May 5, 1942. G. DALKOWITZ 2,281,753

MOTOR

Filed Oct. 1, 1937 2 Sheets-Sheet 1

Fig. 1.

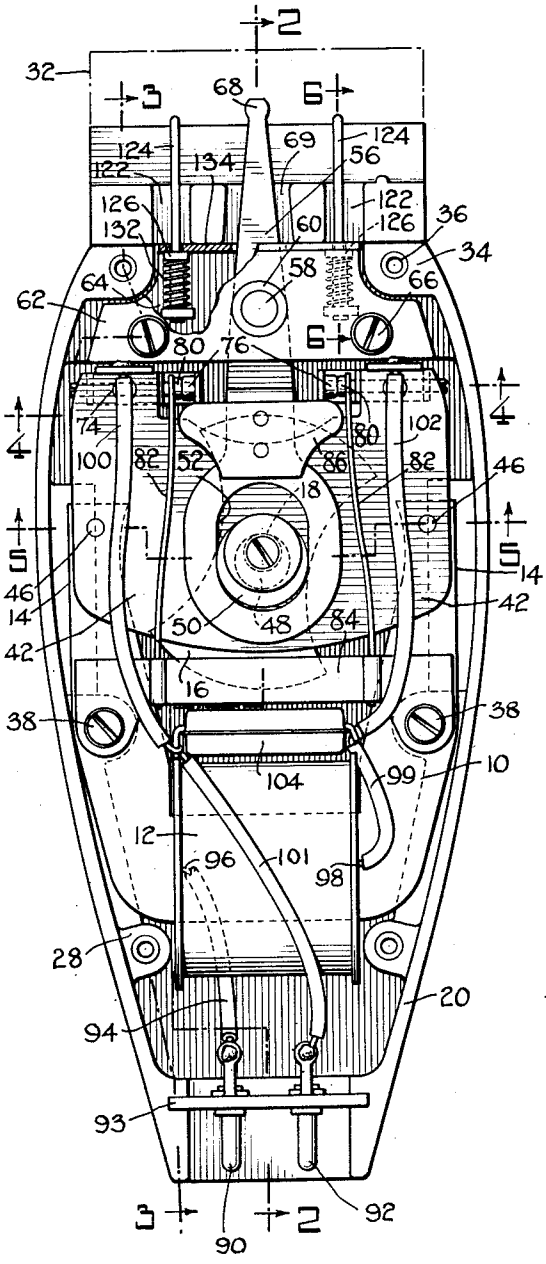
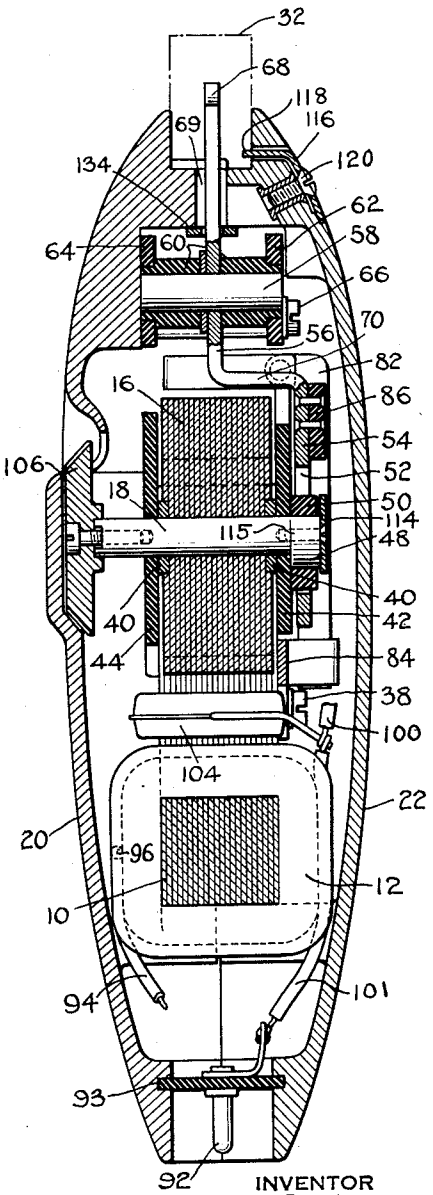


Fig. 2.



INVENTOR
Godfrey Dalkowitz
BY
ATTORNEY

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Fig. 3.

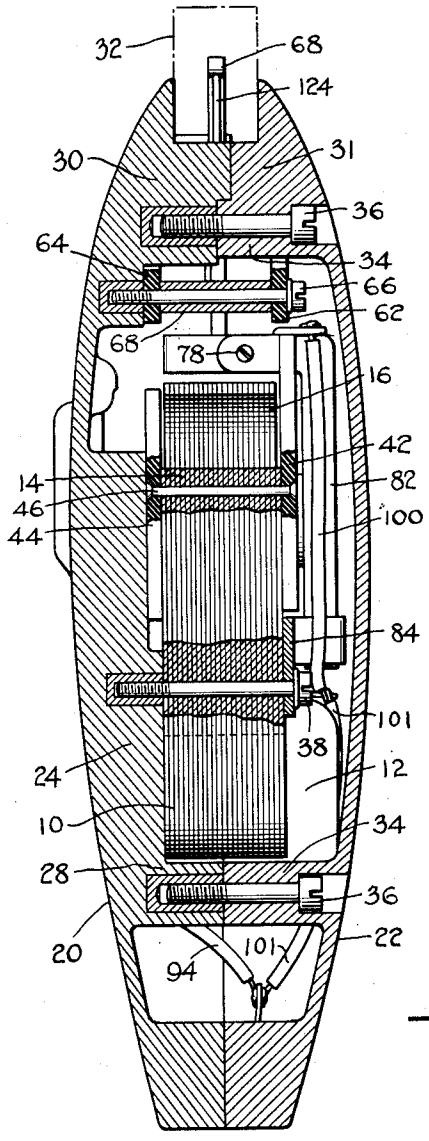


Fig. 4.

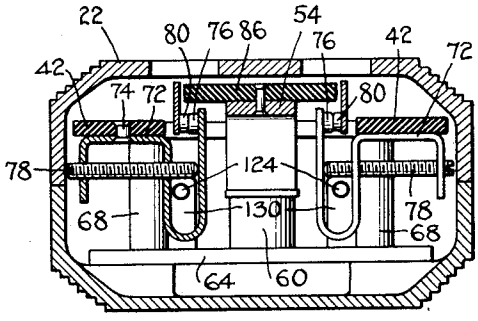


Fig. 5.

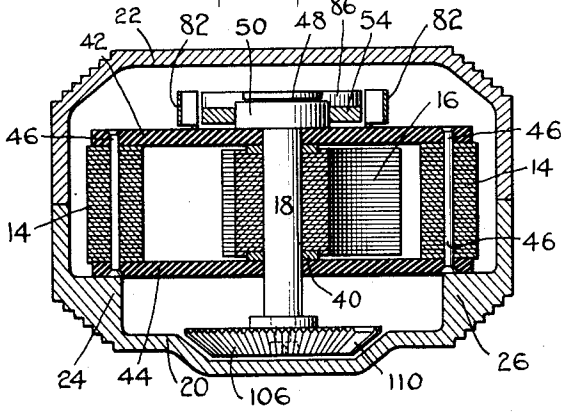
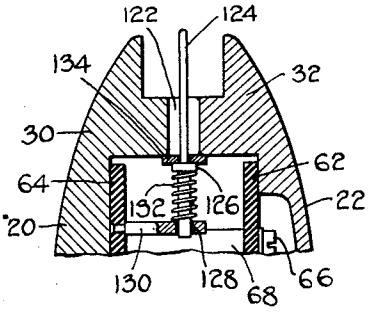


Fig. 6.



INVENTOR
Godfrey Dalkowitz
BY William F. Black
ATTORNEY

Patented May 5, 1942 2,281,753

UNITED STATES PATENT OFFICE

2,281,753

MOTOR

Godfrey Dalkowitz, Brooklyn, N. Y., assignor to American Safety Razor Corporation, Brooklyn, N. Y., a corporation of Virginia

Application October 1, 1937, Serial No. 166,726

8 Claims. (Cl. 172—36)

In one of its aspects, this invention relates to dry shaving apparatus whereby the shaving operation is effected without any preparation of the skin and hair as by the application of soap, shaving cream and the like and in another of its aspects relates to a motor particularly intended for the operation of small tools or instruments of which dry shavers and hair clippers are examples.

Among the general objects of my invention is the provision of a device that is compact, efficient in operation and low in manufacturing and maintenance costs.

Among the more particular objects of my invention may be mentioned the provision in a motor operated tool of an effective arrangement of the parts thereof; the provision in a motor operated tool of an improved motor; the provision in an electric motor of the magnetic type, of improved make and break means; the provision in a motor of improved means for mounting the rotor thereof; the provision in a motor operated tool, the motor of which has a time control operating device associated therewith, of improved means for operating said time control device and for transmitting movement from the motor to the tool; the provision in a motor operated tool, the motor of which is an electric motor of the magnetic type provided with a make and break device, of improved means for operating said make and break device and for transmitting motion from the motor to the tool; the provision in a dry shaver of a motor having improved means for transmitting power from the motor to the shaver head; the provision in an electric motor of the magnetic type of a make and break device comprising two sets of contacts and more particularly of two sets of contacts connected in series so that when the contacts of either set are separated the circuit will be broken; the provision of an improved casing for a motor; and the provision, in a casing for a motor, of improved means for mounting the motor in the casing.

For the attainment of these objects and such other objects as will hereinafter appear or be pointed out I have shown one invention in the drawings, in which:

Figure 1 is a plan view of a dry shaver according to my invention, with a portion of the casing removed so as to expose the interior thereof;

Figure 2 is a sectional view substantially on the irregular line 2—2 of Figure 2, looking in the direction of the arrows, and showing all portions of the device in place within the casing;

Figure 3 is a sectional view substantially on the irregular line 3—3 of Figure 1, looking in the direction of the arrows; and

Figures 4, 5 and 6 are sectional views respectively on the lines 4—4, 5—5 and 6—6 of Figure 1, looking in the direction of the arrows.

Referring now to the drawings for the details of my invention, it will be observed that my invention has been shown in an illustrative embodiment thereof as comprising an electric motor enclosed within a casing from one end of which protrudes an oscillating lever for causing movement of tool parts such as a shaver head (so indicated in dot-and-dash lines) while from its other end protrude terminals through which connection with a source of electrical energy may be made.

The motor is shown as of the "magnetic" type and as comprising a laminated horseshoe-shaped field structure 10 of any suitable or preferred material, such as electrical steel, which has the property of becoming magnetized when subjected to the action of the electric current in a coil of insulated wire, such as shown at 12, and of losing its magnetism when the electric current is no longer allowed to pass through the coil, and this field structure 10 is provided with a pair of poles 14, 14, spaced from each other so as to provide a gap within which is positioned the armature 16, mounted on a shaft 18 for rotation therewith.

The field structure 10 and coil 12 are preferably of such dimensions and proportions that when they are enclosed in the casing, shown as comprising two sections numbered 20 and 22 respectively, the whole may be conveniently grasped in the hand and serve as a handle in manipulating the dry shaver while shaving.

The casing section 20, which may be referred to as the lower section, since it is provided with mountings for holding the motor within the casing, is in the form of a thin shell of any suitable or preferred material, such for example as synthetic resin, which possesses the advantage of being an insulator and may be readily molded into the desired shape, and in order to impart strength to this shell and to afford portions of sufficient thickness to provide an anchorage for the motor and for the means to hold together the parts of the casing, I have shown the casing section 20 as provided with a pair of longitudinally extending ribs 24 and 26, as well as with bosses 28 adapted to receive suitable fastening means, and the section 20 is further shown as having a thickened portion 30 at its forward end

provided with a recess within which is adapted to seat the shaving head, indicated in dot-and-dash lines at 32. Where the anchorages or other fastenings for uniting the casing sections take the form of screws, nuts to receive the same are conveniently molded into the material of the casing, as indicated in the drawings.

The casing section 22 is shown as provided with a thickened portion 31 similar to portion 30 of the section 20 and also recessed to accommodate the shaving head 32, and is further shown as provided with tubular bosses 34 through which may pass screws 36 used to fasten the two casing sections together and it may also be provided with strengthening ribs similar to the ribs 24 and 26 of casing section 20.

In order to hold the field structure 10 in place within the casing section 20 I have shown fastening means, such as a pair of screws 38, one passing through each of the legs of the field structure 10 and anchored respectively in suitable means provided in the ribs 24 or 26 of the casing.

The armature 16, like the field 10, is of any suitable or preferred laminated material, such as electrical steel, and is carried by an armature shaft 18 shown as journalled in a pair of members 42 and 44 disposed respectively on opposite sides of the armature, and anchored to the poles 14 of the field structure 10 in any suitable or preferred manner, as by the rivets 46. In order not to interfere with the functioning of the motor, which depends on the magnetic action of the field on the armature, the members 42 and 44 are preferably made of non-magnetic material of any suitable or preferred type, and for a purpose that will appear later this material should preferably be electrically insulating as well.

A washer 40 is shown interposed between each member 42 and 44 and the armature, and as sunk into the end laminations of the armature. It will be observed that the washers 40 serve the function among others of preventing rubbing of the armature against these members 42 and 44.

At one end thereof the armature shaft 18 is shown as provided with an eccentric 48, and this eccentric is shown as surrounded by a bushing 50 in slidable engagement with the walls of a slot 52 provided in one end 54 of an operating lever 56 pivotally mounted in the casing as by means of the pin 58 passing through the lever and journalled within a pair of bushings 60, one on each side of the lever and carried respectively by spaced members 62 and 64 mounted on the casing section 20 as by means of screws 66 passing through both of said members 62 and 64 and anchored in the casing section 20, the members 62 and 64 being shown as held in spaced relation by sleeves 68 surrounding the screws 66.

The lever 56 of the specific embodiment herein illustrated is shown as made in three sections, one of which 54, already mentioned, is positioned above the armature and is provided with the slot 52, while another carries the pin 58, and extends out of the casing through an opening 69 therein, and is adapted to activate the shaving head 32 by means of its free end portion 68 that is adapted to extend into the shaving head and to cause movement of parts thereof as the lever 56 oscillates about the pin 58 as an axis, this oscillation being effected by the rotation of armature shaft 18 and the consequent movement of the eccentric 48 and bushing 50 within the slot 52 of the inner end of the lever 56. Between the two lever portions just described is shown a third portion 70 angularly related to both of them and serving to connect them.

The bushing 50, it will be observed, serves to reduce friction and consequently wear, between the eccentric 48 and the walls of the slot 52, and by making it of electrically insulating material, it may serve the further purpose of preventing the passage of stray electric currents into the lever 56 and therefrom into the shaving head and into the flesh of the user. Manifestly to secure this result of preventing passage of currents through the lever into the shaving head it is not sufficient to provide insulation only at this point, but insulation must be provided wherever the lever touches parts that are or may become electrically alive.

In order to keep bushing 50 in its place surrounding the eccentric 48 I have shown a plate or disc, 114 mounted on the end of the shaft 18 and secured thereto by suitable or preferred means such as a screw 115.

The motor assembly further requires a make and break arrangement, whereby the electrical circuit consisting of the field coil 12 may be made and broken at appropriate times so as to give the timed magnetic impulses to the armature on which the operation of the motor depends. For this purpose I have shown by way of example, a pair of electrically conducting members 72 (visible most clearly in Figure 4) mounted one on each side of the member 42, as by rivets 74 and which as already stated is made of electrically non-conducting material in any suitable or preferred manner. One end of each of said members 72 is illustrated as of U-shaped contour and as carrying a bead or button 76 of material suitable for a contact for an electrical make and break. Adjusting means whereby the position of the contact 76 may be adjusted with a high degree of refinement is shown in the form of an adjusting screw 78 passing through the inner leg of the U-shaped portion of each member 72, as well as through the other end portion thereof, and in threaded engagement therewith and the nose of the screw 78 is shown as pressing against the outer contact carrying leg of the U-shaped portion. The latter is resilient or resiliently connected to the other portions of the member 72, so that it will always maintain contact with the nose of the screw 78, and as the screw is adjusted the contact will be correspondingly moved. Each contact 76 is opposed by a companion contact indicated at 80, and carried by a resilient or resiliently mounted electrically conducting member 82 that is shown as caried by an electrically conducting strip or plate 84 serving to electrically unite the members 82. The strip or plate 84 is conveniently mounted either by passing the screws 38, that hold the field within the casing, through the strip 84 so that it is clamped against the field under the heads thereof, or by mounting the same on a second strip or plate clamped against the field as just described or in any other preferred or desired manner. Whichever method is used it is obviously preferable that the strip or plate 84 be insulated from the field structure so that the make and break system is insulated therefrom.

In the illustrated embodiment the making and breaking of the electrical circuits is shown as effected by means that cause separation of the contacts 80 and 76 at appropriate times. For this purpose a tapper or cam 86 is shown as mounted on the portion 54 of lever 56, being

secured thereto in any suitable or preferred manner as by rivets 88, and projecting portions thereof are adapted to strike against the members 82 and to cause separation of the contacts 76 and 80 as the eccentric 48 causes the lever portion 54, and consequently the cam 86, to move to one side or the other of its mid-position.

It will be observed that electrical current is introduced into the motor through the terminals 90 and 92, shown as carried on an insulating plate 93 seating within grooves in the casing sections 20 and 22, as by connection thereof to a plug connected to a source of current.

It will be convenient in order to trace the electric circuits of the motor to consider the current as entering at the terminal 90 and from there passing through a lead 94 into the coil 12 through one terminal 96 thereof, and out of the coil 12 through the terminal 98 thereof and into the lead 99 from which it passes through the head 102 into the right hand member 72 (as seen in Figure 1) through the right hand contacts 76 and 80, through the right hand member 82, and through the strip 84 into the left hand member 82, and the left hand contacts 80 and 76 and left hand member 72, from which it passes through the leads 100 and 101 into the terminal 92, which completes the circuit.

It will be observed that the circuit as just described is a closed circuit and presupposes a position of the eccentric 48 in which the cam 86 does not effect separation of either pair of contacts, that is the lever 56 must be in, or near its mid-position. When the circuit is so closed the field structure 10 will be magnetized and the armature 16 will move into bridging alignment with the poles 14 of the field structure. The eccentric 48 is positionally so related to the armature that as the latter reaches the aforementioned bridging position the cam 86 causes either one or the other of the pairs of contacts 80 and 76 to separate, and since these pairs of contacts are in series, separation of the contacts of either pair opens the motor circuit, the coil 12 is deenergized and the field structure 10 demagnetized. The armature, due to its momentum and the cessation of the force causing it to bridge the poles 14, moves past said bridging position and the eccentric also moves until the cam 86 again permits the closing of the circuit through contacts 76 and 80, when the armature again receives a magnetic impulse or kick.

The pairs of contacts operate in alternation as the lever portion 54 moves first to one side and then to the other side of its mid-position, and it will be apparent that to each revolution of the armature corresponds one complete operative cycle of the lever 56 and one opening and closing of each pair of contacts 76 and 80, corresponding each to one impulse of the armature.

It will be understood that instead of connecting the two pairs of contacts 76 and 80 in series, as here shown, I may connect them in other ways and still secure the proper operation of the motor. For example, a parallel connection might be used, with the contacts 76 and 80 normally open, while the cam would serve to close them alternately and energize the coil 12 at each closing of one of said pairs of contacts.

In order to increase the effectiveness of the make and break system, I have shown a condenser 104 shunted across the contacts 76 and 80, which may be done conveniently in the construction shown, by connecting its terminals respectively to the ends of leads 100 and 102.

Since the motor will not be self-starting if it should happen that the circuit is open, I have shown starting means in the form of a starting wheel 106 carried by the armature shaft. As shown in the drawings this wheel is mounted on the end of shaft 18 opposite to that in which the eccentric is positioned and its rim is shown as knurled or corrugated and as accessible to a user through the slot 108 provided in the casing section 20. By means of his finger the operator may, after connecting the motor to the power source push the knurled rim of wheel 106 and rotate the same until the motor starts, or he may, before connecting the motor to the power source rotate the armature into a starting position corresponding to a point at which the circuit has just closed and the armature is in a position roughly about half-way between the poles. To indicate such a position the starting wheel may be provided with a suitable mark such for example as shown at 110, that is, a rim portion from which the corrugations have been omitted, and a corresponding mark (not shown) may be provided on the casing, and it is only necessary to bring these marks into registration in order to assure the starting of the motor as soon as it is connected to the power source.

The wheel 106 may be connected to the shaft 18 in any suitable or preferred manner, as for example by the screw 112 holding the end of the shaft in a keyed recess in the wheel.

For the purpose of locking the shaving head 32 in place, I have shown a detent 118 located in a recess in the casing section and having its nose portion 116 passing through an aperture in said casing section and adapted to press against the shaving head when it is suitably adjusted by means of the screw 120 by which it is attached to the casing section 22. In order to secure a more positive locking of the shaving head I may provide a groove in the wall thereof into which the nose 116 of the detent may enter.

Protruding through openings 122 in the forward end of the casing are shown a pair of pins 124 provided at an intermediate point thereof with abutments in the form of collars indicated at 126, and each having its inner end portion passing through an aperture 128 in a bracket 132 upstanding from the member 64 (see Figure 6). Each aperture 128 is sufficiently large to permit lateral movement of the pin 124 therein, and the openings 122 in the casing also permit lateral movement of the pins 124 therein. A coil spring 132 is shown positioned on each pin between the collar 126 and a bracket 130 and this spring presses against the collar 126 so as to urge the pin outward but without preventing its inward movement when pressure is brought to bear on the outer end of the pin. In order to keep the pins substantially parallel to each other no matter how they move as they contact the moving parts of the shaving head, I have shown a plate 134 provided with apertures through one of which each of the pins passes, each of said apertures serving to hold the pins a fixed distance apart, and said plate is further shown as provided with a centrally positioned aperture through which the lever 56 passes, this aperture however being large enough to permit free lateral movement of the lever therewithin.

By the use of plate 134 it will be observed that

the outward movement of the pins 124 is limited and as they move their positions are substantially parallel to each other at all times. It will be observed that it is impossible to remove the pins from their seats without lifting out the plate 134 and this cannot be done without first removing the lever 56 from the aperture of the plate 134, which requires disassembly of the same from the casing.

It will of course be understood that if desired the plate 134 can be dispensed with; in that case the openings 122 might be made of sufficiently restricted size so that the walls of the reinforced portions 30 and 32 of the casing sections 20 and 22 would serve as abutments to take up the thrust of the collar 128 of the pin 124. It will be noted however that with this construction the positions of the pins would not be kept parallel and that as soon as the casing sections 20 and 22 are separated, there would be great danger and likelihood that the pins 124 on receiving a slight displacement might suddenly fly out of their positions in the casing due to the resilient action of the springs 122.

The pins 124 are intended to enter the shaving head and to exert pressure against parts thereof for the purpose of maintaining contact between them. Since the pins can freely move laterally it will be obvious that their end portions are free to follow any movable parts of the razor head with which they contact, thereby eliminating sliding friction at the points of contact.

I have herein disclosed the details of construction of one specific embodiment of my invention and it will be understood that this has been done only for purposes of illustration and that my invention may be embodied in many other forms differing in construction from that herein illustrated without departing from the spirit thereof as will be obvious to those skilled in the art. The disclosure herein therefore of the details of construction of one embodiment is not to be interpreted in a limiting sense and my invention is not to be limited thereby other than as called for by the prior art.

Having thus described my invention and illustrated its use what I claim as new and desire to secure by Letters Patent is:

1. In an electromotor, a make and break device comprising two sets of paired contacts connected in series so that when the contacts of either set are separated the motor circuit will be broken, means for normally holding the contacts of each set in adjacency but permitting their separation and a single means for alternately separating the contacts of either set.

2. In an electric motor of the magnetic type, a make and break device comprising two sets of paired contacts connected in series so that when the contacts of either set are separated the motor circuit will be broken, means for normally holding the contacts of each set in adjacency but permitting their separation and means for alternately separating the contacts of either set.

3. In an electric motor of the magnetic type, a make and break device comprising two sets of paired contacts connected in series so that when the contacts of either set are separated the motor circuit will be broken, one contact of each set being fixed, means for urging the other contact of each set toward the fixed contact of the set, and means for alternately separating the contacts of either set.

4. In an electric motor of the magnetic type, a make and break device comprising two sets of paired contacts connected in series so that when the contacts of either set are separated the motor circuit will be broken, one contact of each set being fixed, means for urging the other contact of each set toward the fixed contact of the set, and means for alternately separating the contacts of either set and means for adjusting the position of said fixed contacts.

5. In an electric motor of the magnetic type, a make and break system comprising a plurality of pairs of contacts connected in series in the motor circuit, so that when the contacts of any one pair are separated the motor circuit will be broken, means for causing the separation of the contacts of one of said pairs of contacts while the others remain closed and a condenser shunted across the serially connected pairs of contacts.

6. In an electric motor of the magnetic type, a make and break system comprising a plurality of pairs of contacts connected in series in the motor circuit, so that when the contacts of any one pair are separated the motor circuit will be broken, means for causing the separation of the contacts and a condenser shunted across the serially connected pairs of contacts.

7. In a motor operated tool operated by an electric motor of the magnetic type, a make and break device for said motor, having a plurality of sets of contacts arranged in series in the motor circuit, so that when the contacts of any one pair are separated the motor circuit will be broken, an oscillating lever for transmitting motion from said motor to said tool, and means on said lever associated with the contacts of each set for causing separation of the contacts thereof.

8. Means for assuring the starting of an electric motor of the magnetic type comprising indicia positioned in fixed relation respectively with the rotor and the stator of the motor, and their relative positions being such that when said respective indicia are brought into registration with each other the motor will be in a starting position and will start as soon as the electric current is turned on.

GODFREY DALKOWITZ.