A latch (16) for latching or locking a battery housing (14) to a portable radio housing (12) automatically locks into place when it is placed in the radio, and automatically ejects the battery housing when it is unlocked. The latch is movable from a first position, in which the battery housing is locked to the portable radio, to a second position, in which the battery housing is unlocked from the radio, and movable from the second position to the first position. The latch comprises a spring biasing apparatus (18) for attaching the latch to the housing, a retainer apparatus (22) for locking the battery housing to the radio, and a spring finger member (20) for ejecting the battery housing from the radio housing when the latch is moved from the first to the second position.
<table>
<thead>
<tr>
<th>AT</th>
<th>Austria</th>
<th>FI</th>
<th>Finland</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU</td>
<td>Australia</td>
<td>FR</td>
<td>France</td>
</tr>
<tr>
<td>BB</td>
<td>Barbados</td>
<td>GA</td>
<td>Gabon</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
<td>GB</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>BF</td>
<td>Burkina Faso</td>
<td>GN</td>
<td>Guinea</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
<td>GR</td>
<td>Greece</td>
</tr>
<tr>
<td>BJ</td>
<td>Benin</td>
<td>HU</td>
<td>Hungary</td>
</tr>
<tr>
<td>BR</td>
<td>Brazil</td>
<td>IE</td>
<td>Ireland</td>
</tr>
<tr>
<td>CA</td>
<td>Canada</td>
<td>IT</td>
<td>Italy</td>
</tr>
<tr>
<td>CG</td>
<td>Central African Republic</td>
<td>JP</td>
<td>Japan</td>
</tr>
<tr>
<td>CG</td>
<td>Congo</td>
<td>KP</td>
<td>Democratic People's Republic of Korea</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
<td>KR</td>
<td>Republic of Korea</td>
</tr>
<tr>
<td>CI</td>
<td>Côte d'Ivoire</td>
<td>LI</td>
<td>Liechtenstein</td>
</tr>
<tr>
<td>CM</td>
<td>Cameroon</td>
<td>LK</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>CS</td>
<td>Czechoslovakia</td>
<td>LU</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>DE</td>
<td>Germany</td>
<td>MC</td>
<td>Monaco</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
<td>MG</td>
<td>Madagascar</td>
</tr>
<tr>
<td>ES</td>
<td>Spain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI</td>
<td>Mali</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MN</td>
<td>Mongolia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MR</td>
<td>Mauritania</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW</td>
<td>Malawi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NL</td>
<td>Netherlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>Norway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>Poland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RO</td>
<td>Romania</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RU</td>
<td>Russian Federation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>Sudan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>Sweden</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>Senegal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU</td>
<td>Soviet Union</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TD</td>
<td>Chad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>Togo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US</td>
<td>United States of America</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PORTABLE RADIO BATTERY LATCH

This is a continuation-in-part of application No. 7/709,045, filed June 3, 1991.

Technical Field
This invention relates generally to portable radio batteries, and more specifically to latches for radio batteries.

Background
Portable radios must be designed so that the batteries do not easily come off. However, ease of removal and insertion of a battery pack in a radio is desirable feature. Accordingly, a need exists for a latch that facilitates insertion of the battery pack into the radio housing and removal therefrom, while providing protection against accidental removal.

Summary of the Invention
Briefly, according to the invention, a latch, located at a first end of a first housing latches the first end of the first housing to a first end of a second housing. The latch comprises a first spring member for biasing the latch toward a latched position, and a second spring member for ejecting the first housing from the second housing when the latch is moved from
the latched position to an unlatched position, and a retainer member for latching the first end of the first housing to the first end of the second housing.

5 Brief Description of the Drawings

FIG. 1 is a side view of a radio having a battery housing with a latch in accordance with the invention.

FIG. 2 is a rear view of the radio shown in FIG. 1.

FIG. 3 is a sectional view, taken along the line A-A in FIG. 4, of the part of the radio including the latch.

FIG. 4 is an isometric view of a latch in accordance with the invention.

FIG. 5 is a rear perspective view of an alternate battery pack in accordance with the present invention.

FIG. 6 is a top perspective view of the alternate battery pack of FIG. 5.

FIG. 7 is a sectional view of of the part of the modified radio including the modified latch of FIG. 5, compared to the unmodified assembly of FIG. 3.

Detailed Description of the Preferred Embodiment

Referring to FIG. 1, there is shown a side view of a radio 10 having a radio housing 12 and a battery (or other energy source) housing (or pack) 14 that attaches to the radio housing 12. The battery housing includes a latch 16 (shown by broken lines) which locks the battery housing 14 to the radio housing 12. The battery housing 14 also includes a hook 17 that hooks into a hook receiver in the corresponding end of the radio housing 12 to provide a pivotal support. Thus, the battery housing 14 hooks at one end and latches at the opposite end to force the user to move the latch and physically grab and remove the battery pack while maintaining deflection of the latch.

Referring to FIG. 2, there is shown a rear view of the radio 10 shown in FIG. 1. In this embodiment, two latches 16 are used to lock the battery housing 14 to the radio housing 12. Dual latches are used to force the user to remove the battery only when
he wants it off, thus preventing inadvertent removal of the battery. However, it is possible to implement the invention with only one latch in accordance with the invention.

Referring to FIG. 3, there is shown a sectional view of the part of the radio including the latch 16. In the preferred embodiment the latch 16 is molded into the battery housing 14 via support arms 18. The support arms 18 are resilient so as to provide a means for biasing (or urging) the latch toward the latched position shown in this figure. The latch 16 also includes a spring finger ejector 20 which provides a self-ejecting feature.

This flexible plastic piece is activated when the latch 16 is deflected. When the latch is engaged (i.e., locking or latching, the battery housing 14 to the radio housing 12) the spring finger 20 is not engaged (i.e., it is not exerting a spring force on anything).

Thus, the latch does not take a "set" in the locked position. When the user of the radio 10 wishes to remove the battery pack 14 from the radio housing 12, he would deflect the outer ends of the latches 16, thus unlocking the battery housing 14 from the radio housing 12. As each latch is moved to release the battery housing 14, the ejector members 20 spring the battery pack off the housing. This ejection motion helps the user to only have one direction of movement to release the battery pack 14 from its nested position in the radio 10.

Referring again to FIG. 3, the unlocked (or unlatched) position of the latch 16 is shown in broken lines. Self-ejection is accomplished by the spring force of the spring member 20 against an interior wall or slot in the radio housing 12. That force pushes the battery housing 14 outward, making removal easier.

The latch 16 also includes a self-locking feature. This feature is realized when the user inserts the battery pack into the radio housing 12. First, the lower end is inserted and the lower latch 17 is engaged. Then the battery housing is pivoted into its locked position. A protrusion 15 in the radio housing 12 slides along a slope 21 in the latch 16 until the latch locks into place.

The latch 16 is made from a resilient plastic material so that it
moves into its "locked" position when the protrusion 15 is beyond the slope 21.

FIG. 4 shows an isometric view of a latch in accordance with the invention. The outer end of the latch 16 includes a retainer 22 which provides a locking function on the protrusion 15 on the radio housing 12. The latch may be made from any suitable resilient material such as polycarbonate. In the preferred embodiment the latch is molded as an integral part of the battery housing, but other implementations may be apparent to those skilled in the art.

Referring to FIG. 5, there is shown a perspective view of an alternate battery or battery pack 50 having a battery housing 56 and a battery cover 62, where the same reference numbers refer to similar features. The rear portion of the housing portion, or the battery door or cover 62, could be integrally formed with the battery housing 56 or separately attached and then preferably ultrasonically welded together once battery cells (not shown) have been placed inside.

The latches 16 of FIGs. 1-4 have been modified by removing the spring finger ejector 20 to form a pair of living hinges 52 and 54. Even though these hinges and the associated capturing features surrounding them may have different numbers to denote different placement, the hinges (and their corresponding capturing features) can be the same in structure.

The living hinges 52 and 54 each still have a kink, bend, or slope 21 for engaging a protrusion, or upper ledge 15' of an interior wall, defining a recess, or slot 78 in a modified radio housing or chassis 70, as shown in FIG. 7. These living hinges 52 and 54 are each rigidly fixed on and projected from the battery cover 62 and emanate from a pair of notches 112 and 114, protruding through a pair of openings or slots 116 and 118 of the battery housing 56.

The portion of the battery housing containing the slots 116 and 118 form a housing over-travel limiting plastic skirt, detent, or protective sheath 122 that inhibits over-travel and damage by the living hinges 52 and 54 being bent too far, either inwardly or
outwardly, or twisted in any direction, even when the battery pack is removed from the protection of the radio housing 70. The skirt 122 extends from a battery cell compartment portion 106 of the battery housing and intersects an inner wall 124 of the battery cell compartment portion 106. When the battery housing 56 and the battery cover 62 are suitably joined together, the living hinges 52 and 54 slip through the two receiving slots 116 and 118 of the skirt 122 of the battery housing 56. Since the living hinges 52 and 54 are captured by the slots 116 and 118 (the slots being formed on one end by a recessed edge 125 and the inner wall 124 on the other end) in the battery housing 56, the travel of the latches is restricted from moving beyond the plastic's yield limit in any direction.

To facilitate removal of the battery 50, an inner wall portion 108 is sloped downwardly (shown in FIG. 7) from a pair of finger indented recesses 126 and 128 on the outward or topside of the skirt 122 (shown in FIG. 7) where the outer ends 132 of the living hinges protrude above the slots 116 and 118 and their respective recesses 126 and 128. The finger indented recess 126 and 128 and the sloped inner wall portion 108 thus allow easy latch access from the outside of the battery housing 56. When the user of the radio 10 wishes to remove the battery pack 50 from the radio housing 70, he or she would deflect the outer ends 132 of the latches 16, thus unlocking the battery pack 50 from the radio housing 70.

At the same time, the access is purposely designed to be very limited on the inside of the battery housing 56. Referring to FIG. 7, a first protrusion 15' in the radio housing 70 slides along the slope 21 in the latch 52 until the latch locks into place (when the first protrusion 15' is beyond the slope 21). A side edge of the recess 126 forming one end of the slot 116 provides a second protrusion 125 in the battery housing 56. The outer end of the latch 52 includes the retainer 22 which provides a locking function on both the first protrusion 15' on the radio housing 70 and the second protrusion 125 in the battery housing 56.
In summary, only two piece parts, the battery cover and the battery housing, are used to house, cover, and protect a double lock and latch mechanism. Thus, a battery pack latch is provided which facilitates insertion of the battery pack into a radio housing and removal therefrom, while preventing accidental removal.

What is claimed is:
Claims

1. An energy source housing, for a radio, comprising:
   a first end;
   a second end opposite the first end; and
   latching means for latching the energy source housing to
   the radio, the latching means being located in the first end of the
   energy source housing;
   the latching means being movable from a first position, in
   which the energy source housing is latched to the radio, to a
   second position, in which the energy source housing is unlatched
   from the radio, and movable from the second position to the first
   position;
   the latching means comprising:
   retainer means for latching the energy source housing to
   the radio; and
   spring means for urging the energy source housing toward
   the first position when the latching means is in the second
   position.
2. A latch, located at a first end of a first housing, for latching the first end of the first housing to a first end of a second housing, the latch comprising:

first spring means for biasing the latch toward a latched position;

second spring means for ejecting the first housing from the second housing when the latch is moved from the latched position to an unlatched position; and

retainer means for latching the first end of the first housing to the first end of the second housing.
3. A radio assembly comprising:
   a radio housing, having first and second ends;
   radio circuitry contained within the radio housing;
   a second housing, having first and second ends, for
   attaching to the radio housing;
   the second housing comprising latching means
   comprising:
   10  first spring means for biasing the latching means toward a
   latched position;
   second spring means for ejecting the second housing from
   the radio housing when the latching means is moved from the
   latched position to an unlatched position; and
   15  retainer means for latching the first end of the second
   housing to the first end of the second housing.
4. The radio assembly of claim 15, wherein the radio housing further comprises:
   a protrusion extending from the first end of the radio housing such that it is retained within the retainer means when the latching means is in the latched position.

5. The radio assembly of claim 1 wherein the second housing comprises detent means for limiting over-travel of the latching means.

6. The radio assembly of claim 1 wherein the second housing comprises:
   a battery housing having a receiving slot; and
   a battery cover for covering the battery housing, the battery cover having the latching means extending from the battery cover and protruding through the receiving slot.

7. The radio assembly of claim 1 wherein the second housing comprises:
   a battery housing having a protective sheath member surrounding a battery cell compartment, the protective sheath member having a receiving slot; and
   a battery cover for covering the battery cell compartment, the battery cover having the latching means extending from the battery cover and protruding through the receiving slot.

8. The energy source housing of claim 1, wherein the energy source housing further comprises a first protrusion extending therefrom, the first protrusion fitting within the retainer means.

9. The energy source housing of claim 25, wherein the radio further comprises a second protrusion extending therefrom, the first and second protrusions fitting within the retainer means.
10. An energy source housing, for a radio, comprising:
   a first end having a receiving slot; and
   latching means for latching the energy source housing to
   the radio, the latching means being located in the first end of the
   energy source housing and retained by the receiving slot for
   preventing over-travel of the latching means;
   the latching means being movable from a first position, in
   which the energy source housing is latched to the radio, to a
   second position, in which the energy source housing is unlatched
   from the radio, and movable from the second position to the first
   position;
   the latching means comprising:
   retainer means for latching the energy source housing to
   the radio; and
   spring means for urging the energy source housing toward
   the first position when the latching means is in the second
   position.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US92/04635

A. CLASSIFICATION OF SUBJECT MATTER
IPC(5) : H04B 1/38
US CL : 455/90
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 455/89.347; 379/61.58; 292/38.87; 429/97-100.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US.A. 3969796 (HODSDON ET AL.), 20 JULY 1976, See fig. 1 and fig. 2.</td>
<td>1-3, 5, 6, 7, 10</td>
</tr>
<tr>
<td>Y</td>
<td>US.A. 4371594 (OHARA ET AL.), 01 FEBRUARY 1983, See entire document.</td>
<td>1-3, 5-8, 10</td>
</tr>
<tr>
<td>Y, P</td>
<td>EP.A. 0445808 (TAKAGI ), 11 SEPTEMBER 1991, See column 12 lines 46-56, fig. 14.</td>
<td>6, 7, 10</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
  *"A"* document defining the general state of the art which is not considered to be part of particular relevance
  *"E"* earlier document published on or after the international filing date
  *"L"* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  *"O"* document referring to an oral disclosure, use, exhibition or other means
  *"P"* document published prior to the international filing date but later than the priority date claimed
  *"T"* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  *"X"* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  *"Y"* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  *"&"* document member of the same patent family

Date of the actual completion of the international search
05 AUGUST 1992

Date of mailing of the international search report
26 OCT 1992

Name and mailing address of the ISA/
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Authorized officer
NGUYEN VO

Facsimile No. NOT APPLICABLE
Telephone No. (703) 305-4786

Form PCT/ISA/210 (second sheet)(July 1992)