

[54] **AUDIBLE SIGNAL APPARATUS**
[75] Inventor: **Charles Berns**, Brookfield, Conn.
[73] Assignee: **Edwards Company Inc.**, Norwalk, Conn.
[22] Filed: **Feb. 16, 1973**
[21] Appl. No.: **333,232**

Related U.S. Application Data

[62] Division of Ser. No. 205,094, Dec. 6, 1971, Pat. No. 3,742,493.
[52] U.S. Cl. **340/274, 200/61.64, 340/388**
[51] Int. Cl. **E05b 45/12**
[58] Field of Search **340/388, 274, 283, 391; 200/61.64**

References Cited

UNITED STATES PATENTS

2,295,482 9/1942 Kemp 340/274
2,724,823 11/1955 Toepfer 200/61.64
2,756,300 7/1956 Thiberville 340/274
2,818,475 12/1957 Harry 200/61.64
3,041,601 6/1962 Wetzel 340/388 X
3,056,125 9/1962 Harry 340/274
3,171,115 2/1965 Calabro 340/274
3,196,293 7/1965 Howard 340/274 X
3,284,593 11/1966 Hawkins 340/274 UN X

3,656,156 4/1972 Berns 340/388
3,727,210 4/1973 Hawkins 340/274
3,760,411 9/1973 Youhanaian 340/388

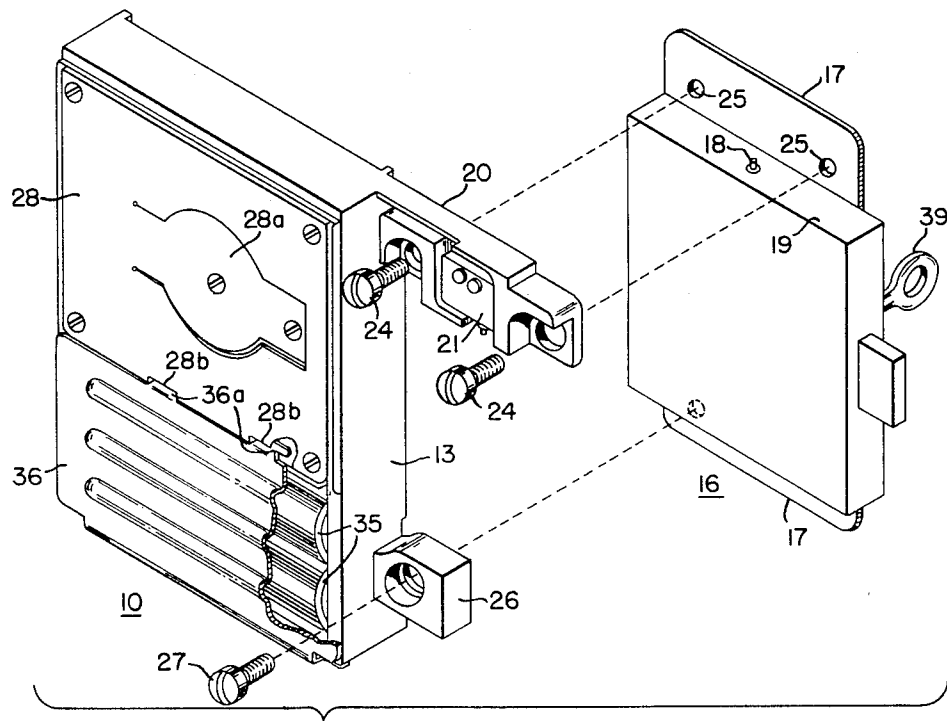
Primary Examiner—Glen R. Swann, III
Attorney, Agent, or Firm—Milton E. Kleinman; Harold S. Wynn

[57] **ABSTRACT**

Audible signal apparatus is provided for manifesting the release of a lock having oppositely disposed mounting flanges and a detent extending through one side of the lock subject to actuation upon an attempt to release the lock. Such apparatus includes an electromagnetic horn having a mounting bracket extending from one side of its housing and adapted for mounting over one of the flanges of the lock. The bracket contains a switch that is subject to actuation by movement of the detent of the lock to control the horn.

The horn has a diaphragm disposed in a recessed portion of one side of the housing and a sounding box for the horn is formed by securing such side of the housing against a flat mounting surface with the sound directed from one end of the housing through the recess.

3 Claims, 5 Drawing Figures



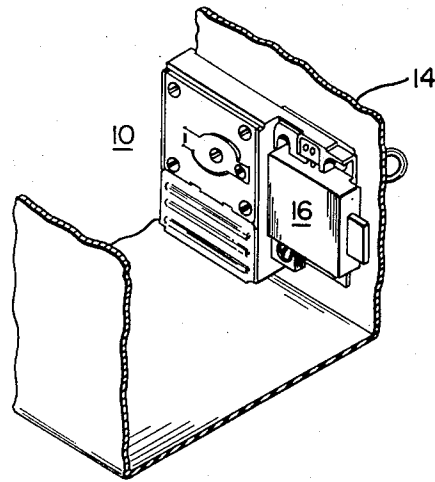


FIG. 4

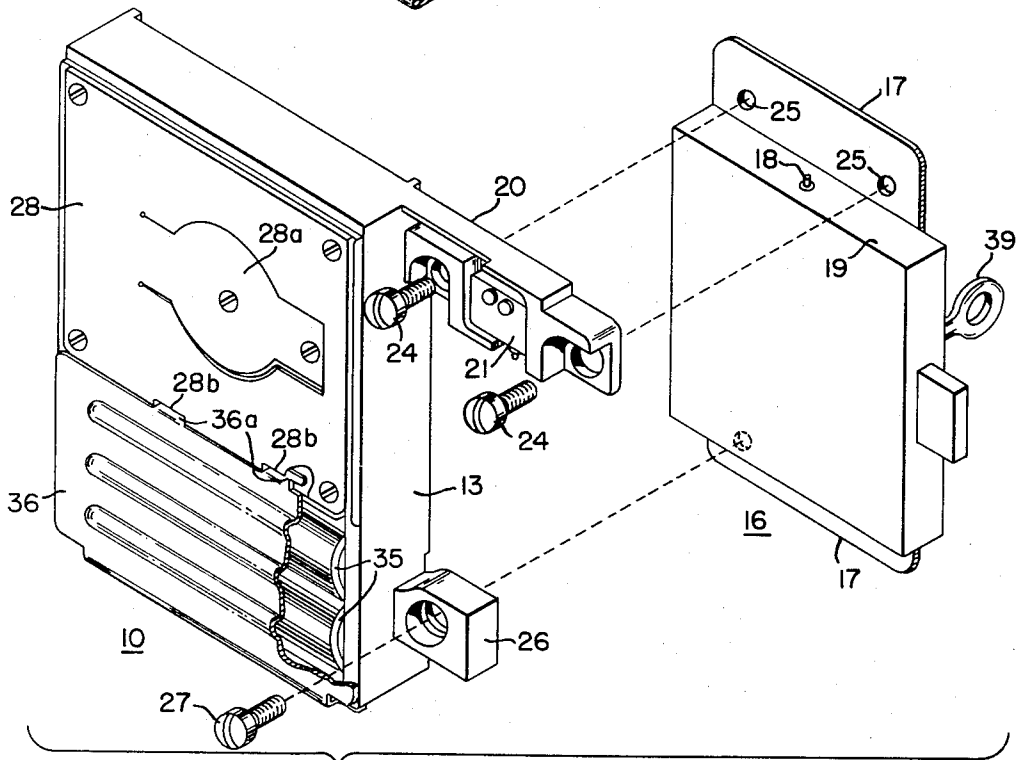


FIG. 1

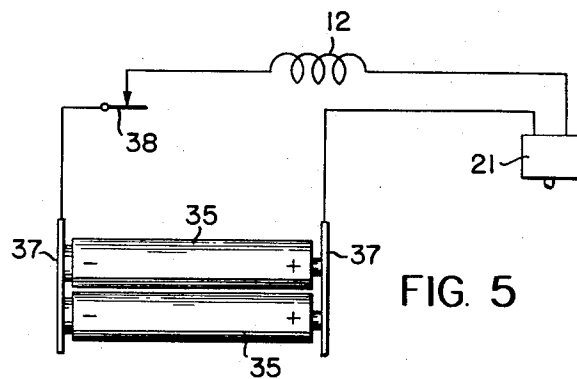


FIG. 5

FIG. 2

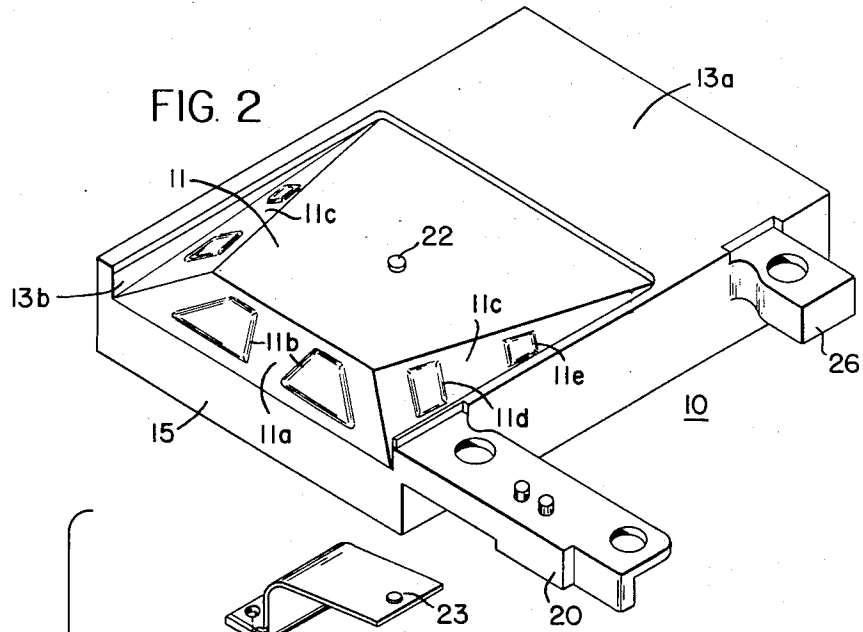
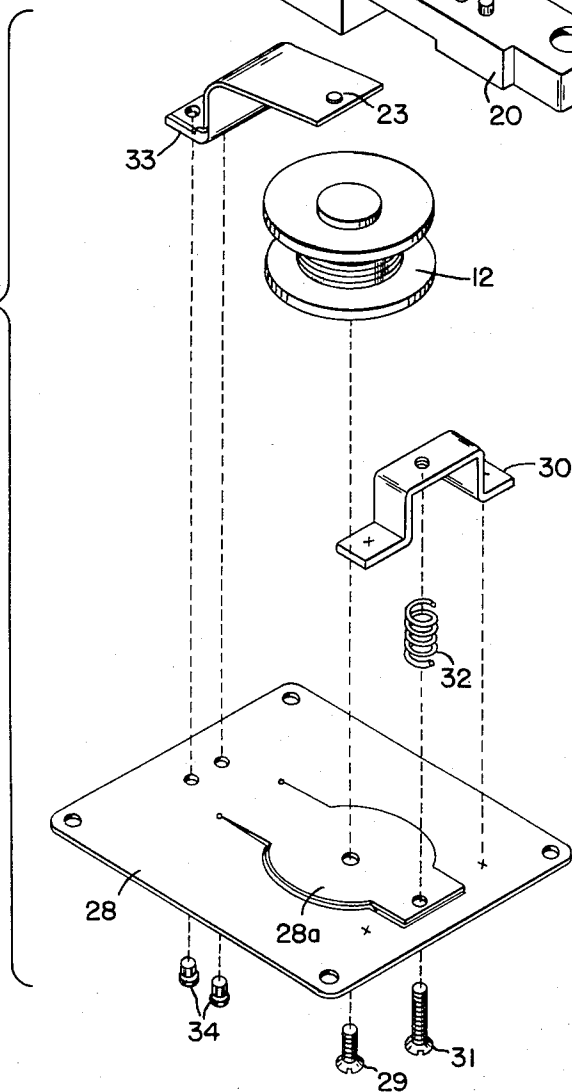


FIG. 3



AUDIBLE SIGNAL APPARATUS

This is a division of application Ser. No. 205,094 filed Dec. 6, 1971 now U.S. Pat. No. 3,742,493.

While the invention is subject to a wide range of applications, it is especially suited for use as audible signal apparatus for manifesting the release of a lock.

The pilferage of coin boxes of pay station telephones in public places has made it necessary to provide some sort of security protection. This has required improvement in the types of locks that are employed, the use of heavier gage material in the construction of the telephones, the use of security guards, and the like. In spite of these precautions, pilferage still exists because it can be accomplished by a pilferer pretending to make a telephone call but at the same time picking the lock of the coin box and removing the coins. Because of the size of an internal receptacle that is used for the coins, there is not sufficient space for a conventional horn between the coin receptacle and its housing for manifesting pilferage.

An object of the present invention is to provide audible signal apparatus that substantially obviates one or more of the limitations and disadvantages of the described prior art security systems.

Another object of the present invention is to provide an improved horn structure that is particularly adapted to be contained in a limited space.

SUMMARY OF INVENTION

Audible signal apparatus is provided including a horn having a diaphragm and an electromagnet for operating the diaphragm. The electromagnet is contained in a substantially shallow housing having the diaphragm secured in one wall of the housing and the electromagnet secured in another wall of the housing opposite the diaphragm. Part of the wall of the housing containing the diaphragm is recessed, the recessed portion extending through an end wall of the housing to permit transmission of sound in a direction normal to vibratory movement of the diaphragm. By this structure, a sound box for the diaphragm can be formed by securing the side of the housing containing the diaphragm against a flat mounting surface wherein sound is directed from the housing through the recess.

The horn is adapted by brackets extending from one side thereof to be secured along with flanges of a lock to a flat surface, and a microswitch is included in one of the brackets for actuation by the lock to control energization of the horn.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description, taken in connection with the accompanying drawings, while its scope will be pointed out in the appending claims.

FIG. 1 is a perspective view, with some parts broken away, showing audible signal apparatus according to a preferred embodiment of the present invention;

FIG. 2 is a view in perspective of the back-side of the horn shown in FIG. 1;

FIG. 3 is a view in exploded perspective of the operating mechanism of the horn shown in FIGS. 1 and 2;

FIG. 4 is a view in perspective of audible signal apparatus of FIG. 1 secured to an inner wall of a container; and,

FIG. 5 is a circuit diagram showing wiring connections for the horn of FIG. 1.

With reference to FIGS. 1, 2 and 3, audible signal apparatus is disclosed according to a preferred embodiment of the present invention including a horn 10 having a diaphragm 11 and an electromagnet 12 for operating the diaphragm. The electromagnet 12 is contained in a substantially shallow housing 13, one side of the housing 13 having a diaphragm 11 formed in a recessed portion of one wall 13a of the housing 13 and the electromagnet is secured in another wall of the housing 13 opposite the diaphragm 11. The recessed portion of the wall 13a including the diaphragm 11 extends through the left-hand end of the housing 13 as viewed in FIG. 2 to permit transmission of sound in a direction normal to vibratory movement of the diaphragm 11.

By this construction, when the horn 10 is secured to a flat surface such as to a wall 14 (see FIG. 4) of a telephone coin box, a sounding box is formed including the diaphragm 11 and the wall 14 to which the horn 10 is secured so that sound is directed from a recessed portion 13b of the horn 10 extending through an end 15 of the housing 13.

With reference to FIG. 4, the horn 10 is illustrated as being provided for manifesting the release of a lock 16 having oppositely disposed mounting flanges 17 and a detent 18 extending through a side 19 of the lock mechanism. The housing 13 of the horn 10 has a mounting bracket 20 extending from one side of the housing for mounting over the upper flange 17 as shown in FIG. 1. The bracket 20 includes a microswitch 21 for actuation by the detent 18 of the lock 16.

The housing 13 is shallow and rectangular in shape and is preferably formed of plastic wherein the diaphragm 11 is integral with the housing and is slightly recessed into the side 13a. The central portion of the diaphragm 11 is in a plane parallel to the side 13a but slightly recessed therefrom. This central portion of the diaphragm is tapered toward the left-hand end of the housing 13 as viewed in FIG. 2, with the left end portion of the diaphragm 11 flared downwardly at 11a to the base of the recess 13b and to the end 15 of the housing 13. This end portion 11a may have a plurality of depressions 11b formed therein which may be the same size as illustrated in the drawing or may be of different sizes to generate different frequencies. Similarly sides 11c of the diaphragm 11 may be flared downwardly to the outer limits of the recessed area 13b as shown in FIG. 2. These flanged portions 11c may also have depressions for generating different frequencies such as the depressions 11d and 11e. The diaphragm 11 has a centrally located fixed contact point 22 which cooperates with a movable contact 23 (see FIG. 3) of a circuit breaker mechanism.

With reference to FIGS. 1 and 4, the housing 13 has an upper mounting bracket 20 with openings formed therein to receive mounting screws 24 for securing the horn 10 against the flat surface 14 through screw holes 25 in the lock 16. Similarly, a lower bracket 26 is secured to the wall 14 by a screw 27.

The wall of the housing opposite the diaphragm 11 includes a plate 28 having a central tongue 28a formed therein as shown in FIG. 3 for adjustably supporting the electromagnet 12. The electromagnet 12 is secured to the central portion of the tongue 28a by a screw 29, and the tongue is made adjustable by a U-shaped bracket that is suitably secured to the inside of the plate 28 as by welding, the bracket 30 having a central open-

ing for receiving a screw 31. A compression spring 32 is provided between the tongue 28a and the bracket 30 for permitting the screw 31 to adjust the offset of the tongue 28a from the inner surface of the plate 28.

A circuit breaker including movable contact 23 is disposed between the electromagnet and the diaphragm, such contact being on a bracket 33 that is suitably secured as by rivets 34 to the plate 28. The bracket 33 is preferably of magnetic material, or at least has a plate of magnetic material that is subject to attraction by the electromagnet 12.

With reference to FIG. 1, the lower portion of the housing 13 has a battery compartment containing batteries 35. The battery compartment is closed by a ribbed cover 36 having hinges 36a that are locked normally between an internal wall in the housing 13 separating the battery compartment from the horn mechanism and slots 28b cut in the plate 28. This permits the changing of the batteries. The batteries 35 are connected in parallel as shown in FIG. 5 by contact strips 37 inserted in the battery compartment at the ends of the batteries. According to the schematic diagram of FIG. 5, the batteries provide energization for the electromagnet 12 through a circuit breaker 38 and through microswitch 21 in series. The circuit breaker 38 comprises movable contact 23 cooperating with fixed contact 22 in the diaphragm 11.

The lock 16 is shown in its normally engaged position, and in this position the contacts of microswitch 21 are open because the detent 18 is in its retracted position. When a key 39 is inserted in lock 16 through the wall 14 of the coin box, and is rotated in a direction to release the lock, the detent 18 is driven upwardly to actuate the microswitch 21 and close a circuit for sounding the horn 10. Energization of this circuit attracts the movable contact 23 which opens the circuit for the horn and the deenergization under these conditions of the electromagnet 12 causes the movable contact 23 to be released and to strike the fixed contact 23 of the diaphragm 11 for actuation of the diaphragm. This recloses a circuit for the electromagnet 12 and thus the horn becomes driven through successive actuations of the diaphragm at a frequency determined by the natural frequency of the diaphragm 11 and by the spacing of the electromagnet 12 from the movable contact 23 as adjusted by the adjustment screw 31. Thus the horn 10 may be adjusted to operate at a fundamental frequency in an approximate range from 100 to 1,500 cycles.

The horn 10 that has been described is a high efficient horn that can provide maximum sound output from power supplied by the batteries contained therein. The construction of the diaphragm 11 to generate a number of different secondary frequencies provides for increasing the sound output of the horn 10 by additive combinations periodically of the different frequencies to produce sound waves of great amplitude.

It is because of the structure permitting the use of the flat mounting surface 14 as one wall of a sounding box for the horn that the horn can be contained in a housing shallow enough to be secured to the wall 14, at the side of lock 16, in a limited space between the wall 14 and a coin receptacle (not shown). Efficiency of the horn is maintained even with these limited dimensions by reason of using the side 14 of the coin box as a part of a sounding box for the horn 10 in combination with

special construction of the diaphragm 11 to direct the sound efficiently from one end of the housing.

The brackets as described for mounting the horn 10 in the preferred embodiment have the particular advantage of mounting the horn 10 by using the same mounting screws that are used for a lock and thus facilitating installation of the horn 10 in existing coin boxes.

Although a preferred embodiment of the horn 10 has been described as adapted particularly to security checking of coin boxes of telephones, it is to be understood the horn 10 can be used in other applications with the mounting means modified to meet the requirements of practice.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein, without departing from the invention, and it is, therefore, aimed in the appending claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. Audible signal apparatus for manifesting a retraction of a lock bolt comprising in combination:

- a. key actuated means for selectively retracting said lock bolt;
- b. lock housing means including therein said lock bolt and having oppositely disposed mounting flanges for securing said lock housing means on a planar surface;
- c. detent means extending through one side of said lock housing means and subject to movement in response to the retraction of said lock bolt;
- d. a shallow housing means for said audible signal apparatus whose major walls are substantially parallel and are coupled together by side walls and end walls;
- e. said shallow housing means including therein a horn having a diaphragm and an electromagnet for operating the diaphragm;
- f. said shallow housing means having a mounting bracket extending in a plane parallel to one major wall thereof and adapted for permitting said bracket to overlap a flange of the lock housing means and yet maintain a major wall of the shallow housing means in the plane of said planar surface to which said lock housing means is secured; and
- g. said bracket having a switch secured thereto in a position to be actuated when said detent is moved to energize said audible signal apparatus.

2. Audible signal apparatus according to claim 1 wherein said shallow housing means has a second bracket extending therefrom adapted for mounting over another flange of said lock housing means.

3. Audible signal apparatus according to claim 1 wherein one of said major walls and one of said end walls have a contiguous cutaway section for providing an opening wherein said diaphragm may be mounted; said diaphragm secured within said cutaway section of said one major wall and said one end wall and with a major planar portion of said diaphragm parallel to, but slightly recessed from, the plane of said one major wall for permitting the transmission of sound in a direction normal to the vibrating movement of said major planar portion of the diaphragm.

* * * * *