

RADIO TELEPHONE FILTERING APPARATUSES

The present invention relates to an apparatus for neutralizing radio telephones in spaces where their use is prohibited or annoying.

At present, the number of radio telephones is becoming very large. Their automatic ringing or calls are of such a nature as to annoy the other people present in the same space or to disturb the operation of acoustic or electronic apparatuses.

By way of examples, the premises to be protected may be: aircraft, auditoria, cinemas, theatres, court rooms, schools, hospitals, meeting rooms, conference rooms, restaurants, churches, etc.

Other spaces may be relevant, whether they be open (cemeteries, etc.) or enclosed (vehicles, trains, etc.). Protection must be effected selectively as a function of the choice of those responsible for these spaces and in compliance with the global radio telephony system.

The MOTOROLA document by Weiss and Muri, Vol. 13 of July 1991 uses a system with radio relays using different frequencies from those of the base transmitters. The Patent US WEST EP 0568824 requires special mobile telephones pre-programmed to identify the zones. Our invention does not use a system with different frequencies and is applicable to mobiles currently in service. The present invention also relates to other radio messaging apparatuses which possess a ringing tone, designated hereinbelow by the general name of radio telephones.

The present invention does not relate to mobile transmitters which could be used on an ad hoc basis for police or military purposes.

The object of the present invention is to deliberately neutralize radio telephones without the intervention of their users, by jamming or modifying the communications: reception and/or transmission.

We shall call the apparatus which is the subject of the invention a jammer even when it merely filters.

The present invention is based on a jamming apparatus having several options and levels of jamming and
5 filtering. The principles of the invention are applicable to all analogue or digital radio telephony systems regardless of the systems or the standards: GSM, DCS, DECT, CT2, 3RP, PHP, PHS, PDC, AMPS, IS54, CDMA, UDPC, CDMA, DSSR, PCN, PCS, FPLMTS, UMTS, etc.
10 with terrestrial or satellite transmitters.

According to a first variant, the present invention jams the reception of the call signals and of beacon paths.

The ringing of a radio telephone is triggered by the
15 receiving of the individual code of the radio telephone via the airwaves.

The present variant uses the superposition onto these codes of an unidentifiable radio signal, on the same frequencies, thereby modifying the call codes which are
20 no longer recognized by the destination radio telephones. The radio telephone will be regarded as inaccessible to the transmitter, and this will trigger a possible messaging. According to several variants, the jammer behaves as a transmitter with superposition
25 on the radio signals so as to render them barely recognizable, either continuously, or intermittently, or as a filter by setting up a coded dialogue with the base stations.

This jammer must not disturb the communications in
30 spaces which are not deliberately protected. The aim of the present invention is to restrict the volume to be jammed by adapting the power of the jamming signal as a function of the volume and of the nature of the materials of the walls of the premises to be protected,
35 its angular coverage as well as the nature of the signals transmitted.

To restrict the jamming and its power, the present invention, according to one of its characteristics,

will comprise a receiver which will make it possible to measure the power of the receptions and thus, to adapt the jamming in terms of power and nature. One variant makes it possible also to detect the response of local
5 telephones so as to jam their signal at certain specific moments (intermittent).

In certain cases, the power may be less than 5mW. According to another method, the jammer will detect and/or neutralize the radio telephones when passing
10 into specific geographical sites: doors, etc. It will therefore be possible for the jammers to be active or passive depending on whether they include a receiver and a transmitter or only a transmitter for each system to be jammed.

15 Depending on their configurations, that will enable varied functionalities to be added to them:

- switchover from ringing tone to buzzer,
- storing of calls,
- selective filtering of telephones according
20 to chosen numbers, chosen sites, etc.
- genuine local radio telephone switching office, able to constitute a genuine selective base station adapted to a restricted volume and for carrying out
25 selective filtering as a function of numbers, of call type, etc. with certain analogies with current telephone switching offices.

To adapt the protection to large volumes or to volumes of any shapes, the combining of several apparatuses
30 will be envisaged, likewise for the various standards. The radio telephone becomes operational again once it leaves the protected space, without intervention by the owner.

Messages will be displayed so as to forewarn the user
35 of calls during his presence in jammed zones (option). In practice, a display will be able to forewarn of the protection of the premises on entry thereto and on exit therefrom.

Specifically, when the mobile telephone is used for important or urgent communications, the users must be forewarned and act under their responsibility. Several levels of jamming are envisaged: blocking of reception and/or blocking of transmission, depending on the choice of those responsible for the volumes to be protected.

The hardware which is the subject of the present invention thus consists, at least, of a housing containing a high-frequency transmitter (480,900,1800 Mhz ... ranges depending on the standards used in the relevant country) with adjustment in terms of power and angular direction.

The transmission of the jamming signal is performed by scanning the frequency ranges used by the radio telephones. According to a first characteristic, the hardware which is the subject of the invention sends a unique periodic signal with frequencies corresponding to the receptions of the radio telephones. For the GSM900 system, for example, the jamming signal will consist of signals transmitted on the frequencies of the beacon paths for the site.

For all the other radio telephony systems present in the same premises, various frequencies will be used. It can also be transmitted on the search channel PCH more selectively, after detecting its frequencies. The call code is modified by this electromagnetic noise, the triggering of ringing does not occur.

Figures 1 and 2 show a simple jamming housing (1) with a directional antenna (2) making it possible to transmit and/or receive at an angle determined in terms of volume. The angle of coverage is adjusted physically by orientation with respect to the volume to be protected (7). The power is adjusted by a potentiometer (3) or automatically as a function of the level received.

The power (8) is adjusted as a function of the volume and of the nature of the walls.

Figure 3 shows the coverage and regulation obtained by a jammer housing (2) which contains in addition a receiver which, among other things, receives the echo of its own jamming signals.

- 5 Figure 4 shows the principle of electronic comparison of transmission by comparison with the echo obtained via a passive reflector (9), situated on the opposite side of the volume (7).

The power of the echo will be compared with that of the
10 communications received so as to allow the jammer to adjust its power.

The angle and the power can therefore be adjusted and held continuously by continuous comparison between the signals transmitted and received.

- 15 This improvement can be envisaged in order to obtain just the necessary coverage without jamming the exterior of the volume to be protected.

Figure 5 shows the configuration of a jammer with a directional antenna making it possible to detect the
20 mobiles to be neutralized and a nondirectional antenna for receiving or transmitting with the base stations. The detecting of the mobiles which will become active makes it possible to restrict the transmissions over time. The jammer can intervene at the start of the
25 communication procedure during the phase in which the data exchanges are not yet enciphered (encrypted). Its intervention on the signalling channels is aided by the absence of frequency hops.

- Figure 6 shows the coverage in terms of detection (e) and in terms of response (r) such as to localize to the
30 greatest possible extent over time and in space the transmission of signals, by the apparatus which is the subject of the invention.

Figure 7 shows the diagram of the functions of the
35 apparatus in the simplest case of continuous jamming. According to another characteristic, the hardware which is the subject of the invention, whilst using the same means for limiting the volume to be protected as

previously, possesses a directional receiving and transmitting antenna which picks up, continuously and in a manner which is localized in terms of angle, the signals transmitted by the radio telephones present within this angle and transmits in a localized manner within the same angle a neutralization code. An improvement to this hardware consists in storing the types of codes to which it must respond selectively (in transmit and in receive mode) by comparing with data loaded into its memory or transmitted by the stations. One variant consists in localizing the operation at a specified geographical passageway (door, entrance, etc.).

More complete integration is possible with the global network and operators by setting up a direct communication between the jammer and the base station or stations by radio signalling of the neutralization operations.

Figure 8 shows the diagram of the functions fulfilled by the apparatus in this version.

In one very complete form of the apparatus, the present jammer can constitute a genuine local and selective radio telephone switching office, with a greater or lesser degree of integration with the exterior global system.

Figures 9 to 16 represent certain variants of the elaborate forms of the apparatus which is the subject of the invention.

The main problem is to avoid to the greatest possible extent radioelectric pollution outside the space (open or enclosed) to be protected or to improve selectivity of detection. This problem is solved by the following combinations:

1. - restrictions in space by:
 - directivity of the jamming transmitted
 - choosing an angle of transmission close to the vertical and a different phase angle

- minimum distance between the jammer and the mobile so as to use minimum power with a rapid $1/d^2$ decay (radiating cables or distributed sensors).
- 5 - self-regulating of the power of the jamming
- 2. - restrictions in time by:
 - transmitting signals only in the event of detecting a mobile which is transmitting in the volume, before ringing or before communicating (AB on RACH for example).
- 10 3. - restrictions in the jamming information:
 - minimum and "harmless" jamming signals, avoiding transmissions on the traffic and communication channels.
- 15 - selectivity related to the type of subscription or to the type of use (for example, the 112, emergency call in France, must get through).
- via synchronization dialogue with the stations and their software.

20 The risk of pollution becomes zero if the jammer transmits a coded signal only to the base station.
The restrictions in time are obtained by transmitting only when a mobile of the volume will recommence communicating, as an incoming or outgoing call.

25 Examples of configurations and operation:

- 1 JAMMER apparatus (BR), transmitter/receiver comprising:
 - 1 adjustable directional antenna of the following types: parabola (d in Fig. 9), yagi (y in Fig. 10), dihedral (d in Fig. 12), radiating cable (c, Fig. 13), panels, sectorial antennas etc. Proximity is achieved by distributing several antennas (Fig. 11, Fig. 14) and the use of:
- 35 . radiating cable (Fig. 16) constructed from coaxial cable with partial periodic interruption of the outer conductor (a few cm every 2 m for example).

. housings (Fig. 15) comprising a radiating element (e) and a concave reflecting surface (r), which are distributed (Fig. 14) within the volume to be protected and are connected to the jammer (BR).

5 The connection can, as a variant, use the existing electrical cables, with possibly different frequencies and installation of filter (F) for isolation from the exterior.

These directional and/or close antennas make it
10 possible to detect the relevant mobiles and to transmit in a localized manner.

- 1 "whip" antenna of conventional models (f in Figs. 9,10,11,12,13,14).

This horizontally nondirectional antenna makes it
15 possible to receive the station or stations, to regulate the power of the jammer, to transmit to the station and to accomplish a role of relay with the station.

Variants with more than 2 antennas (y,g,f) (for
20 separating the transmission and reception functions or for adapting to the various networks, for example) are possible (Fig. 10)

This does not change the principles of the invention.

- examples of operation with regard to the
25 signals:

. detection of a mobile with incoming call by detecting an AB on RACH (signal of the presence of the mobile on the channel for access to the station).

. jamming of the mobile by transmitting one or
30 more jamming bits on PCH (channel for calling the mobiles from the station)

. response of the jammer to the station (signal to be defined with the operators), for complete or selective filtering. (clean dialogue with the
35 stations).

. detection of an outgoing call (transmitted by the mobile): CR on RACH (request for channel by the mobile on the channel for access to the station)

. jamming of mobiles by transmission of a
"false" local BCCH and no connection (BCCH: fixed
identification channel transmitted by the stations)

. etc..

5 . filtering by operating the jammer as a
retransmitter or substation.

The choices of the solutions adopted will have to be
made with the radio telephony operators in order as far
as possible to eliminate undesirable interventions in
10 respect of the global network.

- ADAPTATIONS of mobiles and premises:

(see Patent FR 9708546 of 1/7/1997)

- for urgent or preferential links (doctors,
etc.), a minimum service will be ensured even if a
15 jamming signal is detected.

- adaptation for detection at geographical
entrances/exits to premises.

- creation of booths or unjammed connections.

- LINKS with stations:

20 - adaptations of station software so as to
manage selective filterings in conjunction with the
jammers, with various classes of priority
subscriptions.

- the jammer is identified by the networks and
25 becomes a component, possibly with a subscription and
traffic billing.



1. Apparatus making it possible to neutralize or filter radio telephones or receivers with ringing tones in a space to be protected, CHARACTERIZED in that it comprises at least one transmitter with transmission of signals of the same frequencies as those used between radio telephones and base stations and modifying the exchanges in transmit or receive mode.
2. Apparatus according to Claim 1, CHARACTERIZED in that it comprises, in addition, a receiver for detecting radio telephones present in the zone to be protected and for adapting the nature or the power of the signals transmitted by the apparatus. (Fig. 1)
3. Apparatus according to one of the preceding claims, CHARACTERIZED in that it comprises, in addition, a receiver for the radio links with the base stations. (Fig. 5)
4. Apparatus according to one of the preceding claims, CHARACTERIZED in that it comprises, in addition, a transmitter for the radio links with the base stations. (Fig. 5)
5. Apparatus according to the preceding claims, CHARACTERIZED in that it uses one or more selective antennas for localized transmission to radio telephones or for detection of these local radio telephones.
6. Apparatus according to Claim 5, CHARACTERIZED in that the selective antennas are distributed in the space to be protected as a function of its geometry. (Fig. 11)
7. Apparatus according to Claims 5, CHARACTERIZED in that the selective antennas are directional in terms of angle. (Fig. 5, 9, 12)
8. Apparatus according to Claim 6, CHARACTERIZED in that the distributed selective antenna is of the radiating cable type. (Fig. 13, 16)
9. Apparatus according to the preceding claims, CHARACTERIZED in that the components of the





- 11 -

transmitters and receivers as well as the antennas are multistandard or multiple for the frequency ranges or the radio telephone standards to be filtered. (Fig. 10)

10. Apparatuses according to Claim 6, CHARACTERIZED in that the link with the distributed antennas uses the existing electrical network. (Fig. 14, 15)

11. Apparatus according to Claims 5 to 10, CHARACTERIZED in that it uses selective antennas to detect, neutralize or reactivate the radio telephones at specific sites of passage. (Fig. 12)

12. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it transmits a continuous jamming signal destined for the radio telephones. (Fig. 2, 7)

13. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it detects the transmissions of the radio telephones present and sends them an intermittent jamming signal before they ring or call. (Fig. 6)

14. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it receives the signals from the stations and adjusts the power and the nature of the jamming signals destined for the radio telephones. (Fig. 3, 4)

15. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it transmits intermittently towards the active radio telephones and transmits a coded signal to the base stations so as to forewarn them of the jamming.

16. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it receives a code from the station before jamming the radio telephone.

17. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it detects an active local radio telephone and that it transmits to the station a code requesting filtering by the station, without transmitting to the mobile.

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18. Apparatus according to Claim 17, CHARACTERIZED in that it also transmits a filtering code destined for the mobile. (Fig. 8)

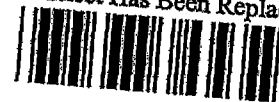
19. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it transmits radio signals only on the signalling channels.

20. Apparatus according to the preceding claims, CHARACTERIZED in that it is identified by the radio telephony networks by virtue of the identification codes in its memory.

21. Apparatus according to Claims 1 to 11, CHARACTERIZED in that it serves the station as a relay, including in respect of the communication channels.



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