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H3R RAMX
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(56) Documents Cited
EP 0767532 A1 **EP 0648009 A1**
US 5983084 A

(58) Field of Search
UK CL (Edition T) **H3F** FJAP FKK FKP, **H3R** RAMX
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Other: **Online: WPI,EPODOC,JAPIO**

(54) Abstract Title
A low-harmonic amplitude-keyed RF oscillator that operates stably at low supply voltages

(57) An RF transmitter comprises a single-transistor oscillator with a resonator 211 in the base circuit and two feedback circuits. The resonant output matching circuit L12,C16,C17 for matching to the antenna L13 reduces the production of harmonics. A first oscillation feedback circuit comprises C14, C15 and L11. A second oscillation feedback circuit C12,C13 ensures that oscillation occurs even at low supply voltages. A series inductor may be used in the output matching circuit (L24, figure 4) to reduce frequency drift caused by stray capacitance at the antenna port.

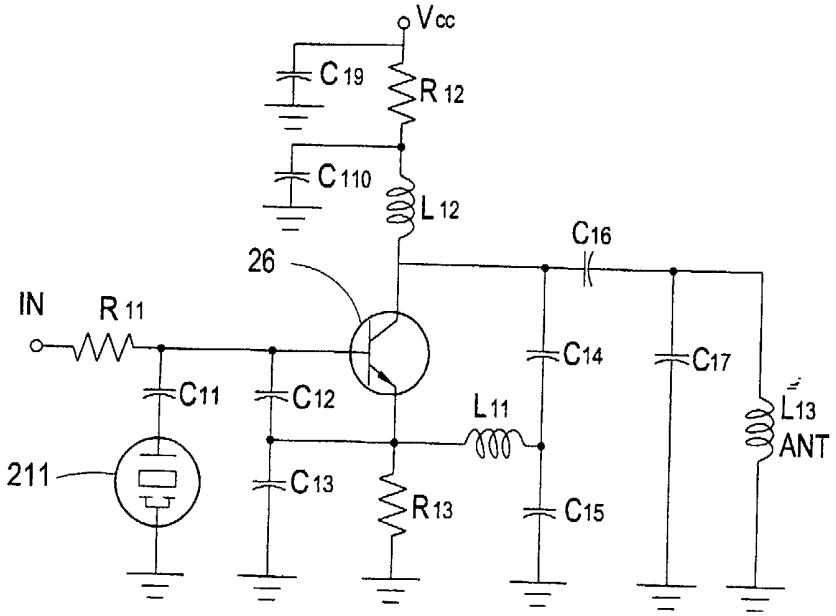

FIG.3

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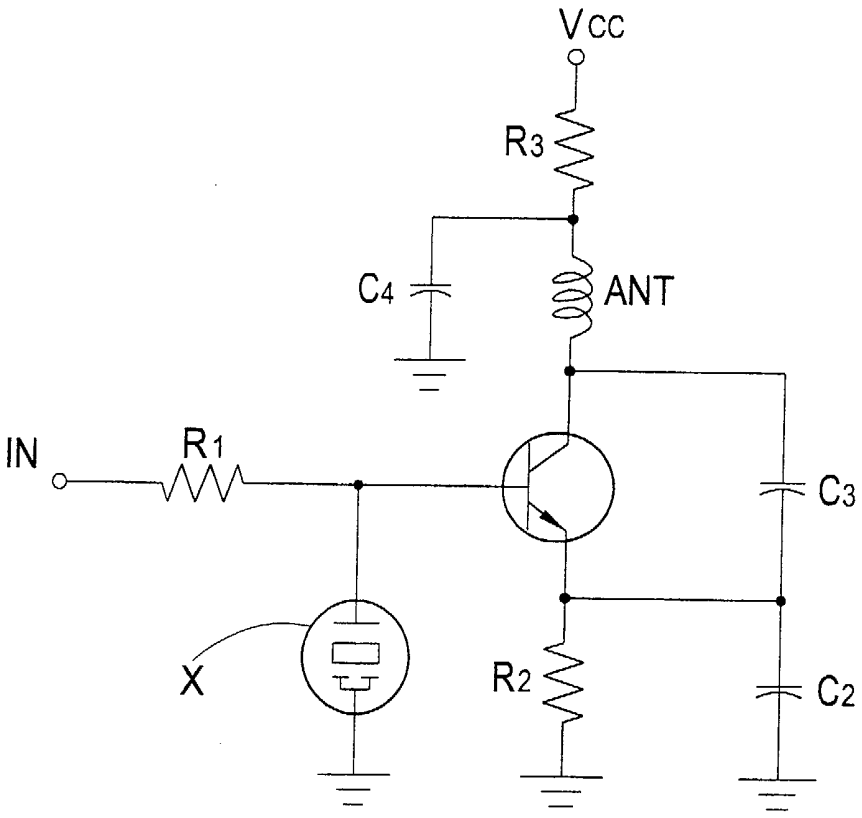
Vcc
R3
C4
ANT
IN
R1
C3
X
R2
C2

FIG. 1

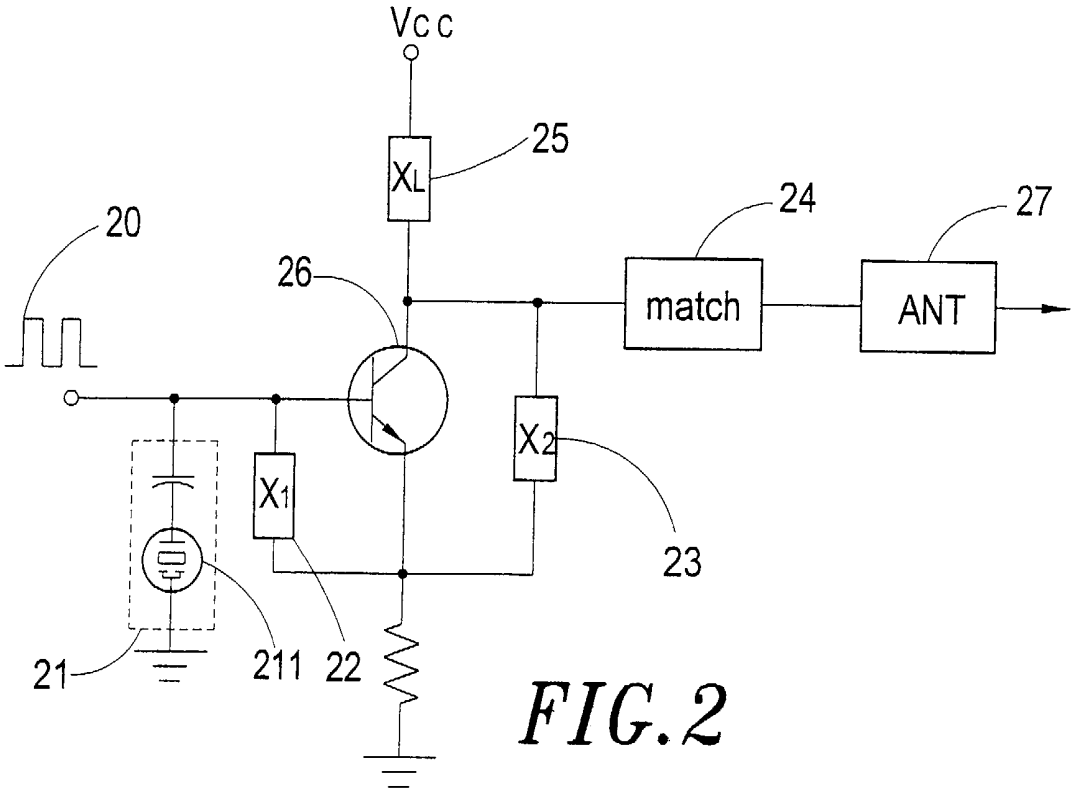
Vcc
25
XL
24
27
20
26
match
ANT
X2
X1
23
21
211
22

FIG. 2

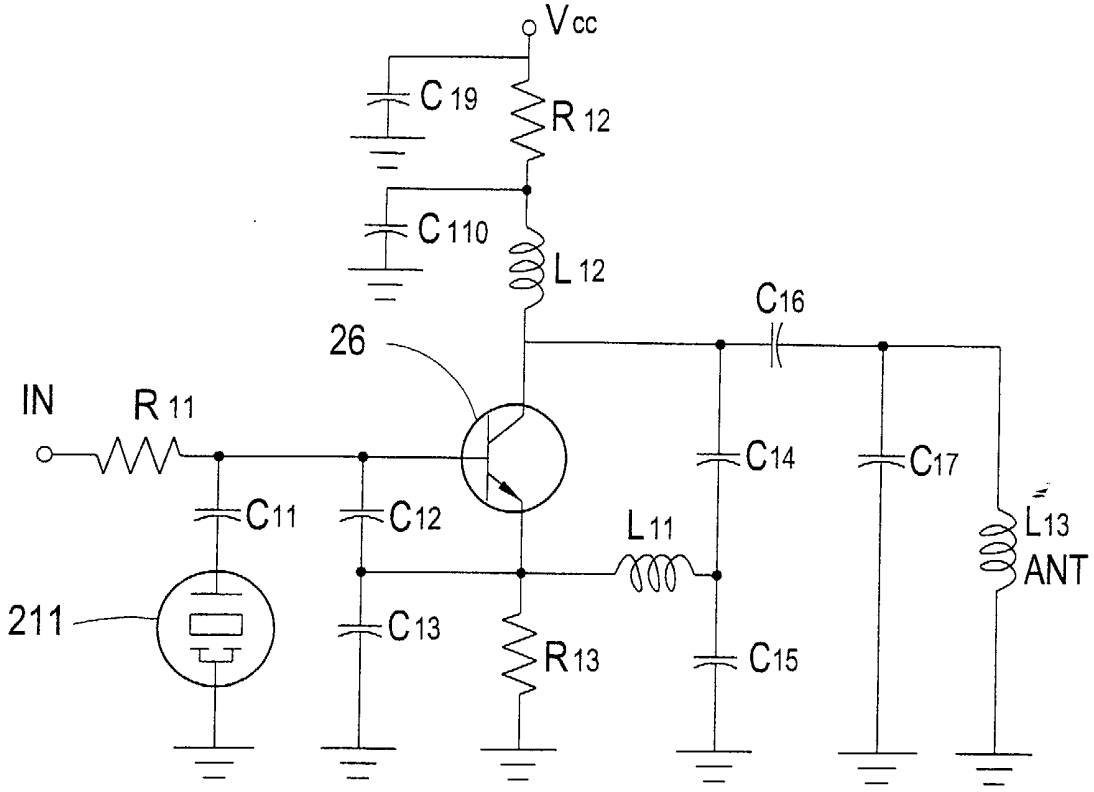
Vcc
C19
R12
C110
L12
C16
26
IN
R11
C14
C17
C11
C12
L11
L13
ANT
211
C13
R13
C15

FIG.3

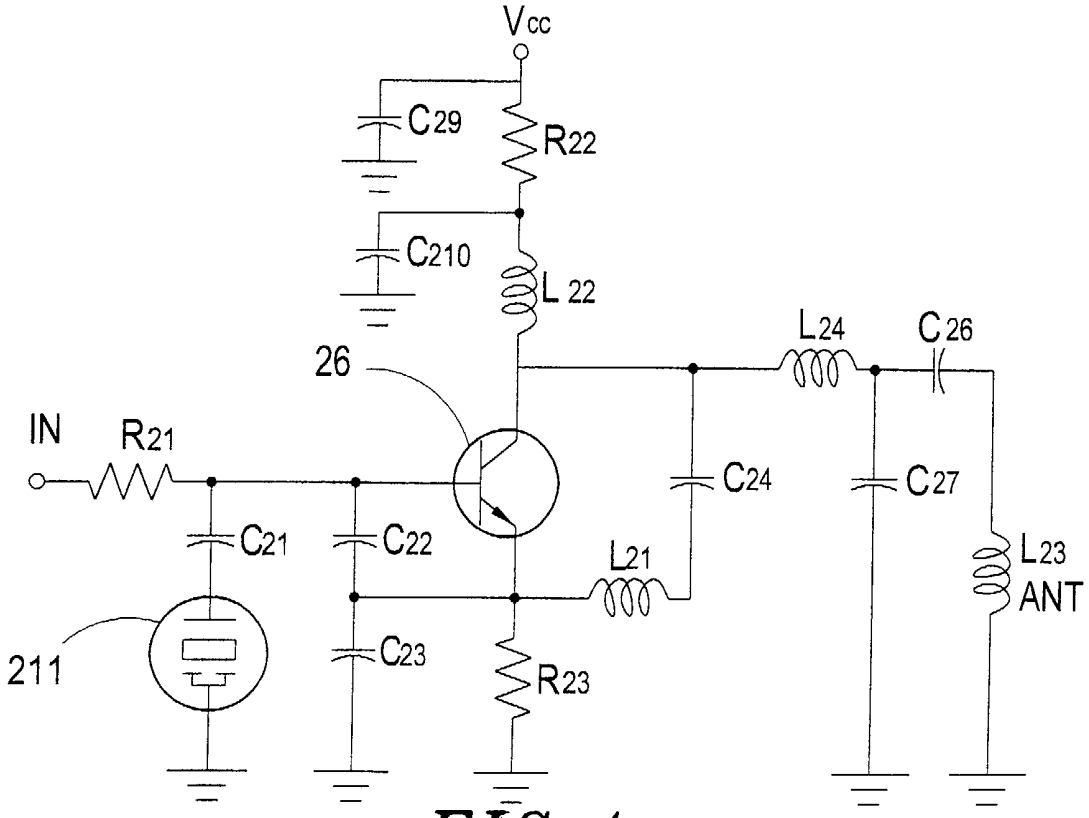
Vcc
C29
R22
C210
L22
L24
C26
26
IN
R21
C24
C27
C21
C22
L21
L23
ANT
211
C23
R23

FIG.4

SPECIFICATION

RF OSCILLATING CIRCUIT

FIELD OF THE INVENTION

The present invention relates to an RF oscillating circuit having multiple feedback for increasing stability of a circuit. The circuit work normally, and under control of an oscillating circuit, a main carrier frequency being increased so that harmonic waves generated by the circuit is controlled within a reasonable value.

BACKGROUND OF THE INVENTION

The prior art RF oscillating circuit is formed by a plurality of transistors. The manufacturing process is complex. Furthermore, the prior art RF oscillating circuit has a problem of overlarge harmonic wave. Furthermore, it can not match the requirement of "a large power in main carrier frequency and a small harmonic wave". The prior art RF oscillating circuit can not effectively suppress the second harmonic wave.

Referring to Fig. 1, in a prior art design, the prior art RF oscillating circuit is improved to have only one transistor so as to simplify the RF oscillating circuit. However, this improved RF oscillating circuit has still the problem of an overlarge harmonic wave and can not match the requirement of "a large power in main carrier frequency and a small harmonic wave". In the circuit, the oscillating circuit formed by C2, C3 and ANT only oscillates as the oscillator X is resonant.

Therefore, the prior art RF oscillating circuit has many defects which is

necessary to be improved.

SUMMARY OF THE INVENTION

Accordingly, the primary object of the present invention is to provide a RF oscillating circuit which uses one transistor, while the prior art RF oscillating circuit has a plurality of transistors. Therefore, the cost of the present invention is low.

Another object of the present invention is to provide an RF oscillating circuit having multiple feedback circuits so as to increase the stability of the circuit oscillation so that the working voltage is within a preset range.

A further object of the present invention is to provide an RF oscillating circuit, wherein by this RF oscillating circuit, the overlarge resonance in general oscillating circuits is improved.

Another object of the present invention is to provide an RF oscillating circuit having the features of large strength and small harmonic waves.

To achieve above objects, the present invention provides an RF oscillating circuit mainly including a transistor, a load circuit, a match circuit, a first feedback circuit, a second feedback circuit, and an oscillating circuit. The input signal of the RF oscillating circuit is mainly pulse signal. The RF oscillating circuit has multiple feedback for increasing stability of a circuit so that as a working voltage is reduced. The circuit work normally, and under control of an oscillating circuit, a main carrier frequency being increased so that harmonic waves generated by the circuit is controlled within a reasonable value.

The various objects and advantages of the present invention will be

more readily understood from the following detailed description when read in conjunction with the appended drawing.

The drawings disclose an illustrative embodiment of the present invention which serves to exemplify the various advantages and objects hereof, and are as follows:

Fig. 1 is a circuit diagram of a prior art RF oscillating circuit;

Fig. 2 shows the construction of the RF oscillating circuit of the present invention;

Fig. 3 is a circuit diagram of the first embodiment of the RF oscillating circuit in the present invention;

Fig. 4 is a circuit diagram of the second embodiment of the RF oscillating circuit in the present invention.

The invention, as well as its many advantages, may be further understood by the following detailed description and drawings in which:

Referring to Fig. 2, the schematic view of the RF oscillating circuit of the present invention is illustrated. The RF oscillating circuit mainly includes a transistor 26, a load circuit 25, a match circuit 24, a first feedback circuit 23, a second feedback circuit 22, and an oscillating circuit 21. The input signal of the RF oscillating circuit is mainly pulse signal 20. When the pulse signal 20 is inputted, the circuit will oscillate, and the oscillating frequency is determined by the oscillator 211 in the oscillating

circuit 21. The first feedback circuit 23 is connected to a collector and an emitter of the transistor 26. The stability of the oscillation of the oscillating circuit is increased by the first feedback circuit 23 and the second feedback circuit 22. The second feedback circuit 22 is connected between the base and the emitter of the transistor 26. The harmonics of the final output signal is suppressed by the match circuit 24 and an antenna 27. The object of the load circuit 25 is to control the basic working point of the transistor 26.

With reference to Fig. 3, the first embodiment of the RF oscillating circuit is illustrated.

1. The match circuit is formed an L12, a C16 and a C17. By the resonance of the L12, C16 and C17, the harmonics are suppressed.
2. Antenna (ANT) is L13.
3. The oscillating circuit is formed by serially connecting an oscillator 211 and a C12. The object is to reduce the strength of the harmonics of C11.
4. By resonance of the C14 and C15, the match circuit, and antenna, a first feedback circuit is formed and an oscillating signal occurs. The oscillation is retained by the oscillating signal of the feedback circuit.
5. When the resonance of the C14 and C15, the match circuit, and antenna is at the resonance frequency of the oscillator, the circuit will oscillate. When the resonance strength of the C11, match circuit and antenna are suppressed, the oscillation of the circuit will suppress by the reduction of voltage. To improve this phenomenon, by the C12 and C13 of the second feedback circuit, a positive

feedback is formed between the emitter and base of the transistor 26. Thereby, the feedback of the oscillating signal is increased so as to improve the problem of without oscillation due to reduction of voltage.

6. An inductor between C14 and C15 is connected to the emitter of the transistor 26 for suppressing the generation of resonance wave.

Referring to Fig. 4, a second embodiment of the RF oscillating circuit is formed for improving the problem of frequency shift due to the miscellaneous capacitor in the first embodiment. In that,

1. The match circuit is formed by L22, C27, C26, and L24. By the parallel resonance of L22, C27, C26, and L24, the harmonic wave is suppressed.
2. The antenna (ANT) is L23.
3. L24 of the match circuit serves for reducing the frequency shift from the miscellaneous capacitors of the environment and the effect of the antenna (L23) to the circuit.
4. The oscillating circuit is formed by serially connecting oscillator 211 and C21. The object is to reduce the strength of the harmonic wave by the C21.
5. The resonance of the C24, match circuit, and antenna is formed with a first feedback circuit and generates an oscillating signal. By this oscillating signal from the first feedback circuit, the oscillation of the circuit is retained.
6. When the resonance of the C24, match circuit, and antenna is at the resonance frequency of the oscillator, this circuit will oscillate.

When the resonance of the C24, match circuit, and antenna suppresses resonance strength, the oscillating condition of the circuit will be reduced due to the reduction of the voltage. To improve this condition, C22 and C24 are installed between the emitter and base of the transistor 26 to be formed with a second feedback circuit so as to increase the feedback of the oscillating signal so as to improve the problem due to the reduction of the voltage.

7. C24 is serially connected to an inductor L21 and the emitter of the transistor 26. The object is to suppress the generation of the harmonic wave.

These two embodiments have the same function, but are used in different environments. The practical measurement of the harmonic waves of these two embodiments are within the confinement of the Law. Therefore, a qualified certificate is awarded, as the attachment.

Comparing the RF oscillating circuit of the present invention with the prior art RF oscillating circuit, the present invention has the following advantages:

The RF oscillating circuit of the present invention uses one transistor, while the prior art RF oscillating circuit has a plurality of transistors. Therefore, the cost of the present invention is low.

The RF oscillating circuit of embodiment has multiple feedback circuits so as to increase the stability of the circuit oscillation so that the working voltage is within a preset range.

The present invention provides an RF oscillating circuit. By this RF

oscillating circuit, the overlarge resonance in general oscillating circuits is improved.

The RF oscillating circuit of the present invention has the features of large strength and small harmonic waves.

The present invention are thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

CLAIMS

1. An RF oscillating circuit having multiple feedbacks for increasing stability of a circuit so that as a working voltage is reduced, the circuit work normally, and under control of an oscillating circuit, a power of a main carrier frequency being increased, thereby, harmonic waves generated by the circuit is controlled within a reasonable value, comprising:

a transistor;

a load circuit connected to a collector of the transistor for controlling a working point of the transistor;

an oscillating circuit formed by serially connecting an oscillator with a capacitor C11 which is connected to a base of the transistor for reducing the harmonic wave in oscillation;

a match circuit formed by an inductor L12, a capacitor C16, and a capacitor C17 which is connected to a collector of the transistor so that the signal of the circuit is matched to an antenna L13;

a first feedback circuit formed by a capacitor C14, a capacitor C15, and an inductor L11, which generates with an oscillating signal with the match circuit; by oscillating signals of this first feedback circuit; the circuit being retained in oscillation;

a second feedback circuit formed by a capacitor C12, and a capacitor C13 so as to feedback between the base and the emitter to increase the stability of the circuit.

2. The RF oscillating circuit as claimed in claim 1, wherein a working frequency of the oscillating circuit is between 300MHz and 900MHz.

3. An RF oscillating circuit having multiple feedbacks for increasing stability of a circuit so that as a working voltage is reduced, the circuit work normally, and under control of an oscillating circuit, a main carrier frequency being increased, thereby harmonic waves generated by the circuit is controlled within a reasonable value, comprising:

a transistor;

a load circuit connected to a collector of the transistor for controlling a working point of the transistor;

an oscillating circuit formed by serially connecting an oscillator with a capacitor C21 which is connected to a base of the transistor for reducing the harmonic wave in oscillation;

a match circuit formed by an inductor L22, a capacitor C26, a capacitor C27, and an inductor L24 which is connected to a collector of the transistor so that the signal of the circuit is matched to an antenna L23;

a first feedback circuit formed by a capacitor C24, and an inductor L21, which generates with an oscillating signal with the match circuit; by oscillating signals of this first feedback circuit; the circuit being retained in oscillation;

a second feedback circuit formed by a capacitor C22, a capacitor C23 so as to feedback between the base and the emitter to increase the stability of the circuit.

4. The RF oscillating circuit as claimed in claim 4, wherein a working frequency of the oscillating circuit is between 300MHz and 900MHz.

INVESTOR IN PEOPLE

Application No:	GB 0117638.7	**Examiner:**	Keith Sylvan
Claims searched:	1-4	**Date of search:**	4 March 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): H3R (RAMX) H3F (FKK,FKP,FJAP)

Int Cl (Ed.7): H03B (1/04,5/04,5/06,5/30,5/32,5/36) H03C (1/36,1/62)

Other: Online: WPI,EPODOC,JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	EP0648009 A1	Tokai-Rika-Denki-Seisakusho. See figure 2 and column 5 lines 12-20.	-
A	EP0767532 A1	Sony. See figure 3.	-
A	US5983084	TRW. See the figures.	-

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X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.