

March 20, 1951

D. M. KING

2,545,959

RADIO APPARATUS CONSTRUCTION

Filed Sept. 3, 1947

2 Sheets-Sheet 1

Fig. 1.

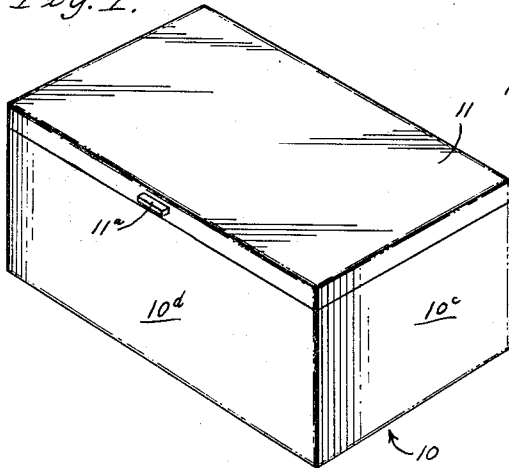


Fig. 2.

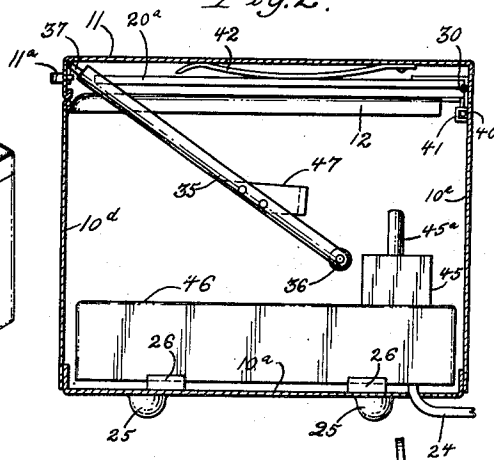


Fig. 3.

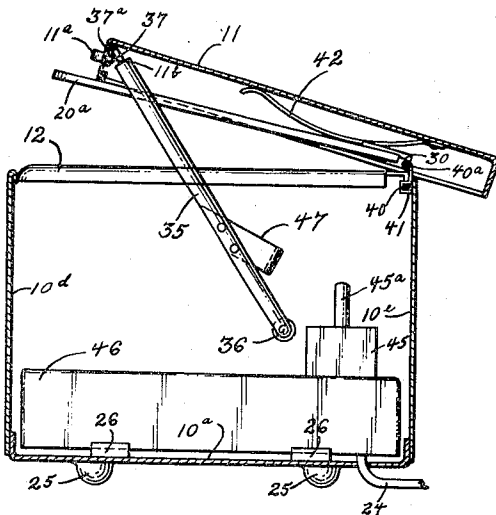


Fig. 4.

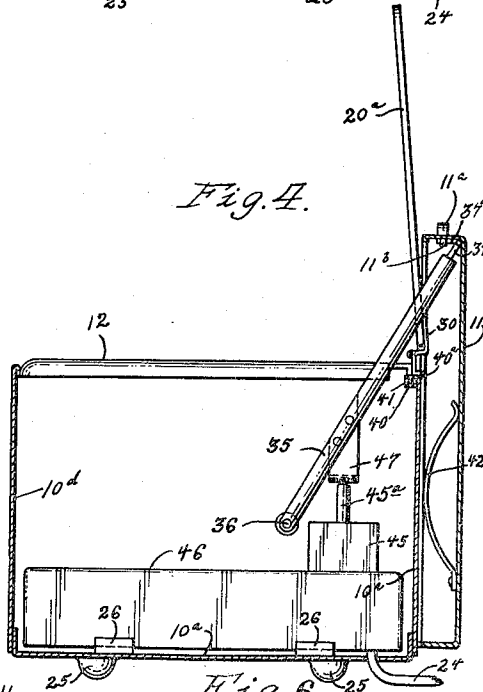


Fig. 5.

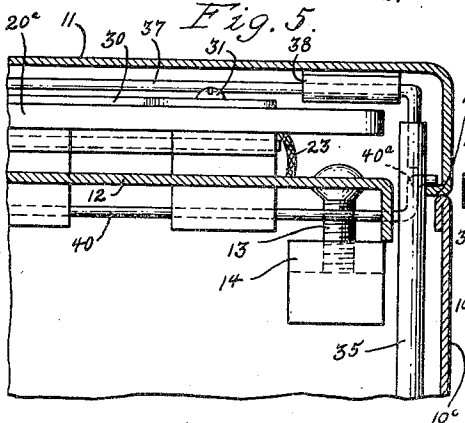
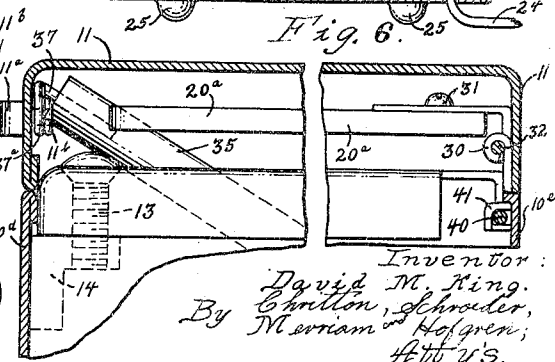


Fig. 6



Inventor:
David M. King.
By Carlton Schroeder,
Merriam and Holgren;
Attys.

March 20, 1951

D. M. KING

2,545,959

RADIO APPARATUS CONSTRUCTION

Filed Sept. 3, 1947

2 Sheets-Sheet 2

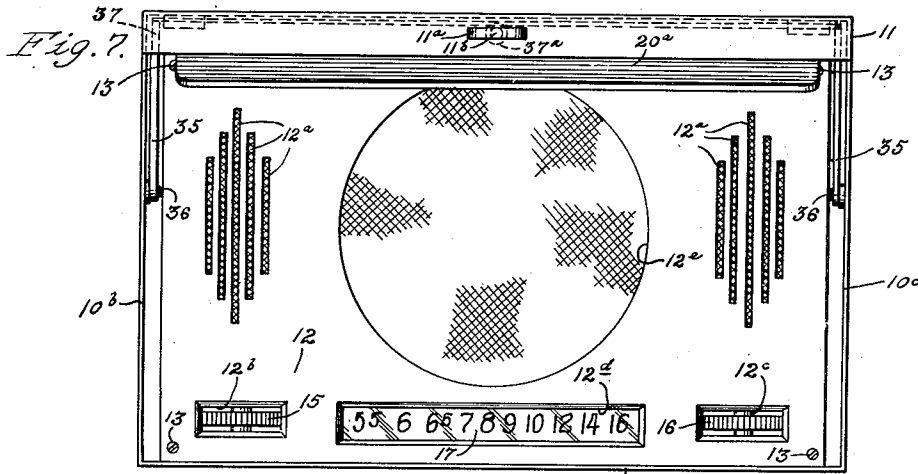
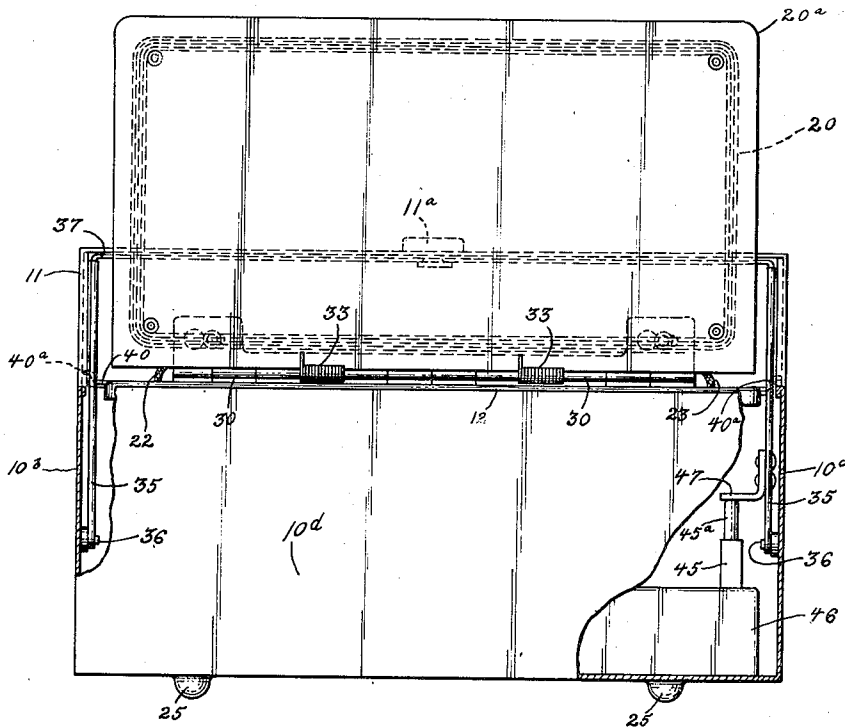


Fig. 8.



Inventor.
David M. King.
By *Chritton, Schroeder, Merriam and Hofgren,*
Attys.

UNITED STATES PATENT OFFICE

2,545,959

RADIO APPARATUS CONSTRUCTION

David M. King, Chicago, Ill., assignor to Illinois
Watch Case Co., a corporation of Illinois

Application September 3, 1947, Serial No. 771,947

9 Claims. (Cl. 250—14)

1

This invention relates to a radio construction, and more particularly to a radio apparatus construction utilizing a foldable loop antenna.

The desirability of providing a radio apparatus which is completely enclosed in a chest-like container, preferably of metal, has long been recognized in the radio apparatus art. Such a radio apparatus construction is particularly adapted to be utilized in certain places where conventional types of radio apparatus construction have not heretofore been suitable, as for example on a dressing table, because of the atmosphere created by adjacent articles or because of esthetic preferences of the room occupant. For such use the container which houses the radio apparatus is preferably of metal which may be either plain surfaced or may be decorated with an ornamental design, and said container should completely house the radio apparatus and should harmonize with its surroundings.

Making such a container of metal provides an effective shield for the radio apparatus contained therein, thereby resulting in improved operation of such radio apparatus. Another advantage obtained through the use of a metal container is that such a container provides a more pleasing appearance and fits more tastefully in certain surroundings, as for example when used on a dressing table as earlier mentioned.

However, the very fact that a metal container has shielding characteristics has, in the past, made it undesirable for use in the circumstances referred to here, since it has heretofore been impossible to associate a built-in loop antenna with such a radio apparatus construction. A loop antenna is, of course, desirable in radio apparatus of the type referred to here because first, the radio apparatus (except of course the line cord) is preferably completely enclosed within the container; and second, an antenna which is not compact, but which must be strung out throughout a considerable length presents an undesirable appearance, and an inconvenience, in such a radio apparatus. However, if a loop antenna were mounted within a metal container during operation, as may be done with wooden or plastic containers, the metal container would shield the antenna from incoming signals, thus rendering the radio apparatus substantially inoperative.

I have devised and am here disclosing and claiming an improved radio apparatus construction comprising a container having a body portion with an open top within which the radio apparatus is mounted. A cover is provided for closing said top to enclose the radio apparatus and the antenna associated therewith, the construc-

2

tion being such that when the cover is closed the container gives the appearance of a jewel box or other chest-like box which may be used on a dressing table or in a similar location where it is desirable that the container housing the radio apparatus harmonize with its surroundings. The cover is arranged to be moved from its front horizontal closed position to a rear vertical position permitting access to the radio apparatus within the container. The loop antenna is foldable, and when the cover is opened, said antenna automatically moves from its folded inoperative horizontal position within the container to a vertical operative position. Obviously, a simple hinge arrangement cannot be used in connection with the cover, for the cover must not be merely tilted up behind the antenna where it would act as a shield for the antenna when the antenna is in operative position. In order to obviate this difficulty, I have devised a novel linking arrangement wherein the cover moves backwardly and downwardly to the rear of the container, thereby removing its shielding effect from the antenna.

Since the cover must "walk" or move to the rear as it moves from horizontal to vertical position, means are also provided to retain the foldable antenna in inoperative position during the first portion of the movement of the cover; and as a further feature of my invention I provide a guide arrangement for the cover, said guide arrangement being mounted on the top of the container and spaced inwardly from the rear side thereof so that each of the edges of the cover may be in the plane of the associated side of the container when the cover is closed. A portion of the guide means is shiftable to a rear position outside the rear side of the container so that the cover may be guided into its vertical open position behind said rear side.

A further feature is an arrangement wherein the simple and natural movement of opening the lid not only results in bringing the antenna into operative position but also, and without any other manipulation, turns on the power supply for the radio apparatus; and this is done in a manner which results in the set being automatically turned off when the lid is again closed.

Other features and advantages of my invention will be apparent from the following specification and from the accompanying drawings, in which:

Figure 1 is a perspective view of a radio apparatus construction including my invention; Figure 2 is a transverse vertical section through the apparatus of Figure 1 with the cover in closed position; Figure 3 is a transverse vertical section

3

similar to Figure 2 but with the cover in partially open position; Figure 4 is a transverse section similar to Figures 2 and 3, but with the cover in open position; Figure 5 is an enlarged fragmentary longitudinal vertical section through a portion of the apparatus in the position of Figure 2; Figure 6 is an enlarged fragmentary transverse vertical section of a portion of the apparatus of Figure 2, the central portion of the apparatus being broken away in Figure 6; Figure 7 is an enlarged plan view of the apparatus of Figure 1 with the cover open; and Figure 8 is an enlarged front elevation, partly broken away, of the apparatus of Figure 1 with the cover open, part of the front of the container being broken away to show underlying structure.

Referring now to the drawings, in Figure 1 a container designated generally at 10 is adapted to house radio apparatus, as for example a radio receiver, including an antenna. The container has a base portion 10a (Figures 2, 3 and 4); and enclosed sides including ends 10b and 10c, a front side 10d, and a rear side 10e. As shown best in Figs. 3, 4 and 7, the container 10 has an open top within which is mounted radio apparatus in a manner to be hereafter described.

The container 10 is fitted with a cover 11 which preferably has outer dimensions the exact size of the outer dimensions of the container so that each edge of the cover is in the same vertical plane as the associated side of the container. Both the container and the cover are preferably, though not necessarily, of metal, and either or both may have thereon an ornamental design, although no such design is illustrated here, the ornamentation being no part of this invention.

Since the radio apparatus which is mounted within the container is conventional except for the antenna mounting, such radio apparatus will be described only briefly here. A chassis member 12 is mounted within the open top by means of mounting screws 13 which cooperate with brackets 14 extending inwardly from the container sides, and this chassis member has a plurality of openings therein as best illustrated in Figure 7. Certain of these openings, as the openings 12a, may serve as ornamentation and as ventilating openings; within another opening 12b there may be mounted a control dial 15 which may serve as an on-off switch and volume control; within another opening 12c there may be mounted another control dial 16 which may serve as a tuning dial and may operate a pointer associated with a tuning scale 17 which may be mounted within another opening 12d; and the opening 12e in the chassis member 12 may house a speaker. This speaker and other conventional radio receiver parts as for example tubes, resistors, coils, condensers, etc. may be mounted within the container below the chassis member 12.

A loop antenna 20 is associated with the radio apparatus. This antenna is preferably mounted within an insulating, non-metallic housing 20a and is connected to the radio apparatus by means of leads 22 and 23 (Figure 8) which extend from the antenna to the radio apparatus. The antenna 20 and the housing 20a will hereafter be referred to as a single unit, and it will be understood that the term "antenna" includes both elements. A line cord 24 shown only fragmentarily in Figures 2, 3 and 4 extends into the housing and is connected to radio apparatus therein in conventional manner, the connections of the line cord and antenna leads not being shown. The general construction of my apparatus is completed by foot

4

members 25 which are preferably of a yieldable insulating material, as rubber, and which serve to space the container 10 from the surface on which it is resting. In order to provide adequate air circulation within the container, I prefer to space the base member 10a from the ends 10b and 10c of said container and I provide brackets or flanges 26 to support said base 10a with reference to the ends 10b and 10c.

The antenna 20 is foldable and is mounted in the top of the opening by means of a hinge 30. This hinge is secured to the antenna by means of screws 31 and is secured to the rear side 10e of the container 10, the hinge being set inwardly from the plane of said rear side a sufficient distance to allow the cover 11 to fit into said plane as shown most clearly in Figure 6. A hinge pin 32 provides an axis about which the antenna 20 may pivot as it folds and unfolds, and the antenna is urged to unfold to its vertical operative position by means of springs 33 which surround said hinge pin.

The cover 11 is provided with an opening-and-closing handle 11a, and the cover is mounted on the container in such manner that said cover is movable by means of said handle from a front horizontal position wherein it encloses the antenna and radio apparatus to a rear vertical position to provide access to the radio apparatus controls, the antenna automatically unfolding to its vertical operative position when the cover is moved to its rear position.

To permit this movement the cover is connected at each of its ends to the container by means of a link 35. Since each of these links and the mechanisms associated therewith are similar, only one will be described in detail, and it will be understood that the link and operating mechanisms at the opposite end of the container are similar to those described in detail. Each of the links 35 has one end pivotally connected to a side (the ends 10b and 10c as illustrated) of the container 10. This connection, designated at 36, is near the center of said side and is preferably located back of the vertical center line and below the horizontal center line of said side as shown best in Figures 2, 3 and 4. The other end of each of the links is pivotally connected to the cover 11 adjacent the front of said cover.

While any type of pivotal connection may be made, I prefer a connection of the type shown most clearly in Figures 5 and 6. As illustrated in such figures, a spring wire rod 37 extends across the front end of the cover 11, said wire rod being turned at a right angle at each of its ends, and the turned ends being drilled into or otherwise fastened to the links 35. Adjacent its center the spring wire rod 37 is formed into a loop 37a, this loop being secured to the cover 11 by means of a rivet 11b, as best shown in Figures 6 and 7. Near the ends of the cover the rod 37 passes through journals 38, as shown in Figure 5. When initially formed, the ends of the rod are turned at a right angle to the plane of the looped portion 37a, so that a torsion or force is exerted when the rod is twisted from this initial position. As may be seen by a comparison of Figures 2, 3 and 4, the angle between the links 35 and the cover 11 is smaller when the cover is in either its closed horizontal position of Figure 2 or its open vertical position of Figure 4 than when it is in any intermediate position, as shown in Figure 3. Consequently, the turned ends of the rod 37 are twisted farther from their right angle position with respect to

the plane of the loop 37a when the cover is in an intermediate position than when it is in either of its terminal positions, and the torsion spring comprising the rod 37 exerts a force to maintain said cover in either of said horizontal or vertical positions and at the same time to hold the cover in a snug relationship to the rear wall 10e of the body of the container when the cover is open.

Another wire rod 40 is rotatably mounted on the container 10 adjacent the rear thereof, this rod 40 being mounted in said top and spaced inwardly from the rear side 10e, brackets 41 (Figure 6) holding said rod within the open top. The ends of the rod 40 are offset, being formed with a double turn of crank shape as best illustrated at 40a in Figure 5, and the sides of the cover 11 are formed with a guide channel or flange thereon. Rod 40 thus comprises a guide member which slidably engages the channels 11b, and the offset portion 40a of the guide member is shiftable from a normal position within the confines of the container to a rear position outside the rear side 10e of said container as the cover is moved to its rear position. Slots may be provided in the top of the rear side of the container to receive the shiftable portion of the guide member.

It will be obvious that, since the cover "walks" or moves back as it is swung into its vertical back position, and since the antenna 20 is urged into its vertical position by the springs 33, the "walking" or rearward movement of the cover would normally be prevented by the antenna housing which would catch on the downwardly extending front portion of the cover. In order to prevent this, I provide a member adapted to engage the antenna cover and to hold such cover in horizontal folded or inoperative position during a portion of the movement of the cover until the downwardly extending front portion of the cover clears the forward edge of the antenna. This member comprises a spring 42 which is carried by said cover adjacent the rear center portion thereof.

In order to turn the set on and off (i. e., to render its power supply and tubes operative or inoperative), I have provided, in the particular embodiment illustrated, a snap-switch 45 mounted on one side of the radio chassis 46. This is wired into the current supply lead in conventional manner; and is, in the form shown, a normally open switch, as by being spring-biased open. The switch is actuated by a vertically movable plunger 45a, so that depressing the plunger turns the switch on and releasing the plunger permits it to return to off position. In order to operate the plunger I provide a bracket 47 on the link 35 on the side of the case adjacent the switch, with a horizontally extending portion adapted to contact the top of the plunger and depress it, to turn the set on, when the link and lid are moved to fully open position.

The operation of the device as the cover is moved from closed to open position is illustrated in Figures 2, 3 and 4. In Figure 2 the cover is closed, the spring 42 holds the antenna 20 in its folded or horizontal position, and the switch 45 is in its off position. As may be seen in said figure, the radio apparatus including the loop antenna is completely enclosed within the container. In Figure 3 the cover 11 has been partially opened. The "walking" or rearward movement of the cover is clearly illustrated in this figure and it is shown how the offset portion 40a of the guide member 40 has shifted so that

the cover may pivot around the top edge of the rear side 10e of the container. The spring 42 has held the antenna 20 in its folded position until the cover moved a sufficient distance to clear the forward edge of the antenna. In Figure 4 the cover has been completely opened and the antenna has unfolded to its operative position; and the bracket 47 has engaged and depressed the plunger 45a to turn the set on. This figure and Figure 8 illustrate clearly the final or open position of the cover in which any shielding effects upon the antenna are minimized or completely eliminated. In the event it is desired to close the cover, the handle 11a may be grasped and the cover pulled into its closed position. Closing the cover automatically folds the antenna to its horizontal or inoperative position.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. Apparatus of the character described, including: a container having a base portion, enclosed sides and an open top; radio apparatus in said container, said apparatus including a switch; a loop antenna connected to said radio apparatus, said antenna being foldable between operative and inoperative positions; a cover for closing said top to enclose said radio apparatus and antenna; a straight link member having one end movably connected to a side of said container and the other end movably connected to said cover adjacent the front thereof; a guide arrangement slidably connecting said cover to said container adjacent the rear thereof, said cover being movable from a front horizontal position to a rear vertical position to provide access to said radio apparatus, said antenna unfolding to operative position when said cover is moved to its rear vertical position; and actuating means for said switch moved by said link.

2. Apparatus of the character described, including: a metal container having a base portion, enclosed sides and an open top; radio apparatus in said container; a loop antenna connected to said radio apparatus, said antenna being foldable between a vertical operative position and a horizontal inoperative position; spring operated apparatus normally urging said antenna into operative position; a cover for closing said top to enclose said radio apparatus and antenna; a link member having one end pivotally connected to a side of said container and the other end pivotally connected to said cover adjacent the front thereof, said last mentioned connection including a torsion spring; a guide arrangement slidably connecting said cover to said container adjacent the rear thereof, said cover being movable from a front horizontal position to a rear vertical position to provide access to said radio apparatus, and said torsion spring exerting a force to maintain said cover in either of said positions, said antenna unfolding to operative position when said cover is moved to its rear vertical position; and a member on said cover for holding said antenna in horizontal position during the initial opening movement of said cover.

3. Apparatus of the character described, including: a container having a base portion, enclosed sides and an open top; radio apparatus in said container, such radio apparatus including a

switch and having controls accessible from said top; a loop antenna connected to said radio apparatus, said antenna being foldable between a vertical operative position and a horizontal inoperative position; spring operated apparatus normally urging said antenna into operative position; a cover for closing said top to enclose said radio apparatus and antenna, said cover having a guide channel thereon; a straight link member having one end movably connected to a side of said container and the other end movably connected to said cover adjacent the front thereof; a guide member mounted on said container adjacent the rear thereof and slidably engaging said channel, said cover being movable from a front horizontal position wherein said link is concealed within said container to a rear vertical position to provide access to said controls wherein said link extends through said open top, said antenna unfolding to operative position when said cover is moved to its rear vertical position; and actuating means for said switch movable in accordance with movement of said top.

4. Apparatus of the character described, including: a container having a base portion, enclosed ends and front and rear sides and an open top; radio apparatus in said container, such radio apparatus having controls accessible from said top; a loop antenna connected to said radio apparatus, said antenna being foldable between a vertical operative position and a horizontal inoperative position; spring operated apparatus normally urging said antenna into operative position; a cover for closing said top to enclose said radio apparatus and antenna, said cover having a guide channel thereon; a link member having one end movably connected to an end of said container and the other end movably connected to said cover adjacent the front thereof; a guide member mounted on said container adjacent the rear thereof and slidably engaging said channel, said member being mounted in said top and spaced inwardly from said rear side and having a portion shiftable to a rear position outside said rear side, said cover being movable from a front horizontal position to a rear vertical position to provide access to said controls, said antenna unfolding to operative position when said cover is moved to its rear vertical position.

5. Apparatus of the character described, including: a metal container having a base portion, enclosed sides and an open top; radio apparatus in said container, such radio apparatus having controls accessible from said top; a loop antenna connected to said radio apparatus, said antenna being foldable between a vertical operative position and a horizontal inoperative position; spring operated apparatus normally urging said antenna into operative position; a cover for closing said top to enclose said radio apparatus and antenna, said cover having a guide channel thereon; a link member having one end pivotally connected to a side of said container back of the vertical center line and below the horizontal center line of said side, and having the other end pivotally connected to said cover adjacent the front thereof; and a guide member mounted on said container adjacent the rear thereof and slidably engaging said channel, said cover being movable from a front horizontal position wherein said link is concealed within said container to a rear vertical position to provide access to said controls wherein said link extends through said open top, said antenna unfolding to operative position when said cover is moved to its rear vertical position.

6. Apparatus of the character claimed in claim 5, wherein the connection between said link member and said cover includes a torsion spring which exerts a force to maintain said cover in either of said horizontal and vertical positions.

7. Apparatus of the character described, including: a metal container having a base portion, enclosed sides and an open top; radio apparatus in said container, such radio apparatus having controls accessible from said top; a loop antenna connected to said radio apparatus, said antenna being foldable between a vertical operative position and a horizontal inoperative position; spring operated apparatus normally urging said antenna into operative position; a cover for closing said top to enclose said radio apparatus and antenna, said cover having a guide channel thereon; a straight link member having one end pivotally connected to a side of said container back of the vertical center line and below the horizontal center line of said side, and having the other end pivotally connected to said cover adjacent the front thereof; a guide member mounted on said container adjacent the rear thereof and slidably engaging said channel, said cover being movable from a front horizontal position to a rear vertical position to provide access to said controls, said antenna unfolding to operative position when said cover is moved to its rear vertical position; and a member adapted to engage said antenna, said member holding said antenna in folded position during a portion of the movement of said cover.

8. Apparatus of the character described, including: a metal container having a base portion, enclosed ends and front and rear sides, and an open top; radio apparatus in said container, such radio apparatus having controls accessible from said top; a loop antenna connected to said radio apparatus, said antenna being foldable between a vertical operative position and a horizontal inoperative position; a spring urging said antenna into operative position; a cover for closing said top to enclose said radio apparatus and antenna, said cover having a guide channel thereon; a link member having one end pivotally connected to an end of said container back of the vertical center line and below the horizontal center line of said end, and having the other end pivotally connected to said cover adjacent the front thereof; a guide member mounted on said container adjacent the rear thereof and slidably engaging said channel, said member being mounted in said top and spaced inwardly from said rear side and having an offset portion shiftable to a rear position outside said rear side, said cover being movable from a front horizontal position to a rear vertical position to provide access to said controls, and said antenna unfolding to operative position when said cover is moved to its rear position; and a spring member carried by said cover and adapted to engage said antenna, said member holding said antenna in folded position during a portion of the movement of said cover.

9. Apparatus of the character claimed in claim 8, wherein said radio apparatus includes a normally open switch at one side thereof and wherein a member carried by said link is adapted to engage a portion of said switch and cause it to close when said link member is moved to rear-most position upon opening of said top.

DAVID M. KING.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
521,957	Hayes	June 26, 1894
802,979	English	Oct. 31, 1905
945,014	Boyer	Jan. 4, 1910
999,207	Clark	Aug. 1, 1911
1,940,259	Lindemann et al.	Dec. 19, 1933
2,013,421	Papworth	Sept. 3, 1935

Number
2,250,936
2,268,104
2,315,315
2,323,093
2,338,477
2,385,364

Number
806,180

Name	Date
Schnell	July 29, 1941
Bentley	Dec. 30, 1941
Cairnes	Mar. 30, 1943
Levin	June 29, 1943
Walters et al.	Jan. 4, 1944
Larson	Sept. 25, 1945

FOREIGN PATENTS

Country	Date
France	Sept. 21, 1936