FEDERAL SUPREME COURT

IN THE NAME OF THE PEOPLE

JUDGMENT

X ZR 20/20

Pronounced on:
January 20, 2022
Anderer
Judicial Employee
as Clerk of the
Court Registry

in the patent nullity case

ECLI:DE:BGH:2022:200122UXZR20.20.0

At the oral proceedings on January 20, 2022 the X. Civil Senate of the Federal Supreme Court by the Judges Dr. Grabinski, Hoffmann and Dr. Deichfuß, the Judge Dr. Kober-Dehm and the Judge Dr. Crummenerl

has ruled:

The appeal against the judgment of the 5th Senate (Nullity Senate) of the Federal Patent Court of October 9, 2019, is dismissed at the plaintiff's expense.

By law

Facts of the Case:

1 The defendant is the owner of European patent 1 022 849 (patent in suit), which was filed on January 20, 2000, claiming a German priority of January 22, 1999, and has by now lapsed due to the expiration of term. The patent in suit relates to an apparatus for setting the gain of a repeater. Claim 1, to which four further claims are referred back, reads in procedural language:

> Apparatus for setting the gain of a repeater (1) which has a downlink path (6) and an uplink path (7), preferably of a mobile repeater, having automatic level control (18, 19, 20) which simultaneously reduces the gain in the downlink path (6) and in the uplink path (7) if a nominal level (Sp) is exceeded in the downlink path (6),
>
> characterized by,
>
> a detector (19) which, together with a control amplifier (20) and with a first attenuator (18) arranged in the downlink path (6), forms a control loop, receives an output signal (S_v) produced in the downlink path (6) and monitors its level, with a manipulated variable (SG), which is generated by the control amplifier (20), being supplied simultaneously to the first attenuator (18) and to a processing device (21, 23, 24), which sets a second attenuator (22), arranged in the uplink path (7), by means of a control signal (ST) such that the gain in the uplink path (7) corresponds to the gain in the downlink path (6).

2 The plaintiff, who is claimed by the defendant for infringement of the patent in suit, has argued that the subject matter of the patent in suit goes beyond the content of the originally filed documents and is not patentable. In addition, the patent in suit does not disclose the invention clearly and completely enough for a person skilled in the art to carry it out. The defendant defended the patent in suit as granted and, in the alternative, in an amended version.

3 The Patent Court dismissed the action. The plaintiff appeals against this decision and continues to seek a declaration of nullity of the patent in suit. The defendant counters the appeal with its requests of the first-instance.

Reasons for Decision:

4 The admissible appeal is unfounded.

5 I. The patent in suit relates to an apparatus for setting the gain of a repeater which has a downlink path and an uplink path with an automatic level control.

6 1. According to the statements in the patent in suit, repeaters of this type are used in a mobile wireless system to supply subscribers who cannot be reached directly by the base station due to high attenuation of the high-frequency signal. In the downlink path, the signals received by the repeater from the base station via a link antenna would be filtered and amplified and then forwarded to the mobile stations to be supplied as amplified transmit signals via a coverage antenna. Accordingly, the uplink path would serve to amplify signals coming from the respective mobile station and forward them to the base station (para. 2).

7 The repeater would not usually add any information to the received signals, but would forward them to the mobile or base station with the same information content. The transparency aimed at was ensured by the fact that both amplifier groups or paths were set to the same gain. It is of importance because the processor of the base station derives the path attenuation from the received signal

level and controls the transmission level of the mobile station. It should be ensured that the amplifiers are not being overloaded and that a maximum transmission level is not exceeded. For this purpose, protective circuits could be provided in the amplifiers or amplifier paths of the repeater, which automatically reduce the output signal to a maximum value in the event of overload and are known in communications technology as automatic level control (ALC) (para. 3).

8 If the level is correct, the ALC in the downlink path would not be activated for a stationary repeater; corresponding level control would only be activated in the uplink path for nearby mobile stations. In contrast, the ALC in a mobile repeater used for wireless coverage in means of transport, such as railroad trains, would be active even with correct level control in the downlink path, since the path attenuation between the base station and the mobile station in a mobile repeater is constantly changing and thus an overload could occur in the downlink path. However, if the level control is active in the downlink, the gain would also be reduced there. This would disrupt the balance of the gain in the two transmission directions and the desired transparency would be lost (para. 4).

9 2. Against this background, the patent in suit concerns the technical problem of providing an apparatus for repeaters, in particular mobile repeaters, by which the signal amplification can be adjusted in both transmission directions in the best possible way.

10 3. To solve the problem, the patent in suit proposes in claim 1 an apparatus, the features of which can be structured as follows (deviating points of structure of the Patent Court in square brackets):

A. The apparatus is used for setting the gain of a repeater (1) which has a downlink path (6) and an uplink path (7), preferably of a mobile repeater.

B. The apparatus

B.0 is having an automatic level control [B];

B.1 simultaneously reduces the gain in the downlink path (6) and in the uplink path (7) if a nominal value (Sp) is exceeded in the downlink path (6) [B];

B.2 comprises

B.2.a a detector (19) which, together with a control amplifier (20) and a first attenuator (18) arranged in the downlink path, forms a control loop [C],

B.2.b a processing device (21, 23, 24) and

B.2.c a second attenuator (22) arranged in the uplink path.

C. The detector (19) receives an output signal (S_V) produced in the downlink path (6) and monitors its level [C.1].

D. The control amplifier (20) generates a manipulated variable (SG) which is simultaneously supplied to the first attenuator (18) and the processing device (21, 23, 24).

E. The processing device (21, 23, 24) sets the second attenuator (22), arranged in the uplink path (7), by means of a control signal (ST) [D.1],

E.1 such that the gain in the uplink path (7) corresponds to the gain in the downlink path (6) [D.2].

11 4. Some features require further consideration.

12 a) The claimed apparatus is designed for setting the gain of repeaters which have two amplifier paths, one of which - referred to as the downlink path - is used for signals arriving from the base station and to be relayed to a mobile station in the repeater's reception area, and the second - referred to as the uplink path - is used for signals to be relayed in the opposite direction. It is intended to allow adjustment of the gain in both paths and to ensure that the balance between the two paths required for transparency is maintained or readily restored when the automatic level control is activated in the downlink path and reduces the gain in that path because the desired output level of the downlink path has been exceeded.

13 In describing the problem underlying the invention, the patent in suit focuses on the special features of mobile repeaters and describes it in particular as disadvantageous that in mobile repeaters, unlike in stationary repeaters, an overload can occur in the downlink path even with correct leveling and that there is thus a need for adjustability of the gain to maintain the balance between the two paths despite correct leveling. The patent in suit thus starts from a problem which, it is true, primarily concerns mobile repeaters and, according to the task formulated in the description, seeks to provide an apparatus which is particularly suitable for adjusting the gain of a mobile repeater in particular. However, the subject matter of claim 1 is expressly not limited to mobile repeaters, but also includes stationary repeaters.

14 b) In order to adjust the gain in the two paths of the repeater to each other and thus to maintain transparency between the base station and the mobile station or to restore it automatically after a disturbance of the equilibrium of the gain in both directions, the apparatus according to the invention reduces the gain in the downlink path as well as - simultaneously - in the uplink path when a nominal value in the downlink path according to feature B.1 is exceeded.

15 Figure 1 reproduced below shows a block diagram of a repeater in which a possible arrangement of the components of the apparatus according to the invention is shown.

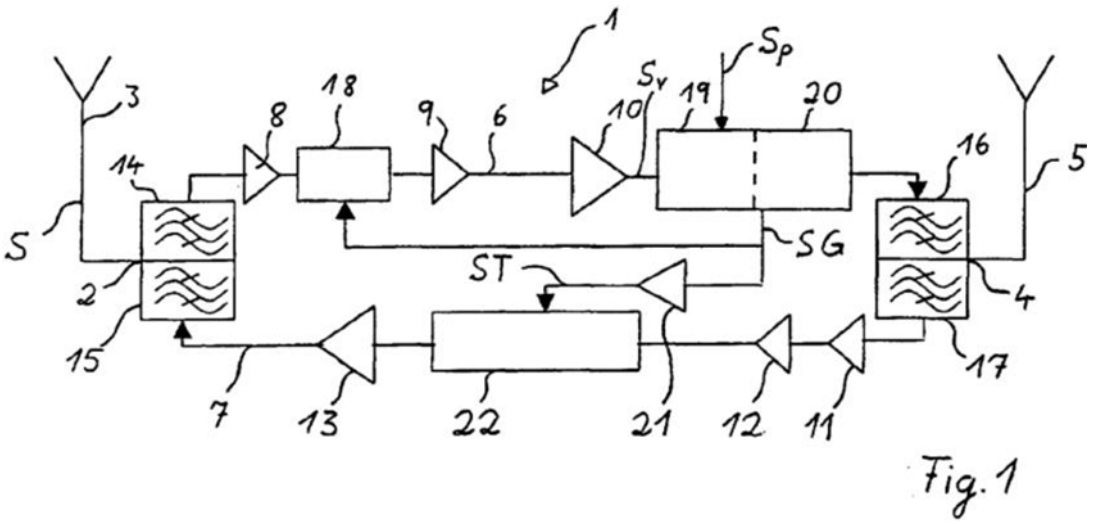


Fig. 1

16 The downlink path (6) and the uplink path (7) are routed via the frequency switches (14, 15) to the port (2) for the link antenna (3) and analogously via the frequency switches (16, 17) to the port (4) for the supply antenna (5). Via these frequency switches (14, 15, 16, 17) in the area of the ports (2, 4), the parallel circuit of the two paths (6, 7) of the repeater is realized (paras. 15, 16), each of which has several amplifier stages (8, 9, 10 as well as 11, 12 and 13) and one

variable attenuator each (18 and 22). In the downlink path (6), control electronics consisting of a detector (19) and a control amplifier (20) are connected downstream of the final amplifier (10). On the output side, the control amplifier (20) is connected on the one hand to the variable attenuator (18) in the downlink path and on the other hand via a control amplifier (21) to the second variable attenuator (22) in the uplink path.

17 c) In the downlink path, the setting of the gain is triggered by the automatic level control in the sense of feature B.0 if the signal to be forwarded from the base station to the mobile station exceeds a certain target level. According to the description, the automatic level control is realized by the control loop formed according to feature B.2.a by the detector (19) together with the control amplifier (20) and the first attenuator (18) (paras. 8, 10). The detector receives the - amplified - output signal (S_v) previously generated in the amplifier stages (8, 9, 10) of the downlink path on the basis of the input signal (S) coming from the base station and monitors its level by comparing it with a nominal level (Sp) given or supplied to it. In the event of a deviation, the control amplifier (20) connected to the detector (19) generates a manipulated variable (SG) which is supplied as a control signal to the variable attenuator (18) in the downlink path (6). If the nominal level (Sp) is exceeded, the attenuator (18) is set or controlled in such a way that the desired output level of the downlink path (6) is maintained (para. 19).

18 d) In the uplink path (7), the gain is regulated by the second attenuator (22) located there, which is set by a processing device, which may be a control amplifier (21) as in the embodiment shown in Figure 1.

19 For this purpose, the manipulated variable (SG) generated by the control amplifier (20) is also supplied simultaneously with the supply to the first attenuator (18) to the processing device, which sets the second attenuator (22) arranged in the uplink path (7) by means of a control signal (ST). The control signal (ST) is thereafter generated by the processing device in response to the manipulated variable (SG) supplied to the processing device. Other factors influencing the control signal (ST) are not excluded, if thereby a signal amplification in the uplink path (feature E.1) corresponding to the signal amplification in the downlink path is further optimized or at least not impaired (cf. also the second supplementary opinion of the expert patent attorney S. , BK7, p. 9 et seq.).

20 This understanding is consistent with the general description, according to which the manipulated variable generated by the control amplifier is simultaneously supplied to the variable attenuator in the downlink path and to the processing device, which simultaneously controls the likewise variable attenuator in the uplink path and sets the gain there simultaneously with that in the downlink path, the gain in the uplink path being expediently in such a way that the levels in the downlink and in the uplink paths are matched to one another (para. 8 et seq.). The fact that in the example shown in Figure 1 the manipulated variable (SG) generated in the control loop (19, 20) is simultaneously supplied as a control signal (ST) to the second variable attenuator (22) in the uplink path (7) (para. 20), does not prevent this, since this is merely an example of an embodiment according to the invention, which does not justify a restrictive interpretation of the patent claim (see BGH, judgment of September 7, 2004 - X ZR 255/01, BGHZ 160, 204 = GRUR 2004, 1023, 1024 - Bodenseitige Vereinzelungseinrichtung).

21 e) The processing of the manipulated variable can be analog or digital in both paths (paras. 11, 20, 21). In this respect, claim 1 does not contain any specifications regarding the type of signal processing.

22 II. The Patent Court essentially justified its decision as follows, insofar as it is of interest for the appeal proceedings:

23 The subject matter of claim 1 as granted was not inadmissibly extended compared to the application documents originally filed. The application discloses not only the possibility of digital signal processing, but also includes the alternative of processing signals in analog form. According to the description of the invention in the application, the form in which the manipulated variable (SG) is provided or processed is not specified. Claim 7 of the application also does not distinguish between analog and digital signals with respect to the manipulated variable (SG). Such a distinction is also not relevant for the person skilled in the art, a graduate engineer in communications engineering with several years of experience in the conception and practical implementation of data exchange and communication between base stations and mobile stations in digital networks, since he always determines the type of signal processing according to the requirements and conditions of the place of use.

24 The subject-matter of claim 1 also does not contain an inadmissible intermediate generalization to the effect that the claimed control signal according to the wording of the claim (by means of *a* control signal) does not have to be generated directly from the manipulated variable, unlike according to the application. The embodiments explained in the application and in the patent specification in dispute and shown in figures 1 to 4 taught unanimously that the claimed control signal is generated from the manipulated variable.

25 The subject matter of claim 1 is disclosed in detail. The objections asserted by the plaintiff in this respect were based on its incorrect assumption that the possibility of processing analog signals was not originally disclosed and that accordingly no technical measures for implementation were provided to the person skilled in the art in this respect.

26 The subject matter of claim 1 as granted was neither anticipated nor suggested by the prior art.

27 The international patent application WO 97/33 381 (K5) discloses a device for monitoring a repeater used in a mobile telephone. It deals with the problem of interference from insufficiently insulated repeater antennas and the resulting signal oscillations in the downlink path and in the uplink path, which can lead to functional impairments and even failure of the mobile station or base station. As a solution, K5 proposed an automatic and preferably continuous monitoring of the signal stability. Unlike the patent in suit, no automatic level control with a permanent control power to a value below a nominal value would be taught. Rather, a stability test and monitoring procedure would only be carried out when the device was started up or when an alarm was triggered because a strong interference signal blocked the path. Thus, feature A was not disclosed. The repeater had control amplifiers, attenuators and detectors in both the downlink path and the uplink path, each of which formed a separate control loop. The level of an output signal would also be monitored and a manipulated variable generated by the respective control amplifier would be supplied to the attenuators arranged in the downlink path and in the uplink path. However, the citation would not allow the supply of a manipulated variable to a processing device, since it was not intended to influence the amplifier

power in the uplink path by means of a control signal starting from the downlink path and to set it to a value corresponding to the downlink path.

28 Japanese patent application Hei 6-334577 (K12) would disclose a wireless repeater with a receiving antenna for receiving signals from a base station and a transmitting antenna for forwarding signals to one or more mobile stations. According to the plaintiff, signal control was provided by a control loop comprising an amplifier, an attenuator, and a detector in the downlink path and an attenuator arranged in the uplink path. To counteract signal oscillations, K12 proposed the use of a phase shifter along the signal path and the detector. The manipulated variable emitted with the signal from the CONT 206 component would simultaneously be supplied to the attenuators arranged in the uplink and downlink paths and would cause the gain of the signal in both paths to be reduced simultaneously. In contrast to the patent in suit, however, the signal level of an incoming signal would not be compared with a nominal level for quality assurance purposes, but the error rate of a useful signal determined by the detector was compared with a nominal rate stored in the wireless repeater. Thus, features B and C would not be fully disclosed. Since, unlike in the patent in suit, the attenuator in the uplink path was not driven by a control signal generated or conveyed by a processing device interposed upstream of this path, feature E was also only partially disclosed. Measures by which it could be achieved that the amplification in the uplink path was equal to that in the downlink path were also not to be found in K12.

29 The subject matter of the patent in suit as granted was also based on inventive step. It is not suggested to the person skilled in the art either on the basis of the US patent application 5 812 933 (K6) in connection with its technical knowledge or in combination with K5 or by the German disclosure 197 05 395 (K14).

30 K6 would disclose a device for preventing interfering self-oscillations in a repeater, such as could occur during operation due to the undesired coupling of uplink and downlink amplifiers. Although the device had control amplifiers and detectors that form a control loop, it did not include automatic level control in the sense of the patent in suit. In contrast to the patent in suit, a detector was arranged not only in the downlink path, but also in the uplink path. The detectors did not serve - as provided for in the invention - to monitor the level of an output signal, but had the purpose of detecting interfering oscillations. These only provided measurement results to control means which would not be comparable to a processing device within the meaning of the patent in suit to which a manipulated variable was supplied. Likewise, there was no component corresponding to the second attenuator in the uplink path. It was not apparent what reason the person skilled in the art should have had to design the device disclosed in K6 with an automatic level control in the sense of the patent in suit, especially since it would have required a multitude of individual steps and complex adaptations to reach the subject matter of the patent in suit. The same applied to a combination of K6 with K5, since K5 did not disclose feature D and feature group E either.

31 K14 disclosed a repeater for transmitting high-frequency signals between a base station and a mobile station in trains and motor vehicles. This citation dealt with the problem of Doppler shift in the transmission frequencies and the resulting poor transmission quality and not with the possibilities of simultaneous signal amplification. The person skilled in the art had no reason to redesign an apparatus designed for frequency matching in the direction of a device for level matching.

32 III. This assessment withstands examination in the appeal proceedings.

33 1. The Patent Court rightly came to the conclusion that the subject matter of claim 1 does not go beyond the content of the originally filed documents.

34 a) Contrary to plaintiff's view, the originally filed documents corresponding to the published European patent application 1 022 849 (K3) disclose a processing device directly and unambiguously as belonging to the invention not only in connection with a purely digital signal processing, but also in connection with the processing of analog signals.

35 The application states that the processing of the controlled variable for automatic level adjustment can be analog or digital. In this respect, it follows from the description of the application first of all that the processing of the or each controlled variable for automatic level adjustment "for example" can be analog and the manipulated variable generated in the control loop for setting the attenuation in the downlink path can be used simultaneously for setting the attenuation in the uplink path and for this purpose can be fed to a processing device in the form of a control amplifier or a computer connected downstream of the control amplifier (K3 para. 8, lines 37 to 46). The fact that such processing with regard to the attenuation or gain setting as well as with regard to the entire signal processing in the downlink and in the uplink path can also be carried out digitally, in particular by means of a controller or signal processor, whereby the manipulated variable for both paths is processed logically and output via digital-to-analog converters (DAC) to corresponding, digitally controllable variable attenuators, is addressed as an advantageous embodiment possibility (para. 8, lines 46 to 55; cf. also para. 21 with

regard to the embodiment in the embodiment examples). In line with this, the device described in claims 5 and 7 of the application does not specify whether the controlled variable for automatic level adjustment is processed in analog or digital form, so that from a technical point of view both possibilities - and thus also a purely analog implementation - are disclosed.

36 b) The subject matter of claim 1 also does not go beyond the content of the original documents because - as the plaintiff suggests - the wording in feature E, according to which the processing device sets the second attenuator in the uplink path by means of a control signal (ST), disregards the causal relationship expressed in the application that the control signal (ST) is generated from the manipulated variable (SG).

37 As explained, the control signal (ST) by which the processing device sets the second attenuator arranged in the uplink path is determined according to the teaching of claim 1 as a function of the manipulated variable (SG) supplied to the processing device. Other factors influencing the determination of the control signal (ST) are in any case not excluded if thereby an amplification in the downlink path corresponding amplification in the uplink path (feature E1) is further promoted or in any case not impaired.

38 This corresponds to the disclosure content of the original application. According to claim 7 of the application, it is provided that the manipulated variable (SG) is simultaneously supplied to a first attenuator provided in the downlink path and to a processing device which sets the second attenuator in the uplink path in such a way that the gain in the uplink path corresponds to the gain in the downlink path. In this regard, the description of the application states that in addition to

setting the attenuation in the downlink path, the control variables generated in the control loop of the downlink path are also used to adjust or control the attenuation in the uplink path to bring the attenuation values in both paths into agreement and to set the gain in the uplink path to match the gain in the downlink path (K3, paras. 7, 8 and 11).

39 It follows without further ado that the second attenuator is set by a control signal generated by the processing device as a function of the manipulated variable (SG) supplied to it. Crucially, as a result of the control signal, the second attenuator in the uplink path is set in such a way that the gain in the uplink path corresponds to the gain in the downlink path. To achieve this, the manipulated variable is required as a measure, but need not be the control signal itself. Insofar as it is stated in connection with the description of the embodiments in the application that the manipulated variable (SG) is simultaneously supplied to the second variable attenuator (22) in the uplink path *as* a control signal (ST) (K3, paras. 20 and 21), this does indeed describe a possible embodiment of the invention. However, the fact that this is limited solely to such an embodiment cannot be inferred from the disclosure content of the application.

40 c) As explained, it is the device which, when a nominal level in the downlink path is exceeded, simultaneously also reduces the gain in the downlink path and in the uplink path. The relative clause in the generic term of claim 1 relating to the simultaneous reduction of the level gain in the downlink path and uplink path and introduced with the pronoun "the" can, as the plaintiff pointed out at the oral proceedings, be referred to both the device and the automatic level control when viewed purely grammatically. However, only the former understanding is consistent with the description, from which it can be inferred that the automatic level control serves solely to set the gain in the downlink path, while the adjustment of the gain

in the uplink path is indeed triggered by the manipulated variable generated by the control amplifier in the downlink path, but is ultimately carried out via further components of the device not belonging to the automatic level control, such as the processing device (paras. 7, 8, 10; likewise the description of the application, cf. K3, paras. 7, 10, 11), so that also in this respect the subject matter of the patent in suit does not go beyond the content of the application.

41 2) The Patent Court rightly considered the invention to be sufficiently disclosed.

42 a) According to the case law of the Senate, sufficient disclosure for practicability is given if the person skilled in the art is able, without inventive step and without unreasonable difficulties, to practically implement the teaching of the patent claim on the basis of the overall disclosure of the patent specification in combination with the general knowledge at the filing or priority date in such a way that the intended success is achieved (Federal Supreme Court (BGH), judgment of May 11, 2010 - X ZR 51/06, GRUR 2010, 901, para. 31 – Polymerisierbare Zementmischung; judgment of October 7, 2014 - X ZR 168/12, juris para. 18 - Fixationssystem).

43 Furthermore, in the case of a feature claimed in a generalized form, it is not generally necessary for the patent specification to show the person skilled in the art a feasible way to realize it for every conceivable embodiment. The degree of generalization that is permissible in this context depends in each individual case on whether the protection provided by the respective version of the claim is within the scope of what can be inferred from the patent from the point of view of the person skilled in the art, taking into account the description and the embodiments contained therein, as the most general form of the technical teaching that solves

the problem underlying the invention (cf. BGH, decision of September 11, 2013 - X ZB 8/12, BGHZ 198, 205 = GRUR 2013, 1210, para. 21 – Dipeptidyl-Peptidase-Inhibitoren; judgment of October 7, 2014 - X ZR 168/12, juris paras. 19 et seq. - Fixation system; most recently judgment of March 12, 2019 - X ZR 32/17, GRUR 2019, 713, para. 40 et seq. – Cer-Zirkonium_Mischoxid I).

44 b) Accordingly, contrary to plaintiff's view, the invention is disclosed so clearly and completely that a person skilled in the art can carry it out.

45 Claim 1 leaves open the form in which the manipulated variable for setting the attenuators in the downlink path and in the uplink path is processed. The patent in suit discloses that the processing of the manipulated variable (SG) for setting the attenuator in the uplink path can be analog or digital. Analog processing is explained with reference to the embodiments shown in Figures 1 and 2, in which the processing device is a control amplifier (21). In the case of digital processing, the signals are processed via a computer which, according to the patent in suit, may be, for example - as in the embodiment example shown in Figure 3 - a control section (23) or - as in the embodiment example shown in Figure 4 - a computer (24) in the form of a signal processor or controller and is used in conjunction with a digital-to-analog converter (25, 26) via which the manipulated variable is output to a digitally controllable attenuator (paras. 8, 11 and 21). Finally, the patent specification in dispute refers to the fact that, in a further expedient further development, the first attenuator in the downlink path can also be set digitally and thus ultimately the entire signal processing is performed digitally (para. 22). Thus, the person skilled in the art is shown several ways which, in combination with its technical knowledge, enable it to implement the technical teaching of claim 1.

46 Against this background, the practicability of the invention claimed in the patent in suit is not precluded by the fact that the wording of claim 1 possibly covers further embodiments which do not correspond to the embodiment examples shown.

47 Contrary to the opinion of the plaintiff, the fact that the description of the patent in suit does not mention any technical measures with which the person skilled in the art could convert an analog manipulated variable into a digital control signal via a control amplifier does not constitute an insufficient disclosure from the point of view of practicability. The patent specification mentions the use of a control amplifier as a possibility for analog signal processing, which according to the description is sufficient to be able to implement the claimed technical teaching (para. 20). The fact that the patent specification does not contain any explanation as to whether and how digital signal processing would also be possible with the use of a control amplifier does not prevent the claimed invention from being practicable.

48 Furthermore, it is disclosed in the description as a possibility of the execution of the feature groups D and E to supply the manipulated variable (SG) simultaneously as a control signal (ST) to the second attenuator in the uplink path via a control amplifier. An insufficient disclosure does not lie in the fact that the patent specification in dispute does not additionally describe providing a further element in the uplink path for reducing or increasing the attenuation, such as a third attenuator. It is true that such an embodiment is not excluded by the teaching of claim 1, as explained, if a signal amplification in the uplink path corresponding to the signal amplification in the downlink path is thereby further optimized or at least not impaired. However, such an embodiment is not necessary for the realization of the teaching of patent claim 1, so that in this respect it is also not necessary to disclose an embodiment in the patent specification in dispute.

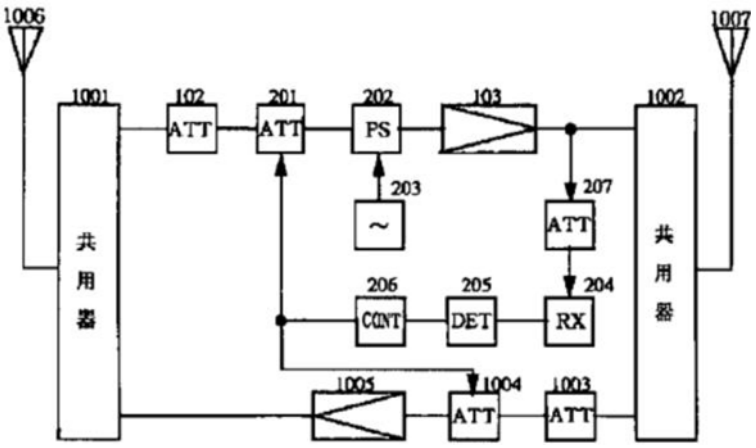
49 3. The Patent Court has rightly decided that K12 (German translation submitted as K12b) does not fully disclose the subject matter of claim 1.

50 (a) The citation concerns stationary wireless repeaters where, for example, a change in topography (such as the construction or demolition of a building) may cause the problem of signals amplified in the downlink path from the transmitting antenna (104) being received again by the receiving antenna (101) (K12b(3)).

51 To solve this problem, K12 proposes to provide a wireless repeater that can detect the occurrence of oscillation in advance and prevent it by reducing the gain in the downlink path (K12b, para. 5).

52 b) An embodiment of a wireless repeater with downlink and uplink paths is shown in Figure 10 reproduced below.

【図１０】



53 In the downlink relay path, where signals are passed from the base station to the mobile station, the signals sent from the base station are received by the repeater's antenna (1006), split by means of the diplexer (1001), and supplied to the first attenuator (102). Those are then passed through the second attenuator (201) and a phase shifter (202), which receives signals for phase shifting from a signal generator (203). After amplification by the amplifier (103), the signals are combined by the diplexer (1002) and sent to the mobile station by the repeater antenna (1007). Conversely, in the uplink relay path, the signals sent by the mobile station are received by repeater's antenna (1007), split by the diplexer (1002), and input to the attenuator (1003). The signals are then supplied to the attenuator (1004), amplified by the amplifier (1005), combined by the diplexer (1001), and sent to the base station by repeater's antenna (1006). After being amplified in the amplifier (103), the signals in the downlink path, before being passed to the diplexer (1002), are first passed to the attenuator (207), which sets the gain of the signals, and then input to the receiver (204), where these are demodulated. The demodulated signals are forwarded to the detector (205), which is configured to detect the error frequency of the signals to be forwarded. If the signal error frequency, which may be bit or frame error frequency (paras. 38, 40 et seq.), reaches or exceeds a certain threshold, the controller (206) outputs a manipulated variable for attenuation, which is supplied to the attenuator (201) in the downlink path and at the same time to the attenuator (1004) in the uplink path, so that both the downlink signals and the uplink signals are attenuated by a certain amount of attenuation. This reduces the gains for the uplink and downlink simultaneously based on monitoring of the bit or frame error frequency in the downlink (K12b, paras. 33 to 41).

54 c) Thus, feature A is disclosed.

55 d) The other features of claim 1 are not disclosed. The repeater disclosed in K12 has, like the device according to the invention, a downlink path with a control loop formed by a detector, a control amplifier and an attenuator, and an uplink path with an attenuator. Unlike the device according to the invention, however, these components do not serve to adapt the gain in the uplink path to that in the downlink path by means of automatic level control. In the repeater disclosed in K12, the controlled variable to be used for improving the transmission quality is not the level of the signal but the error frequency of the transmitted signals.

56 4. The Patent Court rightly decided that the subject matter of claim 1 is based on inventive step.

57 a) The subject matter of claim 1 is not suggested by K5.

58 aa) K5 discloses a device for monitoring a mobile phone repeater having two antennas, an uplink for amplifying signals from a mobile phone to a base station, and a downlink for amplifying signals from the base station to a mobile phone.

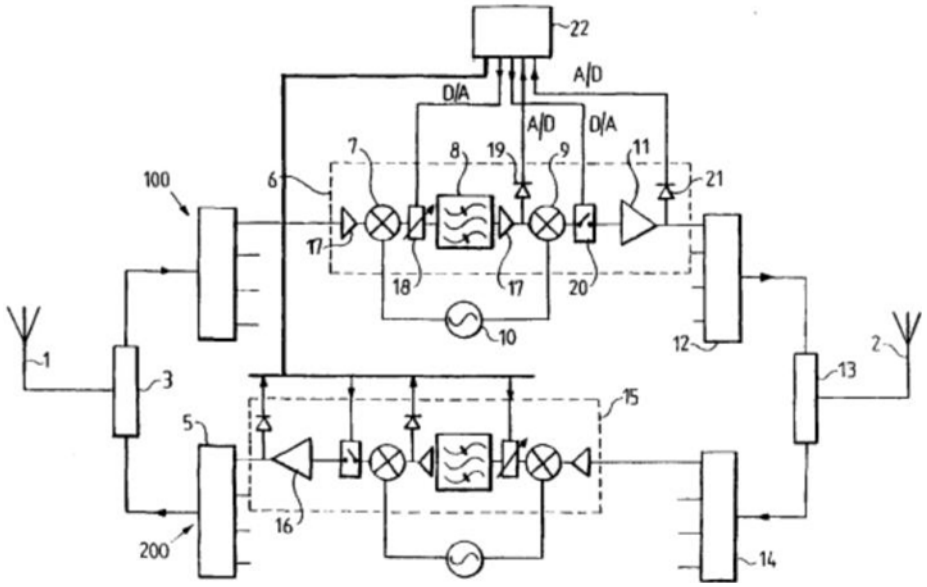
59 According to the explanations in K5, with repeaters of this type, if the two antennas are insufficiently isolated from each other, there is a risk of positive feedback, which impairs the functionality of the base station and the mobile phone by generating a strong self-oscillating signal and maintaining it through the amplifiers in the respective amplifier chain (K5, p. 1 to p. 2, line 16). K5 mentions

as a disadvantage of conventional devices that these could prevent feedback by monitoring the output level and reducing the gain below a threshold value if the signals of a single mobile station are to be processed. In the case of repeaters that have to process signals from several mobile stations, on the other hand, the problem of feedback is only inadequately solved because the threshold value is often reached for a short time and the gain is thus reduced to an unnecessarily low value (K5, p. 2, lines 18 to 33). The object of K5 is therefore to provide a device that checks the repeater's immunity to interference by regularly performing tests for continuous, strong signals originating either from positive feedback or from an interference signal, so that the gain in the two amplifier chains can be controlled accordingly and the repeater's functionality maintained (K5, p. 2, lines 35 to 38).

60 The device proposed as a solution includes means for detecting the input signal level and the output power level, a control unit for controlling the gain in the respective path, and means for measuring the time period in which the levels of the input signal and the output signal exceed certain thresholds.

61 An embodiment of such a device is shown in Figure 1 reproduced below.

Fig.1



62 In the uplink (100), the signals received from the first antenna (1) are supplied through the duplex filter (3) to the antenna amplifier (4), which forwards the signals to the second antenna (2) in parallel amplifier chains (6) and via the antenna switch (12) and the duplex filter (13). Correspondingly, in the downlink, the signals are supplied from the second antenna (2) via the duplex filter (13), the antenna amplifier (14), the amplifier chain (15), the antenna switch (5) and via the duplex filter (3) to the first antenna (1).

63 The amplifier chain (6) in the uplink comprises a first and second mixer (7, 9), a local oscillator (10), a filter (8), several - in the embodiment in Figure 1 two - amplifiers (17), a controllable attenuator (18) at the input side of the filter (8), a diode detector (19) for measuring the level of the input signal, a diode detector (21) for measuring the power level at the output of the power amplifier (11), and a switching device (20). The amplifier chain (15) in the downlink (200) has corresponding components arranged there in reverse order.

64 The control unit (22) is connected via analog-to-digital converters to both the diode detectors (19, 21) of the uplink and the diode detectors of the downlink. It includes a digital processor connected via digital-to-analog converters to the attenuator (18) and switching device (20) in the uplink and to the corresponding components of the amplifier chain (15) in the downlink. In this way, the input signal level and the output power level can be measured in the amplifier chains (6, 15) of both paths and the gain can be controlled by means of the respective attenuator (in the uplink:18; in the downlink: without reference sign). The switching device (20) is used to block the frequency channel, temporarily while checking for possible repeater instability, or permanently if a continuous interfering signal occurs (K5, p. 4, lines 15 to 27).

65 The control unit is programmed to perform a stability test in certain situations, such as when the repeater is put into operation, when operation is resumed after an alarm has been triggered following a power failure, or after the operating parameters have been updated. This involves repeatedly measuring whether and over what period of time the input signal level and output power level exceed certain limits to determine whether the particular path of the repeater is operational or whether it is unstable as a result of feedback or an interfering signal. The control unit causes any necessary adjustments to be made in both paths according to the measurement results (K5, p. 4, lines 29 to 30; p. 5, lines 13 to 24 and claim 14).

66 bb) Thus, there is in any case no disclosure of features B.0, B.1, C and D as well as feature group E.

67 At K5 - especially in certain situations (start of operation or continuation of operation after a reset) - it is a matter of determining whether the respective path is stable and ready for operation or whether instability is to be worried about because self-oscillation occurs between the antennas of the repeater due to positive feedback or a continuous interfering signal occurs which has to be suppressed (K5, p. 5, lines 31 to 37). In the event of such instability, appropriate adjustments are indeed made in both links and the gain is adjusted (K5, p. 5, lines 16 to 19; claim 14). However, K5 does not disclose, based on a manipulated variable generated in the downlink path, not only adjusting the gain in the downlink path, but also simultaneously adjusting the gain in the uplink path and adapting it to the gain in the downlink path, as is provided for according to feature D and feature group E. Rather, according to K5, the measurements are carried out in the uplink path and the adjustment of the gain in the two paths - unlike in the patent in suit - is not triggered from the downlink path, but with the control unit (22) from a device located outside both paths, which centrally controls the gain in both paths (K5, p. 5, line 21 et seq.; p. 4, line 30).

68 cc) K5 does not suggest that the gain in the uplink path should be automatically adapted to the gain in the downlink path by simultaneously feeding a manipulated variable generated in the downlink path to a device which adjusts an attenuator in the uplink path at the same time as the gain in the downlink path is regulated.

69 (1) Contrary to plaintiff's view, all features of claim 1 are to be considered in the examination of inventive step. The fact that under certain circumstances the automatic level control in the downlink path is not of the same importance for a stationary repeater as for a mobile repeater does not justify not taking this feature - comparable to non-technical features (cp. in this regard, for example, BGH, judgment of January 14, 2020- X ZR 144/17, GRUR 2020, 599, para. 25 et seq.

- Rotierendes Menü) - into account when examining inventive step with respect to prior art relating to stationary repeaters. In addition, it is not impossible that automatic level control in the downlink path may also have a function in a stationary repeater, for example, if the path attenuation changes due to changes in the topography.

70 (2) The fact that K5 does not show any reasons which would have prevented the person skilled in the art from further developing the device disclosed therein in the sense of the subject matter of the invention protected in claim 1 does not indicate, contrary to plaintiff's view, that the subject matter of claim 1 was obvious. The finding of a new teaching for technical action cannot be considered as not based on an inventive step already if there are merely no obstacles to move from what is known in the prior art to the subject matter of this teaching. Rather, such an assessment requires that what is known also gave the person skilled in the art cause or suggestion to arrive at the proposed teaching (BGH, judgment of December 8, 2009 - X ZR 65/05, GRUR 2010, 407, para. 17 – einteilige Öse). There is no evidence of this in the case in dispute.

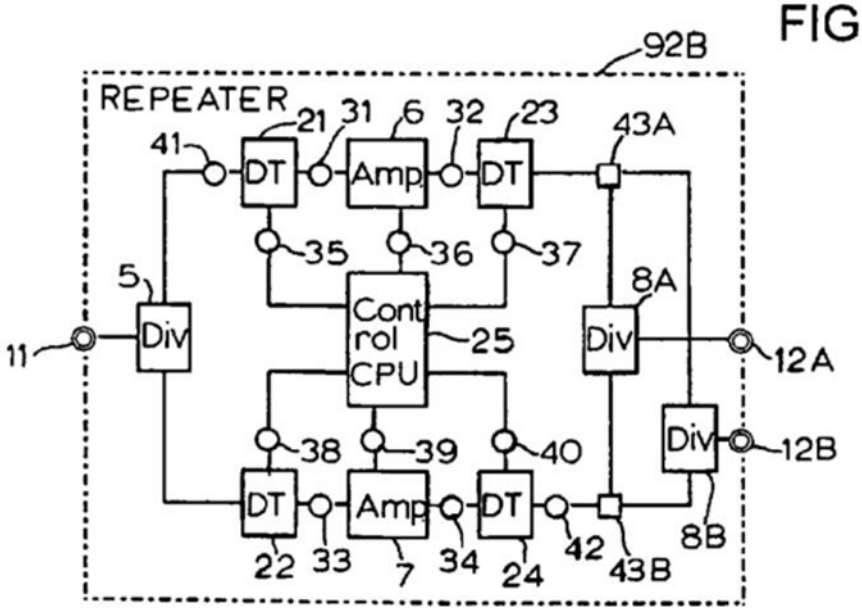
71 b) The subject matter of claim 1 is not suggested by K6.

72 aa) K6 discloses a repeater for amplifying signals to be sent from a base station to a mobile station and vice versa from a mobile station to a base station. The citation makes it its task to avoid undesired self-oscillations caused by over-coupling between uplink and downlink amplifiers. To solve this task, measures for

sufficient isolation between uplink and downlink amplifiers are proposed in particular (K6, col. 2, line 25 et seq.).

73 An example of an embodiment is shown in Figure 3 reproduced below.

FIG. 3



74 The arrangement of the repeater according to the invention in a mobile wireless system is shown in Figure 2 below.

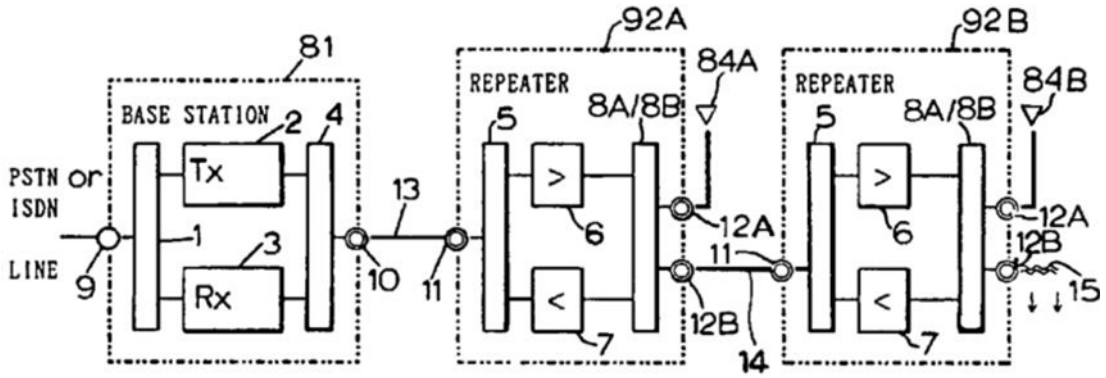


FIG. 2

75 The repeater is designed as a two-way repeater with a downlink path and an uplink path and has a control unit (25) for controlling the gain in the two transmission paths. Each path includes amplifiers (6, 7), detectors (21 and 23 as well as 22 and 24), antenna combiners (5, 8A, 8B), splitters (43A, 43B), and coaxial connectors (11, 12A, 12B) (K6, col. 5, lines 5 to 9). The control unit (25) controls the linearity of both the amplifier (6) in the downlink and the amplifier (7) in the uplink. It monitors whether conditions exist that lead to self-oscillation between downlink and uplink by comparing the outputs of the detectors (21, 23 on the one hand and 22, 24 on the other hand) located there in both transmission paths. If certain limit values are exceeded, the control unit reduces the gain in the respective path (K6, col. 5, lines 17 to 46).

76 bb) This discloses feature A.

77 cc) The other features of claim 1, on the other hand, are not disclosed. In the repeater of K6, a detector is not only arranged in the downlink, but detectors are arranged in both transmission paths, the outputs of which are monitored independently of each other by the control unit (25). An arrangement in which the

gain in the downlink path is monitored and adjusted via an automatic level control, while the gain in the uplink path is adjusted to the level of the gain in the downlink path depending on a manipulated variable generated in the downlink path via a processing device and an attenuator arranged in the uplink path at the same time as the gain in the downlink path, is thus not disclosed - as the plaintiff also does not doubt. Contrary to the opinion of the plaintiff, the person skilled in the art - as the patent court rightly decided - also does not read a corresponding signal level monitoring and a control of the amplification based thereon, since the K6 with the purpose of detecting interfering oscillations is based on a different objective than the patent in suit. Furthermore, the repeater according to the K6, unlike the device according to the invention, has no attenuators in the amplifier paths.

78 dd) From K6, there is also no suggestion to further design the disclosed repeater in such a way that the amplification is performed with a mechanism according to features B.0, B.1, C and D as well as feature group E.

79 As far as the applicant claims that the arrangement disclosed in K6 is suitable without further ado for setting the gain of stationary repeaters, since with this type of repeater the danger of a loss of transparency does not exist in the same way as with mobile repeaters, it does not follow from this that the subject matter of claim 1 was suggested to the person skilled in the art by K6. Rather, this is contradicted by the fact that the K6 is intended to avoid disturbing oscillations and thus to solve a different technical problem than the one underlying the patent in suit.

80 This is not changed by the further submission of the plaintiff that in K6 it is not explained in detail how the control unit (25) of the disclosed repeater works and therefore it is not excluded that this control unit can be programmed in such a way, that the gain of the repeater is set with the same mechanism as in the device claimed by the patent in suit and that the control unit of the repeater of K6 generates a manipulated variable in the downlink path comparable to the control amplifier of the device according to the invention, which then can be used for setting the gain in the downlink path and via a processing device also in the uplink path at the same time. For even if this is assumed in favor of the plaintiff, it does not follow from this why the person skilled in the art should take as a starting point a device intended for the detection of interfering self-oscillations for monitoring and controlling the level of the signals to be forwarded. Furthermore, there is no concrete suggestion to be inferred from this argument that the control unit of the repeater of the K6 should be programmed in such a way that it controls the amplification in the downlink path via an automatic level control and a manipulated variable generated there and simultaneously ensures a corresponding adjustment of the amplification in the uplink path.

81 c) The subject matter of claim 1 is also not suggested by K14.

82 aa) K14 addresses the problem of how to counter transmission quality impairments caused by the Doppler effect in mobile stations located in motor vehicles and trains (K14, col. 1, lines 25 to 44).

83 K14 assumes known repeaters for the transmission of high-frequency signals between a base station and mobile stations, which have a connection for a

tethering antenna and a connection for a coverage antenna as well as at least one signal conditioning circuit located between these two connections, but usually have two signal conditioning circuits in the form of a downlink path and an uplink path (K14, col. 1, lines 5 to 24). As a solution, K14 proposes to neutralize the Doppler shift of the transmitted carrier frequencies by frequency correction circuits assigned to the signal conditioning circuits.

84 The operation of the proposed repeater is illustrated by the block diagram in Figure 2 reproduced below, which shows the internal structure of the repeater.

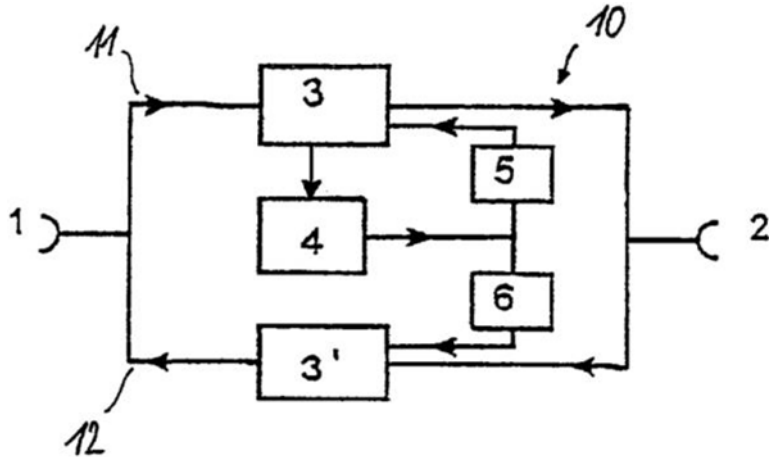


Fig. 2

85 The signal coming from the base station is supplied in the repeater (10) not only to the first signal conditioning circuit (3), but also to the frequency determination circuit (4), which determines the exact carrier frequency and supplies a value corresponding to this carrier frequency to the frequency correction circuits (5, 6) as an input value. If the frequency correction circuit (5)

detects a deviation between this value and the nominal value stored with it, it supplies a correction signal to the signal conditioning circuit (3), which detunes its built-in oscillator in such a way that the frequency difference is cancelled out. The carrier frequency of the signal is set to the nominal value and supplied via the connector (2) and the supply antenna (14) to the mobile station, which thus receives a signal with the correct frequency without Doppler shift (K14, col. 2, line 41 to col. 3, line 4). The same applies to the forwarding of the signals coming from the mobile stations to the base station in the uplink path (K14, col. 3, lines 5 to 21).

86 bb) Thus, as the Patent Court rightly decided, the teaching of claim 1 is not disclosed. The repeater disclosed in K14 aims at remedying the shift of the carrier frequency based on the Doppler effect and provides for this purpose circuit components and measures which enable monitoring of the carrier frequency of the signals and, if necessary, modification thereof. An adaptation of the amplification in the uplink path to the amplification in the downlink path, which takes place when a certain signal level is exceeded, is thus not disclosed - as the plaintiff does not question either.

87 cc) As the Patent Court also correctly decided, there was no suggestion from K14 for a device for setting the gain of the repeater, in which, when a target level is exceeded in the downlink path, the gain is set not only in this path to the desired level, but simultaneously also in the uplink path to the corresponding value.

88 K14, like the patent in suit, aims at improving the transmission quality in the mobile wireless network by further development of the repeater, but it concerns a different technical problem in that it seeks to neutralize the Doppler effect. Against

this background, it is not apparent how the person skilled in the art could have arrived at the subject matter of claim 1 on the basis of K14. There was no reason to resort to a paper dealing with the shifting of carrier frequencies caused by the Doppler effect and the resulting insufficient transmission quality in order to solve the problem of fluctuating path attenuation underlying the patent in suit. Contrary to the plaintiff's view, an inventive step cannot be denied on the grounds that the solution according to the invention is based on a principle comparable to the solution proposed in K14 in that in both cases a comparison is made between a nominal value and an actual value with respect to a controlled variable and in the event of a deviation in both the uplink path and the downlink path, a corresponding adjustment is initiated and made. Such a comparative approach may be obvious in knowledge of both approaches; however, from the point of view of the person skilled in the art at the time of priority, who was aware of K14 but not of the patent in suit, there was no reason to do so.

89 IV. The decision on costs is based on Sec. 121 (2) Patent Law in conjunction with Sec. 97 (1) ZPO.

Grabinski Hoffmann Deichfuß

Kober-Dehm Crummenerl

Lower Court:
Federal Patent Court, Decision of October 9, 2019 - 5 Ni 6/17 (EP) -