

A device for rendering contactors electrically and mechanically inoperative.

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BACKGROUND OF THE INVENTION

The present invention relates to a device for rendering contactors mechanically and electrically
10 inoperative, in which the original design of the mobile elements makes it possible to obtain an arrangement of the output terminals which facilitates wiring and interchangeability with existing systems providing mechanical inoperativeness.

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1. Field of the Invention

It is generally known that devices of this kind providing such inoperativeness are usually associated with contactors for controlling electric motors so as to
20 prevent simultaneous switching on and so short-circuiting particularly when these contactors provide reversal of operation and star-triangle starting.

Such inoperativeness may be electric alone, however, in order to prevent operating errors, it is preferable for
25 it to be both electric and mechanical.

The provision of electric inoperativeness between two contactors consists in actuating, in the first third of the travel of the closing contactor, but preferably as early as possible, a contact which opens the circuit of
30 the coil of the other contactor and vice-versa.

Mechanical inoperativeness uses a system of levers which are interlocked so that when one contactor has begun to close, it is impossible to close the other.

In automatic operation, electric inoperativeness
35 alone would be sufficient. However, in the case of the simultaneous energization of two contactor coils, or in

the case of a shock causing the movement of their mobile assemblies, or else in the case of wrong actuation of these contactors, there is a risk of short-circuiting by the simultaneous closure of the power poles of both 5 contactors. This is why mechanical inoperativeness is generally associated with electric inoperativeness.

2. Description of the Prior Art

To provide such mechanical inoperativeness, even in 10 the case of contactors mounted side by side, a locking mechanism is generally used incorporated in a case from which project movement take-off fingers. This case is then placed between two contactors so that the movement take-off fingers are coupled respectively with actuation 15 members provided in said contactors.

The electric inoperativeness is generally provided by using one of the break contacts (or NC as they are generally called) usually provided on each of the contactors, it being understood that this solution has the 20 drawback of reducing the number of contacts available on each contactor.

To overcome this drawback, a device has been proposed in the form of a module adapted for fitting between the two contactors to be locked and comprising 25 both levers providing mechanical inoperativeness and contacts providing electric inoperativeness. A device of this kind which provides simultaneously mechanical and electric inoperativeness is described in the French patent issued to the firm UNELEC, n° 2 045 090 on 30 May, 1969.

30 Another more recent and more compact device which can be used between two contactors is described in the PCT patent to ALLEN BRADLEY COMPANY (USA) n° 85 03382 dated 23 January 1984.

It can however be observed that the embodiments 35 proposed in this patent have the drawback that the input and output terminals assigned to one of the contacts are

placed on the same side of the case of the device whereas the input and output terminals of the other contact are placed on the other side of the case. The feature, which results from the general design of the device, is particularly troublesome, not only in so far as safety but the simplicity of providing interconnecting wiring are concerned, but also the risks of error which this arrangement may give rise to.

The purpose of the invention is particularly to overcome these drawbacks.

For this it provides a device rendering contactors electrically and mechanically inoperative of the kind comprising :

- a flat case with two opposite parallel front walls, two opposite side walls which extend in planes substantially perpendicular to said front walls, said case being formed so as to be able to be mounted between two contactors disposed side by side ;

- first and second movement take-offs adapted for respectively coupling with the mobile assembly of the two contactors through respective substantially coaxial apertures provided in the central regions of the two front walls, each of these two movement take-offs being movable in a direction substantially parallel to said side walls between two positions corresponding respectively to the work position and the rest position of the contactor with which it is associated ;

- mobile elements providing reciprocal inoperativeness, driven respectively by said movement take-offs, said mobile elements having a travel distance such that the passage of one of the movement take-offs to the work position brings the element which corresponds with it to a position

preventing the passage of the other movement take-off to the work position ; and

- two switch devices, each comprising at least one pair of fixed contacts connected respectively by connecting conductors to an input connection element and to an output connection element, and a mobile contact element actuated by a corresponding mobile element providing inoperativeness.

According to the invention, in a device as set forth in the prededing paragraph the two input connection elements of the two switch devices are located adjacent ^{one of} said side walls of the case, and the two output connection elements of said two switch devices are located adjacent the other side wall, and said switch devices form with the input and output connection elements which are associated therewith as well as with the corresponding connecting conductors a first and a second through current lines which do not cross each other and extend across the case between the input and output connection elements.

Some embodiments of the invention will be described hereafter, by way of non limitative examples, with reference to the accompanying drawings in which :

Figure 1 shows in a front view one embodiment of a device of the invention associated with two contactors in the rest position ;

Figure 2 is a view similar to that of Figure 1 but in which the first contactor is in the work position and the other is in the rest position ;

Figure 3 shows the same device with the first contactor in the rest position and the other in the work position ;

Figure 4 shows in a front view another embodiment of the device of the invention ; and

Figure 5 is a diagrammatical representation of another variant of the device of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Such as shown in figures 1 to 4, the device providing mechanical and electric inoperativeness comprises :

- a support case 1,
- 5 - a lever 2 mounted for rotation about a fixed pin 4 fixed to case 1, this lever 2 being rotated by a first pin 6 adapted for coupling with the mobile assembly of a first contactor,
- 10 - a pusher 3 mounted for sliding inside case 1 along a linear path, by means of slides 5, 5', this pusher 3 being driven by a second pin 7 adapted for coupling to the mobile assembly of a second contactor,
- 15 - two switch devices I_1 , I_2 of the double break contact type whose mobile parts 12, 13 are respectively carried by the pusher 3 and lever 2, preferably via a resilient crushing system, and whose fixed parts each comprise a pair of fixed contact elements 15, 16-17, 18 respectively connected to the input and output terminals 19, 21-20, 22.

20 The input terminals 19, 21 are situated on one side 40 of the case (preferably at the level of one of its lateral edges) whereas the output terminals 20, 22 are situated on the other side 39 of the case (preferably at the level of the lateral edge of the case opposite the preceding one), so that when the switch devices I_1 , I_2 are closed, the current lines pass through the case in a direction substantially perpendicular to that of the opposite side walls 39, 40.

25 As mentioned above, lever 2 and pusher 3 are interlocked respectively with the movements of the mobile assemblies of the contactors by means of pins 6 and 7; for this, these pins project on each side of case 1
30 through openings 14, 14a formed in its two opposite front

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walls, so as to be able to engage in housings provided in the mobile assemblies of the contactors.

The edges of the openings 14, 14a are oriented in a direction which corresponds to the direction of movement of the mobile assembly of the contactors.

More precisely, lever 2 comprises three arms B_1 to B_3 joined together by two portions bent substantially at right angles C_1 , C_2 in the following arrangements :

- the first arm B_1 is adapted so as to occupy a position such as that shown in figure 1 in which it extends substantially parallel to the axis of movement of pusher 3 at a given distance therefrom,

- the second arm B_2 is connected to the first arm B_1 by the bent portion C_1 through which pin 4 passes, and extends in the direction of the axis of movement of pusher 3, the end of this arm situated opposite the bent portion C_1 carrying pin 6,

- the third arm B_3 is connected to said end of arm B_2 by the bent portion C_2 so as to extend, in the position shown in figure 1, parallel to and in line with pusher 3, this third arm B_3 having at its end the mobile part 13 of the switch device 1_1 .

20 Pusher 3 comprises a lateral protuberance P oriented towards arm B_1 of lever 2 and has at its end opposite the end of arm B_3 the mobile part 12 of a switch device 1_2 .

This protuberance P is more particularly adapted so that its area of movement overlaps that of lever 2 and so
25 that conversely, the area of movement of the lever overlaps that of said protuberance P, so as to be able to obtain the following operation.

When the contactor which drives pusher 3 is closed, as shown in figure 2, the switch device 1_2 which is
30 generally placed in series with the coil of the other contactor is open.

If, however, in this position an attempt to close the other contactor is made, tending to move lever 2, the surface 10 of said lever 2 will abut against the surface
35 11 of protuberance P of said pusher, thus preventing said closure.

Similarly and, in accordance with figure 3, when the contactor secured to lever 2 is closed, the switch device I₁ generally placed in series with the coil of the first contactor is open. If, in this position, an attempt to close said first contactor is made, the surface 8 of protuberance P of pusher 3 will abut against surface 9 of lever 2 and will prevent said closure.

The mechanical inoperativeness thus achieved, through the combination of the translational/rotational movements of pusher 3 and lever 2, proves very efficient for the movements of surfaces 8 to 11 which block each other are practically perpendicular.

With the above described arrangement and because there is no crossing of electric connections inside case 1, it becomes possible to use a case of small thickness which may readily replace existing cases providing mechanical inoperativeness. Furthermore, the rectilinear or substantially rectilinear movement of the movement take-off parts simplifies adaptation to the mobile assemblies of the contactors.

Figure 4 shows another embodiment of the invention which uses more conventional interlocking levers 23 and 24.

One of the levers 23 is modified and comprises an additional arm 38 on which at least one mobile contact 25 is placed which closes the fixed contacts 26 and 27 connected to terminals 28 and 29.

The other lever 24 also has, on a portion close to its locking surfaces, at least one mobile contact 30 which closes the fixed contacts 31 and 32 connected to terminals 33 and 34.

The movement take-offs are conventionally formed by pins 35 and 35a passing through the openings 36 and 36a in case 37 having opposite side walls 42, 43.

The arrangement of the contacts, such as described, also makes it possible to have current paths, passing

through the case, substantially perpendicular to the direction of movement of the mobile assemblies of the contactors to be made inoperative, which is materialized by the direction of the openings 36 and 36a.

5 This arrangement and the absence of connection crossings inside the case makes possible as reduced a thickness as possible.

10 It should be noted that, in this solution, levers 23 and 24 may be made in the same mould, the additional arm 38, required on lever 23, being removed from lever 24 after moulding thereof.

15 It should also be noted that, in the two embodiments, the term input or output for the connection terminals is only given for the sake of clarity of the explanation and in no way prejudices the actual subsequent assignment of said terminals.

The device shown in figure 5 is based on a principle similar to that of the above described example.

20 However, in this case, the two levers 50, 51 are formed of moulded parts of identical shape each having two impressions 52, 53-54, 55 each adapted to receive a mobile contact bridge. These two levers 50, 51 are mounted for rotation about two respective pins 56, 57 disposed symmetrically with respect to the median plane of symmetry P, P' of case 58 having opposite side walls 82, 83.

25 Each of these levers 50, 51 has three arms 60, 61, 62-63, 64, 65 disposed in the form of a fork which are connected, by one of their ends to a common region 66, 67 through which one of said pins 56, 57 passes.

30 Actuation of one of the two levers 50, 51, from a corresponding contactor, is provided by means of a pin 68, 69 mounted on the free end of its central arm 61, 64 and which passes through an oblong aperture 70 centered on the plane of symmetry P, P'.

35 The other two arms 60, 62-63, 65 of this lever 50, 51 are equipped with reception means (impressions 52 to

55) adapted each for receiving a mobile contact bridge.

As in the above described example, this device comprises two through current lines, namely an upper line 71 and a lower line 72, each of these lines comprising a switch device including two fixed contact elements and a mobile contact bridge carried by a corresponding lever.

The upper through line 71 is formed so as to define in case 58 a free space of substantially trapezoidal shape inside which arms 60, 63 of levers 50, 51, which provide the locking function, may move.

The fixed contact elements 73, 74 of the upper current line 71 are then disposed at the level of one of the oblique sides of said free space and cooperate with a mobile contact bridge 75 carried by the arm of the lever 63.

The lower through line 72 extends in a plane offset with respect to the mean plane in which levers 50, 51 move, so as to facilitate the passage of one 76 of the two conductors 76, 77 of this line.

This through line 72 comprises, opposite the oblique side of the upper line including the fixed contact elements 73, 74 an oblique part 78 including two fixed contact elements 79, 80 which cooperate with a mobile contact bridge 81 carried by the arm of lever 62.

It should be noted that in this case the reception means 52, 54 provided on arms 60, 65 are not used.

The advantages of the above described solution are its simplicity and the fact that, since it only uses a single type of lever, it lends itself better to mass production and is of a lower cost price.

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CLAIMS

1. a device rendering contactors electrically and mechanically inoperative, of the kind comprising :

- a flat case with two opposite parallel front walls, two opposite side walls which extend in planes substantially perpendicular to said front walls, said case being formed so as to be able to be mounted between two contactors disposed side by side ;

- first and second movement take-offs adapted for respectively coupling with the mobile assembly of the two contactors through respective substantially coaxial apertures provided in the central regions of the two front walls, each of these two movement take-offs being movable in a direction substantially parallel to said side walls between two positions corresponding respectively to the work position and the rest position of the contactor with which it is associated ;

- mobile elements providing reciprocal inoperativeness, driven respectively by said movement take-offs, said mobile elements having a travel distance such that the passage of one of the movement take-offs to the work position brings the element which corresponds with it to a position preventing the passage of the other movement take-off to the work position ; and

- two switch devices, each comprising at least one pair of fixed contacts connected respectively by connecting conductors to an input connection element and to an output connection element, and a mobile contact element actuated by a corresponding mobile element providing inoperativeness, wherein the two input connection elements of the two switch devices are located adjacent one of said side walls of the case, and the two output connection elements of said two switch devices are located



adjacent the other side wall, and said switch devices form with the input and output connection elements which are associated therewith as well as with the corresponding connecting conductors ~~a~~ first and ~~a~~ second through current lines which do not cross each other and extend across the case between the input and output connection elements.

2. The device, as claimed in claim 1, wherein one of said elements providing reciprocal inoperativeness comprises a lever mounted for rotation about a fixed pin on the case, said lever carrying the mobile contact element of one of said two switch devices and being driven by one of said movement take-offs, and the other mobile element providing inoperativeness comprises a pusher mounted for sliding in the case so as to move in translation under the action of the other movement take-off, said pusher carrying the mobile contact element of the other switch device.

3. The device as claimed in claim 2, wherein said pusher has a protuberance whose area of movement overlaps that of said lever so as to provide said inoperativeness.

4. The device as claimed in claim 1, wherein said mobile elements providing inoperativeness comprises two rotary levers driven by pins, one of said levers comprising an additional arm on which is placed the mobile contact bridge of one of the switch devices, the other lever having, in the vicinity of its locking surfaces, the mobile contact bridge of the other switch device.

5. The device as claimed in claim 1, wherein said mobile elements providing inoperativeness comprises two rotary levers of identical shape each having two impressions adapted each for receiving a mobile contact bridge, said levers each having three arms disposed in the form of a fork and which are connected, by one of their ends, to a common



region through which a pivot pin passes, the actuation of each of said levers, from a corresponding contactor, taking place by means of a pin mounted on the free end of its central arm and the other two arms of each of these levers each comprise one of said impressions.

6. The device as claimed in claim 5, wherein the said first through line is formed so as to define inside the case a free space of trapezoidal shape inside which the arms of said levers which provide the locking function may move, and the fixed contact elements of said current line are disposed at the level of one of the oblique sides of said free space and co-operate with a mobile contact bridge carried by one of said arms.

7. The device as claimed in claim 5, wherein the said second through line extends in a plane offset with respect to the mean plane in which said levers move, said second through line including an oblique part having two fixed contact elements of the second switch device which co-operate with a mobile contact bridge carried by a lever arm which does not participate in providing mechanical inoperativeness of the device.

8. A device, as claimed in claim 1, substantially as described herein with reference to the accompanying drawings.

