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SEARCH ROOM

April 20, 1965 A. M. DELGADO 3,179,867

ELECTRIC DRIVER FOR DRIVING THE WOOF-CARRYING UNIT OF A LOOM

Filed March 1, 1962 2 Sheets-Sheet 1

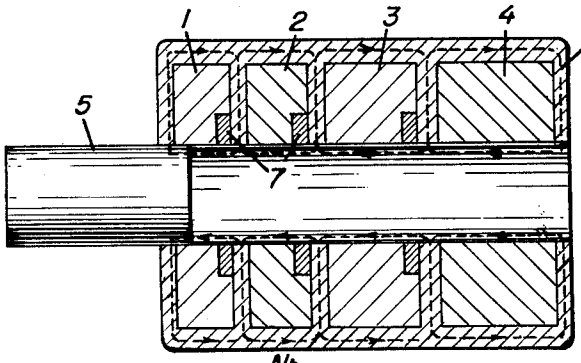


FIG 1

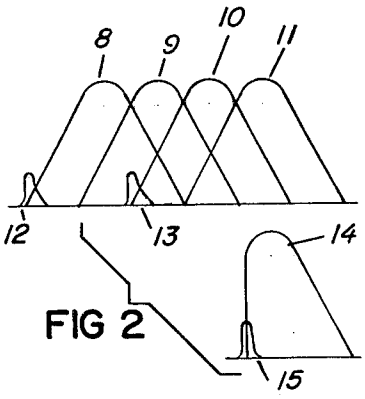


FIG 2

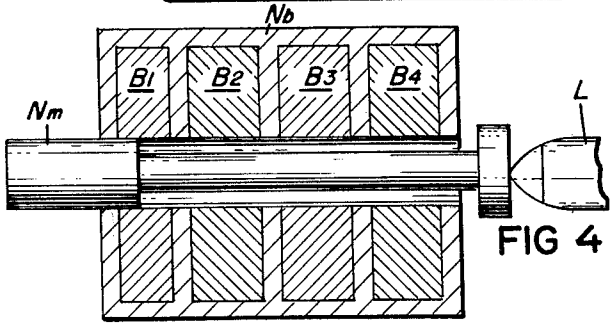


FIG 4

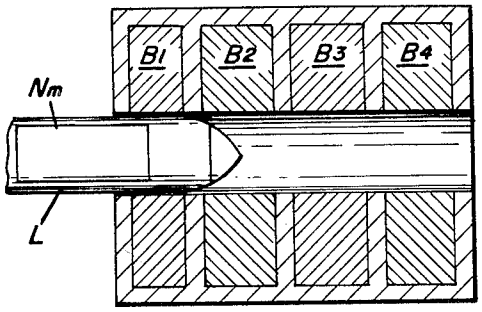


FIG 5

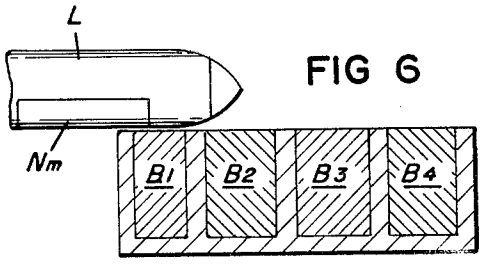


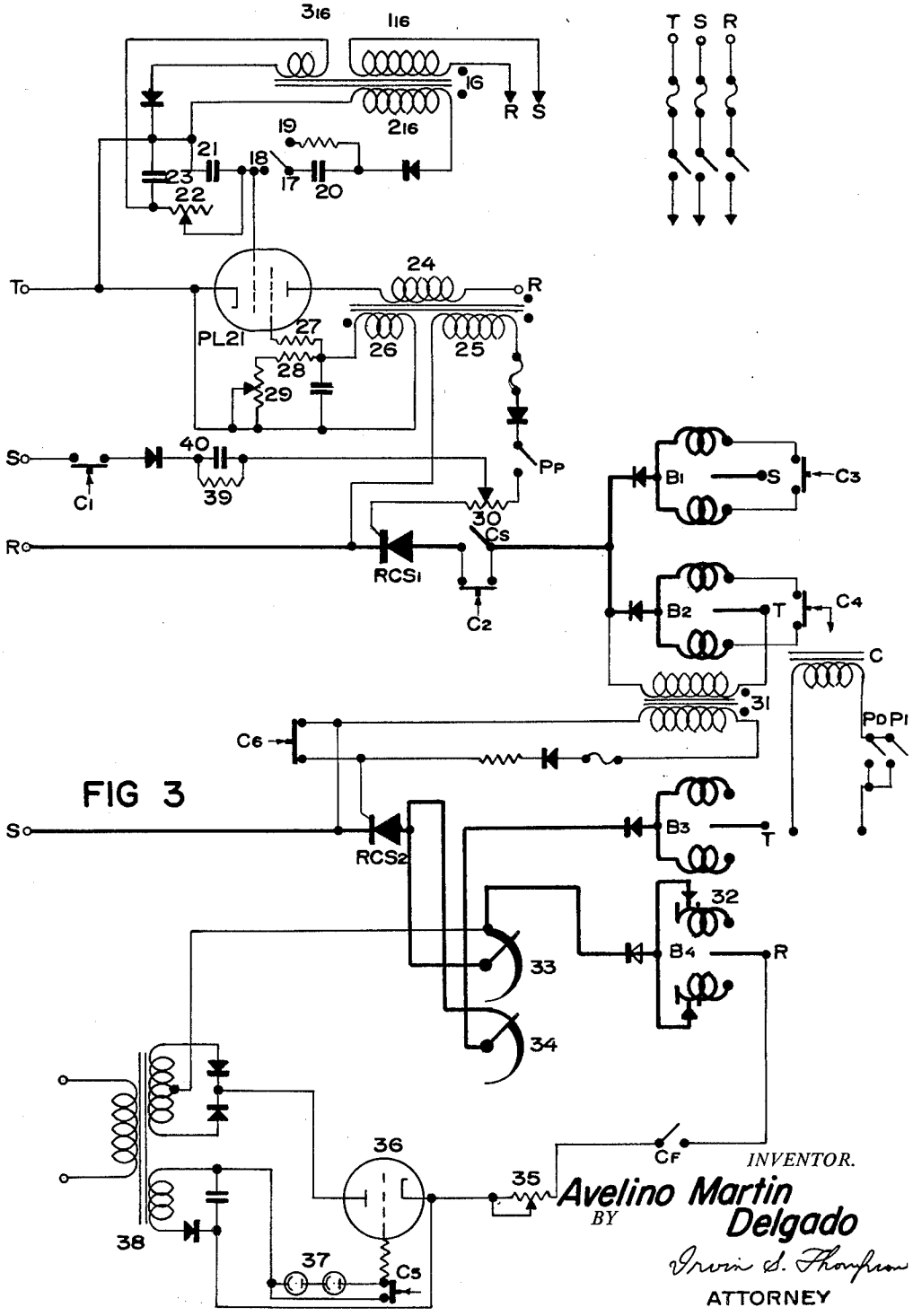
FIG 6

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ELECTRIC DRIVER FOR DRIVING THE WOOF-CARRYING UNIT OF A LOOM

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ELECTRIC DRIVER FOR DRIVING THE WOOF-CARRYING UNIT OF A LOOM

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8 Claims. (Cl. 318—135)

The invention is concerned with an electric driver for driving the woof-carrying unit of a loom. This invention embodies a working system of introducing or substituting the mechanical picking of looms by electro-magnetic impulsion of the woof-carrying unit, e.g., the shuttle.

One object of the invention is to provide an electric driver, by which the woof-carrying unit is driven electrically with a practically constant acceleration.

The electro-drive unit herein put forward works off main line voltage, provided this is or can be 3-phase.

Another object of the invention is to make it possible for the speed of the woof-carrying unit to be adjusted while the loom is in operation until the most adequate speed is obtained.

In the electro-drive put forward by this invention, the circuit is so planned that if the loom stops the woof-carrying unit will never be released.

Another object of the invention is to create an electric driver in which the electro-drive system itself is used to brake the woof-carrying unit.

One further aim of the invention is to make it possible for the speed adjustment of the electro-drive units to be carried out jointly or indepedently.

The trigger circuit requires there to be only one firing every time the shed opens, and this invention allows for a circuit which ensures the single firing.

The circuit proposed by this invention also allows loose courses to be obtained on a pre-determined basis, in order to make designs or because this is required by the fabric.

The circuit itself of the invention incorporates a manual discharge system so that the woof-carrying unit can be fired when the loom is not working.

A fuller idea of the object of this patent is given in the following description in conjunction with the figures accompanying these specifications, somewhat diagrammatically and solely by way of example, showing the most characteristic units and details of the invention, with reference to a possible case of putting it into practice.

FIGURE 1 is a diagrammatic section of one of the shuttle driving coil units;

FIGURE 2 is a graph of the current inputs to the coils of FIGURE 1;

FIGURE 3 is a wiring diagram of an embodiment of the three-phase supply network;

FIGURE 4 is a diagrammatic section of one of the shuttle driving coil units showing the embodiment of the magnetic core driving the shuttle;

FIGURE 5 is a diagrammatic section of one of the shuttle driving coil units showing the embodiment of the magnetic core embedded in the shuttle; and

FIGURE 6 is a diagrammatic section of one of the shuttle driving coil units illustrating the embodiment of the magnetic core embedded in the shuttle with the drive system open to permit change of the shuttle.

The sequence of operations performed by the loom and circuit is:

(1) The shed closing actuates switch **17–18**,

(2) Switches S, T, T and R mounted on the loom shaft are actuated in series by rotation of the loom shaft,

(3) Switches S, T, T and close to complete circuits

to coil components B_1, B_2, B_3 and B_4 sequentially on the left of the loom to give a series of impulses to shuttle N*m*,

(4) Shuttle N*m* moves to the right across the loom,

(5) Shuttle N*m* activates photocell **37** on the right of the loom to energize coil component B_4 at the right of the loom to brake the shuttle,

(6) Switches S, T, T and R close to complete circuits to coil components B_1, B_2, B_3, B_4 sequentially on the right side of the loom to reverse the direction of the shuttle and impulse the shuttle N*m* to the left.

(7) Shuttle N*m* moves to the left across the loom,

(8) Shuttle N*m* activates photocell **37** on the left of the loom to energize coil component B_4 at the left side of the loom to brake the shuttle, and

(9) Repeat 2, etc.

FIGURE 1 is a simple sketch showing the electro-drive unit, which should have at least one coil; in the drawing shown as an example, it consists of four coils **1**, **2**, **3** and **4**; and **5** is the magnetic core, which may form the woof-carrying unit itself or may drive a woof-carrying unit; **6** is the general core of the electro-drive system, and **7** is field or control coils.

In FIG. 2, the current waves of the coils are represented by **8**, **9**, **10** and **11**, while **12** and **13** are the impulses which make way for these waves, as explained later when dealing with the interpretation of FIG. 3.

In this case the half-waves of current have been represented with a phase shift of **60** electrical degrees, although any of the many other possible combinations of the 3-phase network is permissible.

When the half-wave **8** passes through the coil **1**, the flow commences and grows in the air gap attracting the core **5** and when it has closed or half-closed the air gap the half-wave **9** has already commenced on the coil **2**, which continues to attract the core **5**, and this process is continued as far as half-wave **11**, on coil **6**.

As the branches of the core are common, it is clear that the flows will unite and lengthen, producing a continuous and practically constant suction effect.

As the half-waves are electronically controlled, in the same FIG. 2, one of them **14** has been shown cut off as the impulse is retarded, and in this way the suction effect and with it the speed of the woof-carrying unit can be controlled, although this does not rule out another control system, as will be seen when FIG. 3 is explained below.

The impulse shifter circuit, which will be additional to the one in FIG. 3, has not been shown, since it does not affect the basic circuit, and one of the many standard types can be adapted for the purpose.

In the same way a single RCS unit or similar can be used, using a neutral Y-connected transformer ("star-connected"), with one reversed phase so that in those looms where it is enough to use the 3-coil electrodrive, i.e. with 3 impulses, it can be done with this transformer and a single RCS unit or similar provided the 3 waves, staggered at 60 electrical degrees, expire before a complete cycle.

As this transformer is of normal standard type it has not been shown in the drawings, in order to avoid unnecessary complications.

Also for greater simplicity the current waves are shown as solenoid without taking into account the transistory effects which give more complex waves with a greater time-base.

In order that the core **5** (which may itself be the woof-carrying unit, or instead may drive the later) should do the job at the correct speed, the half-waves **8**, **9**, **10** and **11** must pass through the coils **1**, **2**, **3** and **4** only once at the opening of the shed, otherwise the core **5** would be sucked in both directions, or at least very much slowed down, and the desired effect would not be achieved.

The entire arrangement of FIG. 3 is mainly to ensure this; it works as follows:

17, **18** and **19** represent a switch driven by the main shaft of the loom, synchronized with the shed opening, and STTR.

When the movable contact **17** closes with **18**, the whole system must fire just once.

Then the secondary 2_{16} of the transformer **16** start a current through a rectifier, which goes through the condensers **20** and **21**, and a positive polarity is produced in **18**, which is connected to the first grid of the thyratron, for example a PL_{21}, and this is left in the firing position.

The first grid of the thyraton is previously negatively polarized and the thyratron blocked.

As will be seen from the outline, the thyratron will be left in the firing position with the positive half-wave RS and fires with the half-wave RT, which is staggered or retarded 60 electrical degrees.

The passage of the half-wave RT through the primary **24** induces the corresponding voltages in the secondaries **25** and **26**.

The current in **25** chain-fires the whole electro-drive system, and that in **26** again blocks the thyratron.

That in **25** is injected into the Gate through a rectifier and a resistance in order to keep the current down to the proper flow.

That in **26** charges a condenser connector to a cathode and second grid in which a negative polarity is induced, blocking it.

Previously, owing to the resistances **28** and **29** controlling the time-discharge constant RC, the second grid is at the potential of the cathode and the thyratron would be a conductor if not prevented by the first grid.

The signal of the secondary **25** fires the RCS_1; passing through B_1 is the current half-wave corresponding to that of SR tension retarded 60 electrical degrees after the RT of the thyratron.

Before it expires, the TR, also 60 electrical degrees retarded after the SR, appears through B_2, and both will flow until SR dies out.

Between the ends of the coil B_2 has been connected the transformer **31** whose job it is to fire the RCS_2 and let TS and RS through B_3 and B_4.

STTR a contractor driven by the main loom shaft and designed to connect the electronic unit to one or other electro-drive system on each side of the loom sley, so that B_1, B_2, B_3 and B_4 are doubles, one for each system on each side.

The coils B_3 and B_4 have the series rheostats **33** and **34**, which limit and regulate the current and thus the discharge speed of the woof-carrying unit.

The reheostat **34** does not start limiting until **33** is half-way along its run.

After this joint regulation, independent regulation can be effected by means of the switch **32** through take-offs on coil B_4.

The coil B_4, which is an impulsor together with B_1, B_2 and B_3, is also a braker when it receives the woof-carrying unit; for this purpose, when the latter reaches its field it shuts one of the photocells **37**; there are two of these, each situated at one end of the loom sley in the proper receiving position.

One of the photocells now being a conductor **37** the thyratron grid **36** is left without negative polarity and discharges supply current to B_4 from the standard source of supply shown from transformer **38**.

The braking current is controlled by the potentiometer **35**.

Thus the woof-carrying unit will have to break the strong field produced in B_4, and will undergo rapid braking.

C_f is the braking contact synchronized with the main loom shaft, and its purpose is to break the braking current before the next impulse firing.

As the contactor STTR is already synchronized with the loom, the thyratron **36** will supply braking energy alternately to each of the coils B_4, in each case to the one receiving the woof-carrying unit.

The interruptor C_s is a safety contact operated by the mechanical coupling of the loom so that it prevents firing if the loom is not working.

P_p is an interruptor in series within the excitation circuit of the RCS_1, and when it opens the electrodrive systems will not fire.

This contact P_p is included so as to allow for the possibility of pre-determining loose courses.

Finally, there follows an explanation of the manual discharge circuit, which is of great use to the loom operator, by means of it the woof-carrying unit can be passed from one side of the loom sley to the other when the loom is stopped.

To this end, there is a push-button or feeler, P_I or P_D, at each end of the loom sley, right and left, either of which drives the woof-carrying unit.

When either of these two buttons, P_I or P_D, is pressed, the contactor C is excited, closing the contacts C_1, C_2, C_3, C_4, C_5 and C_6.

C_1 will only excite the RCS_1 once, as the condenser **40** will be charged and the small amount of current circulating on account of **39** will not be enough to excite the RCS_1 a second time, but the charge current of the condenser **40** will have done this already, in principle.

C_2 shortcircuits the safety contacts C_s which will be open since the loom is stopped.

C_3 and C_4 shortcircuit the ends of the coils B_1 and B_2 so that as S and T will always be in one of them both coils will discharge but only the one holding the woof-carrying unit inside it will do so effectively.

It should be noted that in the manual discharge only two of the four coils work, as this is enough to pass the woof-carrying-unit, in this example, and in this case less quickly.

C_5 ensures the negative polarity of the breaking thyratron **36** as it is not necessary for this to work either on manual discharge.

C_6 stops the impulse in the transformer **31** being transmitted to the RCS_2, avoiding the firing of B_3 and B_4, as stated above.

Thus, every pressing of the button will result in only one discharge.

The field or control coils **7** are designed to allow flow-metering, obtaining signals, etc.

In FIGS. 4, 5 and 6 are shown the various forms of drive with the same basic system.

In FIG. 4, the magnetic core N*m* operates a rod which drives the shuttle or woof-carrying unit.

In FIG. 5, the magnetic core N*m* is positioned inside the woof-carrying unit.

And in FIG. 6, in which the magnetic core N*m* is again inside the woof-carrying unit, the electro-drive system is open to allow the shuttle or woof-carrying unit to be changed.

The system described in this patent application and for which claims are made is not subject to any limitations as regards number of coils, or strength, phase shift or frequency thereof.

The electronic components used may be substituted by any other or others of a similar nature, provided the basic process is maintained, without this signifying any alteration.

Thus, in FIG. 3 the RSC's may be substituted by thyratrons or ignitrons, or one unit may be used for each coil.

The above is an adequate description of the nature of the present invention and how it can be operated on an industrial basis; during any such practical working of the invention, any modifications of detail may be introduced that appear advisable in practice, provided the variations introduced do not change, alter, or modify the essential nature of the object described.

I claim:

1. An electric driver for driving the woof-carrying unit or shuttle of a loom comprising:

(*a*) two driving coil units electrically connected together, each of said coil units comprising a plurality of coils,

(*b*) core drive means within said coil units for driving a said loom shuttle,

(*c*) a three-phase network applying half-wave pulses to said coil units, and

(*d*) means for applying said pulses sequentially to said coils to accelerate the core drive means in the driving coil units.

2. An electric driver as claimed in claim 1, and means for altering the length of time during which said half waves are applied thereby to control the speed of a said shuttle.

3. A driver as claimed in claim 1, in which the last-named means includes at least one triode and a transformer in the secondary.

4. An electric driver as claimed in claim 1, and a loom-actuated interrupter in said network whereby said network is disconnected when the loom is not in operation in order to prevent discharging said drive means.

5. An electric driver as claimed in claim 1, and electromagnetic braking means for said core drive means comprising a photocell controlling at least one said coil whereby said at least one coil operates as a brake.

6. An electric driver as claimed in claim 1, and means for regulating the speed of a said shuttle, comprising at least one rheostat for regulating the power to the coils.

7. An electric driver as claimed in claim 1, in which said network comprises at least one thyratron having grids supplying said coil units with half waves of current, and discharge safety means comprising a secondary, a condenser having condenser plates in said secondary, one of said condenser plates being connected to one of said grids of said thyratron whereby a negative polarity is produced in said condenser plates, and said thyratron is blocked and second and third discharges are prevented.

8. An electric driver as claimed in claim 1, in which the last-named means include at least one triode and a transformer in the secondary, and manually actuable discharge means for a said shuttle comprising manually operable switches in circuit with said coils thereby to eject a said shuttle from a said loom when the loom is otherwise stationary.

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