H. F. KRANTZ.

SAFETY STARTING SWITCH.

APPLICATION FILED MAR. 22, 1916.

1,399,488.

Patented Dec. 6, 1921.

2 SHEETS—SHEET 1.

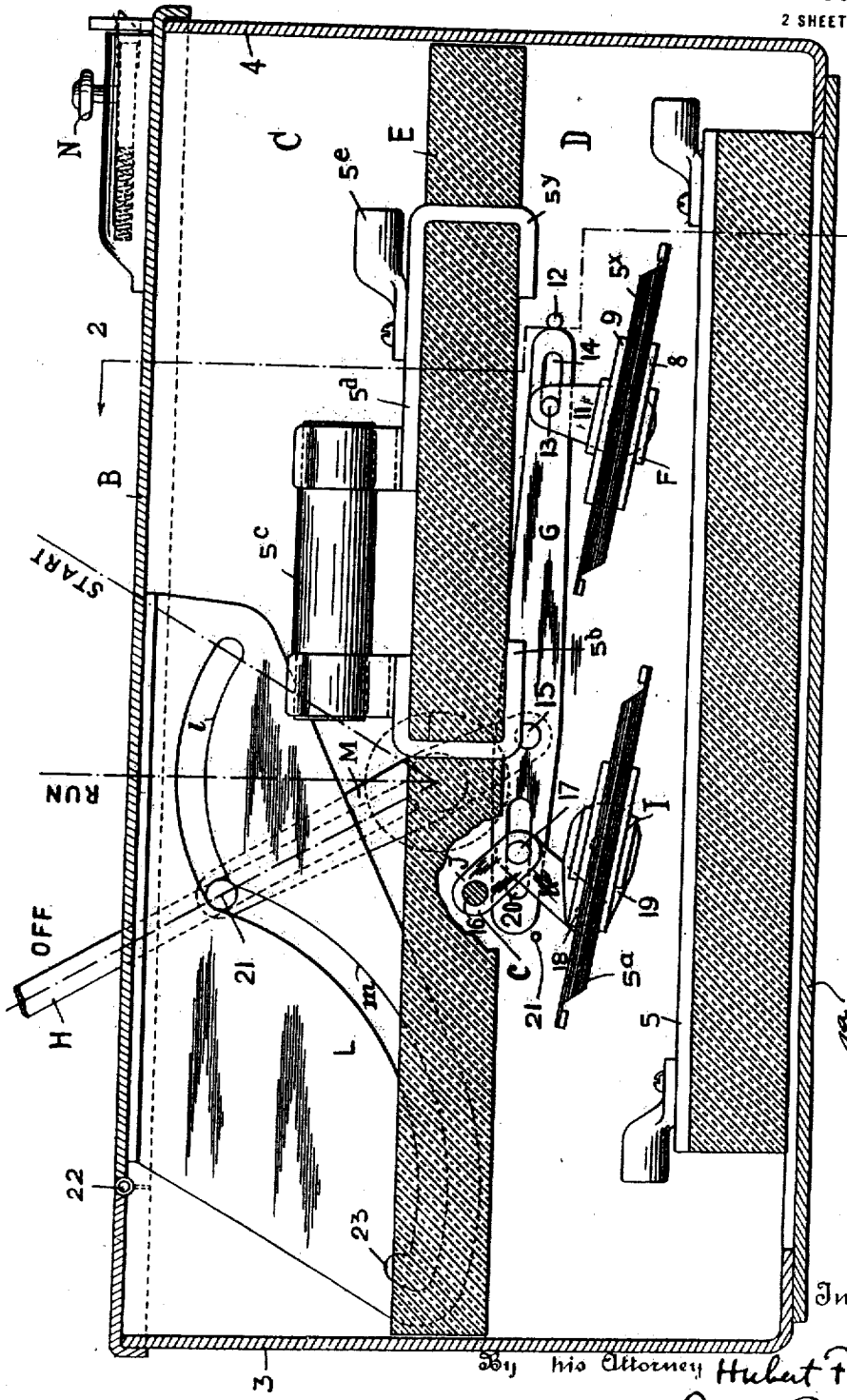


FIG 1.

Inventor

By his Attorney Hubert F Krantz

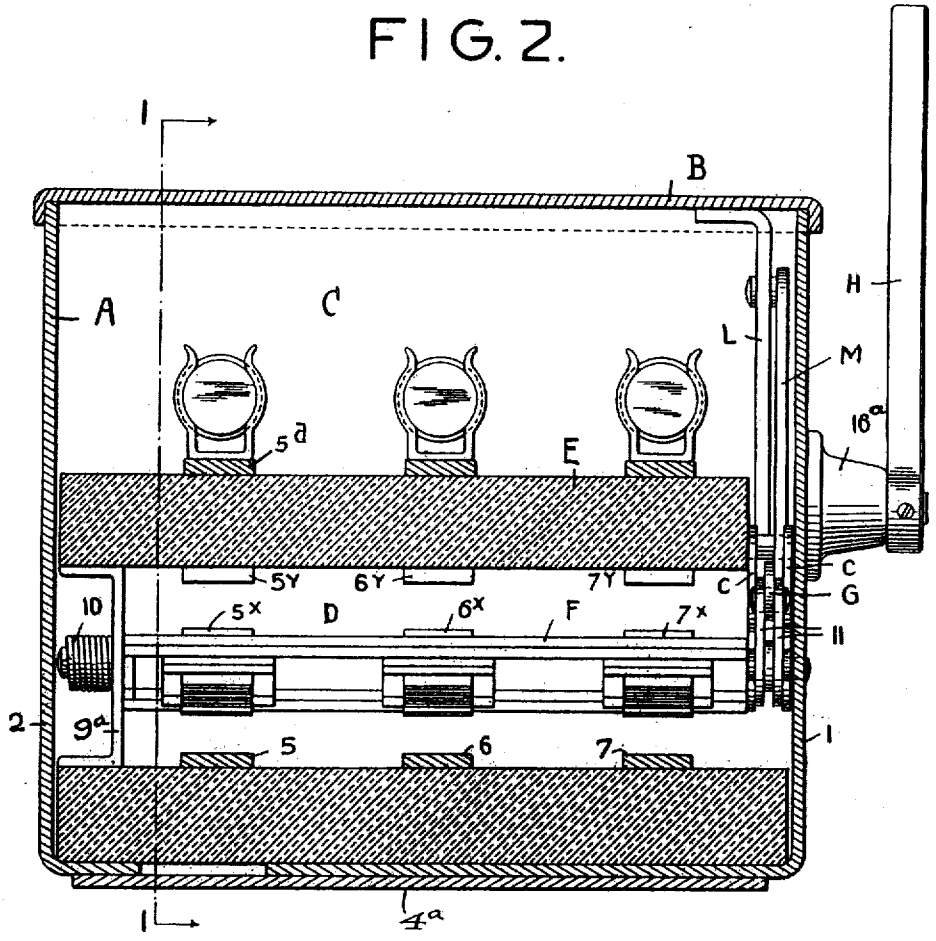
Albert F. Nathan

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2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

HUBERT F. KRANTZ, OF BROOKLYN, NEW YORK, ASSIGNOR TO KRANTZ MANUFACTURING COMPANY, INC., OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

SAFETY STARTING-SWITCH.

1,399,488. Specification of Letters Patent. Patented Dec. 6, 1921.

Application filed March 22, 1916. Serial No. 85,854.

To all whom it may concern:

Be it known that I, HUBERT F. KRANTZ, a citizen of the United States, and residing at Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Safety Starting-Switch, of which the following specification is a full disclosure.

This invention deals with a switch-mechanism, and it proposes an arrangement of which safety is its chief attribute, so that such accidents as have heretofore occurred through careless handling will be materially diminished.

One object is to create an instrumentality useful for electric motors, and which will overcome two defects, to wit the danger of coming into contact with "live" elements, and second, the liability of prematurely blowing the fuses before the back electromotive force of the motor has risen to its normal running point.

Another object is to develop a motor-starter in which the switch-devices are semi-permanently concealed and in which the fuse-holder is easily accessible through the mere opening of a door or panel and in which the door is so connected to the switch-devices that the fuse-clips will, of necessity, be "dead" whenever the door is open.

Another object of this invention is to render available a connection between the switch-operating handle and the door covering the fuse-compartment, such that the handle will serve to lock the door from displacement whenever any of the current-carrying parts are connected through the switches of the main-line.

A further object is to provide a motor starting switch combined with a fuse element and so arranged that the first inrush of current through the motor will be shunted past the fuse, and very shortly thereafter the normal motor current will switch entirely through said fuse, and in which the fuse is inclosed within a compartment, which of necessity must be closed whenever the fuse is carrying a current and is likely to be blown.

Other objects will be in part obvious from the annexed drawings and in part indicated in connection therewith by the following analysis of this invention.

This invention accordingly consists in the features of construction, combination of parts and in the unique relations of the members and in the relative proportioning and disposition thereof; all as more completely outlined herein.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same by the numerous modifications in structure and relation contemplated by this invention, drawings depicting a preferred form have been annexed as a part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:—

Figure 1 is a longitudinal section, through line 1—1 of Fig. 2 showing the switches in open circuit position corresponding to the "off" position of the starting device. In this position it will be seen that the door may be readily opened and closed. Fig. 2 is a section through line 2—2 of Fig. 1 showing the manner in which a tier of fuses and switches is used for a three wire system.

Continuing now by way of a more detailed description of this embodiment, the invention contemplates any suitable housing, such for example, as the iron box A consisting of side walls 1 and 2, the end walls 3 and 4, the bottom 4^a and a displaceable cover plate B. These parts may be conveniently made of metal and the inclosed space is divided into two main compartments C and D, by means of a partition E of insulating material. Access to the compartment C may be had through the door B and this compartment is utilized for containing the fuse holders and fuses or any other elements which are likely to need frequent inspection or replacement. The compartment D, however, is primarily intended for the switch devices and other parts which will need to be inspected or repaired at infrequent periods, and then only by experts. The partition E is used, so to speak, to permanently lock access to the compartment D, although it, of course, may be unscrewed and displaced by expert skill. It is intended to serve as a barrier for ordinary users of the switch box.

Within the compartment D are located a number of bus bars 5, 6 and 7 which are connected with the main source of current, which remain "live" during the normal periods of use of the box. These bus bars are connected alike through their individual fuses with leads to the motor, or rather cur-

rent carrying devices and therefore it will suffice to describe one. The terminal leading to the motor is indicated by 5^e and the arrangement and operation is such that at the moment of starting the motor when an excess current is needed, the terminal 5^e is connected directly with the bus bar by means of a switch blade 5^x through the connection 5^y. Shortly thereafter, however, the supply of current is derived through the fuse 5^c by means of the switch blade 5^a and the connections 5^b and 5^d; and the switch blade 5^x is thrown out of operation. This is accomplished through the following instrumentality:

The switch blade 5^x is mounted in a rocker F consisting of side bars 8 and 9 which are pivotally mounted at their ends, as for example, in the side rail 9^a at the one end and in the side of the box 1 on the other end. The switch blades 5^x, 6^x and 7^x are composed of laminæ of copper, bound together at their intermediate point and secured to the holder F so as to extend in opposite directions diametrically from the axis thereof, one for each bus bar. This rocker F is normally urged into its intermediate position shown by Fig. 1 by means of a spring 10 operating through the lever arm 11 which in turn is limited in its movement by the stop 12. The free end of the lever 11 carries a pin 13 which rides in a slot 14 in the end of a link G which is pivoted at 15 to the end of a hand lever H which in turn is arranged at the side of the box and is mounted in the bearing 16^a.

Now, to start the motor, the handle H is pulled into the position indicated by "Start" and this has the effect of swinging the switch blade 5^x so that its one end contacts directly with the bus bar 5 and its other end with the contact 5^y. This position is held only momentarily because the motor is now unprotected by any fuse, and therefore the lever H will shortly thereafter be brought to its normal running position indicated by "Run" and this permits the spring 10 to swing the switch blade 5^x into its intermediate position which is determined by the stop 12. It will be noted that the slot 14 provides a certain amount of lost motion and the purpose of this is to permit the link G and the different switch blades 5^a and 5^x to be differentially positioned as will be explained.

The normal running of the motor is effected through the other switch 5^a which is mounted on the rocker I in a manner analogous to that explained in connection with the switch blade 5^x, but a different mechanism is interposed for controlling the rocker I. Thus a toggle is formed of the link J swaying about the fixed pivot 16 and connected through the floating pin 17 with the floating link K, which latter in turn is pivoted at 18 to the arm 19 extending from the rocker I. The floating pivot 17 rides in the elongated slot 20 of the link G, so that when the handle H is swung into the position indicated by "Start", the toggle will be erected and thrown slightly over its "dead" center against the pin 21 with the consequence that the switch blade 5^a is flexed with its one end pressing against the contact 5^b carrying current to the fuse 5^c.

In the same position of the lever the switch blade 5^x has short circuited the fuse 5^c; but upon returning the handle H to the position indicated by "Run", the brush 5^a (the running brush) will remain in place due to the free play between the pin 17 in the slot 20, while the other brush 5^x will open. This is the normal running position of the parts and it will be maintained until the lever H is again returned to "off" position when the end of the slot 20 will impact the pin 17 and break the toggle so as to enable the spring to swing the rocker I into its intermediate position.

The provision of the fuses 5^c presupposes an occasional "blowing" thereof and a corresponding necessity for their replacement; and heretofore users have been injured by attempting to replace the fuses through carelessness in not first throwing off the current by means of the switch. Such accidents are entirely overcome by my provision of a connection between the cover B and some part movable with the switch of such a nature and so arranged that it is impossible for the door to be in its open position unless the switch is in its open circuit position with the fuse holder dead. My arrangement is such that a successful attempt to open the door compels a setting of the switch into its open circuit position; and preferably also it prevents the switch from being moved back into its closed circuit position while the door remains open. In the preferred embodiment illustrated herein the switch controls the movement of the door when the latter is closed and the door controls the movement of the element when it is opened. This is effected by a two part device which, for the sake of simplicity, may assume the form of a cam in the nature of a pin and slot. That is to say, the slot is made up of two parts; the one locking the door down when the switch is closed and the other locking the switch open when the door is open.

Referring to the drawings, L indicates a plate secured in this instance to the cover B and extending alongside the arm M which is fast to the axle of the handle H so as to move in correspondence with the switch. This plate L has a door locking groove *l* and a switch locking groove *m* and a pin or other element 21 is carried by the arm M and rides in the above mentioned portions

of said slot. The slot *l*, or at least its effective portion to wit the convex shoulder or surface thereof is cut or formed so that all of its portions may lie equally distant from the path of movement from the lever M which in this case is the axis of the handle H. In other words the slot is concentric with respect to the pivotal point of the member M. Here, it is therefore instanced as a circular arc. One the other hand the groove *m* or the concave bearing surface formed thereby, is equi-distant from the path of movement of the cover B and, as in this instance, such cover is hinged at 22, the slot will be in the form of a circular arc struck about 22 as its center. By reason of this construction, it will now be understood that when the cover B is closed, the handle H can be readily shifted from one position to another, inasmuch as the pin 21 can always move freely from one end of the slot *l* to its other end. The pin, however, cannot enter the groove *m* unless the cover be opened and, when it is fully opened, the pin may enter the socket 23 and retain the cover in its open position, leaving both hands free to handle the fuses. When the cover has thus been opened it will be seen that the lever H will be constrained within its "off" position in which the switches are both opened and the fuse holders are all dead. A latch N of any desired construction may also be employed, if desired, and may be provided with a lock to prevent unauthorized persons from interfering with the fuses or changing the capacity thereof.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can by applying current knowledge readily adapt it for various applications without omitting certain features that, from the standpoint of the prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, I claim as new and desire to secure the following combinations of elements, or equivalents thereof, by Letters Patent of the United States:—

1. A motor starting switch mechanism comprising a casing having a front wall constituting a door giving access into the casing, a plate of insulating material arranged within the casing spaced from the door, a barrier of insulating material within the casing arranged between the insulating plate and the door substantially parallel with the insulating plate to form a fuse compartment between itself and the door accessible when the door is open and to form a guarded switch compartment between itself and the insulating plate relatively inaccessible whether the door is open or closed, an elongated contact member extending along the front face of the insulating plate within the switch compartment, a starting switch and a running switch spaced apart along the length of said elongated contact member, a pair of separate contacts one for each of said switches, said separate contacts being supported by said barrier spaced from the elongated contact member and from each other within the switch compartment, each of said switches comprising a switch blade movable to open and close connection between the elongated contact and the respective adjacent separate contact, fuse holders at the opposite side of said barrier to retain the fuse within the fuse compartment, means for connecting the fuse holders to the respective separate contacts, means for connecting an incoming conductor to said elongated contact, means for connecting an outgoing conductor to the separate contact associated with the starting switch, and means for actuating said switches with relation to each other.

2. A switching device comprising an inclosing casing, a door in the front wall thereof to give access therein, a plate of insulating material arranged within the casing spaced from the door, a barrier of insulating material within the casing arranged between the insulating plate and the door substantially parallel with the insulating plate to form a fuse compartment between itself and the door accessible when the door is open and to form a guarded switch compartment between itself and the insulating plate that is inaccessible, an elongated contact member extending along the front of the insulating plate within the switch compartment, a contact member disposed at one side of the barrier within the switch compartment, a switch for engaging the contact members, a fuse disposed on the barrier in the fuse compartment and connected to one of the contact members, and means for actuating the switch.

In witness whereof, I hereunto subscribe my name, as attested by the two subscribing witnesses.

HUBERT F. KRANTZ.

Witnesses:
J. A. NEWTON,
S. L. WHITLOCK.