with reference to an auxiliary electric motor as auxiliary drive with exception of the embodiment of FIG. 9, the invention will now be explained in connection with an example using a mechanical auxiliary drive in the form of the rotate brake member and with an electromagnetic control means for operating and disconnecting the drive.

In the embodiment shown in FIGS. 27 through 32, those parts, which are common to the species already described, will in order to facilitate the explanation be referred to by the same reference numerals and only a general survey of the common features will be given here.

The motor 26 has a right hand end cover 34, in which the rotatable brake 86 and the shaftable clutch member 62 together with the intermediate spindle 56 are arranged as a unit to be secured to the clutch motor with the shaftable clutch member 62 disposed opposite the clutch motor flywheel 40.

In the actual construction of the embodiment of FIG. 28, the only difference is that the friction members, which in FIG. 28 are referred to as 62a and 86a, instead of being arranged in grooves of the surface of the flywheel and brake member respectively, as shown in FIG. 2, are incorporated in grooves in the shaftable clutch member 62 itself.

Another difference between the embodiment of FIG. 2 and that of FIG. 28 resides in the actual design of the clutch shifting arm 64 which in FIG. 28 comprises an arm having two perpendicular parts 64a and 64b carried on the spindle 65a. This spindle is secured in a bracket or the like 66a firmly secured to the end cover. A spring 67a is interposed between this bracket 66a and the arm 64. Such embodiment of the clutch shifting arm is rather traditional in clutch motors and will be known to those skilled in the art in various designs so that a further description will not be necessary.

In the left hand end cover 33 of the motor 26 there is provided a cavity 33a. A pulley 30a is mounted on the end of the motor spindle 38 extending beyond the ball bearing 37. The 33a of the end cover extends as shown at 34a (FIG. 27) inside extension walls 35a and 36a and 37a. On the wall 36a there are secured bifurcated bearings 38a and 39a in which pulleys 40a and 41a are arranged by means of short bearing spindles 42a and 43a. In the connection with the auxiliary drive main spindle 56, viz. the spindle driving the worm 94, there is arranged in a manner to be more fully disclosed hereinafter a further pulley 44a (FIGS. 27, 29 and 30). A belt 45a is arranged between the pulleys 30a and 44a guided over the pulleys 40a and 41a so as to drive the worm spindle 96 from the continuously rotating main motor spindle.

The purpose of arranging the cavity 33a and the extension walls 35a and 37a is to be able to apply a suitable cover plate (not shown) so as to enclose the belt drive.

As will be understood from this description the general idea of the embodiment of FIGS. 27 through 30 is to drive the rotational brake member mechanically from main motor spindle 38 in a similar manner as already described with reference to FIG. 9.

The clutch arrangement is, however included in the embodiment of FIGS. 27 through 30. In contrast to FIG. 9 where the clutch is arranged at the left hand end of the main motor spindle a more compact design of the clutch is used in the embodiment of FIGS. 27 through 30.

It has already been indicated in the above specification that magnetic control means may be used for operating and disconnecting of the auxiliary drive. In the embodiment of FIGS. 27 through 30 this magnetic control means is designed more specifically as electromagnetic control means being equivalent, for instance, to the electromagnetic winding $A_1$ as shown in FIG. 20.

More specifically there is provided between the pulley 44a and the worm spindle 96 an electromagnetically operated clutch member 62 for operating and disconnecting the drive from the belt 45a to the spindle 96. Furthermore this electromagnetically operated clutch is of the clutch-and-brake type by which is understood that simultaneously with the disconnection of the drive the clutch acts as a brake serving instantaneously to stop the worm spindle and prevent the rotation of brake member 62 from making any superfluous revolutions or part thereof which again means that the brake action caused by the clutch-and-brake member interposed between the auxiliary drive and the worm spindle will prevent any superfluous rotations of the sewing machine spindle and thereby any superfluous stitches of the needle.

As most clearly shown in the cross section of FIG. 30 and supported by the perspective view of the parts in FIG. 31 there is provided in the end of the spindle 96 a bore 96a. The spindle 96 is surrounded by a sleeve 97 forming a bearing for the spindle 96. At the end of the sleeve 97 there is provided a radially extending flange 97a against which rests a bearing for the pulley 44a. In the bore 96a of the spindle 96 there is arranged a spring 96b. The end of the spindle 96 is as most clearly shown in FIG. 31 slotted at 96c. On the end of the spindle there is provided a dog 98a having two oppositely extending arms 98b and 98c and a circular portion 98d, in which there is a hole 99a substantially corresponding to the diameter of the spindle and having two inwardly extending flaps 99b and 99c gripping into the slot 96c.

The dog arms 98b and 98c are received in slots 101b and 101c provided in two substantially semi-circular discs 102a and 103a.

The disc 102a has an exterior bifurcated portion 102b, 102c and the disc 103a has an interior bifurcated portion 103b, 103c. These bifurcated portions 102b, 102c and 103b, 103c overlap each other so as to allow connection of the two discs by means of a pin 104a. Adjacent their centers the discs define an aperture 105a substantially corresponding to the exterior diameter of the spindle 96. Within this aperture a circular portion 106a is arranged on the pin 104a having an exterior diameter substantially corresponding to the bore 96a of the circular discs 102a and 103a are slightly wedge-formed. The discs 102a and 103a together with the dog 98a are secured on the slotted end of the spindle 96 with the spring 96b abetting against the portion 106a.

It will be understood that with the semi-circular discs 102a and 103a in alignment in a position in which their surfaces form a part of a cylinder coaxial with spindle 96, the outer surfaces thereof exhibit the smallest diameter. By tilting the discs 102a and 103a in the direction of the arrow shown in FIG. 31, their left hand edges rotating about pin 104a will expand to a larger diameter and by tilting the discs in the opposite direction their right hand edges will expand similarly to a larger diameter.

The discs 102a and 103a are arranged in a cavity defined by a collar 108a of the pulley 44a and another collar 109a extending from a member generally referred to as 110a. This member 110a has a projection 111a, which by a convenient support 112a (FIG. 27) such as an extending bracket on the motor casing, is prevented from rotation. In the member 110a there is a cavity, in which is enclosed a coil winding 113a. This cavity is closed by an end cover 114a in an end bore of which there is slidably arranged a closure member 115a, which is allowed to effect an axial movement but is prevented from rotating, for instance, by a keyway connection between the cover 114a and the closure member 115a.

Further the closure member 115a is prevented from being
withdrawn by any convenient means such as a set screw extending into the key way.

In the closure member 115a there is a center bore provided with screw threads for receiving the screw through the portion 116a of a magnetizable core member 117a. At the exterior end thereof there is provided a finger screw 118a and between the interior surface thereof and the end of the closure member 115a there is arranged a spring 119a.

The left end of the core member 117a abuts against the end of the member 110a remote from the spring 96a, and in order to decrease the friction there is preferably interposed at that end a ball 120a, which may be wholly or partly embedded or in any other way rotatably supported in the end of the member 117a.

The interior diameters of the sleeves 106a and 109a are so adapted to the exterior diameter of the semi-circular wedge-formed discs 102a and 103a that with the discs in alignment they are allowed to rotate freely in the cavity defined between the pulley 44a and the member 110a and the flanges 108a and 109a, while by tilting the discs in one direction of the arrow shown in FIG. 31, they will at their left hand edges abut against the interior surface of the sleeve 108a so as to transmit the rotation of the pulley 44a to the spindle 96 by means of the dog 98a. By tilting the discs in the opposite direction they will at their right hand edges engage the interior surface of the sleeve 108a, which will cause an instantaneous stoppage due to the fact that the member 110a is prevented from rotating.

In other words there is provided by the mechanism described herein a clutch-and-brake type device also in the auxiliary drive. It will be appreciated that the actual embodiment of this clutch-and-brake type connection is not limited to the specific embodiment including tiltable discs. This embodiment, however, is advantageous insofar as it enables a very compact structure, which only occupies a small space. The construction is also advantageous insofar as the movement necessary in order to switch over the tiltable discs 102a and 103a from the driving position to the brake position is very small, and very little energy is necessary in order to effect the tilting.

As shown in FIG. 32 the coil winding 113a may be enclosed in a circuit equivalent, for instance, to the circuit of FIG. 20 similarly in the same manner as the electromagnetic coil winding A5 is enclosed in that circuit.

The difference between the circuit of FIG. 32 and that of FIG. 20 is that since no auxiliary electric motor is used in the embodiment of FIGS. 27 through 31, the auxiliary motor winding which in FIG. 20 is connected in series with the electromagnetic coil winding A5 is eliminated in FIG. 32. It will be understood that instead of the arrangement of FIG. 32 also that of FIG. 20 may be used in connection with the embodiment of FIGS. 27 through 31 as it is possible also to use either of the tachometer arrangements of FIGS. 11, 14 or 25 in connection with the circuit of FIG. 32.

Considering that the circuit of FIG. 20 has been described in great detail, only a short survey of the circuit of FIG. 32 will be given herein. A2, B2, and C2 designate the stator winding of the main motor. Supplementary windings a2, b2, and c2 are inductively coupled to the windings A2, B2, and C2. These auxiliary windings are interconnected in series so as to supply a voltage over the terminals 120a and 120b. From these terminals the voltage is applied over the synchronizer comprising the four mercury switch tubes S1, S2, S3, S4, the tachometer switch 274a1-2, 274b1-2 and the clutch operating coil 113a in series with a rectifier 121a.

The operation of the arrangement of FIGS. 27 through 32 is as follows:

As long as the main clutch tach is operated by the toe and the arm 64 swung downwardly in the direction of the arrow shown at the end of this arm in FIG. 28, the clutch member 62 is connected to the flywheel 40 and the machine is driven at full speed. Due to the action of the centrifugal force, the mercury bodies in all the four mercury switch tubes S1, S2, S3, S4 close the circuits through the switch tubes and current flows through either of the pairs of switch tubes S1, S2 or S3, S4 depending on which part of the tachometer device's tongue area coincides with the tachometer step 121a, and the coil 113a.

As a result thereof, the core member 117a is drawn inwardly against the action of the spring 119a to displace the clutch tubes and current flows through the tiltable discs 102a and 103a thereby tilting the same in such a manner to engage with their left hand edges the interior of the clutch collar 108a, whereby the rotation of the pulley 44a is transmitted to the worm spindle 96, which, in turn, drives the brake member 86 at low speed.

When the operator steps with the heel on the main tachindle to stop the machine, the clutch operating arm 64 is swung back to the position shown in FIG. 28 and the clutch member 62 is moved to engage the rotating brake member. If as shown in FIG. 32 it is the right hand side of the tachindle which is used in operation, then the circuit is completed through the switch tubes S3, S4, which circuit will remain closed during the slow motion of the machine until these switch tubes assume the circuit breaking position as explained in detail in connection with FIG. 20. By tilting the exterior face of the sleeve 108a of the clutch member 62, the current flows through the rectifier 121a and the coil 113a is interrupted with the result that the core member 117a is retracted under the influence of the spring 119a. The spring 96a thereby tilts the discs 102a and 103a into the opposite direction to engage with their right hand edges the interior of the clutch collar 108a, which instantaneously not only disconnects the driving connection between the pulley 44a and the worm spindle 96, but also stops the worm spindle.

In the actual design of the arrangement the synchronizer and the tachindle are constructed as separate subassemblies, or are performed as specific units adapted to be connected with the motor unit by means of electric plugs as shown schematically in FIG. 33. Preferably also the electromagnetic auxiliary drive control coil is adapted to be connected with the motor by means of a plug type connection.

As shown in FIG. 27 there is provided on the motor housing a box 125a having two double pole outlets 126a, 126b through 127a, 127b, and two three-pole outlets 128abc and 129abc. The circuit within this box is as shown schematically in FIG. 33. In order to simplify the showing in FIG. 33, only one of the auxiliary windings a, is shown, leading to two terminals 132a and 132b of the rectifier 121a arranged within the box 125a. From the terminals 130a, 130b there is a direct connection to the outlets 126a, 126b which is adapted for plugging in a plug 140a, from which an electric cable 141a leads to the lamp 142a normally used for the sewing machine.

The rectifier 121a is provided with three output terminals 131a, 131b and 131c, of which the terminals 131a and e are interconnected and connected with the outlet terminal 129b. The rectifier output terminal 131b is connected with the output terminal 127a. Furthermore, the output terminal 127b is connected with that designated by 128c, while the output terminal 128b is connected with that designated by 129c. Finally the terminal 129a is connected with that designated by 128a. From the synchronizer a three-wire cable 142a leads to a three-pole plug 143a adapted to be plugged in the outlet 129a, 129b, 129c. In a similar manner a three-wire cable 144a leading from the tachindle arrangement to a three-pole plug 145a is adapted to be plugged in the outlet 128abc. Finally a two-wire cable 146a leads from the electromagnetic coil 113a to a two-pole plug 147a adapted to be plugged in the outlet 127a, b.
and 147a are plugged into the respective outlets will be that shown more schematically in FIG. 32. The specific plug arrangement has as mentioned the advantage that the synchronizer and the treadle arrangement can be made as independent units fully pre-wired and adapted to be connected with the motor only by plugging in the plugs 145a and 143c. Similarly also that part of the electromagnetic clutch control, which comprises the parts enclosed in the stationary housing 110a can be made as an independent unit which is attached to the motor after pre-assembly thereof and connected to the electric circuits by plugging in the plug 147a.

One important feature of the arrangement shown in FIGS. 27 through 31 is the manual control of the auxiliary clutch-and-brake connection interposed in the auxiliary drive between the power source thereof and the rotatable brake member. As explained the closure member 115a is axially movable in the end cover 114a but prevented from rotating relatively thereto.

When the parts are assembled the correct location of the core member 117a relative to the clutch-and-brake member 102a, 103a is simply obtained by adjusting the control screw 118a by turning it clockwise so as to approach the end of the armature member 117a which is provided with the small rotational stop 120a to the clutch member and during the rotation pushing the set screw inward. At a certain point during this repeated screw and push operation it will be seen that the main pulley of the motor is driven, which means that the auxiliary clutch is coupled to the auxiliary drive pulley 44a. Hereafter the adjustment is completed.

Another way of adjusting the electromagnetic clutch when the main motor is coupled to a sewing machine is to turn the hand wheel of the machine to a needle position, which does not correspond to either the top or the down-position, in which the needle is supposed to be automatically adjusted by means of the mercury switch synchronizer and then effect the same turn and push adjustment as hereinafore described, until the end of the core member is capable of operating the auxiliary clutch to turn the sewing machine to a position in which it is stopped with the needle in the correct position corresponding to that part P₁ or P₂ of the treadle which is depressed during the adjustment operation.

While in the foregoing embodiment of FIGS. 27 through 33 are described in connection with the circuit in which the electromagnetic winding of the auxiliary clutch is supplied constantly with current and operates the auxiliary clutch when the circuit is interrupted only, it will be understood that it is also possible to design the auxiliary clutch to be operated in such a manner that no current normally flows in the electromagnetic coil winding of the auxiliary clutch so that in such instance the clutch will be operated when the circuit is closed through the electromagnetic winding. Such arrangement may be achieved, for instance, in form of a modification in either of the embodiments according to FIGS. 2, 10, 12, 13 or 15, which involves such change of the arrangements of these embodiments that he switch operated by the synchronizer instead of being opened in the correct position of the needle is closed in that position.

Having now by way of example described different embodiments of my invention it will be understood that the invention is not limited to the specific examples and may be varied in different respects without departing from the scope of my invention.

Basically my invention provides, in combination with a sewing machine or another machine, means for driving the machine at high speed and auxiliary driving means for driving the machine at a reduced speed which is so slow that the stoppage of the machine when driven by the auxiliary drive is completely under control and can be stopped either at will in a predetermined position, for instance, of the reciprocatory needle of the sewing machine or automatically in such predetermined position.

An important feature of my invention therefore resides in the provision of an auxiliary drive in the driving connection with the sewing machine spindle for rotating the latter at reduced speed in the position in which the driven clutch element is disengaged from the driving clutch element.

Another important feature of my invention resides in the provision of a small electric motor as auxiliary drive. In combination with such small electric motor a further feature of my invention resides in the circuit arrangements including circuit branches and switch means to be controlled automatically in the different manners described to provide automatic stoppage of the machine in a predetermined position of the movable parts thereof.

It will readily be understood that my invention is by no means confined to the specific embodiments illustrated.

Though in combination with a sewing machine the driven spindle and the machine have to be stopped instantaneously and then after stoppage rotated, it will be understood that my invention is not confined to an operative connection of the auxiliary drive with the stoppage or brake member. Considering, however, that it will not be practical to allow the machine to decelerate by itself, because the stitch forming mechanism will then make 3, 4 or 5 further stitches before it stops the provision of a stoppage or brake member is variable and therefore it is practical to allow the driven clutch element to remain in engagement with the brake member which is rotatable and driven by the auxiliary drive.

The basic point is, however, to provide the auxiliary drive, but whether this provides a driving connection between the driven clutch element and the sewing machine as illustrated and described by means of a rotatable brake member or by means of an auxiliary drive with the clutch member in some other way or elsewhere in the driving connection between the driven clutch member and the sewing machine is of less importance.

It will also be understood that my electric circuits for the auxiliary driving motor and the different embodiments of the automatic control, for instance, by means of the two way pivotable treadle can be used in combination with any kind of auxiliary driving motor irrespective of the fact where it interconnected into the driving connection.

I claim:

1. In a driving arrangement comprising a motor of the clutch-and-brake type having a continuously rotating driving clutch member, an auxiliary drive, a rotatable brake member driven by said auxiliary drive at reduced speed, a driven clutch member, means for alternately shifting said driven clutch member to engage said driving clutch member and said brake member, a driving connection between the driven clutch member of said clutch motor and a working machine provided with a spindle, auxiliary clutch and brake means between said auxiliary drive and said brake member driven thereby, and means for activating said auxiliary clutch-and-brake means responsive to a predetermined angular position of said working machine spindle for disconnecting said auxiliary drive and stopping the movement of said brake member.

2. In a driving arrangement comprising an electric motor of the clutch-and-brake type having a continuously rotating driving clutch member, an auxiliary drive, a rotatable brake member driven by said auxiliary drive at reduced speed, a driven clutch member, means for alternately shifting said driven clutch member to engage said driving clutch member and said brake member, a driving connection between said driven clutch member of said clutch motor and a working machine provided with a spindle, switch means rotating synchronously with
said spindle of said working machine, an auxiliary clutch-and-brake type arrangement operatively connected between said auxiliary drive and said brake member, an electric wiring system, a main driving clutch element, and said auxiliary brake member, means for shifting said main driving clutch element and said auxiliary brake member, means for controlling said auxiliary clutch and brake means included in said system for retransmitting the movement thereof to a working machine, an auxiliary driving element, a driving clutch element driven by said auxiliary driving element, an auxiliary brake element, an auxiliary driven clutch element, means for shifting said auxiliary driven clutch element to alternately engage said auxiliary driven clutch element and said auxiliary brake member, means for transmitting the movement of said auxiliary driven clutch element to forcibly drive said main brake element.

In a clutch motor, a main electric motor, a main driving clutch element driven by said electric motor, a rotatable brake element, a driven clutch member, means for shifting said driven clutch element to alternately engage said main driving clutch element and said brake element, means connected with said driven clutch element for transmitting the main drive thereof to a working machine, an auxiliary driving element, a driving clutch element driven by said auxiliary driving element, an auxiliary brake element, an auxiliary driven clutch element, means for shifting said auxiliary driven clutch element to alternately engage said auxiliary driven clutch element and said auxiliary brake member, means for transmitting the movement of said auxiliary driven clutch element to forcibly drive said main brake element.

In a clutch motor, a main electric motor comprising an electric wiring system, a main driving clutch element driven by said electric motor, a rotatable brake element, a driven clutch member, means for shifting said driven clutch element to alternately engage said main driving clutch element and said brake element, means connected with said driven clutch element for transmitting the movement thereof to a working machine, an auxiliary driving element, a driving clutch element driven by said auxiliary driving element, an auxiliary brake element, an auxiliary driven clutch element, means including electromagnetic means to enable shifting of said auxiliary clutch and brake means included in said auxiliary clutch and brake means included in said system for retransmitting the movement of said auxiliary driven clutch element to forcibly drive said main brake element, an auxiliary voltage source, a unitary switch structure, means for rotating said unitary switch structure synchronously with a part of said working machine, means for operating said unitary switch structure at a predetermined angle of said part of said working machine, a unitary brake arrangement, means for engaging said unitary brake arrangement, electromagnetic means for operating said auxiliary drive means, said voltage source being combined with said clutch motor, parts of said circuit arrangement extending from said voltage source to outlets arranged on said clutch motor, and said switch means rotating synchronously with said working machine being plugged into said one of said outlets.

In combination with a clutch motor having a main driving arrangement of the clutch-and-brake type including a main driving clutch element, a brake member, a driven clutch element, means for shifting said driven clutch element to alternately engage said main driving clutch element and said brake element, an auxiliary drive to forcibly rotate said brake member, electromagnetic means for operating said auxiliary drive and a circuit arrangement comprising a voltage source, a working machine in driving connection with said driven clutch element, a unitary switch structure, a unitary brake arrangement, means for disengaging said unitary brake arrangement and said unitary trolley arrangement to said voltage source in series with said electromagnetic means, means for rotating said unitary switch structure synchronously with a part of said working machine, means for operating said unitary switch structure in at least one predetermined angular position of said part of said working machine, switch means selectively operated by means of said unitary trolley arrangement, outlets from said voltage source arranged on said clutch motor.

A clutch motor comprising an electric motor, a flywheel driven by said electric motor, a driving clutch element on said flywheel, a brake member arranged in juxtaposition with said clutch element, a driven clutch element disposed between said driving clutch element and said brake member, means for engaging said driving clutch element to alternately shift said driven clutch element or said brake member, an auxiliary drive, means for driving said brake member by said auxiliary drive including a clutch-and-brake type connection between said auxiliary drive and said brake member, and means for operating said auxiliary clutch and brake means for controlling the brake position when cutting off said auxiliary drive.

A clutch motor comprising an electric motor, a flywheel driven by said electric motor, said flywheel forming a driving clutch element, a rotatable brake member, a driven clutch element, means for alternating shifting said driven clutch element to engage either said driving clutch element or said brake member, a worm member for driving said brake member, means for driving said worm member by said electric motor including an auxiliary clutch-and-brake type connection between said electric motor and said worm, and electromagnetic means for operating said auxiliary clutch-and-brake type connection to assume the brake position when cutting off said electric motor from said worm.

A clutch motor comprising an electric motor, a flywheel driven by said electric motor, a power transmission member driven by said motor, said flywheel forming a first driving clutch element, a first rotatable brake member, a first driven clutch element, means for engaging said first driven clutch element to alternately shifting said first-driven clutch element to engage either said driving clutch element or said brake member, an auxiliary driving spindel, a reduction gear between said driving spindel and said brake member, a second driving clutch element driven by said power transmission member, a second brake element, a second driven clutch element.
in driving connection with said auxiliary driving spindle and adapted to be alternately shifted to engage either said second driving clutch element or said brake element, and means for shifting said second clutch element.

12. A clutch motor comprising an electric motor, a flywheel driven by said electric motor, a power transmission member driven by said motor, said flywheel forming a first driving clutch element, a first rotary brake member, a first driven clutch element, means for alternately shifting said first driven clutch element to engage either said drive clutch element or said brake member, said auxiliary driving spindle and said brake member, means for normally keeping said auxiliary clutch-and-brake connection in one of said positions, and means for operating said auxiliary clutch-and-brake connection to assume the brake position when cutting off said auxiliary drive.

13. A clutch motor comprising an electric motor, a flywheel driven by said electric motor, a power transmission member driven by said motor, said flywheel forming a first driving clutch element, a first rotary brake member, a first driven clutch element, means for alternately shifting said first driven clutch element to engage either said drive clutch element or said brake member, said auxiliary driving spindle and said brake member, means for normally keeping said auxiliary clutch-and-brake connection in one of said positions, and means for operating said auxiliary clutch-and-brake connection to assume the brake position when cutting off said auxiliary drive.

14. In a clutch-and-brake driving arrangement in combination: a first driving clutch element, a first rotary brake member, a first driven clutch element, means for alternately shifting said first driven clutch element to engage either said driving clutch element or said brake element, an auxiliary driving spindle, and a transmission between said auxiliary driving spindle and said brake member including an auxiliary clutch-and-brake connection between said auxiliary drive and said brake member and effectively and selectively providing two operating conditions for said brake member consisting of a driving condition by said auxiliary drive and of an effective braking condition by the auxiliary brake, resilient means for normally keeping said auxiliary clutch-and-brake connection in one of said positions, and means for operating said auxiliary clutch-and-brake connection to assume the brake position when cutting off said auxiliary drive.

15. A clutch motor comprising an electric motor, a first driving clutch element driven by said motor, a first rotateable brake member, a first driven clutch element, means for alternately shifting said first driven clutch element to engage either said driving clutch element or said brake member, an auxiliary driving spindle, a reduction gear between said auxiliary driving spindle and said brake member, auxiliary driving means including a power transmission member, a second driving clutch element concentric with said auxiliary spindle and driven by said power transmission member, a second brake element concentric with said auxiliary spindle and axially spaced from said second driving clutch element, a second driven clutch element supported on said auxiliary drive spindle and having a portion axially displaceable relatively thereto between a first position in which said second driven clutch element is engaging said second driving clutch element which form a second position in which said second driven clutch element is engaging said second brake element, and means for keeping said second driven clutch element in one of said positions, a member in axial alignment with said auxiliary spindle, and means for axially displacing said member to thereby axially displace said portion of said auxiliary driven clutch member to the other of said positions.

16. A clutch motor comprising an electric motor, a first driving clutch element driven by said motor, a first rotateable brake member, a first driven clutch element adapted to be alternately shifted to engage either said driving clutch element or said brake element, an auxiliary driving spindle, and a transmission between said auxiliary driving spindle and said brake member including a power transmission member, an auxiliary driving spindle, a reduction gear between said auxiliary driving spindle and said brake member, a second driving clutch element, a second drive clutch element concentric with said auxiliary spindle and axially spaced from said second driving clutch element, a second driven clutch element supported on said auxiliary drive spindle and having a portion axially displaceable relatively thereto between a first position in which said second driven clutch element is engaging said second driving clutch element and a second position in which said second driven clutch element is engaging said second brake element, and means for keeping said second driven clutch element in one of said positions, a member in axial alignment with said auxiliary spindle, and means for axially displacing said member to thereby axially displace said portion of said auxiliary driven clutch member to the other of said positions.
auxiliary driving means for driving said driving member, a longitudinal bore provided in the end of said spindle, a spring in said bore, a member arranged for longitudinal displacement in said spindle bore adjacent the end of said spindle, means operable against one end of said elongated member to abut said member slightly arranged in said spindle bore at the end remote from said spring in said spindle bore, an electromagnet coil winding for displacing said elongated member in the direction against said spindle to displace said member slidable arranged in the bore thereof against the action of said spring, diametrically opposite slots provided in said bored spindle end, supporting pins extending through said slots and connected with said member slidably arranged in said spindle bore, clutch members supported on said supporting pins outside the periphery of said spindle, an auxiliary stationary brake member arranged opposite said auxiliary driving member rotatably supported on said spindle, said auxiliary brake member and said auxiliary driving member being located to be alternately engaged by said auxiliary clutch members in the extreme positions of said member slidably arranged in the bore of said spindle.

18. In a clutch and brake driving mechanism for driving a machine having a rotating spindle in combination: a high speed driving member, means for driving said member at a high speed, a brake member spaced from but adjacent to said driving member, a clutch element positioned between said driving member and said brake member, means operable at will to shift said clutch element to alternately engage said driving member and said brake member, auxiliary driving means for slowly driving said brake member, means operable to disconnect said auxiliary driving means, and auxiliary brake means operable to halt said brake member in response to the disconnection of said auxiliary driving means.

19. A driving mechanism as claimed in claim 18, wherein disconnecting means includes clutch means operatively connected to said auxiliary driving means, electromagnetic means for operating said clutch means, means for energizing said electromagnetic means to thereby operatively connect said auxiliary driving means to drive said brake member, and means for applying said auxiliary brake means in response to de-energization of said electromagnetic means.

20. A driving mechanism as claimed in claim 19, further comprising switch means operable by said rotating spindle of said machine to be opened in at least one predetermined angular position thereof, switch means operable to be closed at will, and a power source included in series with both said electromagnetic means and said switch means.

21. A driving mechanism as claimed in claim 20, in which switch means operable to be closed at will is provided with actuating means operable in response to shifting by said shifting means of said shiftable clutch element to the position thereof engaging said brake member.

22. A driving mechanism as claimed in claim 20, in which said first-mentioned switch means operable to open said circuit includes two switch means operable in two predetermined different angular positions of said rotatable spindle, and further comprising selector means for selecting each of said switch means.

23. A driving mechanism as claimed in claim 22, in which said circuit includes two circuit branches, each of said last-mentioned two switch means being included in a respective one of said branches, and in which said switch means operable to be closed at will includes two switch means operable at will for selectively connecting each of said branches in said circuit with said electromagnetic means and said power source.

24. A driving mechanism as claimed in claim 19, in which said means for applying said auxiliary brake includes resilient means.

25. A driving mechanism as claimed in claim 24, in which said resilient means is operative to urge said clutch means to assume a braking position, and in which said electromagnetic means is operative to overcome the tension of said resilient means to connect said auxiliary driving means to drive said brake.

26. In a clutch and brake driving mechanism for driving a machine having a rotating spindle in combination: a high speed driving member, means for driving said member at a high speed, a brake member spaced from but adjacent to said driving member, a clutch element positioned between said driving member and said brake member, a driving transmission between said clutch element and a machine, means operable at will to shift said clutch element to alternately engage said driving member and said brake member, means for slowly driving said brake member including an auxiliary drive provided with a power source, a driving member connected with said power source of said auxiliary drive, a brake driving member operatively connected with said brake member, a driven clutch member connected with said brake driving member, an auxiliary stationary brake member, and means for shifting said driven clutch member from a position engaging said driving member to a position engaging said auxiliary stationary brake member.

27. A driving arrangement as claimed in claim 26, in which said means including said auxiliary drive forms an auxiliary clutch-and-brake assembly.

28. A driving arrangement as claimed in claim 27, further comprising means operable to energize said auxiliary clutch-and-brake assembly to drive said brake member, and means operable to normally retain said auxiliary clutch-and-brake assembly in its brake position.

29. A driving arrangement as claimed in claim 28, in which said auxiliary clutch-and-brake assembly comprises at least one clutch member of the expansion and said machine.

30. A driving arrangement as claimed in claim 29, in which said expansion type clutch member comprises two hingedly connected wedgeformed semicircular discs, a driving sleeve member, and a stationary sleeve member mounted in alignment outside the periphery of said semicircular discs, both sleeve members extending beyond the radius larger than the centre radius of said disc and less than the dimension thereof across either surface thereof, and further comprising means for tilting said discs in the opposite direction.

31. A driving arrangement as claimed in claim 30, in which said driving sleeve forms a part of a pulley driven by said auxiliary drive for said brake member.

32. A driving arrangement as claimed in claim 30, including a driving spindle for said brake, said driving spindle having an extending end, means connecting said driving spindle with said semicircular discs to rotate together, a resilient member operable to tilt said semicircular discs to the position engaging said stationary sleeve, and electromagnetic means operable to tilt said discs against the action of said resilient means to engage said driving sleeve member.

33. An electric power source for a sewing machine which enables the operator to stop the machine with the needle bar in a pre-elected dead position, the said power source comprising an electric motor having an extended motor shaft, a first coupling element fastened to one end of said motor shaft, a second coupling element adapted to move in and out of operation in engagement with said first coupling element mounted at the coupling shaft end adjacent to said first coupling element, spring tension means adapted to keep the said second coupling element out of contact with the said first coupling element, a braking element adapted to operatively contact said second coupling element, a sheave for driving a sewing machine attached to the free end of the said coupling shaft, a lever adapted to be connected at one end to the foot control of
the sewing machine and linked at the other end to means counteracting the spring tension and moving the said second coupling element into operative contact with the said first coupling element when the said lever is moved into one position and moving the said second coupling element into operative contact with said braking element when the said lever is moved into the opposite position, means rotatably connecting the said braking element to a first element of a magnetic clutch consisting of the said first and another element rotated by the said motor shaft, and circuit means including an interrupter adapted to act in synchronism with the rotation of the sewing machine for supplying power to the said magnetic clutch and keeping the said magnetic clutch closed when the said lever is maintained in the said one position and for cutting the power supply to the said magnetic clutch when the said lever is moved into the opposite position and the sewing machine attains a pre-elected point of rotation.

34. A sewing machine driving arrangement comprising a unitary self-contained electric clutch brake power transmitter having frame means, comprising an electric motor with a rotor, means rotatably supporting said rotor within the said frame means, a clutch including a driving clutch member operatively connected with said rotor, a single brake member, and a driven clutch member, means for selectively shifting said driven clutch member into engagement with said single driving clutch member and with said single brake member, output means operatively connected with said driven clutch member, means rotatably supporting said driven clutch member, said output means and said brake member within said frame means, slow speed drive transmission means for said single brake member supported on said frame means and operative to constitute said single brake member a directly acting slow speed drive member, said slow speed drive transmission means including electromagnetically operated clutch means, and means operable in response to a predetermined position of said sewing machine for operating said electromagnetically operated clutch means to thereby render said slow speed drive transmission means ineffectual to drive said single brake member so as to thereby constitute said single brake member a directly acting brake member for stopping said sewing machine in a predetermined position of its parts by halting said driven clutch member during engagement thereof with said brake member.

35. A sewing machine driving arrangement comprising a unitary self-contained electric clutch brake power transmitter having frame means, comprising an electric motor with a rotor, means rotatably supporting said rotor within the said frame means, a clutch including a driving clutch member operatively connected with said rotor, a single brake member, and a driven clutch member, means for selectively shifting said driven clutch member into engagement with said single driving clutch member and with said single brake member, output means operatively connected with said driven clutch member, means rotatably supporting said driven clutch member, said output means and said brake member within said frame means, slow speed drive transmission means for said single brake member supported on said frame means and operative to constitute said single brake member a directly acting slow speed drive member, said slow speed drive transmission means including electromagnetically operated clutch means.

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