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CONTACTING DEVICE FOR CONTROLLING THE IGNITING CIRCUIT OF  
MAINSRING-DRIVEN, DYNAMO-ELECTRICAL IGNITING DEVICES

2,563,494

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2 Sheets-Sheet 2

Fig. 2

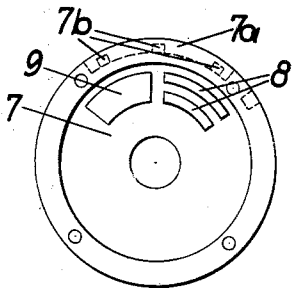


Fig. 3

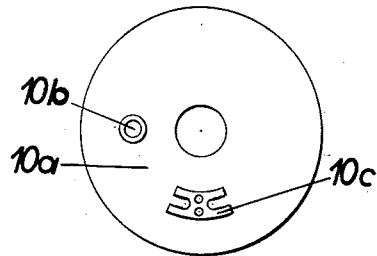


Fig. 4

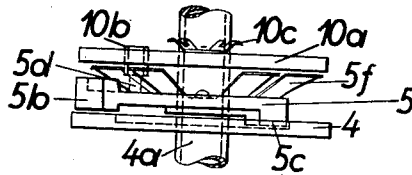


Fig. 5

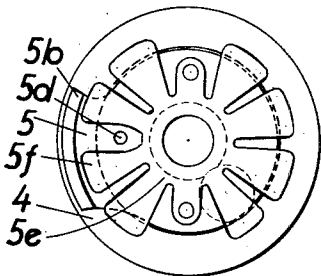
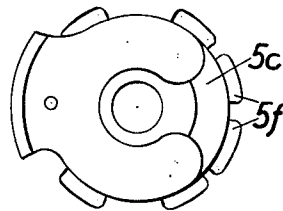


Fig. 6



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# UNITED STATES PATENT OFFICE

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## CONTACTING DEVICE FOR CONTROLLING THE IGNITING CIRCUIT OF A MAIN- SPRING-DRIVEN, DYNAMOELECTRICAL IGNITING DEVICE

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6 Claims. (Cl. 171-209)

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This invention relates to a contacting device for controlling the igniting circuit of a main-spring-driven, dynamo-electrical igniting device, in particular, of a detonator for mines.

It is the object of this invention to provide a contacting device which is capable of producing igniting pulses of very short duration.

According to the invention a resilient wiping contact is fixedly connected to a contact carrier, which is driven at high speed by drive means consisting of means for coupling the contact carrier to the mainspring of the igniting device, which spring is released in the usual manner. This wiping contact cooperates with non-rotatable, rigid countercontacts, which extend in a part of the orbit of the wiping contact. By making contact with the said countercontacts the wiping contact closes the igniting circuit for the passage of a pulse, the beginning and duration of which depend on the location and longitudinal dimension of the countercontacts and on the speed of rotation of the wiping contact. Preferably the wiping contact is fixed on an element which is driven by way of impact by the mainspring of the igniting device during the final phase of its unwinding operation, the non-rotatable countercontacts being provided in the orbit of said element.

E. g., the wiping contact may be located in a freely rotatable control disc, which is adapted to be engaged for joint rotation by a rotating control member driven directly by the mainspring and coupled with the generator of the igniting device, substantial backlash being provided for between the control member and control disc.

This invention is applicable to advantage in any mainspring-driven igniting device which is provided with a so-called end contacting device, and particularly in such igniting devices which are provided, for another function, with two control elements which are driven by the mainspring and can be coupled with each other over a substantial backlash, said control elements being used for operating the wiping contact. Such igniting devices are described in my U. S. Patent No. 1,788,892. In the igniting device described in that patent two controlling members are provided, one of which is connected on the one hand to the winding up mechanism by a unilaterally acting coupling, e. g., a ratchet device, and on the other hand to one end of the driving spring, said member controlling a pawl or the like for locking and releasing the armature driving gear, whereas the second controlling member is displaced by the first member only in the end portion of its stroke in order to unlock the usual releasing

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bolt for the purpose of enabling the driving spring to be released and preferably also to actuate the contact device of the igniting circuit to be actuated for firing the mines.

In that known igniting device, however, the second controlling member operates, differently from the subject of the present invention, an instantaneous switching device provided with a separate switching spring, by which the switching speed aimed at cannot be achieved.

The drawing shows the contacting device according to the invention, as applied by way of example to the known igniting device mentioned hereinbefore, of which—

Fig. 1 shows diagrammatically in an overall perspective view only those elements which are necessary for understanding the invention, as well as a wiring diagram,

Figs. 2 to 6 show structural details of the loose control disc and of the contacting device operated by it,

Fig. 2 showing a plan view of the stationary contact disc,

Fig. 3 showing a top view of the loose control disc which carries the wiper spring,

Fig. 4 being a side view of the movable control wheels and contact carrying discs, arranged one above another,

Fig. 5 showing a top view, and Fig. 6 a plan view of the loose control wheel.

According to Fig. 1, the drive wheel 1, which is in mesh with the pinion 2 of the igniting dynamo 11 and with a winding-up wheel (not shown), is connected with a ratchet wheel 3, with which engages, as conventional the locking-and-releasing pawl (not shown either). The drive wheel 1 is, moreover, coupled with a control wheel 4, but only in sense of rotation, e. g., by means of a ratchet toothing and a pawl. A second control disc 5 runs freely on a sleeve 4a of the control wheel 4, which sleeve surrounds the shaft 1a of the drive wheel 1. This control member 5 has a concentric guide slot 5a, which extends over about three fourths of its circumference and in which an engaging pin 4b of the control wheel 4 is guided. Hence, the control member 5 can be coupled in either sense of rotation with the control wheel 4, over a backlash which corresponds to the length of the slot 5a. The inside end of the mainspring 6 is fixed to the free end of the control wheel sleeve 4a, whereas the other end is fixed to the stationary spring case. A stationary insulating disc 7 is mounted over the loose control disc 5 and carries on its circumference two contact laminations 8 insulated from each other and,

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arranged behind said contact laminations in the clockwise sense, a short-circuiting lamination 9, which is insulated from the contact laminations 8 and the width of which corresponds to the distance between the outside edges of the laminations 8.

These contacts 8 and 9 are swept over by a wiper spring 10, which is connected for rotation with the loose control disc 5. The conductors for the current between the compound-excited direct-current igniting dynamo 11 and the two terminals 12 and 13 for the ignition line to the series-connected fuses run on the one end from the collecting brush 11a through the series-excitation winding 15 and the terminal 12 to the short-circuiting lamination 9, on the other hand from the second brush 11b to the lower contact lamination 8 and from the upper lamination 8 to the terminal 13. Hence, when the wiper spring 10 runs in the direction of the arrow on to the contacts 8, the igniting circuit is closed at the latter and maintained closed until the wiper spring 10 has reached the short-circuiting lamination 10, thus short-circuiting the two poles whereby the ignition line becomes without current.

Figs. 2 to 4 show by way of example in a preferred embodiment the practical design and arrangement of the contacting device according to the invention, which in Fig. 1 has been shown only diagrammatically. A cam 5c (Figs. 3 and 4), having the shape of a ring sector, is provided on the loose control disc 5 and, protruding over the bottom face of said disc, extends over about one fourth of the disc circumference. The cam 5c is guided in an annular groove of the control wheel 4, which groove is interrupted by an engaging piece. A coupling pin 5d is inserted, diametrically opposite the sector 5c, on the top side of the control disc 5, to which also a spring ring 5e, having radial spring lugs 5f, which are bent off at an angle, is riveted. An insulating wheel 10a rests on the lugs 5f of the spring ring 5e and is detachably coupled for rotation with the coupling pin 5d of the loose control disc 5 by means of a bush 10b. Said insulating disc 10a has on its top side a wiper spring 10c, which is staggered by 90 deg. against the bush 10b. A stationary contacting disc 7, made from insulating material (Fig. 2, top), is fixed over the disc 10a. The two contact laminations 8 and the short-circuiting lamination 9, which consist of ring sectors and co-operate with the wiper spring 10c (Fig. 2, bottom, and Fig. 3), are attached to the underside of the stationary disc 7 in such a manner that together they extend over about one fourth of the wheel 10a in its circumferential direction. The soldering lugs 7b of the contacts 8, 9 are led out to the top edge of the disc 7 (Fig. 2, top). The two discs 10a and 7 are pressed together by the action of the spring lugs 5f, whereby a metal ring 7a, fixed to the circumference of the disc 7, on its underside, serves as a seating. Being made of thicker material, this ring protrudes beyond the contacts 8, 9 so that a contact chamber is formed which is completely closed off from the outside.

The device described with reference to Fig. 1 operates as follows: The full tension of the mainspring 6 is reached after approximately one and three fourths of a counterclockwise turn of the drive wheel 1. In this operation the control disc 4, connected with the drive wheel 1 by a unilaterally acting coupling, carries along, by means of its coupling pin 4b, the loose control disc 5 only after having performed three fourths of a turn, that is, after having gone through the backlash

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provided by the slot 5a. The locking and releasing pawl engaging with the ratchet toothing 3 of the drive wheel 1 can be lifted by means of the conventional releasing pin only when a cam 5b provided on the loose control disc 5 has lifted a checking lever which prevents the turning of the releasing pin. This is the case after one turn of the loose control wheel 5 or one and three fourths of a turn of the drive wheel 1. Said releasing means are not shown in the drawings because their structure and operational relationship is known from my U. S. patent mentioned hereinbefore, and because they do not constitute a feature of this invention.

After the locking pawl has been released, the unwinding mainspring 6 drives the igniting machine 11 over the control disc 4 and the drive wheel 1, which are now rotating in the clockwise sense, and the pinion 2. During that operation the pin 4b of the control disc 4 first idles along the slot 5a, and impinges on the opposite end of said slot at very high speed after three fourths of a turn (this moment is shown in Fig. 1), so that the control disc 5, which carries the wiping contact 10 and the mass of which is much smaller than the rotating masses of the parts 4, 3, 1, 2 and of the armature of the dynamo 11, is thrown off in the sense of rotation indicated, the contact spring 10 wiping at top speed consecutively over the contacts 8 and 9. After the mainspring 6 has relaxed, all movable parts are again in the position shown in Fig. 1. The wiper spring 10, which closes the igniting circuit at the two contact ring segments 8 and interrupts it at the ring segment 9 by short-circuiting the igniting machine, wiping at extremely high speed over the short ring sectors 8 of the stationary insulating disc 7 (the sectors are shown approximately in natural size in Fig. 1), the resulting ignition current has a duration of less than four thousandths of a second. When the ignition current has a strength of approximately 1.2 amp., all fuses 16 which are connected in series in the loop 14 for the ignition current are safely fired. The use of wiping contacts, their arrangement in a space which is closed on all sides and in which they are protected against any improper treatment, and the fact that the contacting is effected by a part of the igniting device which is running quickly and subject only to the influence of the mainspring, ensure the permanently safe operation of the device.

What I claim is:

1. A contacting device for controlling the igniting circuit of a mainspring-driven, dynamo-electrical igniting device, which comprises a control element which is adapted to be driven exclusively by the mainspring at unreduced speed, and coupled with a drive wheel for the generator of the igniting device, a freely rotatable control disc which is coupled for joint rotation with said control element, means providing for a substantial backlash between said control element and said control disc, a coupling pin and a spring ring having radial lugs bent off at an angle on the top face of the freely rotatable control disc, a sleeve constituting an extension of said control element, said sleeve enclosing the shaft of the drive wheel for the generator of the igniting device and being connected with the free end of the mainspring, a rotatable insulating disc detachably coupled for joint rotation with said rotatable control disc, a non-rotatable insulating disc which is coaxial with said rotatable insulating disc, said rotatable control disc and said insulating discs being passed over said sleeve, a bushing on the rotatable insu-

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lating disc for receiving the coupling pin, a resilient wiping contact mounted on said rotatable insulating disc, a pair of contact laminations, insulated from each other, and a short-circuiting lamination insulated from said contact laminations, said contact and short-circuiting laminations extending on said non-rotatable insulating disc in different parts of the orbit of said wiping contact.

2. A contacting device for controlling the igniting circuit of a mainspring-driven, dynamo-electrical igniting device, which comprises a control element which is adapted to be driven exclusively by the mainspring at unreduced speed, and coupled with a drive wheel for the generator of the igniting device, a freely rotatable control disc which is coupled for joint rotation with said control element, means providing for a substantial backlash between said control element and said control disc, a coupling pin and a spring having radial spring lugs bent off at an angle on the top face of the freely rotatable control disc, a sleeve constituting an extension of said control element, said sleeve enclosing the shaft of the drive wheel for the generator of the igniting device and being connected with the free end of the mainspring, a rotatable insulating disc detachably coupled for joint rotation with said rotatable control disc, a non-rotatable insulating disc which is coaxial with said rotatable insulating disc, said rotatable control disc and said insulating discs being passed over said sleeve, a bushing on the rotatable insulating disc for receiving the coupling pin, a resilient wiping contact mounted on said rotatable insulating disc, a pair of contact laminations, insulated from each other, and a short-circuiting lamination insulated from said contact laminations, said contact and short-circuiting laminations extending on said non-rotatable insulating disc in different parts of the orbit of said wiping contact, and having the shape of annular sectors, and an annular flange at the circumference of the non-rotatable insulating disc, said flange protruding beyond the contact and short-circuiting laminations, the spring lugs of the loose control disc urging the insulating discs together so that the rotatable insulating disc is in full sliding engagement with the flange of the non-rotatable insulating disc, so as to form a totally enclosed contact chamber.

3. A contacting device for controlling the igniting circuit of a mainspring-driven, dynamo-electrical igniting device, which comprises a rotatable contact carrier, a resilient wiping contact fixedly connected with said contact carrier, drive means for said contact carrier, said drive means constituting a part of the igniting device and consisting of means for coupling the contact carrier to the mainspring, and non-rotatable countercontacts extending in a part of the orbit of said wiping contact, the wiping contact being adapted to make contact with the countercontacts to close the igniting circuit for the passage of an electric pulse, the beginning and duration of which depend on the location and longitudinal dimension of the countercontacts and on the speed of rotation of the wiping contact.

4. A contacting device for controlling the igniting circuit of a mainspring-driven, dynamo-electrical igniting device, which comprises a freely rotatable contact carrier, a resilient wiping contact fixedly connected with said contact carrier, drive means for said contact carrier, said drive

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means constituting a part of the igniting device and being directly coupled to the mainspring, means providing for a substantial backlash between the drive means and the contact carrier, the drive means being adapted to exercise during the final phase of the unwinding operation of the mainspring an impact in its sense of rotation on the contact carrier, and non-rotatable countercontacts extending in a part of the orbit of said wiping contact, the wiping contact being adapted to make contact with the countercontacts to close the igniting circuit for the passage of an electric pulse, the beginning and duration of which depend on the location and longitudinal dimension of the countercontacts and on the speed of rotation of the wiping contact.

5. A contacting device for controlling the igniting circuit of a mainspring-driven, dynamo-electrical igniting device having a generator drive gear, which comprises a freely rotatable control disc constituting a part of the igniting device, a resilient wiping contact fixedly connected with said freely rotatable control disc, drive means for said control disc, said drive means consisting of a control element of the igniting device and being directly coupled to the mainspring and to the generator drive gear, means providing for a substantial backlash between the drive means and the freely rotatable control disc, the drive means being adapted to exercise during the final phase of the unwinding operation of the mainspring an impact in its sense of rotation on the freely rotatable control disc, the wiping contact being adapted to make contact with the countercontacts to close the igniting circuit for the passage of an electric pulse, the beginning and duration of which depend on the location and longitudinal dimension of the countercontacts and on the speed of rotation of the wiping contact.

6. A contacting device for controlling the igniting circuit of a mainspring-driven, dynamo-electrical igniting device, which comprises a freely rotatable control disc constituting a part of the igniting device, a rotatable insulating disc detachably coupled for joint rotation with the freely rotatable control disc, a resilient wiping contact fixedly connected with said insulating disc, drive means for said control disc, said means consisting of a control element of the igniting device and being directly coupled to the mainspring, means providing for a substantial backlash between the drive means and the freely rotatable control disc, the drive means being adapted to exercise during the final phase of the unwinding operation of the mainspring an impact in its sense of rotation on the freely rotatable control disc, a non-rotatable insulating disc which is coaxial with said rotatable insulating disc, and countercontacts consisting of a pair of contact laminations insulated from each other and of a short-circuiting lamination insulated from said contact laminations, said contact and short-circuiting laminations, respectively, extending on said non-rotatable insulating disc in different parts of the orbit of said wiping contact, said wiping contact being adapted to make contact first with the contact laminations and subsequently with the short-circuiting lamination, whereby the igniting circuit is first closed for the passage of an electric pulse, the beginning and duration of which depend on the location and longitudinal dimension of the

countercontacts and on the speed of rotation of the wiping contact, and thereafter is short-circuited.

KONRAD SCHAFFLER-GLOSSL.

**REFERENCES CITED**

The following references are of record in the file of this patent:

**UNITED STATES PATENTS**

Number	Name	Date
877,284	Berglund -----	Jan. 21, 1908
1,771,870	Banzhof -----	July 29, 1930
1,788,892	Schaffler-Glossl -----	Jan. 13, 1931
2,092,845	Holmes -----	Sept. 14, 1937
2,192,542	De Benedetti -----	Mar. 5, 1940
2,438,228	Nims -----	Nov. 15, 1949
2,525,817	MacAdams -----	Oct. 17, 1950