Intellectual Property Office

BL O/0035/23

13 January 2023

PATENTS ACT 1977

APPLICANT	Schneider Electric Industries SAS
ISSUE	Whether patent application GB2003182.9 complies with section 1(1)(b) of the Patents Act 1977
HEARING OFFICER	B Micklewright

DECISION

Introduction

1 This decision relates to whether patent application GB2003182.9 complies with section 1(1)(b) of the Patents Act 1977 ("the Act").

2 The application is the national phase application of Patent Cooperation Treaty application PCT/CN2018/098963, filed on 6 August 2018 and with a declared priority date of 9 August 2017. The application was published under the PCT as WO 2019/029481 A1 on 14 February 2019 and, following entry to the UK national phase, assigned the GB publication number GB 2579953 A

3 The examiner has maintained that the claimed invention does not involve an inventive step. The applicant disagrees and the matter therefore came before me at a video hearing held on 21 October 2022. The applicant was represented by Mr Patrick Chapman of Haseltine Lake Kempner.

The invention

4 The invention relates to a leakage circuit breaker which integrates a leakage protection module and a circuit breaker module, as illustrated in Figure 1 below. The circuit breaker 100 of the invention comprises an inlet terminal 102, a circuit breaker assembly 104, a leakage protection assembly 106 and an outlet terminal 108 arranged sequentially along a first direction (in the figure this is shown as the Z-direction).

5 The leakage protection assembly 106 is shown in Figure 3 (reproduced below) and comprises a zero sequence transformer 202 for sensing a leakage current in a loop, a control circuit disposed on an electronic circuit board 204 for determining whether the sensed leakage current exceeds a threshold, and an action actuator 206 for disconnecting the loop. The zero sequence transformer 202 and action actuator 206 are disposed at a first side of the circuit board 204 in a second direction orthogonal to the first (Z) direction (in the figure this is shown as the Y direction), and they do

not overlap with each other. Terminal portions of the zero sequence transformer 202 and action actuator 206 overlap with the electronic circuit board in the first (Z) direction.

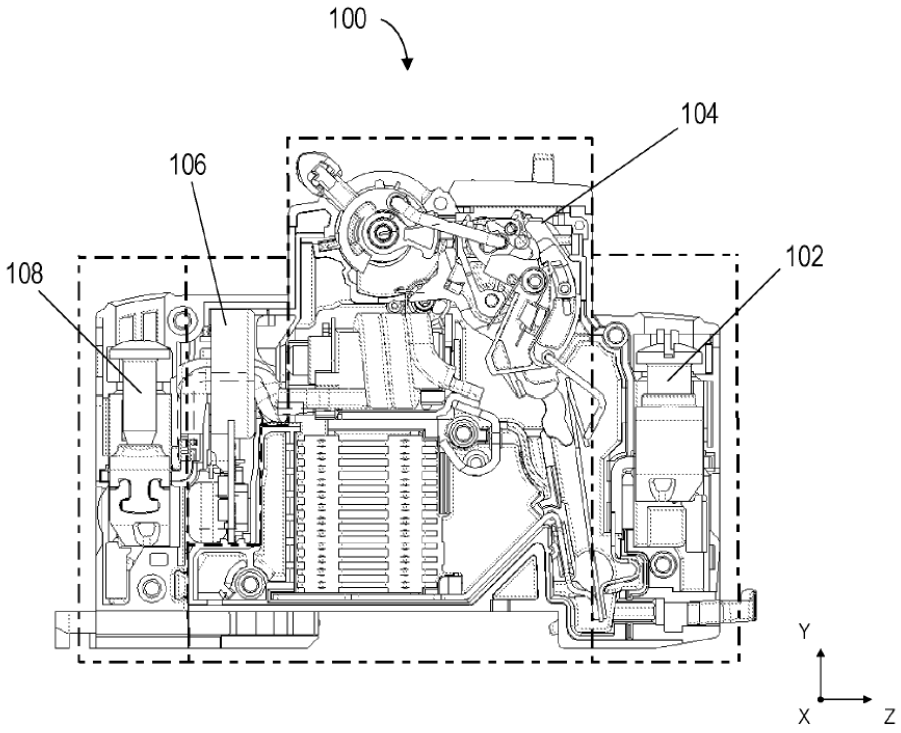

FIG. 1

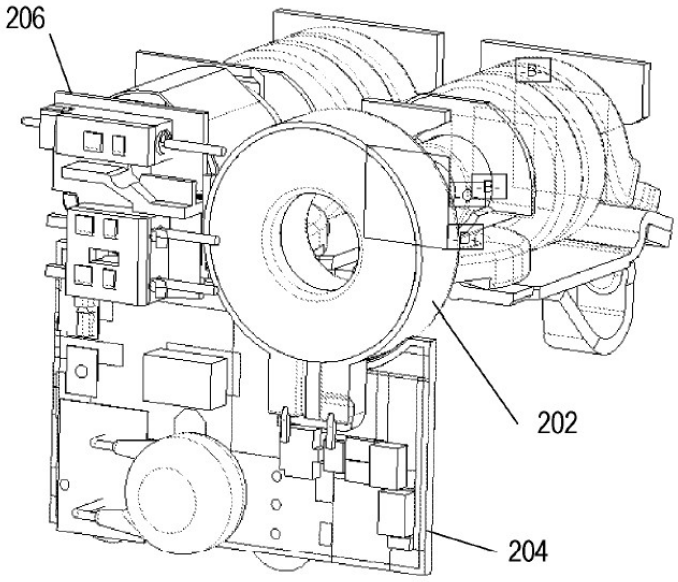

FIG. 3

6 The latest amendments to the claims were filed on 30 June 2022. Claim 1 is the only independent claim and reads as follows:

> *1. A leakage circuit breaker, comprising:*
>
> *an inlet terminal, a circuit breaker assembly, a leakage protection assembly and an outlet terminal disposed sequentially along a first direction,*
>
> *wherein the leakage protection assembly comprises:*
>
> *a zero sequence transformer configured to sense a leakage current in a loop to output a sense signal;*
>
> *a control circuit disposed on an electronic circuit board, and configured to receive the sense signal and determine, based on the sense signal, whether the leakage current exceeds a threshold; and*
>
> *an action actuator configured to execute an action if the leakage current exceeds the threshold, to cause the circuit breaker assembly to disconnect the loop,*
>
> *wherein the zero sequence transformer and the action actuator are disposed at a first side of the electronic circuit board in a second direction orthogonal to the first direction, and*
>
> *wherein terminal portions of the zero sequence transformer and the action actuator for coupling or connecting to the electronic circuit board overlap with the electronic circuit board in the first direction and the zero sequence transformer and the action actuator do not overlap with each other.*

7 Possible amendments were suggested at the hearing if I found that claim 1 in its current form did not involve an inventive step. As agreed at the hearing, Mr Chapman promptly submitted a copy of these proposed amendments shortly thereafter, for which I am grateful. The first of these relates to incorporating claims 2 and 4 into claim 1 with the further clarification that the magnetic protection assembly comprises a relatively fixed portion and a relatively movable portion. The second proposed amendment further clarifies features of the housing of the magnetic protection assembly. I will discuss these suggestions to the extent necessary in my analysis below.

The law

8 Section 1(1) of the Act states:

> *A patent may be granted only for an invention in respect of which the following conditions are satisfied, that is to say —*
>
> *(a) the invention is new;*
>
> *(b) it involves an inventive step;*
>
> *(c) it is capable of industrial application;*

(d) the grant of a patent for it is not excluded by subsections (2) and (3) or section 4A below;

and references in this Act to a patentable invention shall be construed accordingly.

9 Section 3 of the Act states:

An invention shall be taken to involve an inventive step if it is not obvious to a person skilled in the art, having regard to any matter which forms part of the state of the art by virtue only of section 2(2) above (and disregarding section 2(3) above).

10 In *Windsurfing*[1], the Court of Appeal formulated a four-step approach for assessing whether an invention is obvious to a person skilled in the art. This approach was restated and elaborated upon by the Court of Appeal in *Pozzoli*[2] where Jacob LJ reformulated the Windsurfing approach as follows:

(1)(a) Identify the notional "person skilled in the art"
(b) Identify the relevant common general knowledge of that person;

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;

(3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;

(4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

Assessment

Step (1): identify the notional person skilled in the art and the relevant common general knowledge of that person

11 The skilled person here is clearly a designer of circuit breakers and there is no disagreement about that. The examiner suggested the common general knowledge of that person would include circuit breaker form factors, residual current detection, the interaction between components in circuit breakers and electrical engineering in general. The applicant does not disagree with the examiner's assessment here.

12 The examiner also suggested all the components of the circuit breaker defined by the claim would be part of the common general knowledge of the skilled person. When asked for his view on this, Mr Chapman confirmed this was a reasonable assessment and that there was no dispute of that.

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[1] *Windsurfing International Inc v Tabur Marine (Great Britain) Ltd* [1985] RPC 59
[2] *Pozzoli SPA v BDMO SA* [2007] EWCA Civ 588

13 However, when considering the layout of those components, Mr Chapman argued that the skilled person would be constrained by convention in this particular field of technology. Someone in the field of general circuit design would have the freedom to locate components in different positions on a circuit board, but in this specific industry there is more standardisation which limits the skilled person's creativity. I will consider this in more detail below at step 4.

Step (2): Identify the inventive concept of the claim in question or if that cannot readily be done, construe it

14 As the components of claim 1 are well known and form part of the common general knowledge, there is no dispute that the inventive concept is considered to be the specific layout of those components as defined by claim 1 and shown in the figures.

Step (3): Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or claim as construed

15 The examiner has maintained that the invention is obvious in light of each of the following five documents:

D1:	CN 203553079 U	(SCHNEIDER ELECTRIC INDUSTRIES)
D2:	JP 2002329452 A	(MATSUSHITA ELECTRIC WORKS)
D3:	JP 2002329450 A	(MATSUSHITA ELECTRIC WORKS)
D4:	US 5293522 A	(WESTINGHOUSE ELECTRIC CORP)
D5:	CA 2105918 A1	(WESTINGHOUSE ELECTRIC CORP)

16 The examiner argued these documents show circuit breakers containing each of the components of the claim: an inlet terminal, outlet terminal, circuit breaker assembly, and leakage protection assembly comprising a transformer coil, a control circuit disposed on a circuit board and an action actuator. The applicant does not refute this. What is of interest is the spatial arrangement of the components.

17 D1 discloses a two-pole integrated circuit breaker with a zero-sequence transformer 210 and an electric circuit board 51 arranged to receive a signal from the zero-sequence transformer 210. Operating coil 52 is the action actuator for tripping the circuit breaker when a leakage current is detected. As is shown in figure 2 reproduced below (with my annotations added), the actuator 52 is located on the opposite side of the circuit board 51 from the transformer 210, in terms of both the first (Z) direction and the second (Y) direction.

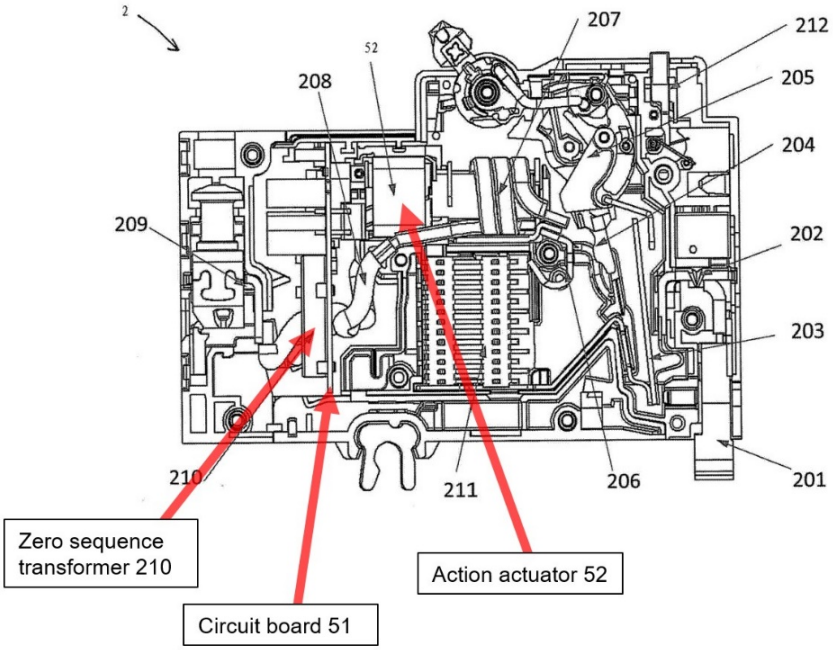

Fig. 2 of D1

18 D2 and D3 can be treated together as they are related patent applications disclosing the same spatial arrangement of components. They show a circuit breaker with a zero phase transformer ZCT, an electromagnetic release apparatus 48 comprising an actuator coil 68, and evaluation circuit 51a mounted on a circuit board 74 (as shown in figure 10 below, with my annotations added). Although the transformer and actuator are located on the same side of the circuit board 74 with respect to the first (Z) direction, they are not disposed to one side of the circuit board with respect a second direction orthogonal to the first direction.

【図１０】

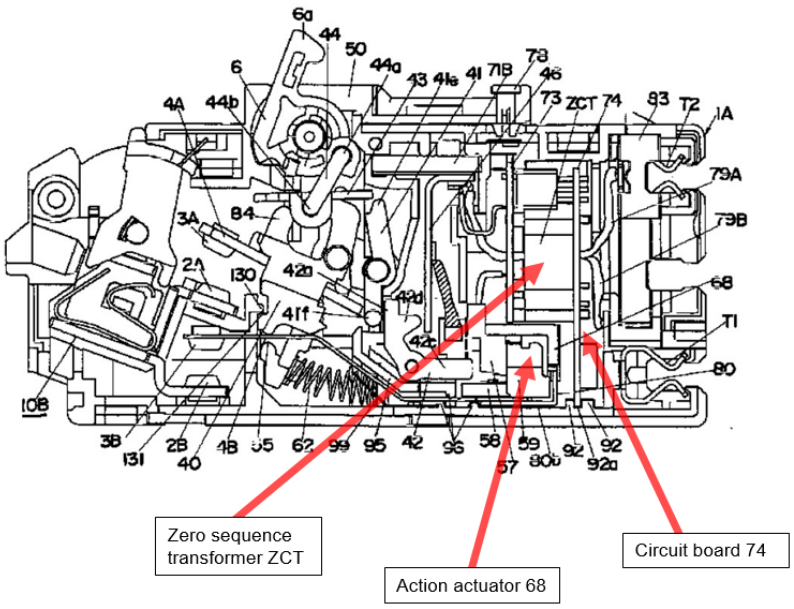

Fig. 10 of D2 and D3

19 D4 and D5 can also be treated together because they are also related patent applications which disclose the same spatial arrangement of components. They show a circuit breaker with two sensing transformer coils 97, 99, an action actuator 123, and a circuit board 91 (as shown in figure 3 of D5 below (which is almost identical to figure 3 of D4), with my annotations added).

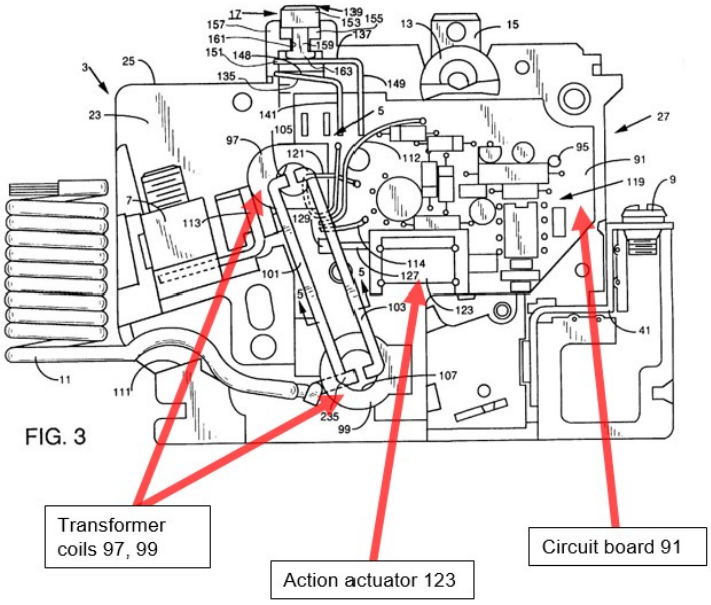

Fig. 3 of D5

20 I note that the design of this circuit breaker is rather different from the circuit breakers of the present invention and the other citations. It involves a circuit breaker mechanism in one compartment and a ground fault circuit interrupter (analogous to the leakage protection assembly of the present invention) in a separate adjacent compartment. Both these compartments span from the inlet terminal to the outlet terminal. Claim 1 of the present invention requires these components to be disposed sequentially along a first direction. This circuit breaker thus doesn't appear to meet this requirement and I am therefore of the opinion it is not a particularly useful starting point for the assessment of inventive step. I recognise the examiner's point that this shows all the relevant components are known in the art, but Mr Chapman has already acknowledged the components are common general knowledge. Consequently, I do not think the disclosure of D4/D5 is of much use here.

21 The examiner suggested that, since all citations show the components mounted on circuit boards, it is implicit that terminal portions of the zero sequence transformer and action actuator for coupling or connecting to the electronic circuit board overlap with the electronic circuit board in the first direction, as is required by claim 1. The applicant argued in their correspondence with the examiner that there is no evidence to suggest this is the case, although this line of argument was not pursued in the hearing. I am in agreement with the examiner's assessment that citations D1 and D2/D3 show the components mounted on circuit boards in such a way that it would be implicit that their connections overlap the circuit board in the first direction.

22 The difference between the inventive concept of the application and the disclosure of D1 and D2/D3 is therefore that these citations do not show the zero sequence

transformer and action actuator being disposed at a first side of the circuit board in a second direction orthogonal to the first direction.

Step (4): Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps that would have been obvious to the person skilled in the art or do they require any degree of invention?

23 The examiner argued that the location of the components is a simple design choice, and that it is nothing more than routine workshop activity for the skilled person to arrive at a component layout in which the transformer and actuator are disposed at a first side of the circuit board in a direction orthogonal to the first direction. The skilled person would naturally consider various ways of arranging components within the available space. The examiner pointed to the citations D1-D5 as examples of varied arrangements of the components in circuit breakers and argued that the skilled person would therefore know the physical arrangement of components within a breaker can be changed in order to satisfy the space restrictions imposed by a given housing design.

24 The examiner also argued that the arrangement of claim 1 does not result in a circuit breaker that is improved in function. Rather, it is a circuit breaker that operates in a conventional way with a component layout simply selected to occupy less space. The skilled person would therefore appreciate the arrangement as an obvious possibility.

25 Mr Chapman refuted the examiner's argument that there was no functional benefit to the arrangement of the circuit breaker. At the hearing, Mr Chapman argued that a benefit of the invention was that it allowed the circuit breaker to be assembled more easily. When pressed on whether such a benefit was actually apparent to the skilled person from reading the specification, Mr Chapman pointed to paragraph [0063]. At my invitation, Mr Chapman provided further references to paragraphs [0012], [0061] and [0066] after the hearing. Mr Chapman explained that the invention relates to having an assembly which can be created before putting it in the housing which means assembling the circuit breaker is much easier. He built on this point by referencing paragraphs [0053]-[0055] and explaining that the side-by-side arrangement allows for the assembly to have a fixed side and a movable side to facilitate assembling the circuit breaker.

26 I agree that the referenced passages point to improving assembling efficiency as a benefit of the invention in general terms, but I believe the specific benefits with regards to having a fixed side and movable side to aid assembly are not reflective of the scope of claim 1. Claim 1 certainly allows for such a benefit to be realised, but it is not limited to such an assembly and as such I do not accept that this particular benefit would be apparent to the skilled person with regard to the circuit breaker defined by claim 1.

27 Mr Chapman also outlined benefits relating to minimised power consumption and reduced temperature increases in the circuit breaker. He argued that the specific arrangement of the components results in a shorter circuit breaker which results in minimised power consumption and reduced temperature increases due to a shorter length of loop through the circuit breaker. Mr Chapman stressed that an issue with miniaturising circuit breakers is that temperature rises become more significant. By

arranging the components in the way defined by claim 1, this problem of temperature increase has been offset by reduced loop length through the circuit breaker. The conventional wisdom was to miniaturise the width of the assemblies, whereas here the length is being shortened which allows for the loop length to be reduced.

28 I put it to Mr Chapman that the examiner raises a reasonable argument that this is the sort of thing that would be obvious to try given these sorts of things are what the skilled person might want to achieve. In response, Mr Chapman argued that there would be a technical prejudice against doing this. The desire in the prior art is to avoid temperature increases. Furthermore, in the prior art it is conventional for the circuit board to take up the full space of the housing and there is a desire to have a transformer of large diameter taking up the full width of the housing. Mr Chapman argued that a skilled person would therefore not be able to get to the invention from the prior art simply with routine modifications as the particular arrangement would be considered undesirable.

29 On the balance of the evidence available, I find these arguments persuasive. I accept that there is more to the claimed arrangement than the mere saving of space and that there is a functional benefit to the arrangement. The advantages of the arrangement include minimising power consumption, reducing temperature rise, and improving the assembling efficiency. The arrangement defined by claim 1 is therefore more than a design choice motivated simply by the size and shape of the housing. Without any evidence to the contrary, I also accept Mr Chapman's assertion that the skilled person would be limited in their freedom to arrange the components in the circuit breaker. Components tend to be laid out according to convention in this particular field of technology and the skilled person would have an inclination for avoiding temperature rises. In light of this, I am of the opinion that the skilled person would not find the arrangement of components defined by the claim obvious to try in the course of routine workshop modifications to the cited prior art devices and the common general knowledge. Furthermore, there is no hint or suggestion in the citations to point the skilled person to such an arrangement.

30 I therefore conclude that the claimed invention contains an inventive step over the cited prior art documents D1-D5. As I have reached this conclusion, I do not need to consider the auxiliary claim requests made to me.

Conclusion

31 I have found that the claimed invention involves an inventive step under section 1(1)(b). I therefore refer the application back to the examiner for completion of the deferred aspects of the search and examination.

B Micklewright

Deputy Director, acting for the Comptroller