AUSTRALIAN PATENT ABSTRACT

AUSTRALIA

(12) AUSTRALIAN PATENT ABSTRACT
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(54) ELECTRICAL PRESSURE CONTACT
CONVENTION
APPLICATION FOR A PATENT

X/We SOCIETE D'EXPLOITATION DES PROCESSES MARECHAL (SEPM)
a Société Anonyme of 92, Avenue de Saint Mande, 75012
Paris, France

hereby apply for the grant of a Patent for an invention entitled

AN ELECTRICAL PRESSURE CONTACT WITH BUILT-IN OPENING
AND CLOSING CAPABILITY

which is described in the accompanying specification.

This application is made under the provisions of Part XVI of the Patents Act 1952 and is based on an application for a patent or similar protection made in France on 9 August 1982 (82 13891).

Our address for service is: F. B. Rice & Co., 101 Mort St., Balmain, NSW 2041.

Dated this 1st day of August 1983.

SOCIETE D'EXPLOITATION DES PROCESSES MARECHAL (SEPM)

by

Patent Attorney

To: The Commissioner of Patents,
Commonwealth of Australia.
Commonwealth of Australia
The Patents Act 1952

DECLARATION IN SUPPORT

In support of the (Convention) Application made by:  SOCIETE D'EXPLOITATION DES
PROCEDES MARECHAL (SEPM)

for a patent for an invention entitled:
AN ELECTRICAL PRESSURE CONTACT WITH BUILT-IN OPENING AND CLOSING
CAPABILITY

I (we) M. Gilly Harechal, Director
of and care of the applicant company do solemnly and sincerely declare as follows:

a) I am (we) the applicant(s) for the patent
or
b) I am (we) authorised by the applicant(s) for the patent to make this declaration on its behalf.

Delete the following if not a Convention Application.
The basic application(s) as defined by section 141 (67) of the Act was (were) made

in  France  on  9 August 1982

by  SOCIETE D'EXPLOITATION DES PROCEDES MARECHAL (SEPM) of
92, Avenue de Saint Mande, 75012 Paris, France

The basic application(s) referred to in this paragraph is (are) the first application(s) made in
a Convention country in respect of the invention the subject of the application.

a)  Yves Le Magourou of 71, rue la Bruyere, 95120 Ermont, France
or
b) Yves Le Magourou of 71, rue la Bruyere, 95120 Ermont, France

is (are) the actual inventor(s) of the invention and the facts upon which
the applicant company
is (are) entitled to make the application are as follows:

The applicant is a person who would if a patent were granted upon
application made by the actual inventor be entitled to have the
patent assigned to it under the Provisions of Section 34(1)(fa) of
the Act.

Declared at PARIS this 2/ day of July 1983

Signed  M. Gilly HARECHAL

Status  Directeur General

DECLARANT’S NAME

F. B. RICE & CO PATENT ATTORNEYS

This form is suitable for any type of Patent Application. No legalisation required.
A pressure contact for establishing an electrical connection between a conductive connector-pin rigidly carried by the insulating support of a plug and a stationary contact bead connected electrically to an input terminal and placed within a chamber formed in the insulating support of a plug socket when the plug connector-pin is introduced axially into the plug socket chamber, the bodies of the plug and socket being adapted to carry associated guiding and locking means for carrying out and then maintaining said introduction, characterized in that said pressure contact comprises a rigid and movable conductive member placed within the plug socket chamber and extending over part of the height of said chamber, said conductive member being intended to be thrust back towards the end wall of said.../2
chamber by the free end of the connector-pin which is applied against an end heel of said member in opposition to a first resilient means which tends to apply said heel against the edge of the bore of said chamber, that guiding means are provided for ensuring that the movable member undergoes a displacement in a direction substantially parallel to the contact axis until the end of the member remote from the heel reaches the level of the contact bead which is connected to the input terminal and that the movable member and the guiding means are so arranged that, at the end of said displacement in a direction parallel to the axis, said member moves away from said guiding means in order to tilt forward and to be abruptly applied against the stationary contact bead under the action of a second resilient means, a contributory role being played by said second resilient means in the abrupt opening of the contact at the time of outward withdrawal of the plug connector pin by enhancing the tilting motion of said movable member.
so arranged that, at the end of said displacement in a direction parallel to the axis, said member moves away from said guiding means in order to tilt forward and to
This invention relates to electric pressure contacts and is directed to a pressure contact with built-in opening and closing capability.

A contact of this type can be employed in various types of devices such as a modular system, a disconnectable single-pole switch, and so on, but is particularly recommended for equipping industrial current-supply connectors.

Industrial connectors must in fact conform to the regulations defined by Publication 309-I of the International Electrotechnical Commission which establishes in particular a minimum breaking capacity for each size of connector.

In sliding-contact connectors (contacts by means of connector-pins and sockets), the contact pressure is perpendicular to the movement of withdrawal of the connector-pin and acts in opposition to this movement, with the result that the breaking capacity is practically nonexistent. In order to comply with the regulations mentioned above, connectors of this type should be locked by means of a switch.

In pressure-contact connectors, the contact pressure is parallel to the movement of separation and assists this movement, with the result that locking means must therefore be provided for maintaining the contact pressure. It is then only necessary to add a suitable
device to said locking means in such a manner as to
ensure that the contact elements separate at a given
distance and speed at the moment of unlocking. The
characteristics defined by Publication 309-I of the
I.E.C. can thus be readily attained. However, some
countries, and in particular the United States, require
that industrial current-supply connectors have a breaking
capacity which is comparable with that of a switch or, in
other words, that they achieve the performances specified
in the case of switches by Publication 408 of the I.E.C.
In the case of end-pressure contacts of types which are
at present in use, current-supply connectors cannot satisfy
this requirement by reason of the fact that, at the
moment of unlocking and before the contact elements
separate, the contact pressure which was of the order of
a few kilograms decreases and finally falls to zero at
the moment of separation, the speed of separation being
limited in addition by the inertia of the system.

Two types of pressure contacts are at present
in use:
- for current intensities below 250 amps, contacts of
  this type are provided with a resilient contact having
  a movable head mounted on a spring and connected
electrically to a stationary stud for connecting the
  conductors by means of a braided wire element which is
  coaxial with the spring;
- for current intensities above 250 amps, contacts of this type comprise a rocker-arm which operates at right angles to the line of contact elements.

The invention provides a third type of pressure contact and is capable of endowing these latter with the breaking capacity of a switch by means of a rocker-arm which works in a direction parallel to the line of contact elements.

In comparison with contacts which make use of a braided wire element, a system of this type offers all the advantages of a rocker-arm contact, namely:

a) the voltage drop of the device is guaranteed in time by virtue of the fact that, in contrast to the braided wire element device, voltage drops which are liable to vary exist only at the point of contact;

b) the disadvantages attached to brazing or crimping of the braided wire element are removed;

c) the cross-section of the rocker-arm can be at least equal to the largest conductor which it is possible to connect to the device;

d) the movement of the rocker-arm produces powerful self-cleaning of the contacts.

It is also worthy of note that, in this design, each contact becomes a single-pole switch having quick-break and quick-make action which is independent of the action produced by the operator.
In accordance with the invention, the pressure contact is intended to establish an electrical connection between a conductive connector-pin rigidly carried by the insulating support of a plug and a stationary contact bead connected electrically to an input terminal and placed within a chamber formed in the insulating support of a plug socket when the plug connector pin is introduced axially into the plug socket chamber. The bodies of the plug and of the socket are adapted to carry associated guiding and locking means for carrying out and then maintaining said introduction. The pressure contact essentially comprises a rigid and movable conductive member placed within the plug socket chamber and extending over part of the height of said chamber. Said conductive member is intended to be thrust back towards the end wall of the chamber by the free end of the connector-pin which is applied against the end heel of said member in opposition to a first resilient means which tends to apply said heel against the edge of the bore of said chamber. Guiding means are provided for ensuring that the movable member undergoes a displacement in a direction substantially parallel to the axis of the contact until the end of the member remote from the heel reaches the level of the contact bead which is connected to the input terminal. The movable member and the guiding means are so arranged that, at the end of said
displacement in a direction parallel to the axis, said member moves away from said guiding means in order to tilt forward and to be abruptly applied against the contact bead under the action of a second resilient means. Said second resilient means plays a part in producing abrupt opening of the contact at the time of outward withdrawal of the plug connector pin by enhancing the tilting motion of the movable member.

A veritable quick-make quick-break switch is thus obtained while at the same time permitting high contact pressures and complying with safety regulations since the stationary contact bead under tension cannot be reached accidentally since it is possible to gain access to said contact bead only by thrusting back the movable member.

Other features of the invention will be more apparent to those skilled in the art upon consideration of the following description and accompanying drawings, wherein:

- Fig. 1 is a fragmentary sectional view of a contact in accordance with the invention;
- Figs. 2A to 2F are diagrammatic presentations to a smaller scale showing the different stages of operation of the movable member at the time of operations which consist of inward displacement and outward withdrawal of the connector-pin.
In the accompanying drawings, an end-pressure contact is intended to establish an electrical connection between a conductive connector-pin 11 rigidly carried by the insulating support of a plug (not illustrated) and a stationary contact bead 12 which is connected electrically to an input terminal (not shown in the drawings) by means of a conductive strip 13. The stationary contact bead 12 is placed within a chamber 14 formed within the insulating support 15 of a plug socket (not otherwise illustrated) and provided with a bore 16 for the axial introduction of the connector-pin 11. Said electrical connection between the elements 11 and 12 is achieved by the guided longitudinal displacement followed by a tilting movement of a rigid conductive member 17 placed within the chamber 14 and adapted to extend along part of the height of said chamber 14.

In the example shown in the drawings, the movable conductive member 17 is constituted by a small plate (as shown in particular in Fig. 1), one end of which is bent-back twice at 90° in order to form a U-shaped heel 18, the other end of said small plate being adapted to carry a contact bead 19 which is intended to cooperate with the stationary contact bead 12 and being provided with lateral extensions 20 which give said member a T-shaped configuration.

In the rest position (Fig. 2), that is to say
after withdrawal of the connector-pin 11, the member 17 is urged towards the exterior of the chamber 14 whilst the heel 18 of said member is applied against the edge of the bore 16 under the action of a torsional coil spring 21, one end arm of which is engaged within the U-shaped portion formed by the heel 18 whilst the other end arm is clamped and held in position against the internal wall of the chamber 14.

Two guide lugs 22 located at a distance from the chamber wall 23 along which the member 17 is capable of longitudinal displacement are placed transversely within the chamber 14 in the line of extension of each other. The distance between the opposite edges of the two guide lugs 22 is greater than the width of the central portion of the member 17 but smaller than the width of the T-shaped end portion of said member.

A second torsional coil spring 24 is intended to produce action on the member 17. One end arm of said second spring is applied against that face of said member which is directed towards the side wall 23 of the chamber, the coil spring being placed within the U-shaped portion formed by the heel 18. As an advantageous feature, the end arm of the spring 21 which is engaged within said U-shaped portion is placed inside the coil of said spring 24 and thus serves to maintain this latter in position.
In the aforesaid rest position (shown in Fig. 2A), the T-shaped end of the member 17 with its contact bead 19 is located at a lower level than the guide lugs 22 (assuming that the axis of the contact is vertical as shown in the drawings) and the second end arm of the spring 24 is not subjected to any stress.

When the connector-pin 11 is displaced inwards within the bore 16 of the chamber 14, the free end of said pin is applied against the heel 18 of the member 17.

When the inward displacement operation is continued, said member is thrust back towards the end wall of the chamber. In a first stage (as shown in Fig. 2B), the lateral extensions 20 of the member 17 engage between the side wall 23 and the guide lugs 22. At the same time, the free end of the spring 24 is abuttingly applied against an internal projection 25 of the chamber 14, another function of said projection being to maintain the spring 21.

As the inward displacement of the connector-pin 11 continues, so the member 17 undergoes a displacement in a direction substantially parallel to itself towards the end wall of the chamber, the lateral extensions 20 being firmly applied against the guide lugs 22 under the action of the spring 24 (as shown in Fig. 2C).

The assembly is so arranged that the contact
bead 19 of the movable member 17 reaches the level of the stationary contact bead 12 just as the lateral extensions 20 pass beyond the top edges of the guide lugs 22 (as shown in Fig. 2C and in Fig. 1). Under the action of the spring 24, the member 17 which is no longer retained by the lugs 22 then tilts forward towards the chamber wall opposite to the side wall 23 and the contact bead 19 is abruptly applied against the stationary contact bead 22 (as shown in Fig. 2D), thus resulting in abrupt closing of the contact.

It will be readily apparent that a locking action then takes place in order to maintain the connector-pin 11 in a stationary position. This locking action can be obtained by any known means which usually consist of a bayonet-type coupling such that the plug which is rigidly fixed to the plug connector-pin is locked in position with respect to the plug socket in which the chamber 14 is located.

After unlocking, outward withdrawal of the plug connector-pin 11 is carried out by simple axial traction. The movement is facilitated by the action of the spring 21 which tends to drive the connector-pin 11 out of the chamber by maintaining the heel 18 applied against the top end of said connector-pin. At the beginning of the operation (shown in Fig. 2E), the movable contact bead 19 which is still resiliently
applied against the stationary contact bead 12 by means of the spring 24 slides over said bead 12, thus resulting in self-cleaning of the contact bearing surfaces. As an advantageous feature, the contact beads 12 and 19 are semi-cylindrical in order to produce a powerful self-cleaning action.

As the outward withdrawal of the connector-pin 11 continues, so the member 17 continues to follow the pin in the direction of the bore 16 of the chamber. At a given moment, the contact bead 19 moves away from the contact bead 12 and, under the action of the spring 24, tilts forward abruptly towards the wall opposite to the side wall 23 (as shown in Fig. 2F), thus resulting in abrupt opening of the contact. At the same time, the end arm of the spring 24 moves away from the projection 25. Since the spring 24 is thus freed from any further stress, the member 17 is subjected only to the action of the spring 21 which accordingly applies the curved front portion of the heel 18 against the top end of the connector-pin 11. The point of contact is not level with the end arm of the spring 21 and the member 17 tends to move back to its upright position, this movement being facilitated by the curved design of the heel 18. At the end of travel, the heel of the member 17 is applied against the edge of the bore of the chamber, thus re-assuming its rest position (as shown in Fig. 2A) in
readiness for another introduction of the connector-pin 11. It is possible, however, to devise different means for guiding the member 17 as it returns to its upright position.

Thus the contact has become a true single-pole switch of the quick-make quick-break type.

The foregoing description relates to a single contact employed alone but it is apparent that a plurality of contacts of this type permits the construction of different devices, especially current supply connectors in which each contact (with the possible exception of an earth contact if it exists) performs the function of a switch. This result is achieved independently of all known arrangements which may be adopted (angular displacement of at least one contact, insulating supports having variable angular positions, single or double safety disk, and so on).
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A pressure contact for establishing an electrical connection between a conductive connector-pin rigidly carried by the insulating support of a plug and a stationary contact bead connected electrically to an input terminal and placed within a chamber formed in the insulating support of a plug socket when the plug connector-pin is introduced axially into the plug socket chamber, the bodies of the plug and socket being adapted to carry associated guiding and locking means for carrying out and then maintaining said introduction, characterized in that said pressure contact comprises a rigid and movable conductive member placed within the plug socket chamber and extending over part of the height of said chamber, said conductive member being intended to be thrust back towards the end wall of said chamber by the free end of the connector-pin which is applied against an end heel of said member in opposition to a first resilient means which tends to apply said heel against the edge of the bore of said chamber, that guiding means are provided for ensuring that the movable member undergoes a displacement in a direction substantially parallel to the contact axis until the end of the member remote from the heel reaches the level of the contact bead which is connected to the input terminal and that the movable member and the guiding means are
so arranged that, at the end of said displacement in a
direction parallel to the axis, said member moves away
from said guiding means in order to tilt forward and to
be abruptly applied against the stationary contact bead
under the action of a second resilient means, a
contributory role being played by said second resilient
means in the abrupt opening of the contact at the time
of outward withdrawal of the plug connector pin by
enhancing the tilting motion of said movable member.

2. A pressure contact in accordance with claim 1,
characterized in that the movable member is constituted
by a small plate, one end of said small plate being bent-
back twice at 90° in order to form a U-shaped heel which
is intended to cooperate with the free end of the plug
connector pin and the other end of said small plate which
carries a movable contact bead corresponding to the
stationary contact bead being provided with lateral
extensions so as to form a T whereas the means for guid-
ing said movable member are constituted by two lugs
placed transversely within the chamber in the line of
extension of each other and in a direction parallel to
the side wall of the chamber along which said member is
capable of displacement, said guide lugs being located
in spaced relation to said side wall and the distance
between the opposite edges of said lugs being greater
than the width of the central portion of the movable
member but smaller than the width of the T-shaped end of said member.

3. A pressure contact in accordance with claim 2, characterized in that the resilient means which tends to cause the movable member to tilt forward towards the stationary contact bead is a torsional coil spring, one end arm of said spring being applied against that face of said movable member which is opposite to the stationary contact bead and the other end arm which is free in the rest position being abuttingly applied against an internal projection of the chamber as soon as the T-shaped end portion of the movable member engages behind the guide lugs.

4. A pressure contact in accordance with any one of claims 1 to 3, characterized in that the stationary contact bead connected to the input terminal and the corresponding movable contact bead carried by the movable member at the end remote from the heel are both semi-cylindrical in order to produce self-cleaning action with maximum efficiency.

Dated this 1st day of August 1983.

SOCIETE D'EXPLOITATION DES PROCEDES MARECHAL (SEPM)

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