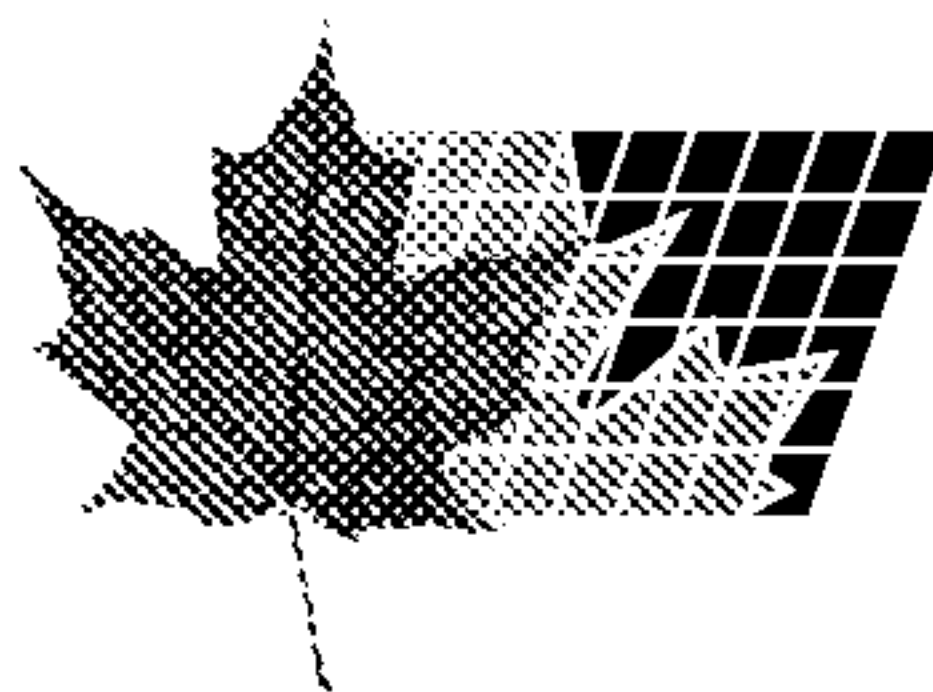




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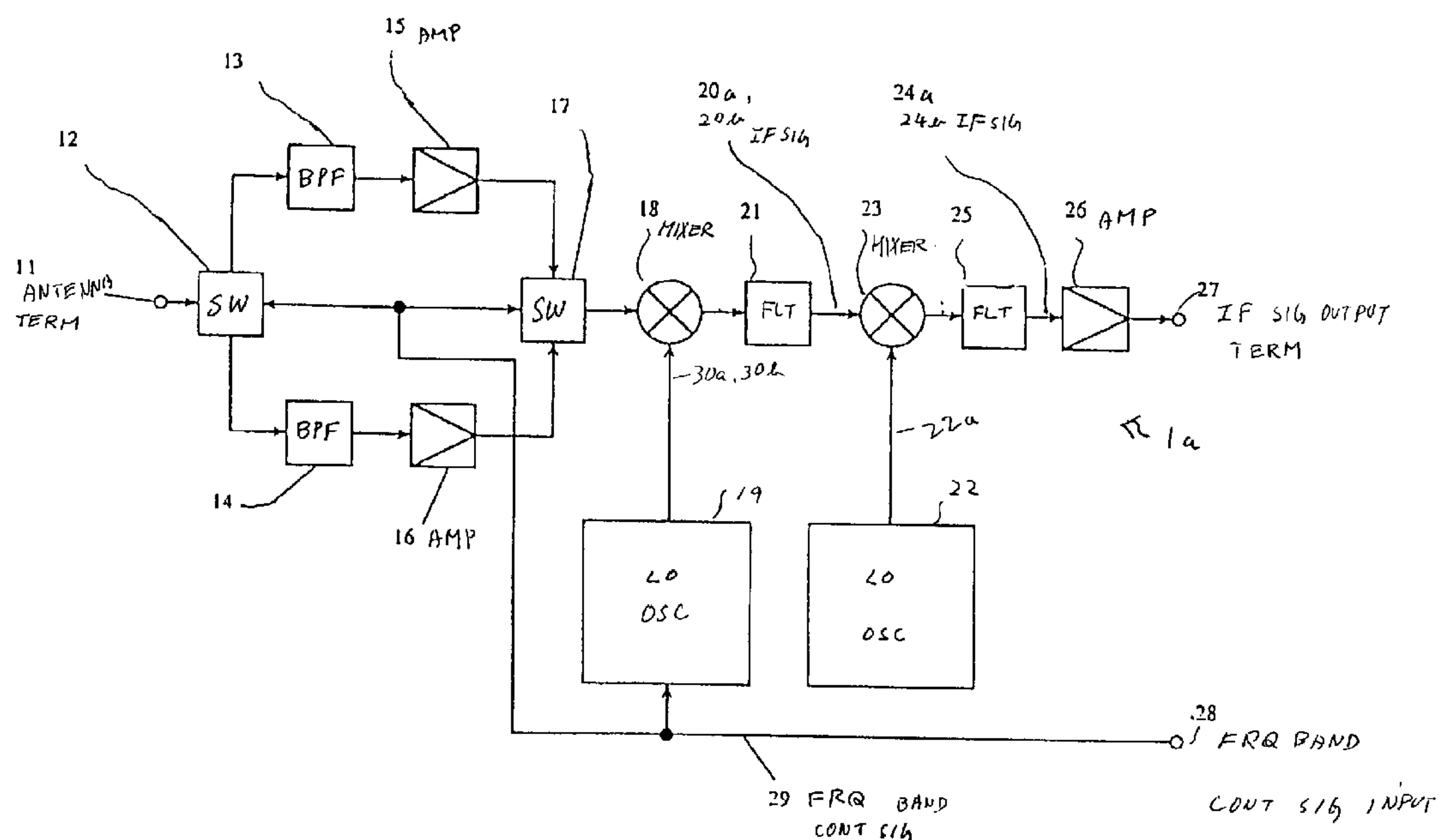
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(54) **RECEPTEUR A DEUX BANDES**

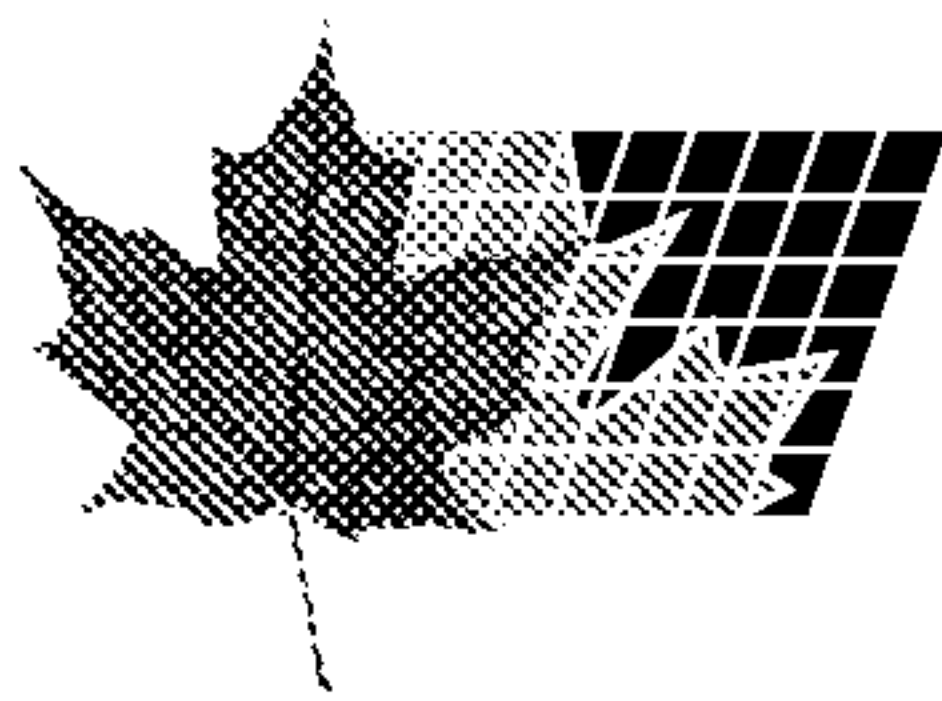
(54) **TWO BAND RECEIVER**



(57) L'invention est un récepteur comportant les éléments suivants : un terminal (11) de réception d'ondes radio constituées d'au moins l'une de deux composantes d'une onde radio captée par une antenne; un premier commutateur (12); un premier filtre passe-bande (13) servant à extraire la première composante de l'onde radio; un second filtre passe-bande (14) servant à extraire la seconde composante de l'onde radio; un second commutateur (17) servant conjointement avec le premier (12) à créer sélectivement des passages pour la première et la seconde composante du signal radio dans le premier et le second filtre passe-bande fonctionnant

(57) A receiver comprises; an input TERM (11) for receiving a radio wave signal including at least one of 1st and 2nd radio wave components from an antenna; a 1st SW (12); a 1st BPF (13) for extracting the 1st radio wave component; a 2nd BPF (14) for extracting the 2nd radio wave component; a 2nd SW (17), the 1st and 2nd SW to selectively forming 1st and 2nd SIG passages through the 1st BPF in a 1st mode and the 2nd BPF in a 2nd mode respectively; a 1st LO (19) for generating 1st and 2nd LO SIGs (30a, 30b) in the 1st and 2nd modes respectively; a 1st mixer (18) for mixing an output of the 2nd SW with the 1st and 2nd LO SIGs in the 1st and 2nd modes





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respectivement dans un premier et un second mode; un premier oscillateur local (19) servant à engendrer un premier et un second signal (30a, 30b) dans le premier et le second mode respectivement; un premier mélangeur (18) servant à mélanger le signal de sortie du second commutateur avec les signaux de sortie du premier et du second oscillateur local dans le premier et le second mode respectivement; un premier filtre (21) servant à filtrer le signal de sortie du premier mélangeur pour produire un premier et un second signal de sortie de même fréquence intermédiaire; un second oscillateur local (22), un second mélangeur (23) et un second filtre (25) servant à engendrer un troisième et un quatrième signal de fréquence intermédiaire correspondant à la première et à la seconde composante de l'onde radio au moyen de signaux de sortie du premier filtre dans le premier et le second mode respectivement. Un système de réception comporte deux récepteurs, sauf que le premier et le second oscillateur local sont mis en commun; le système de réception fonctionne en diversité. Le récepteur peut être doté d'un commutateur et d'une seconde entrée pour une seconde antenne. Ce commutateur permet d'obtenir un second mode de réception en diversité. Un récepteur modifié peut fonctionner en diversité avec l'addition d'une seconde antenne de détection.

respectively; a 1st FLT (21) for filtering an output of the 1st mixer to output 1st and 2nd IF SIGs having the same FRQ; a 2nd LO (22), 2nd mixer (23), a 2nd FLT (25) for generating 3rd and 4th IF SIGs corresponding to the 1st and 2nd radio wave components from an output of the 1st FLT in the 1st and 2nd modes, respectively. A receiver includes two sets of the receivers except 1st and 2nd LOs commonly used, which provides a diversity receiving. The receiver may further comprise a SW and another input coupled to another antenna. This SW provides another diversity receiving. A modified receiver provides a diversity receiving after an antenna and after detection.

ABSTRACT OF THE DISCLOSURE

A receiver comprises; an input TERM (11) for receiving a radio wave signal including at least one of 1st and 2nd radio wave components from an antenna; a 1st SW (12); a 1st BPF (13) for extracting the 1st radio wave component; a 2nd BPF (14) for extracting the 2nd radio wave component; a 2nd SW (17), the 1st and 2nd SW to selectively forming 1st and 2nd SIG passages through the 1st BPF in a 1st mode and the 2nd BPF in a 2nd mode respectively; a 1st LO (19) for generating 1st and 2nd LO SIGs (30a, 30b) in the 1st and 2nd modes respectively; a 1st mixer (18) for mixing an output of the 2nd SW with the 1st and 2nd LO SIGs in the 1st and 2nd modes respectively; a 1st FLT (21) for filtering an output of the 1st mixer to output 1st and 2nd IF SIGs having the same FRQ; a 2nd LO (22), 2nd mixer (23), a 2nd FLT (25) for generating 3rd and 4th IF SIGs corresponding to the 1st and 2nd radio wave components from an output of the 1st FLT in the 1st and 2nd modes, respectively. A receiver includes two sets of the receivers except 1st and 2nd LOs commonly used, which provides a diversity receiving. The receiver may further comprise a SW and another input coupled to another antenna. This SW provides another diversity receiving. A modified receiver provides a diversity receiving after an antenna and after detection.

TITLE OF THE INVENTION

TWO BAND RECEIVER

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 This invention relates to a two band receiver for receiving two bands of radio wave signals.

2. Description of the Prior Art

 A first prior art portable receiver receives a radio wave of 800 MHz band and a second prior portable receiver
10 receives a radio wave of 1.5 GHz band. The user uses first prior art portable receiver when the user desires to receive the radio wave of 800 MHz band and the user uses second prior art portable receiver when the user desires to receive the radio wave of 1.5 GHz band. Therefore, two
15 relieves are necessary.

SUMMARY OF THE INVENTION

 The aim of the present invention is to provide an improved two band receiver.

 According to the present invention, a first receiver
20 is provided, which comprises; an input terminal for receiving a radio wave signal including at least one of first and second radio wave components from an antenna; a first switch; a first band pass filter for band-pass-filtering the radio wave signal from the first
25 switch and extracting the first radio wave component; a

second band pass filter for band-pass-filtering the radio wave signal from the first switch and extracting the second radio wave component; a second switch, the first and second switch selectively forming first and second signal passages
5 through the first band pass filter in a first mode and the second band pass filter in a second mode respectively; a first local oscillator for generating first and second local oscillation signals in the first and second modes respectively; a first mixer for mixing an output of the
10 second switch with the first and second local oscillation signals in the first and second modes respectively; a first filter for filtering an output of the first mixer to output first and second intermediate frequency signals corresponding to the first and second radio wave components
15 in the first and second modes, respectively, the first and second local oscillation signal being generated such that the first and second intermediate frequency signals have the same intermediate frequency; a second local oscillator for generating a third local oscillation signal; a second
20 mixer for mixing an output of the first filter with the third local oscillation signal; and a second filter for filtering an output of the second mixer to output third and fourth intermediate frequency signals corresponding to the first and second radio wave components in the first and
25 second modes, respectively.

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In the first receiver, the first local oscillator may comprise a first frequency synthesizer for generating the first local oscillation signal, a second frequency synthesizer for generating the second local oscillation
5 signal, and a switch for outputting the first and second local oscillation signals in the first and second modes respectively.

In the first receiver, the first local oscillator may comprise a first frequency synthesizer for generating
10 the first local oscillation signal, a third mixer for mixing the first oscillation signal with the third local oscillation signal to provide the second oscillation signal, and a third switch for outputting the first and second local oscillation signals in the first and second modes
15 respectively. Moreover, a fourth switch for supplying the first oscillation signal to the third switch in the first mode and to the third mixer in the second mode and a fifth switch for supplying a supply power to the third mixer in the second mode may be further comprised.

20 The first receiver may further comprise an amplifier provided between the second switch and the first mixer for amplifying the output of the second switch.

The first receiver may further comprise; a first amplifier provided between the first bandpass filter and
25 the second switch for amplifying an output of the first

band pass filter and a second amplifier provided between the second bandpass filter and the second switch for amplifying an output of the second band pass filter. Moreover, a third filter for filtering an output of the first amplifier and a fourth filter for filtering an output of the second amplifier may be further provided.

The first receiver may further comprise an amplifier provided between the first filter and the second mixer for amplifying an output of the first filter.

10 According to this invention a second receiver is provided, which comprises; a first local oscillator for generating first and second local oscillation signals in first and second modes respectively; a second local oscillator for generating a third local oscillation signal; 15 and first and second receiving circuits. Each includes: an input terminal for receiving a radio wave signal including at least one of first and second radio wave components from an antenna; a first switch; a first band pass filter for band-pass-filtering the radio wave signal from the first 20 switch and extracting the first radio wave component; a second band pass filter for band-pass-filtering the radio wave signal from the first switch and extracting the second radio wave component; a second switch, the first and second switch to selectively forming first and second signal 25 passages through the first band pass filter in a first mode

and the second band pass filter in a second mode
respectively; a first mixer for mixing an output of the
second switch with first and second local oscillation
signals in the first and second modes respectively; a first
5 filter for filtering an output of the first mixer to output
first and second intermediate frequency signals in the
first and second modes, respectively, the first and second
local oscillation signal being generated such that the
first and second intermediate frequency signals have the
10 same intermediate frequency; a second mixer for mixing an
output of the first filter with the third local oscillation
signal; and a second filter for filtering an output of the
second mixer to output third and fourth intermediate
frequency signals in the first and second modes,
15 respectively, wherein the second filters of the first and
second receivers provides output interference signals of
diversity receiving.

In the second receiver, each of the receiving
circuits may further comprise a first amplifier provided
20 between the first bandpass filter and the second switch for
amplifying an output of the first band pass filter and a
second amplifier provided between the second bandpass
filter and the second switch for amplifying an output of
the second band pass filter.

25 In the second receiver, each of the receiving

circuits may further comprise an amplifier provided between the second switch and the first mixer for amplifying the output of the second switch.

In the second receiver, each of the receiving
5 circuits may further comprise a third filter for filtering an output of the first amplifier and a fourth filter for filtering an output of the second amplifier.

In the second receiver, each of the receiving
circuit may further comprise an amplifier provided between
10 the first filter and the second mixer for amplifying an output of the first filter.

A third receiver comprises, in addition to the structure of the first receiver, a second input terminal for receiving a second radio wave signal including the
15 first and second radio wave components from another antenna and a third switch for supplying either of the radio wave signal or the second radio wave signal to the first switch in response to an antenna switching signal, wherein the supplying either of the radio wave signal or the second
20 radio wave provides a diversity receiving.

The third receiver may further comprise an amplifier provided between the second switch and the first mixer for amplifying the output of the second switch. Moreover, it may further comprise a first amplifier between the first
25 bandpass filter, the second switch for amplifying an output

of the first band pass filter, a second amplifier provided between the second bandpass filter, and the second switch for amplifying an output of the second band pass filter. Moreover, a third filter for filtering an output of the
5 first amplifier and a fourth filter for filtering an output of the second amplifier may be further provided.

The third receiver may further comprise an amplifier provided between the first filter and the second mixer for amplifying an output of the first filter.

10 According to this invention, a fourth receiver is provided, which comprises: a first input terminal for receiving a first radio wave signal including at least one of first and second radio wave components from an antenna; a first switch receiving the first radio wave signal from
15 the first input terminal; a second input terminal for receiving a second radio wave signal including at least one of the first and second radio wave components from another antenna; a second switch receiving the second radio wave signal from the second input terminal; a first band pass
20 filter for band-pass-filtering the first radio wave signal from the first switch and extracting the first radio wave component in a first mode; a third switch receiving the first and second radio wave signals from the first and second switches respectively in second mode and outputting
25 either of the first or second radio wave signal in response

to an antenna switching signal in the second mode; a second band pass filter for band-pass-filtering an output of the third switch and extracting the second radio wave component; a fourth switch, the first and fourth switches forming a
5 first passage through the first band pass filter in the first mode, the third and fourth switch forming a second passage through the second band pass filter in the second mode; a first local oscillator for generating first and second local oscillation signals in the first and second
10 modes respectively; a first mixer for mixing an output of the second switch with the first and second local oscillation signals in the first and second modes respectively; a first filter for filtering an output of the first mixer to output first and second intermediate
15 frequency signals in the first and second modes, respectively, the first and second local oscillation signal being generated such that the first and second intermediate frequency signals have the same intermediate frequency; a second local oscillator for generating a third local
20 oscillation signal; a second mixer for mixing an output of the first filter with the third local oscillation signal; a second filter for filtering an output of the second mixer to output third and fourth intermediate frequency signals in the first and second modes, respectively; a third band
25 pass filter for band-pass-filtering the second radio wave

signal from the second switch and extracting the first
radio wave component, the second switch supplying the
second radio wave signal to the third band pass filter in
the first mode; a third mixer for mixing an output of the
5 third band pass filter with the first local oscillation
signal in the first mode; a second filter for filtering an
output of the third mixer to output third intermediate
frequency signal in the first mode; a fourth mixer for
mixing an output of the second filter with the third local
10 oscillation signal; and a second filter for filtering an
output of the fourth mixer to output a fourth intermediate
frequency signal in the first mode.

BRIEF DESCRIPTION OF THE DRAWINGS

The object and features of the present invention
15 will become more readily apparent from the following
detailed description taken in conjunction with the
accompanying drawings in which:

Fig. 1 is a block diagram of a receiver of a first
embodiment of this invention;

20 Fig. 2 is a partial block diagram of a receiver of
the first embodiment;

Fig. 3 is partial block diagram of a receiver of a
second embodiment showing a local oscillation circuit;

Fig. 4 is a partial block diagram of a third
25 embodiment showing another local oscillation circuit;

Fig. 5 is a block diagram of a receiver of a fourth embodiment;

Fig. 6 is a block diagram of a receiver of a fifth embodiment;

5 Fig. 7 is a block diagram of a receiver of a sixth embodiment;

Fig. 8 is a block diagram of a receiver of a seventh embodiment;

10 Fig. 9 is a block diagram of a receiver of an eighth embodiment; and

Fig. 10 is a block diagram of a receiver of a tenth embodiment.

The same or corresponding elements or parts are designated with like references throughout the drawings.

15 DETAILED DESCRIPTION OF THE INVENTION

Hereinbelow will be described a first embodiment of this invention.

Fig. 1 is a block diagram of a receiver of the first embodiment of this invention.

20 The receiver of the first embodiment comprises an antenna terminal 11 for receiving a radio wave signal including at least one of first and second radio wave components from an antenna (not shown), a first switch 12, a first band pass filter 13 having a first center frequency
25 corresponding the first radio wave component, for

band-pass-filtering the radio wave signal from the first switch to extract the first radio wave component, a second band pass filter 14 having a second center frequency corresponding the second radio wave component for

5 band-pass-filtering the radio wave signal from the first switch 12 to extract the second radio wave component, a second switch 17, the first and second switches 12 and 17 responsive to a frequency band control signal 28 selectively forming first and second signal passages

10 through the first band pass filter 13 in a first mode and the second band pass filter 14 in a second mode respectively, a first local oscillator 19 for generating first and second local oscillation signals 30a and 30b in the first and second modes, respectively, a first mixer 18

15 for mixing an output of the second switch 17 with the first and second local oscillation signals 30a and 30b in the first and second modes respectively, a first filter 21 for filtering an output of the mixer 18 to output first and second intermediate frequency signals 20a and 20b in first

20 and second modes, respectively, the first and second local oscillation signals being generated such that the first and second intermediate frequency signals 20a and 20b having the same intermediate frequency, a second local oscillator 22 for generating a third local oscillation signal 22a, a

25 second mixer 23 for mixing an output of the first filter 21

with the third local oscillation signal 22a; and a second filter 25 for filtering an output of the second mixer to output third and fourth intermediate frequency signals 24a and 24b in the first and second modes, respectively. The
5 third and fourth intermediate frequency signals are amplified by an amplifier 26 to provide an output of this receiver from the third and fourth intermediate frequency signals in the first and second modes. The frequency band control signal 29 indicates the first and second modes.

10 Fig. 2 is a partial block diagram of the receiver of this embodiment.

The first local oscillator 19 (19a) comprises a frequency synthesizer 31 for generating the first local oscillation signal 30a, a frequency synthesizer 32 for
15 generating the second local oscillation signal 30b, and a switch 33 for outputting the first and second local oscillation signals 30a and 30b in the first and second modes respectively in response to the frequency band control signal 29.

20 An operation will be described.

The radio wave signal including at least one of the first and second radio wave components from the antenna is supplied to the first switch 12. The first band pass filter 13 has the first center frequency corresponding the
25 first radio wave component to extract the first radio

component from the radio wave signal from the first switch
12. The second band pass filter 14 has the second center
frequency corresponding the second radio wave component to
extract the second radio component from the second radio
5 wave signal from the first switch 12. The first and second
switches 12 and 17 selectively forms the first and second
signal passages through the first band pass filter 13 in a
first mode and the second band pass filter 14 in a second
mode respectively in response to the frequency band control
10 signal 29.

The first local oscillator 19 generates first and
second local oscillation signals 30a and 30b in the first
and second modes, respectively in response to the frequency
band control signal 29. The first mixer 18 mixes the
15 output of the second switch 17 with the first and second
local oscillation signals 30a and 30b in the first and
second modes respectively. The first filter 21 filters the
output of the first mixer 18 to suppress unnecessary
components, such as frequency adding components, to output
20 first and second intermediate frequency signals (frequency
different components) 20a and 20b in first and second modes,
respectively. The first and second local oscillation
signals are generated such that the first and second
intermediate frequency signals 20a and 20b has the same
25 intermediate frequency.

The second local oscillator 22 fixedly generates the third local oscillation signal 22a and the second mixer 23 mixes the output of the first filter 21 with the third local oscillation signal 22a. The second filter 25 filters
5 the output of the second mixer 23 to output third and fourth intermediate frequency signals 24a and 24b in the first and second modes, respectively. The third and fourth intermediate frequency signals are amplified by the amplifier 26 to provide an output of this pager from the
10 third and fourth intermediate frequency signals in the first and second modes.

As mentioned, the local oscillation frequency of the first local oscillator 19 is changed to provide the first and second intermediate frequency signals having the same
15 frequency in accordance with the desired frequency band, so that the circuits after the mixer 18 are commonly used.

A second embodiment will be described.

A receiver of the second embodiment has substantially the same structure and operation as the
20 receiver of the first embodiment. Fig. 3 is a partial block diagram of the receiver of the second embodiment. The difference is in the first local oscillation circuit 19. In this embodiment, the first local oscillation signal is generated by the frequency synthesizer 31 as similar to the
25 first embodiment. However, the second local oscillation

signal is generated by a mixer 34 for mixing the first local oscillation signal with the third local oscillation frequency signal 22a to generate the second local oscillation frequency signal 30b. Therefore, the local
5 oscillation frequency of the third local oscillation signal is determined in consideration of the frequency difference between the first and second radio wave components.

As mentioned, in the receiver of the second embodiment, the second frequency synthesizer 32 used in the
10 first embodiment is replaced by the mixer 34, so that the circuit configuration can be made small.

A third embodiment will be described.

A receiver of the second embodiment has substantially the same structure and operation as the
15 receiver of the second embodiment. The difference is in the first local oscillation circuit 19. Fig. 4 is a partial block diagram of the fourth embodiment showing the local oscillation circuit 19c. The local oscillation circuit 19c of the third embodiment comprises, in addition
20 to the structure of the first local oscillation circuit 19b, a switch 41 for transferring the first local oscillation signal to the switch 33 in the first mode and to the mixer 34 in the second mode and a switch 42 for supplying a supply power to the mixer 34 in the second mode in response
25 to the frequency band control signal 29.

In the first mode, the first local oscillation signal 30a is supplied to the mixer 18 via the switch 41 and the switch 33 and is not supplied to the mixer 34. Further, the mixer 34 is not supplied with the supply power in the first mode. Therefore, the second local oscillation signal which was generated in the first and second modes in the second embodiment is not generated in the first mode in the third embodiment, so that a deterioration in a spurious response characteristic developed in accordance with the isolation characteristic of the switch 33 can be prevented.

In the second mode, the first local oscillation signal is supplied to the mixer 34 which is supplied with the supply power and generates the second local oscillation signal 30b which is supplied to the mixer 18 via the switch 33. The first local oscillation signal 30a is isolated from the line connected to the switch 33 to the mixer 18 by the switches 33 and 41. Therefore, the deterioration in a spurious response characteristic developed in accordance with the isolation characteristic of the switch 33 can be also prevented. Moreover, a power consumption of the mixer 34 can be reduced in the first mode.

A fourth embodiment will be described.

Fig. 5 is a block diagram of a receiver of the fourth embodiment.

A receiver of the fourth embodiment has

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substantially the same structure and operation as the receiver of the first embodiment. The difference is in that the amplifiers 15 and 16 in the first embodiment are omitted and, instead, an amplified 51 is provided between
5 the switch 17 and mixer 18. The amplifier 51 has a broad band or two bands characteristic. Therefore, the number of the amplifies can be reduced.

A fifth embodiment will be described.

Fig. 6 is a block diagram of a receiver of the fifth
10 embodiment.

A receiver of the fifth embodiment has substantially the same structure and operation as the receiver of the first embodiment. The difference is in that filters 61 and 62 are provided between the amplifier 15 and the switch 17
15 and between the amplifier 16 and the switch 17 respectively in addition to the structure of the first embodiment. Then, though the number of the filters increases, the attenuation characteristics required for the filters 13, 14, 61, and 62 are moderated, so that these filters can be relatively
20 miniaturized and a total cost is reduced. Further, the miniaturization of the filters increases a degree of freedom in the arrangement of elements in the assembly of the receiver.

A sixth embodiment will be described.

25 Fig. 7 is a block diagram of a receiver of the sixth

embodiment.

A receiver of the sixth embodiment has substantially the same structure and operation as the receiver of the first embodiment. The difference is in that an amplifier
5 71 is further provided between the filter 21 and the mixer 23.

The amplifier 71 has a relative high isolation characteristic, so that a load change to the filter 21 can be prevented. More specifically, if a strong electric
10 field enters the antenna, the mixer 23 may saturate, so that a load condition of the filter 21 varies. Therefore, a receiving characteristic may be reduced due to a deterioration in the group delay characteristics or the like of the filter 21. Then, the amplifier 71 having the
15 high isolation characteristic reduces an affection to the filter 21 by the load variation in the circuits after the mixer 23.

A seventh embodiment will be described.

Fig. 8 is a block diagram of a receiver of the
20 seventh embodiment.

A receiver of the seventh embodiment has a similar structure and operation to the receiver of the seventh embodiment. That is, the receiver of the seventh embodiment has a first receiving circuit 1a for receiving a
25 first radio wave signal from a first antenna (not shown)

and a second receiving circuit 1b for receiving a second radio wave signal from a second antenna (not shown) which is arranged to have a suitable distance from the first antenna, and the local oscillators 19 and 22. This circuit
5 provides a diversity receiving.

The receiver of the seventh embodiment provides a favorable receiving characteristic even though it encounters a phasing condition. In this embodiment, the circuit in the seventh embodiment is used for each of the
10 receiving circuit. However, the circuits from the first to sixth embodiments can be used also.

An eighth embodiment will be described.

Fig. 9 is a block diagram of a receiver of the eighth embodiment.

15 A receiver of the eighth embodiment has a common structure as the receiver of the seventh embodiment. That is, the band pass filter 14, the amplifier 16, and the filter 52, and the switch 17 in the receiving circuit 1b provided in the seventh embodiment are omitted. On the
20 other hand, a switch 91 is further provided between the switch 12 and the band pass filter 14. The switch 91 outputs either of the output of the switch 12 or the output of the switch 85 provided between an antenna terminal and a band pass filter 13' of the receiving circuit 1d in
25 response to an antenna switching signal 92. When this

-20-

receiver receives the first radio wave component, the first radio wave component is received by two signal passages to provide a diversity receiving with selecting one on passages after detection. When this receiver receives the
5 second radio wave component, the second component is received by two antennas and the received second component is selected by the switch 91 to provide a diversity receiving with selection after the antenna receiving.

More specifically, when the receiver receives the
10 first radio wave component, the switch 12, the switch 17, and the switch 85 is turned to the sides "a". Then, the first radio wave component from the first antenna (not shown) is processed by the signal passage including the band pass filter 13 and the mixer 18 via the switches 12
15 and 17 and its intermediate frequency output is provided at the intermediate frequency output terminal 27b. The first radio wave component from the second antenna (not shown) is processed by the signal passage including the band pass filter 13' and the mixer 18' via the switch 85 and its
20 intermediate frequency output is provided at the intermediate frequency output terminal 84.

When the receiver receives the second radio wave component, the switch 12, the switch 17, and the switch 85 is turned to the sides "b". The switch 91 is turned to
25 either of the side "c" or "d" in response to the antenna

switching signal 92. Then, either of the radio wave signals from the first and second antennas (not shown) is supplied to the signal passage including the band pass filter 14 and the mixer 18 via the switches 91 and 17 and
5 its intermediate frequency output is provided at the intermediate frequency output terminal 27b. That is, the second radio wave component is processed through only one signal passage in this embodiment.

As mentioned, according to the eighth embodiment,
10 when the first radio wave component is processed by two signal passages and the diversity receiving with selection after detection is provided. When the second radio wave components received by the first and second antennas are selected and processed by one signal passage, so that the
15 diversity receiving with selection after antenna receiving is provided.

A tenth embodiment will be described.

Fig. 10 is a block diagram of a receiver of the tenth embodiment.

20 A receiver of the tenth embodiment has substantially the same structure and operation as the receiver of the sixth embodiment. The difference is in that a switch 94 selectively supplying radio wave signal from the first and second antennas (not shown) in response to an antenna
25 switching signal 93. The switch 94 supplies either of the

radio wave signal to the switch 12 from the first or the second antenna in response to the antenna switching signal 92, so that a diversity receiving with a selection after antenna receiving is provided. The switch 12 is switched
5 in accordance with the frequency band control signal 29 for receiving as similar to the sixth embodiment. This structure provides a favourable receiving at the first and second frequency bands even in a phasing condition.

In this embodiment the switch and the antenna
10 terminal 83 are provided in addition to the structure of the first embodiment. However, this structure can be applied to the second to sixth embodiment also.

15

20

25

WHAT IS CLAIMED IS:

1. A receiver comprising:

an input terminal (11) for receiving a radio wave
5 signal including at least one of first and second radio
wave components from an antenna;

a first switch (12);

a first band pass filter (13) for
band-pass-filtering said radio wave signal from said first
10 switch and extracting said first radio wave component;

a second band pass filter (14) for
band-pass-filtering said radio wave signal from said first
switch and extracting said second radio wave component;

a second switch (17), said first and second switch
15 selectively forming first and second signal passages
through said first band pass filter in a first mode and
said second band pass filter in a second mode respectively;

a first local oscillator (19) for generating first
and second local oscillation signals (30a, 30b) in said
20 first and second modes respectively;

a first mixer (18) for mixing an output of said
second switch with said first and second local oscillation
signals in said first and second modes respectively;

a first filter (21) for filtering an output of said
25 first mixer to output first and second intermediate

frequency signals corresponding to said first and second radio wave components in said first and second modes, respectively, said first and second local oscillation signal being generated such that said first and second
5 intermediate frequency signals have the same intermediate frequency;

a second local oscillator (22) for generating a third local oscillation signal (22a);

a second mixer (23) for mixing an output of said
10 first filter with said third local oscillation signal; and

a second filter (25) for filtering an output of said second mixer to output third and fourth intermediate frequency signals corresponding to said first and second radio wave components in said first and second modes,
15 respectively.

2. A receiver as claimed in claim 1, wherein said first local oscillator comprises a first frequency synthesizer (31) for generating said first local oscillation signal, a
20 second frequency synthesizer (32) for generating said second local oscillation signal, and a switch (33) for outputting said first and second local oscillation signals in said first and second modes respectively.

25 3. A receiver as claimed in claim 1, wherein said first

local oscillator comprises a first frequency synthesizer (31) for generating said first local oscillation signal, a third mixer (34) for mixing said first oscillation signal with said third local oscillation signal to provide said
5 second oscillation signal, and a third switch (33) for outputting said first and second local oscillation signals in said first and second modes respectively.

4. A receiver as claimed in claim 3, further comprising a
10 fourth switch (41) for supplying said first oscillation signal to said third switch in said first mode and to said third mixer in said second mode and a fifth switch (42) for supplying a supply power to said third mixer in said second mode.

15

5. A receiver as claimed in claim 1, further comprising an amplifier (51) provided between said second switch and said first mixer for amplifying said output of said second switch.

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6. A receiver as claimed in claim 1, further comprising: a first amplifier (15) provided between said first bandpass filter (13) and said second switch for amplifying an output of said first band pass filter and a second amplifier (16)
25 provided between said second bandpass filter (14) and said

second switch for amplifying an output of said second band pass filter.

7. A receiver as claimed in claim 6, further comprising a
5 third filter (61) for filtering an output of said first amplifier and a fourth filter (62) for filtering an output of said second amplifier.

8. A receiver as claimed in claim 1, further comprising an
10 amplifier (71) provided between said first filter (21) and said second mixer (23) for amplifying an output of said first filter.

9. A receiver comprising:
15 a first local oscillator (19) for generating first and second local oscillation signals in first and second modes respectively;
a second local oscillator (22) for generating a third local oscillation signal; and
20 first and second receiving circuits (1a-1, 1b-1, 1a-2, 1b-2), each including:

an input terminal (11a, 11b) for receiving a radio wave signal including at least one of first and second radio wave components from an antenna;

25 a first switch (12a, 12b);

a first band pass filter (13) for
band-pass-filtering said radio wave signal from said first
switch and extracting said first radio wave component;

a second band pass filter (14) for
5 band-pass-filtering said radio wave signal from said first
switch and extracting said second radio wave component;

a second switch (17), said first and second switch
selectively forming first and second signal passages
through said first band pass filter in said first mode and
10 said second band pass filter in said second mode
respectively;

a first mixer (18) for mixing an output of said
second switch with first and second local oscillation
signals in said first and second modes respectively;

15 a first filter (21) for filtering an output of said
first mixer to output first and second intermediate
frequency signals in said first and second modes,
respectively, said first and second local oscillation
signal being generated such that said first and second
20 intermediate frequency signals have the same intermediate
frequency;

a second mixer (23) for mixing an output of said
first filter with said third local oscillation signal; and

a second filter (25) for filtering an output of said
25 second mixer to output third and fourth intermediate

frequency signals in said first and second modes,
respectively, wherein said second filters of said first and
second receivers provides output intermediate frequency
signals of diversity receiving.

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10. A receiver as claimed in claim 9, wherein each of said
receiving circuits further comprising a first amplifier (15)
provided between said first bandpass filter (13) and said
second switch for amplifying an output of said first band
10 pass filter and a second amplifier (16) provided between
said second bandpass filter (14) and said second switch for
amplifying an output of said second band pass filter.

11. A receiver as claimed in claim 9, wherein each of said
15 receiving circuit further comprises: an amplifier (51)
provided between said second switch and said first mixer
for amplifying said output of said second switch.

12. A receiver as claimed in claim 9, wherein each of said
20 receiving circuits further comprises: a third filter (61)
for filtering an output of said first amplifier and a
fourth filter (62) for filtering an output of said second
amplifier.

25 13. A receiver as claimed in claim 9, wherein each of said

receiving circuit, further comprises an amplifier (71) provided between said first filter (21) and said second mixer for amplifying an output of said first filter.

5 14. A receiver as claimed in claim 1, further comprising a second input terminal (83) for receiving a second radio wave signal including at least one of said first and second radio wave components from another antenna, and a third switch (94) for supplying either of said radio wave signal
10 or said second radio wave signal to said first switch in response to an antenna switching signal, wherein the supplying either of said radio wave signal or said second radio wave provides a diversity receiving.

15 15. A receiver as claimed in claim 14, further comprising an amplifier (51) provided between said second switch and said first mixer for amplifying said output of said second switch.

20 16. A receiver as claimed in claim 14, further comprising a first amplifier (15) provided between said first bandpass filter (13) and said second switch for amplifying an output of said first band pass filter, and a second amplifier (16) provided between said second bandpass filter (14) and said
25 second switch for amplifying an output of said second band

pass filter.

17. A receiver as claimed in claim 16, further comprising
a third filter (61) for filtering an output of said first
5 amplifier and a fourth filter (62) for filtering an output
of said second amplifier.

18. A receiver as claimed in claim 14, further comprising
an amplifier (71) provided between said first filter (21)
10 and said second mixer for amplifying an output of said
first filter.

19. A receiver comprising;

a first input terminal (11) for receiving a first
15 radio wave signal including at least one of first and
second radio wave components from an antenna;

a first switch (12) receiving said first radio wave
signal from said first input terminal;

a second input terminal (83) for receiving a second
20 radio wave signal including at least one of said first and
second radio wave components from another antenna;

a second switch (85) receiving said second radio
wave signal from said second input terminal;

a first band pass filter (13) for
25 band-pass-filtering said first radio wave signal from said

first switch and extracting said first radio wave component in a first mode;

a third switch (91) receiving said first and second radio wave signals from said first and second switches in
5 second mode and outputting either of said first or second radio wave signal in response to an antenna switching signal (93) in said second mode;

a second band pass filter (14) for
band-pass-filtering an output of said third switch and
10 extracting said second radio wave component;

a fourth switch (17), said first and fourth switches forming a first passage through said first band pass filter in said first mode, said third and fourth switch forming a second passage through said second band pass filter in a
15 second mode;

a first local oscillator (19) for generating first and second local oscillation signals in said first and second modes respectively;

a first mixer (18) for mixing an output of said
20 second switch with said first and second local oscillation signals in said first and second modes respectively;

a first filter (21) for filtering an output of said first mixer to output first and second intermediate frequency signals in said first and second modes,
25 respectively, said first and second local oscillation

signal being generated such that said first and second intermediate frequency signals have the same intermediate frequency;

a second local oscillator (22) for generating a
5 third local oscillation signal;

a second mixer (23) for mixing an output of said first filter with said third local oscillation signal; and

a second filter (25) for filtering an output of said second mixer to output third and fourth intermediate
10 frequency signals in said first and second modes, respectively;

a third band pass filter (13') for band-pass-filtering said second radio wave signal from said second switch and extracting said first radio wave
15 component, said second switch supplying said second radio wave signal to said third band pass filter (13') in said first mode;

a third mixer (18') for mixing an output of said third band pass filter with said first local oscillation
20 signal in said first mode;

a second filter (21') for filtering an output of said third mixer to output third intermediate frequency signal in said first mode;

a fourth mixer (23') for mixing an output of said
25 second filter with said third local oscillation signal; and

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a second filter (25') for filtering an output of
said fourth mixer to output a fourth intermediate frequency
signal in said first mode.

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Fig. 1

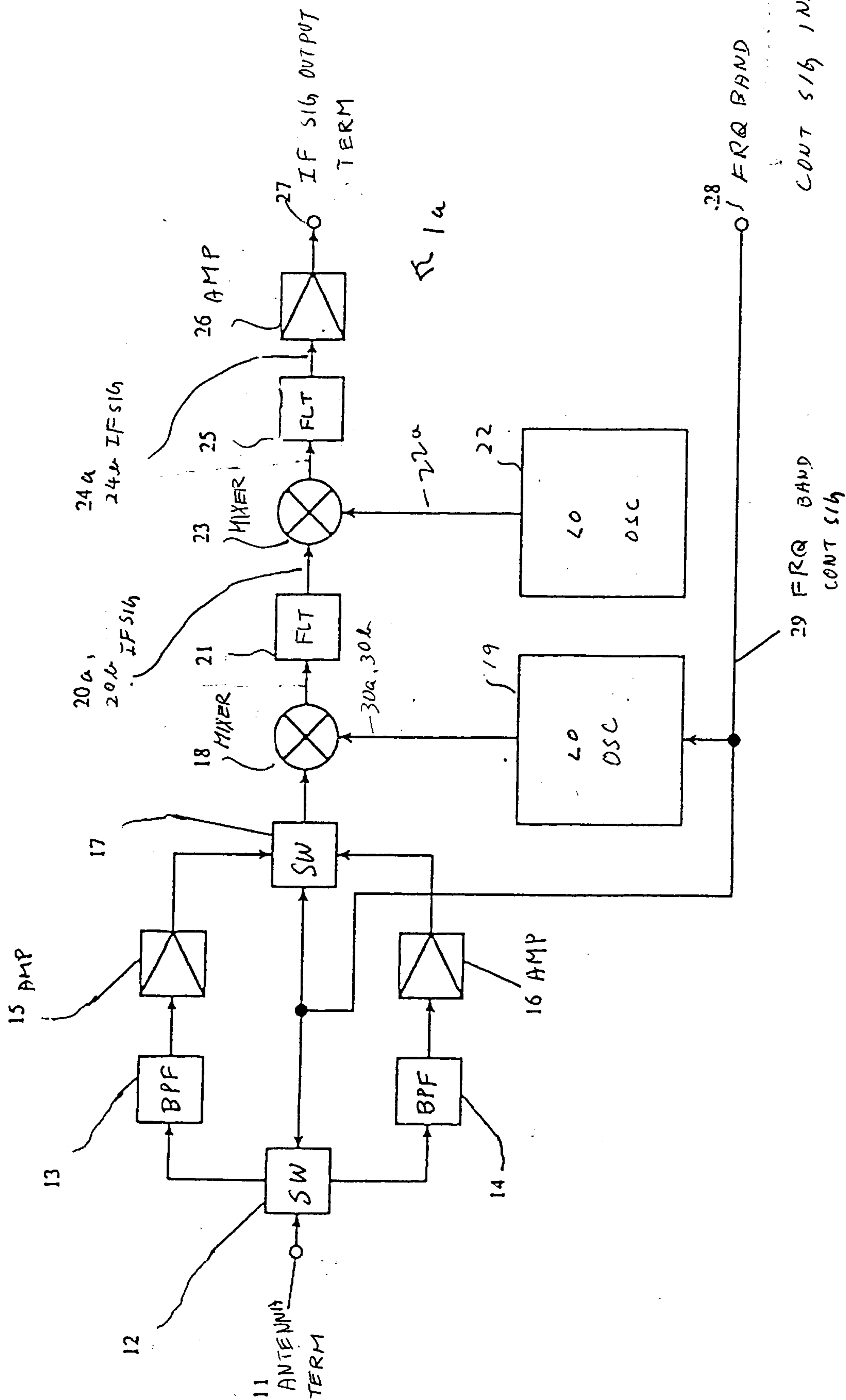


FIG. 2

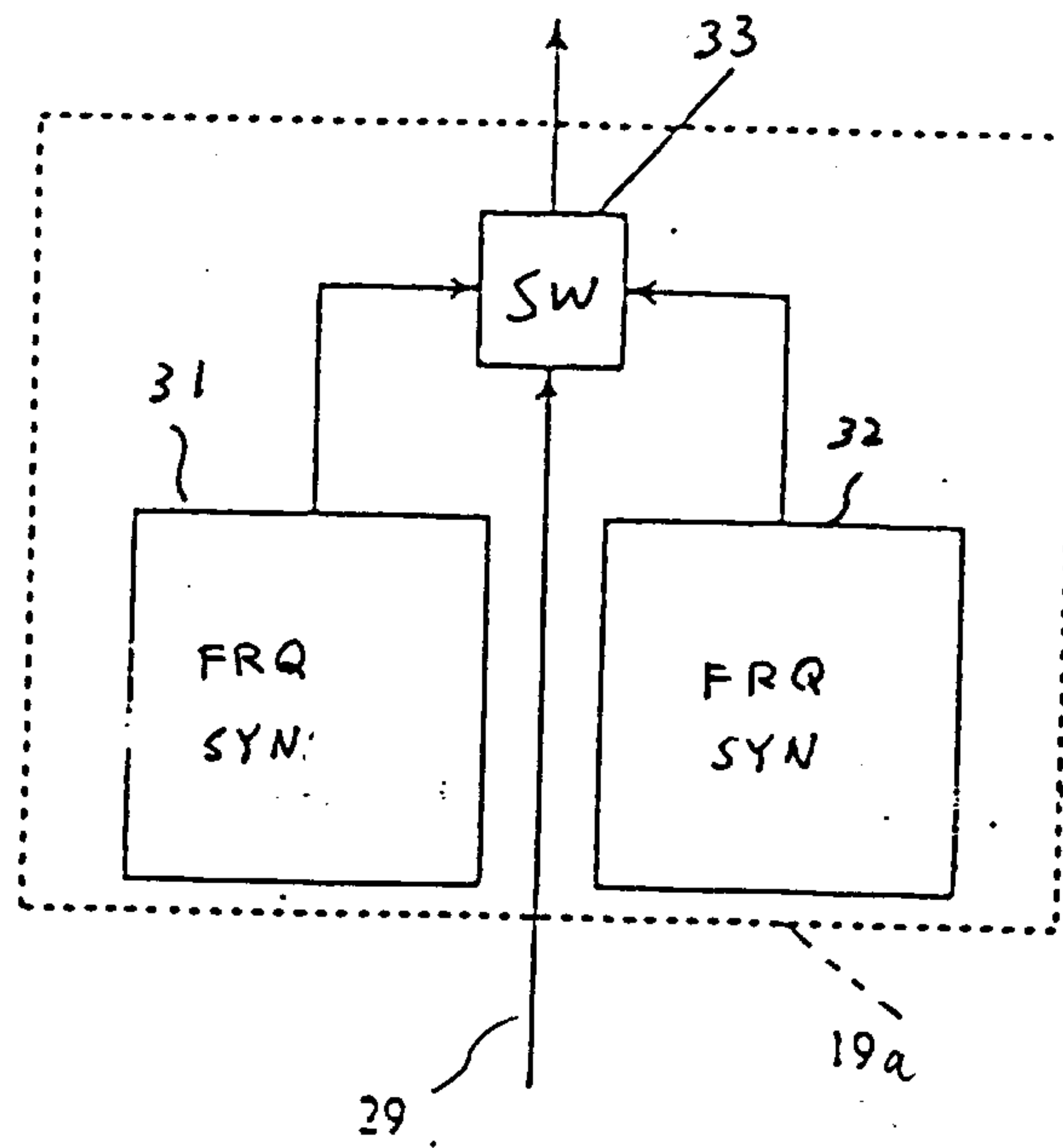


FIG. 3

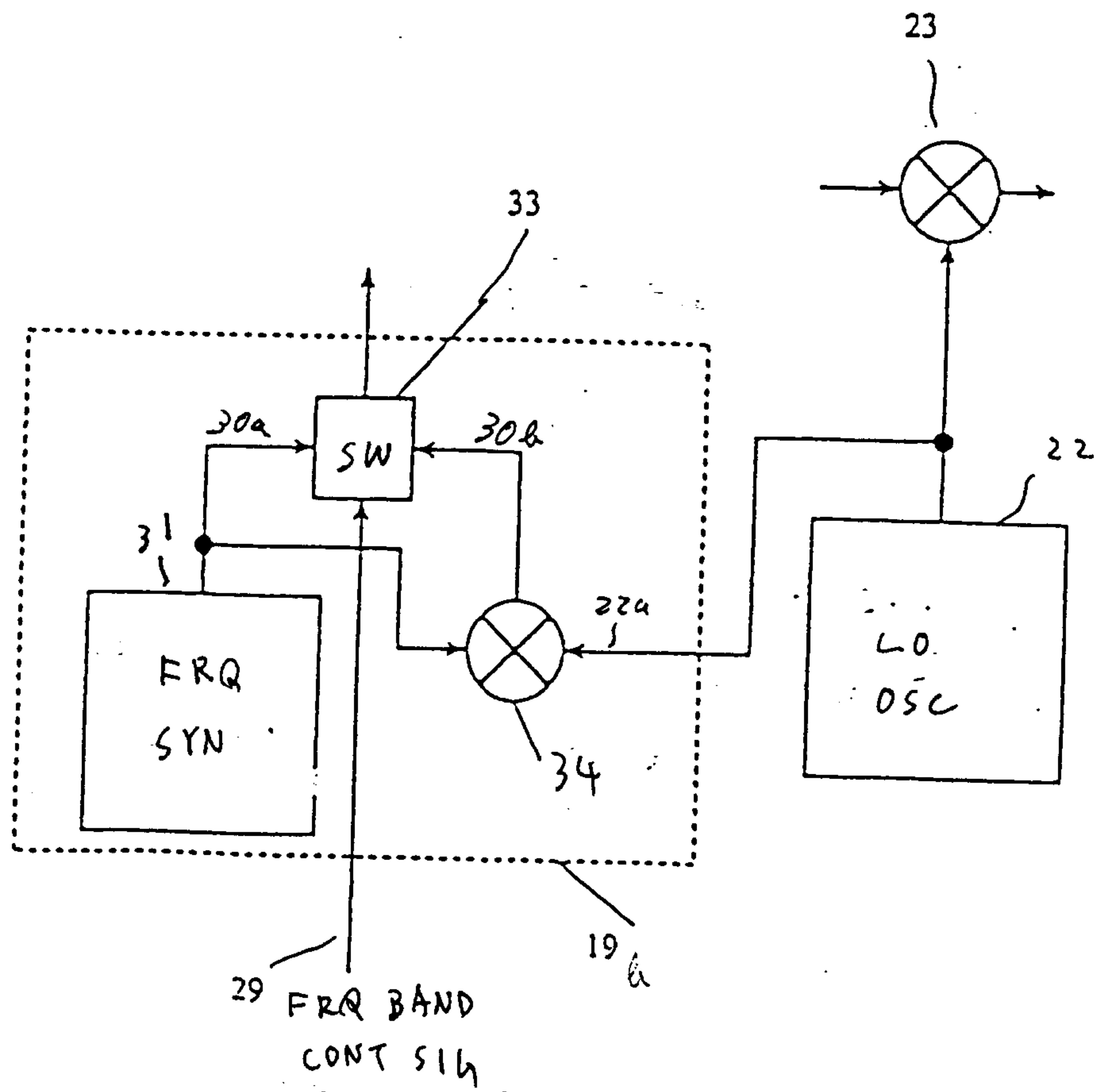


FIG. 4

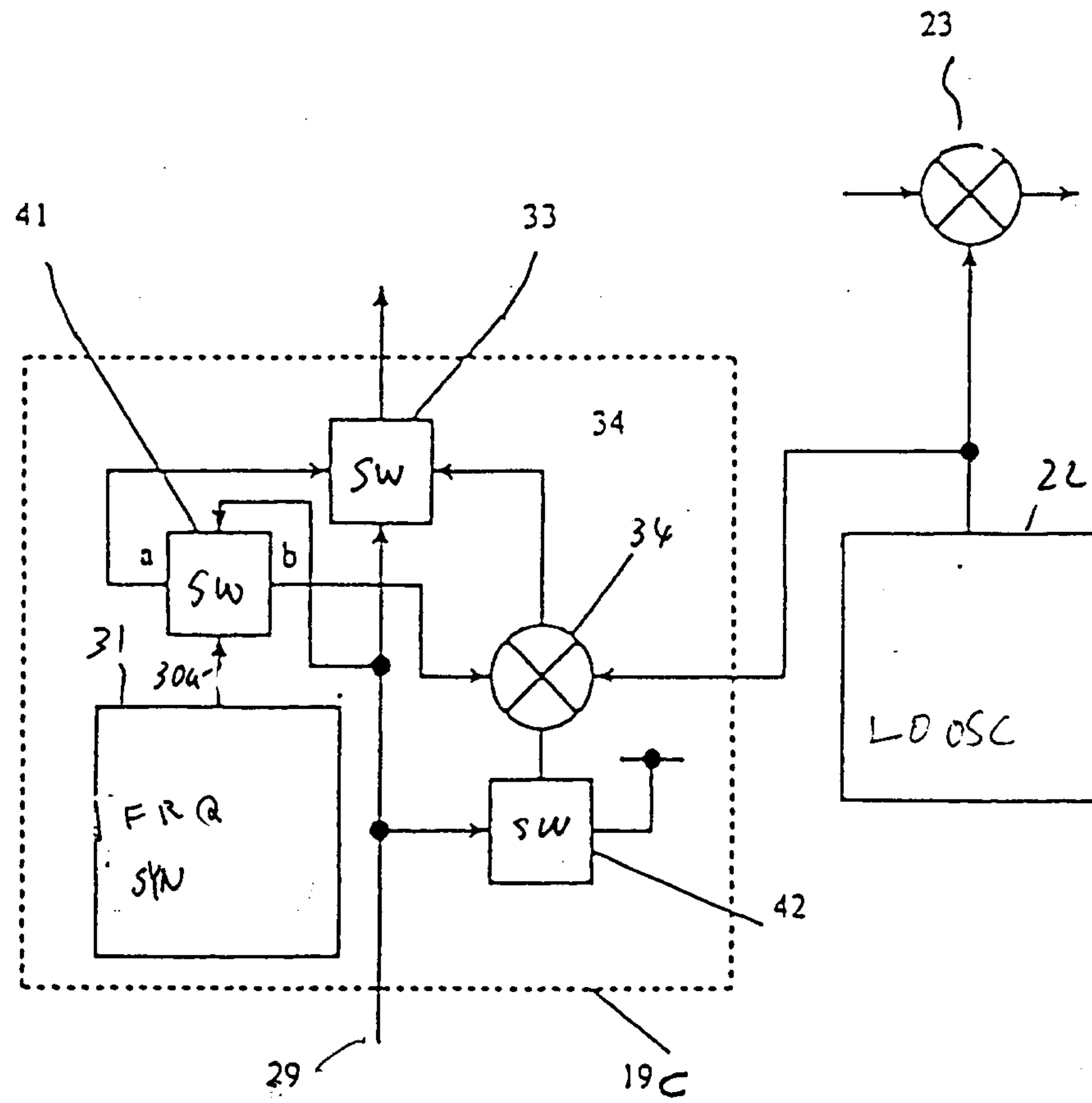
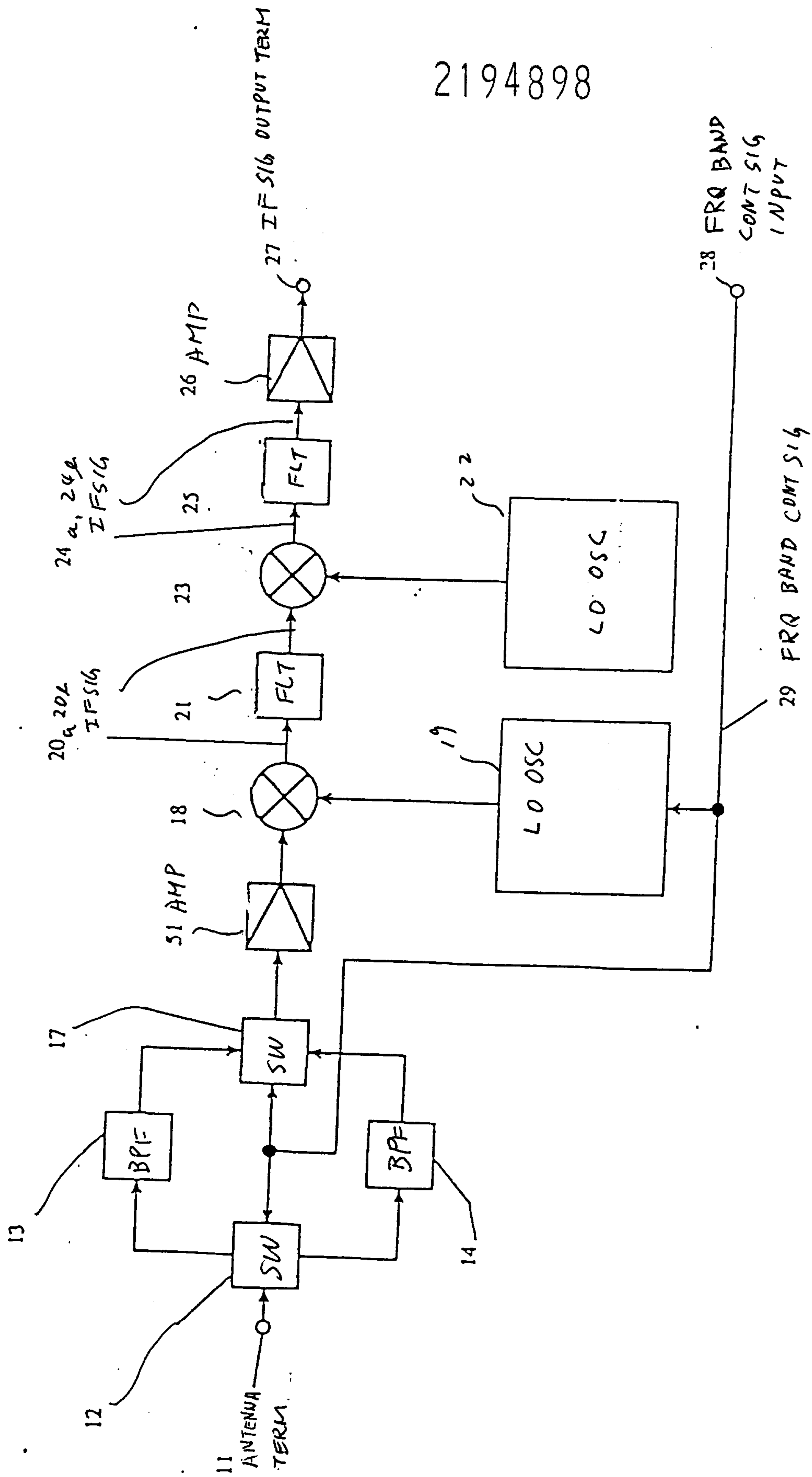


FIG. 5



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Fig. 6

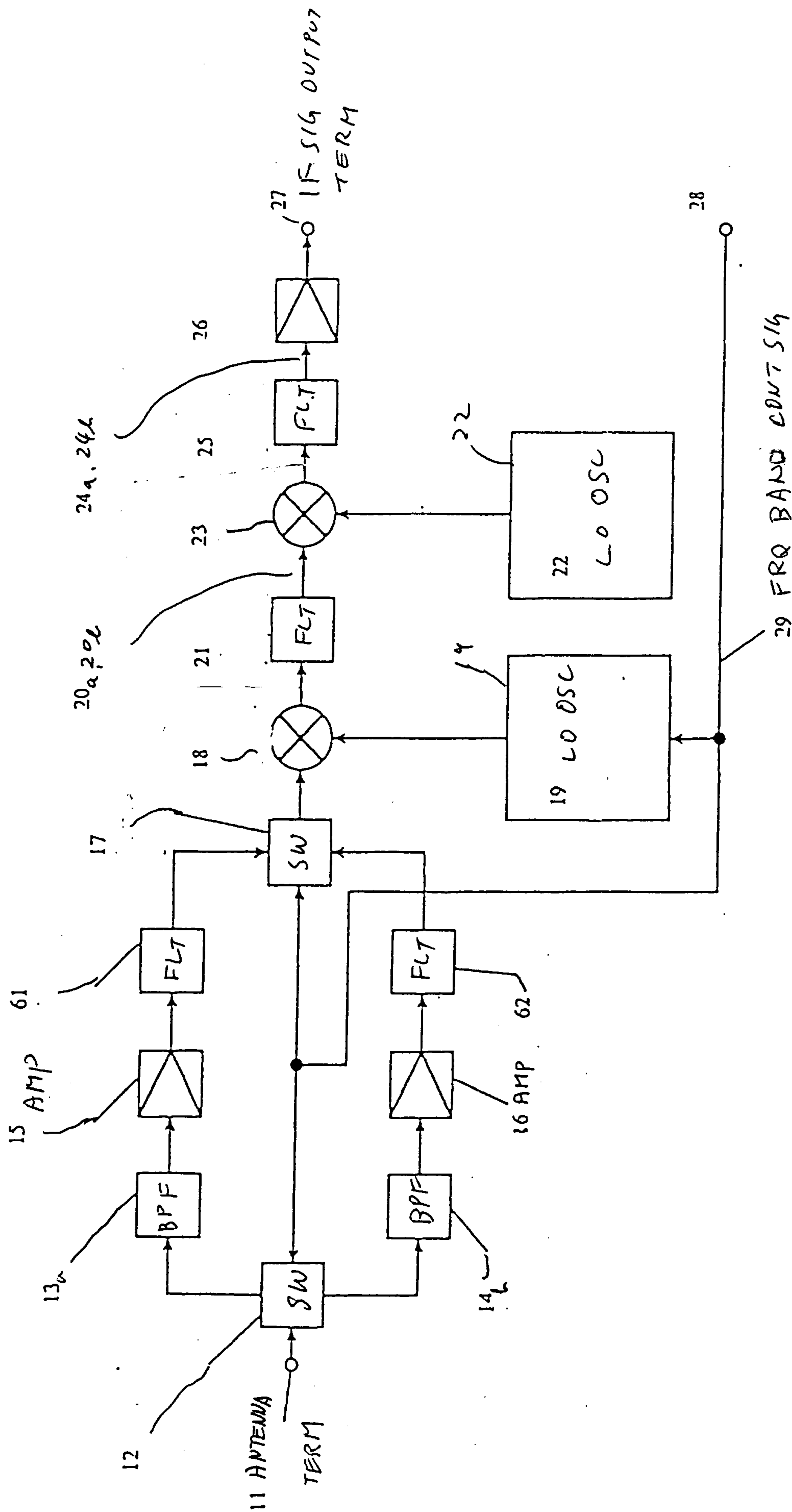


FIG. 7

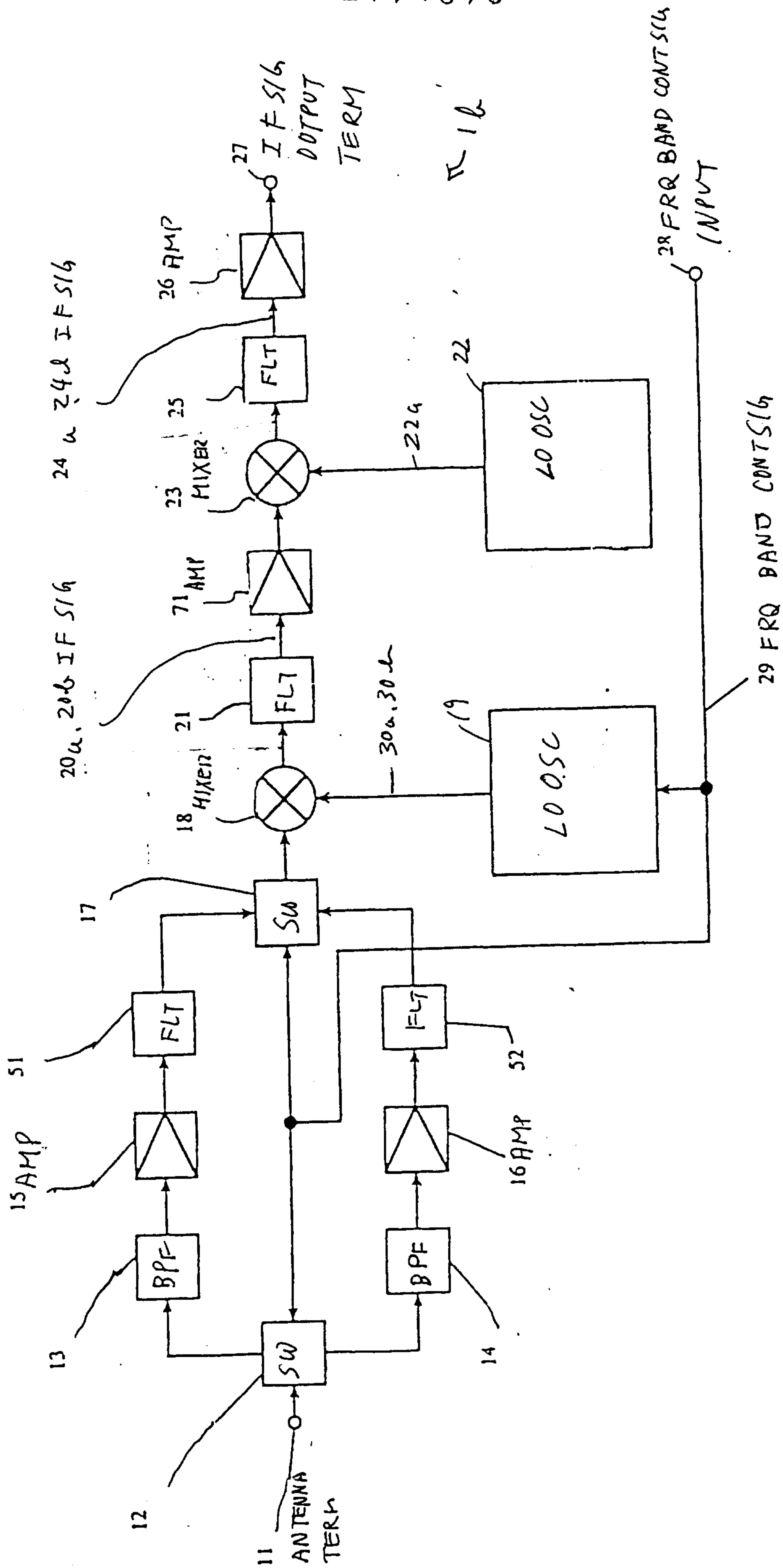


FIG. 8

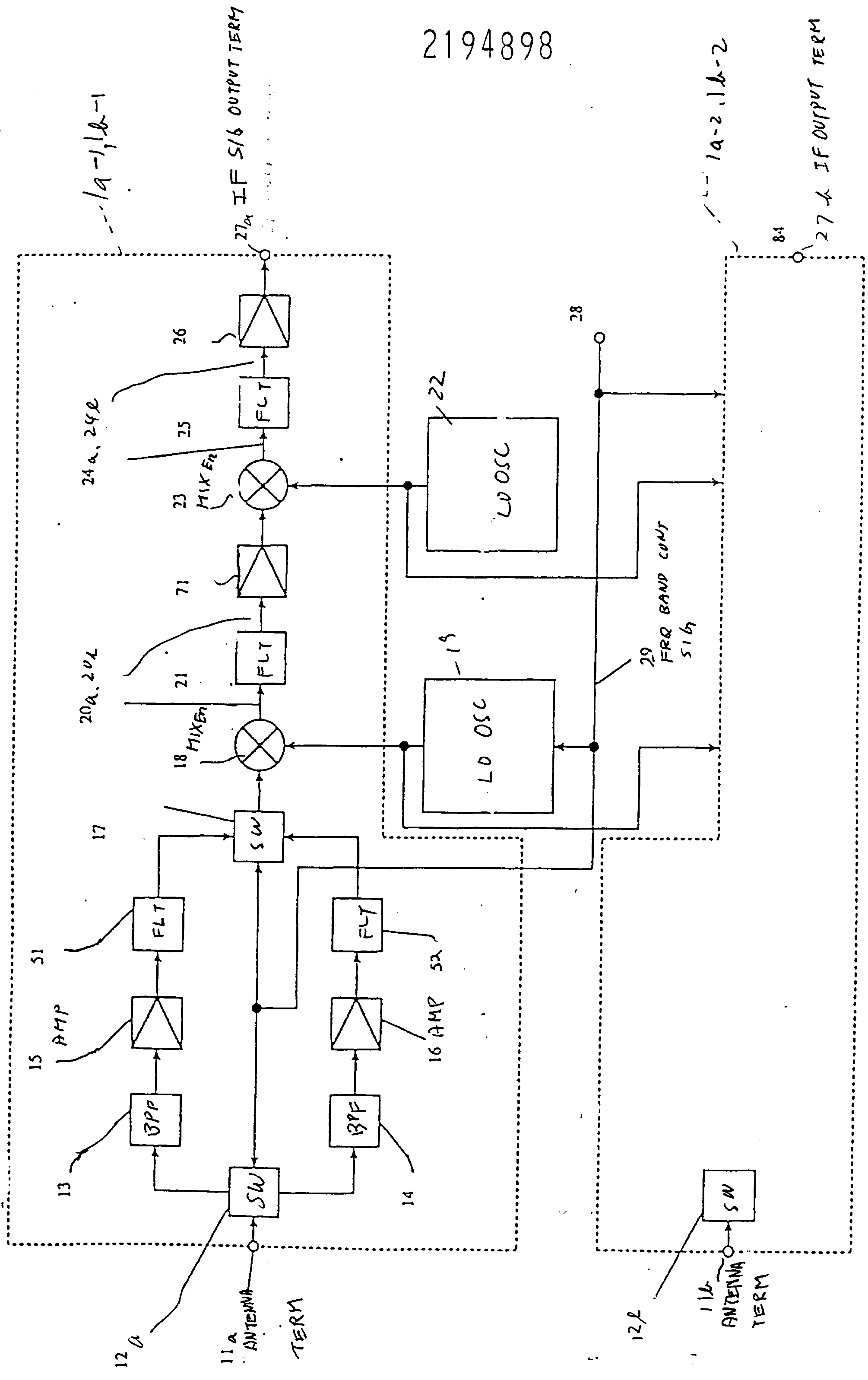


Fig. 9

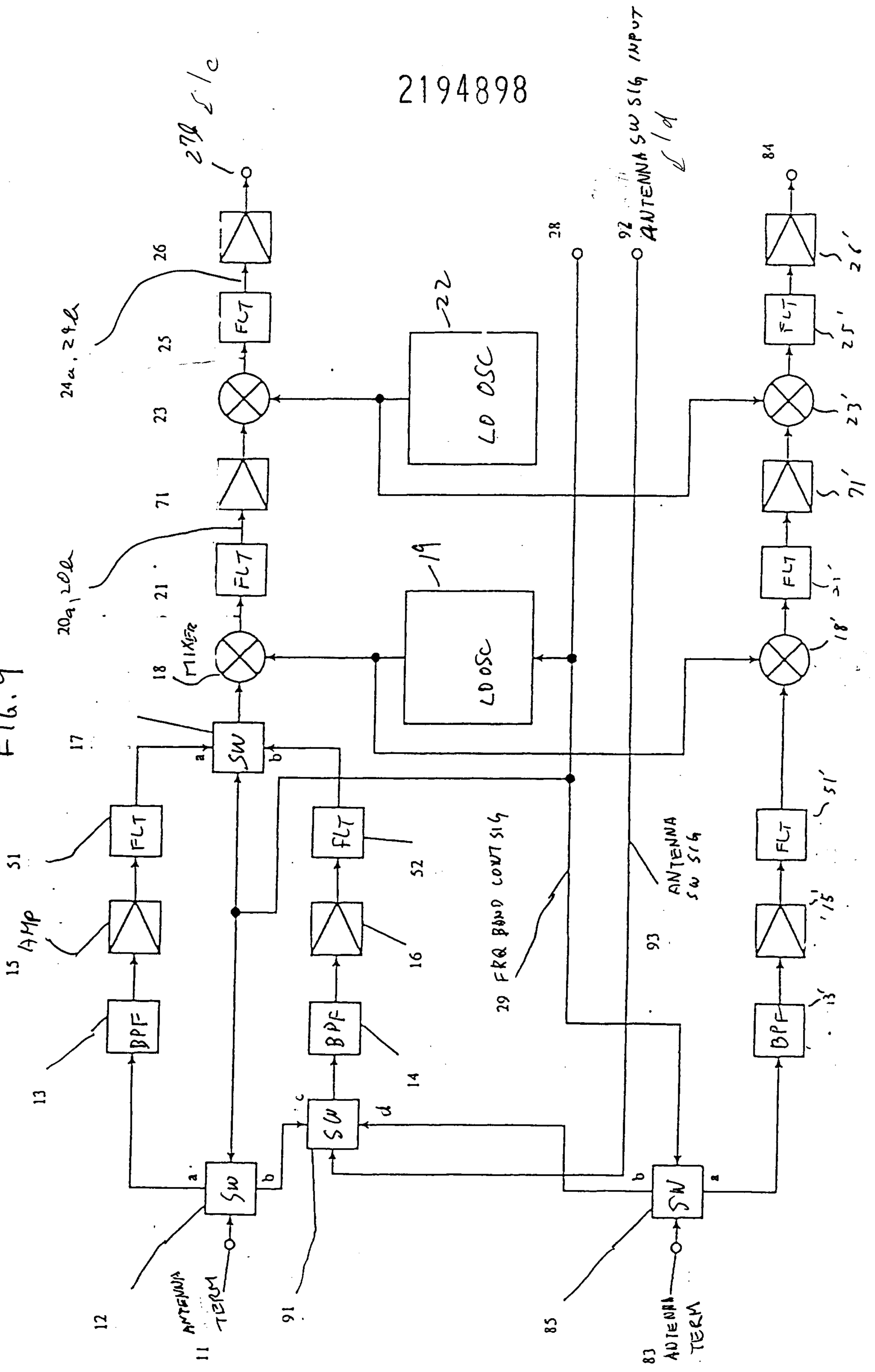
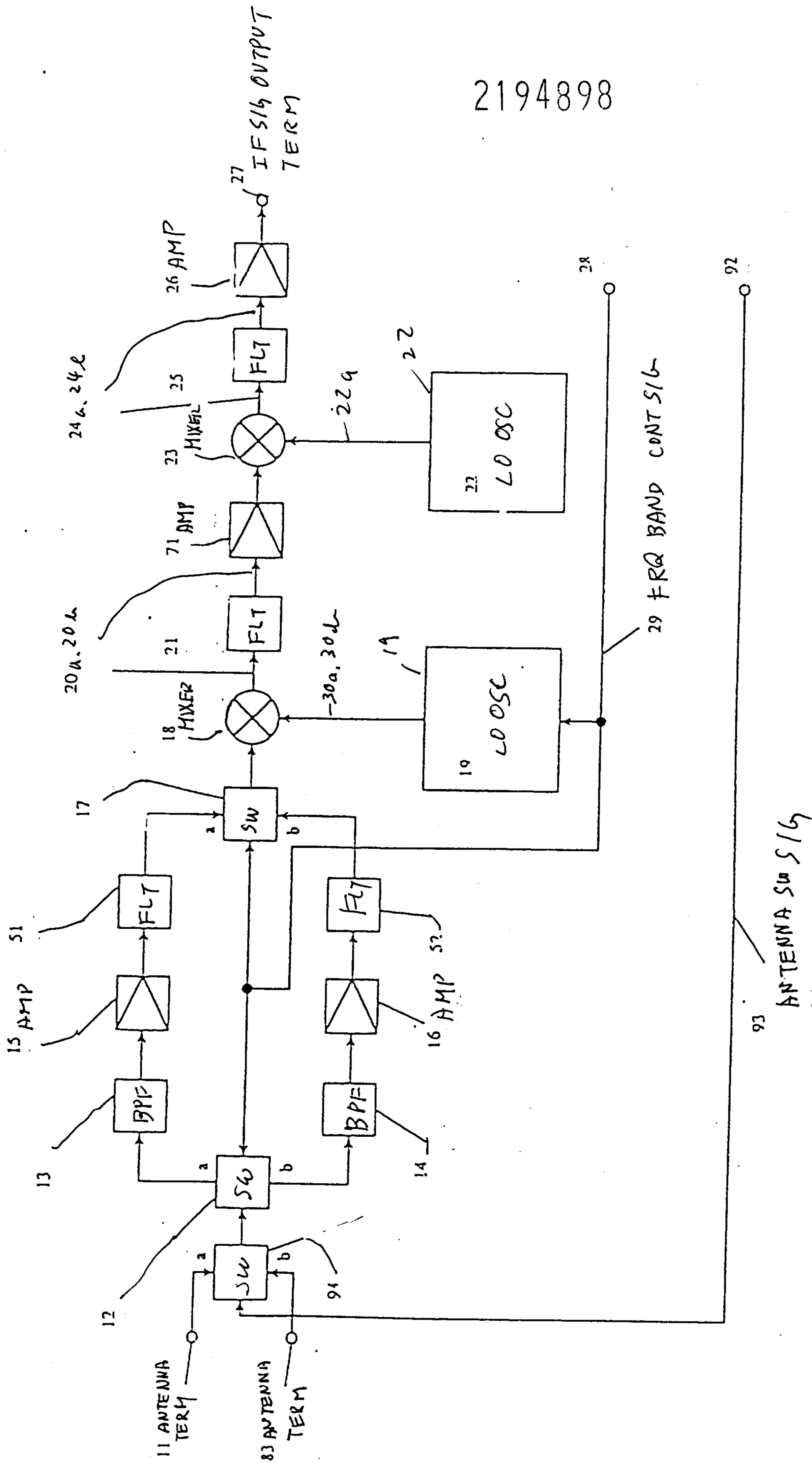


FIG. 10



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