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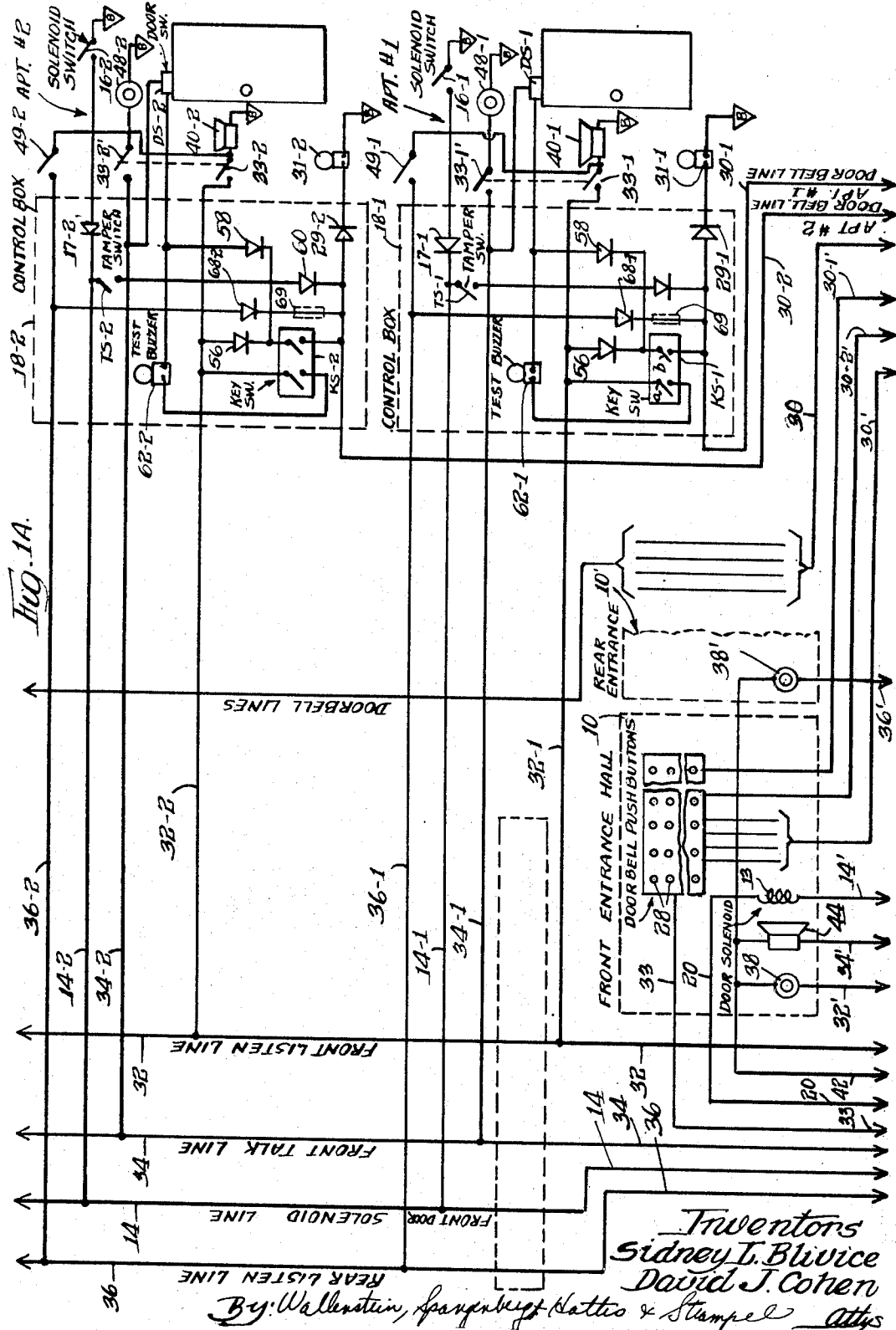
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3,404,393

ALARM SYSTEM

Filed April 1, 1965

6 Sheets-Sheet 1



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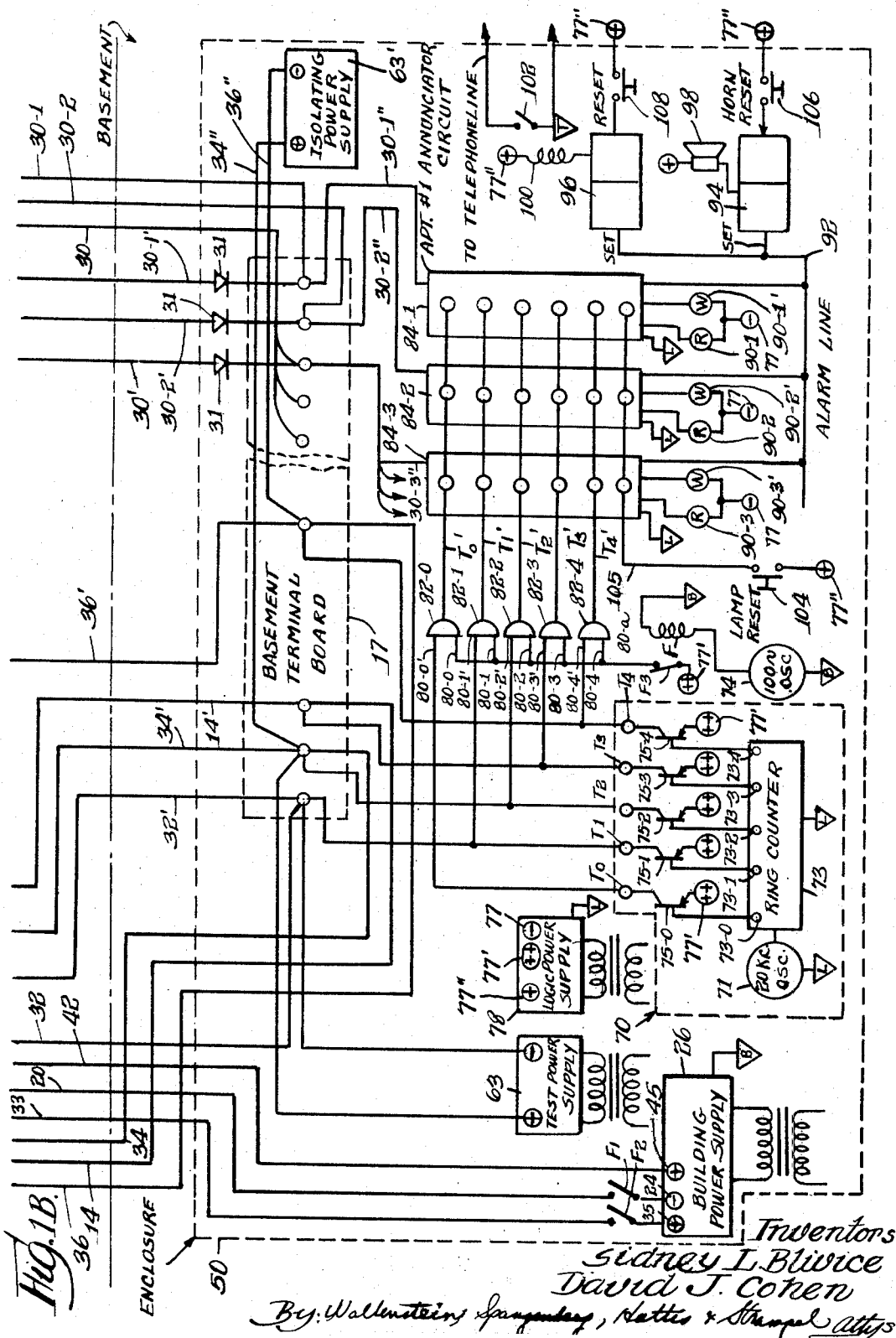
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# ALARM SYSTEM

Filed April 1, 1965

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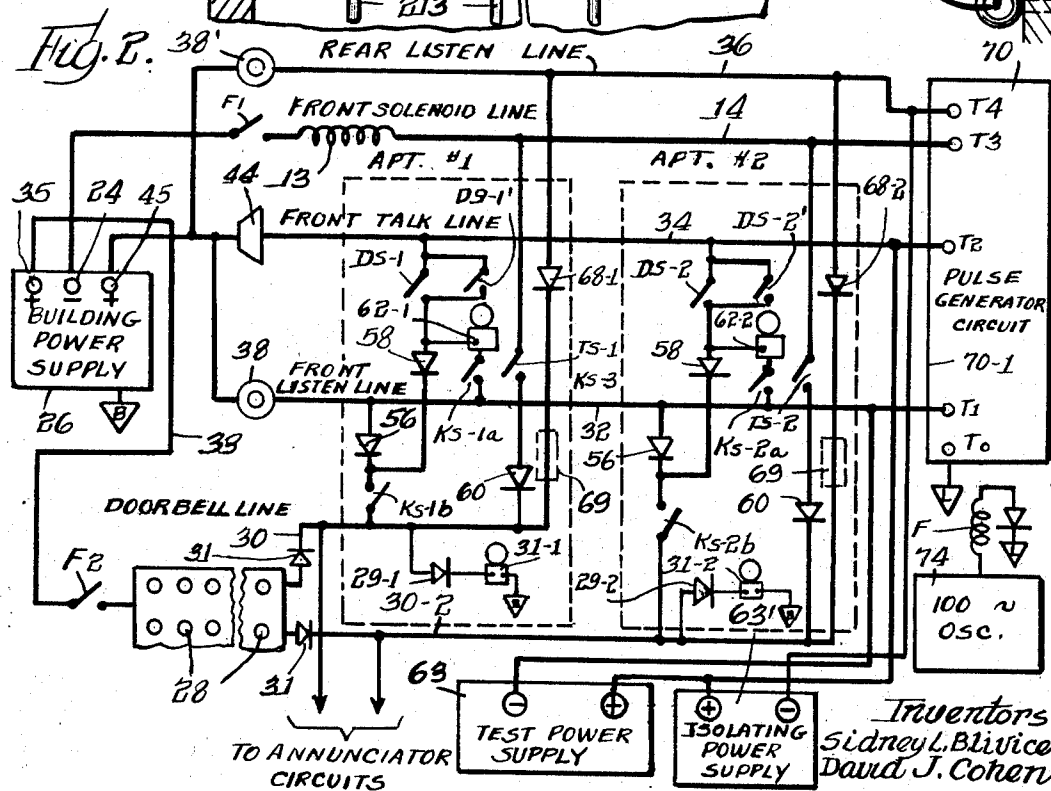
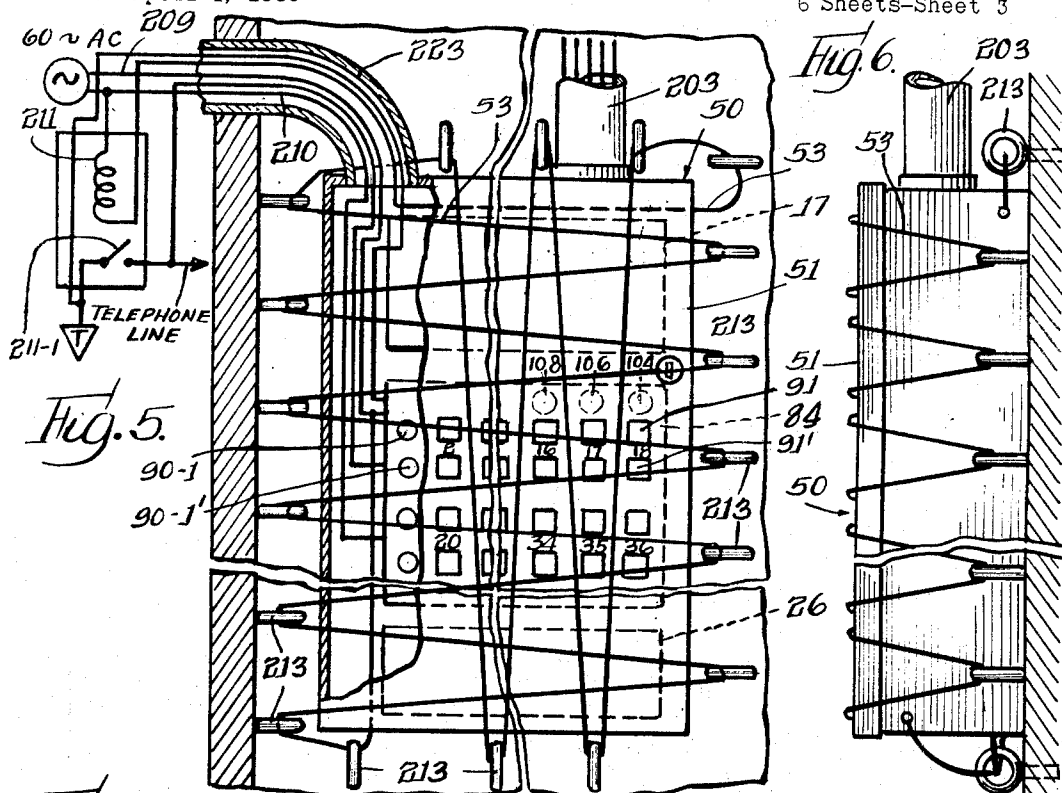
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ALARM SYSTEM

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6 Sheets-Sheet 3



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ALARM SYSTEM

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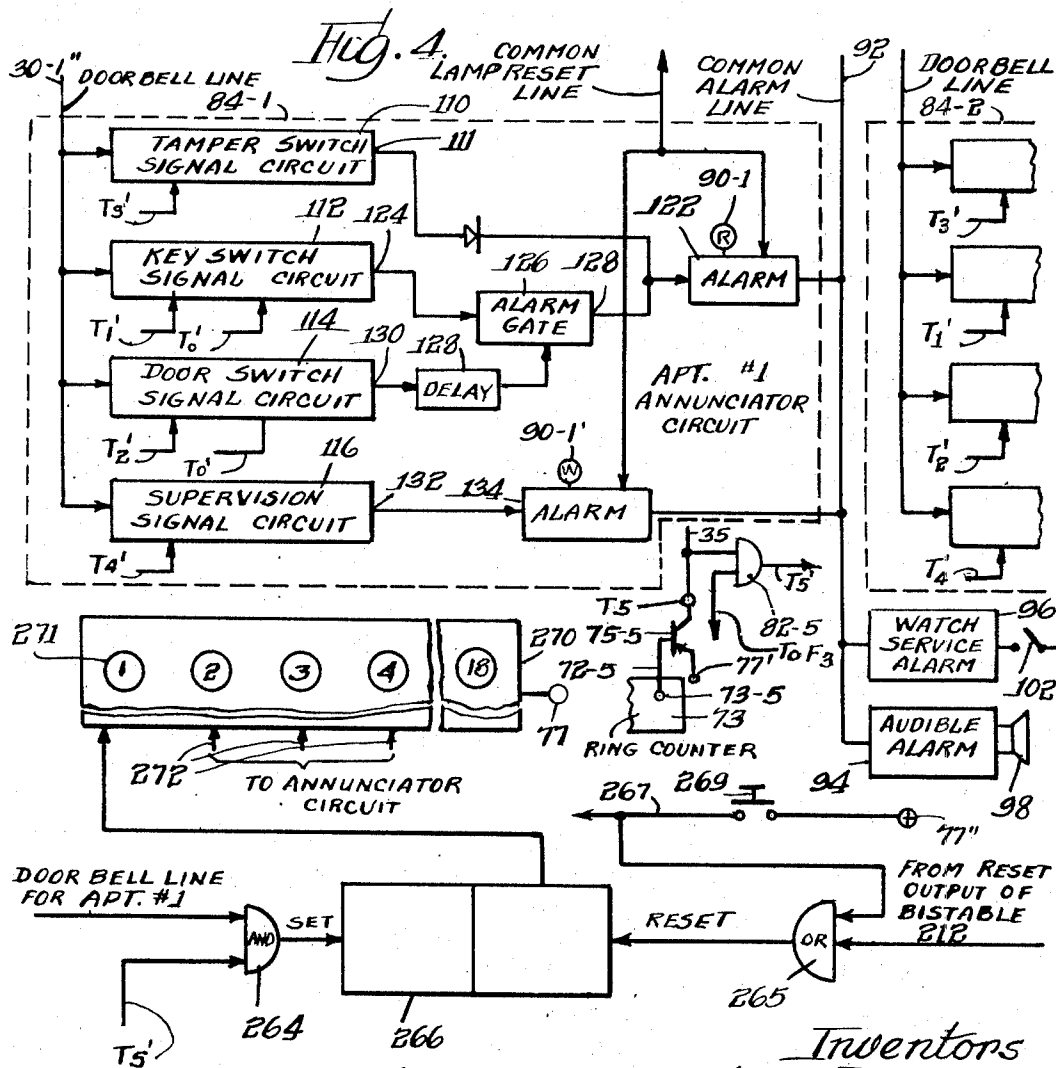
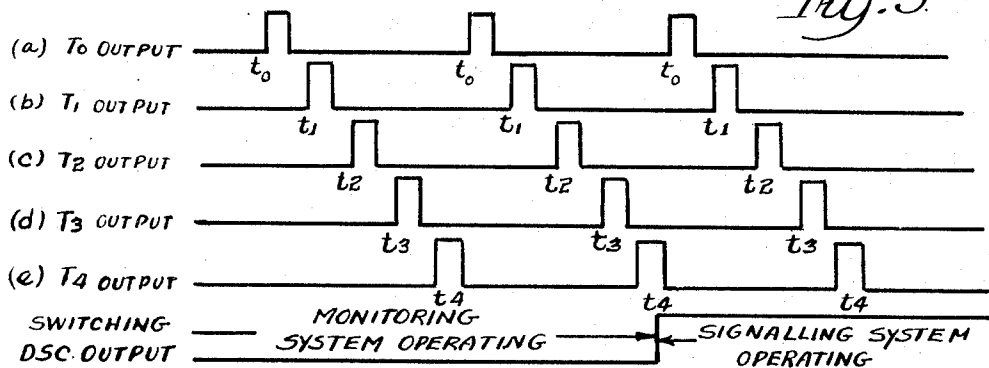


*Fig. 9*

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ALARM SYSTEM

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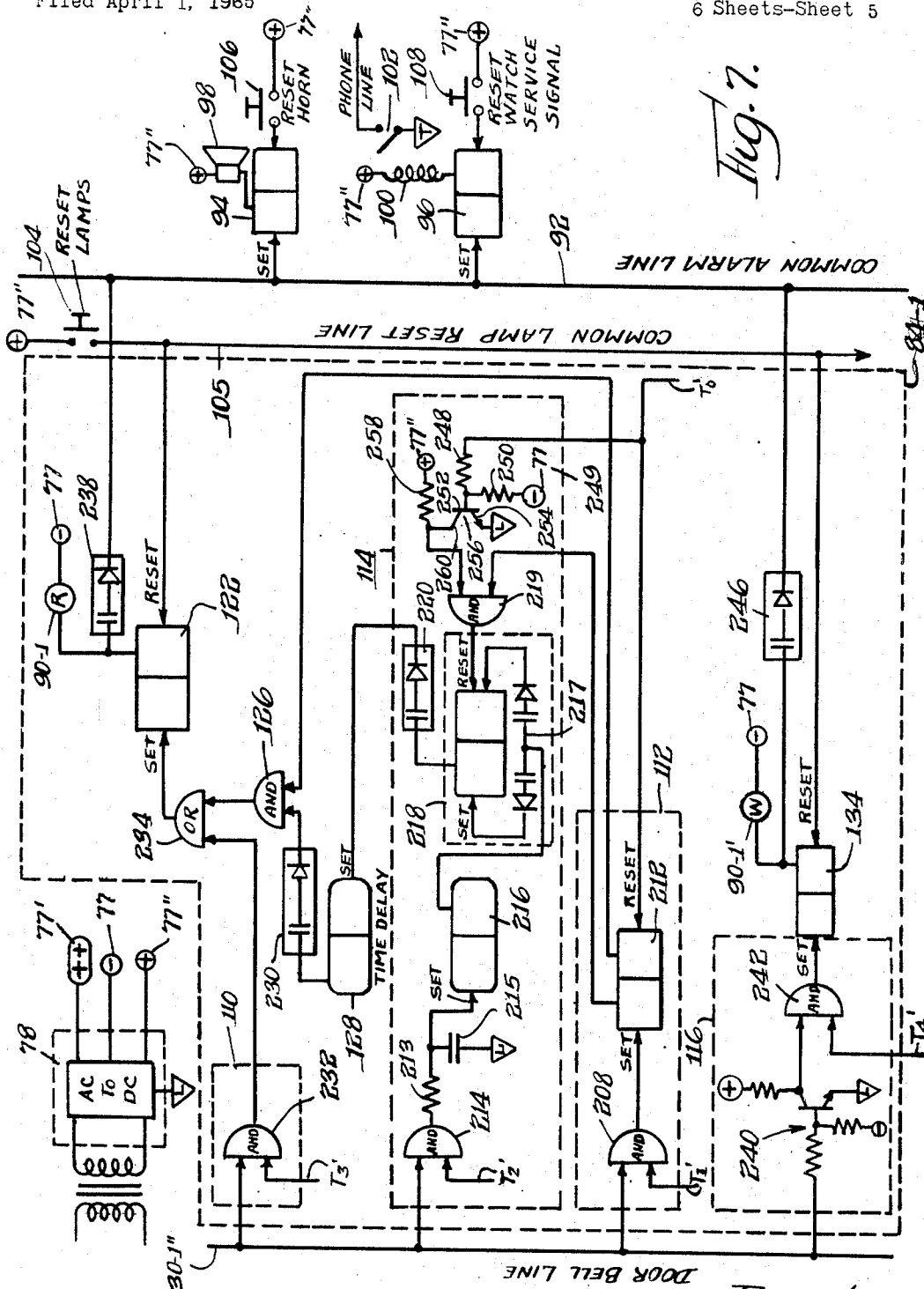


Fig. 7.

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# ALARM SYSTEM

Filed April 1, 1965

6 Sheets-Sheet 6

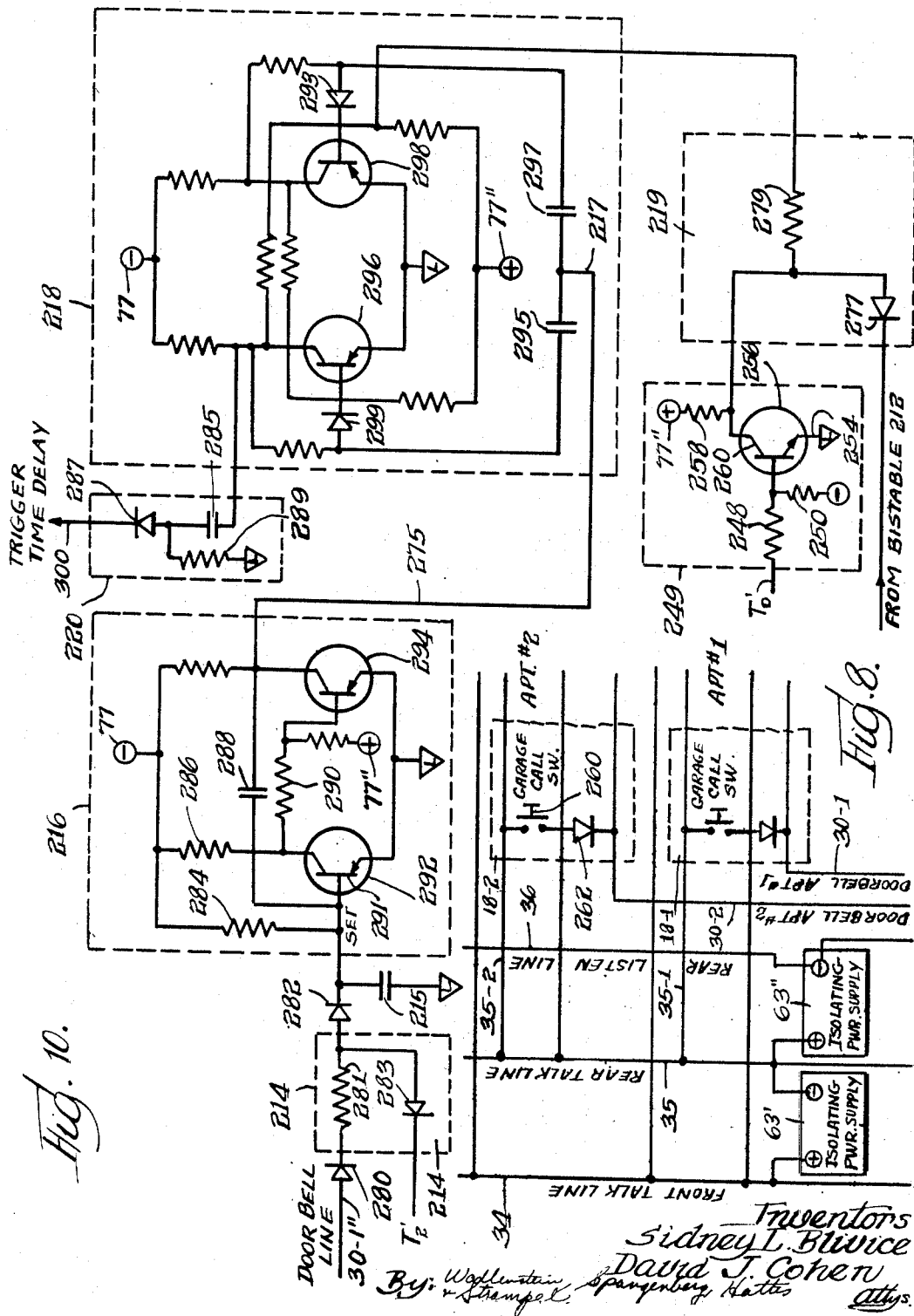


Fig. 8.

20  
 T<sub>2</sub> 2  
 30  
 Twenty  
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3,404,393

## ALARM SYSTEM

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47 Claims. (Cl. 340—276)

The present invention has its most important application to burglar alarm systems for buildings of various kinds, although certain aspects thereof have application to other alarm systems, such as fire alarm systems. The most important application of the invention, however, is in burglar alarm systems for high-rise apartment buildings.

It is well known that burglary is becoming an increasingly serious problem. Burglary of high-rise apartment buildings is a particularly serious problem. To be most effective, burglar alarm equipment should be tied in with a watch service, and it should be easy for the apartment occupant to turn the burglar alarm system on and off when he goes in and out of the apartment without setting off false alarms and without adversely affecting the security of the alarm system. Burglar alarm equipment has been rarely installed in high-rise apartments because of the high cost of the available equipment and/or because such equipment has had many functional deficiencies which make it impractical or ineffective for use by the ordinary apartment occupant.

In high-rise apartments the principal point of entry into an unoccupied apartment is through the doors thereof. Expert burglars have become very adept at picking the locks of these doors (i.e. only about ten seconds are required to pick many of these locks). The simplest system for monitoring these apartments is to monitor the unauthorized opening of the doors thereof, but such a system must distinguish between the opening of the door by the occupant and an unauthorized person in a manner which does not adversely affect the security of the system, and it should be of a relatively low cost to install.

One of the objects of the invention is to provide a burglar alarm system where an alarm is given by the unauthorized entry of a person through the door or window of any apartment and wherein the burglar alarm system provides maximum security at a reasonable cost. Another related object of the invention is to provide a burglar alarm system as just described wherein the occupant can, in a very simple manner, set the alarm into operation when he leaves the apartment and wherein, upon return to the apartment, the burglar alarm system can be readily disabled before false alarm is given in a manner which does not adversely affect the security of the system.

Another object of the invention is to provide a burglar alarm system which provides a higher degree of security at lesser cost than burglar alarm systems heretofore developed.

A further object of the invention is to provide a burglar alarm, fire alarm or other alarm system for an apartment house, office building or the like, which utilizes existing wiring of the building, as, for example, the usual talk, listen, door solenoid and doorbell lines of a high-rise apartment building, and where this wiring of the building is used simultaneously for its normal function as well as for the added alarm functions without interference or interaction between the same. A related object of the present invention is to provide an alarm system as described which can be applied to old or new buildings at a modest cost.

A still further object of the invention is to provide an alarm system as above described where additional alarm or signalling systems can be superimposed thereon at any time at a very modest cost. Thus, in accordance with one aspect of the invention, a garage calling system readily can be incorporated into a burglar alarm system of the present invention at a minimum cost.

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Another object of the invention is to provide a relatively inexpensive alarm system which is substantially tamper-proof.

Where the invention is applied to a burglar alarm system of an apartment building, two or more switches are wired into each apartment, one of the switches being an entry sensing switch like a door switch which is operated to an alarm position when the door is opened and an inoperative position when the door is closed. Although it is common in high-rise apartments to have only one entry door, if additional points of entry are to be monitored in the form of windows or doors, an additional entry sensing switch like the door switch referred to is added and connected in a parallel circuit with the door switch referred to for each entry point to be monitored.

Another of the switches is preferably a key operated switch most advantageously accessible on the outside of a control box in each apartment holding various components and terminals constituting that portion of the burglar alarm system other than the door switch located in each apartment. The key switch includes a key operated lock which takes a much longer time to pick (such as one minute) than the usual key operated lock used on the front door of the apartment involved. The key switch has a burglar alarm preparing position which prepares the alarm system in the apartment for operation and a burglar alarm turn-off position which renders the burglar alarm system of the apartment in an inoperative position. When an occupant leaves his apartment with its key switch in the burglar alarm preparing position, as the door to the apartment is then opened by the occupant, the door switch is operated to its alarm position. A counter is provided for each apartment which responds to the door switch or other entry sensing switch by providing an alarm signal every two times an entry is made to the apartment so that the alarm is not set off when the occupant leaves the apartment. The next (second) time an entry is made to the apartment, the counter initiates an alarm signal which will energize an audible alarm and a line extending to a watch service after a short time delay (like 30 seconds) unless the key switch is operated to its alarm turn-off position within the delay period. Since this period is less than the time it would take a burglar to pick the lock on the key switch, the entry of a burglar into the unoccupied apartment (or an occupied apartment where the occupant had opened the door once before retiring for the night) would trip the alarm system.

In the preferred form of the invention, a tamper switch is incorporated in the control box of each apartment which switch will immediately initiate an alarm if anyone opens the control box.

Still another feature of the invention is the provision of a test circuit which indicates an audible alarm in each apartment as a monitored door or window is opened and remains open provided the key switch is in its burglar alarm preparing position and the system is otherwise operating properly. The absence of such a signal thus indicates to an occupant leaving his apartment that he either forgot to prepare the alarm system for operation or that the system is defective. Since the audible alarm will be sounded also for an unauthorized entry as long as the door or window involved remains opened, such an alarm could frighten a would-be burglar away. The test circuit may comprise a set of contacts of the key switch connected in series with a test buzzer and the door switch between two common lines across which a test power supply is connected. Thus, as the occupant walks out of his apartment, if the key switch is in its alarm preparing position, the door switch will close to energize the test buzzer as long as the door remains open.

Control pulses of a given pulse repetition rate but of different phase are fed to the common lines to which the

key and entry sensing switches are connected so that pulses are fed to the individual doorbell lines at various reference times each cycle to be hereinafter referred to as times  $t_1$  and  $t_2$ . Thus, if the key switch of an apartment is operated to its alarm preparing position, pulses at, say, time  $t_1$  cyclically appear on the associated doorbell of the apartment involved. If the door to an apartment is opened, control pulses cyclically appear on the doorbell line of the apartment involved at, say, time  $t_2$ .

One of the important aspects of the invention is the manner in which the burglar alarm system is superimposed on the common wiring in the building involved to minimize wiring costs. In the preferred form of the invention, the burglar alarm system uses common and individual wiring already used in various signalling circuits to connect the various aforementioned key, door and tamper switches to a central annunciator control station. The common and individual wiring is most conveniently the conventional common door solenoid, listen and talk lines extending between the various apartments and the entrance hallway of the apartment house, and the individual doorbell lines respectively extending to the various apartments. In this regard, it is common to provide in the entrance hall of an apartment house individual doorbell pushbutton switches connected through individual doorbell lines extending to the various apartments where closure of a switch operates the doorbell in the selected apartment. The entrance hallway also frequently has a telephone transmitter unit connected by a common listen line to receiver units in all the apartments for enabling a visitor to converse with the occupant of an apartment, and a receiver unit connected by a common talk line to the transmitter units in all the apartments to enable the visitor to hear the occupant of the apartment involved. Entrance to the interior of the apartment house is usually blocked by an entrance door on an inside wall of the entrance hall. A solenoid operated lock is usually provided for locking the entrance door until the occupant of an apartment presses a solenoid pushbutton switch which releases the lock to the door.

In the most preferred form of the present invention, a set of contacts of each door switch is connected through an isolating rectifier between one of the aforesaid common lines referred to and the doorbell line of the apartment involved. A set of contacts of each key switch are connected through an isolating rectifier between another of the common lines and the doorbell line of the apartment involved.

It is desirable to provide a tamper switch on each control box so that any opening of the box will initiate an alarm. Where a tamper switch is used, a set of contacts thereof is connected through an isolating rectifier between still another one of the common lines to which control pulses of a third  $t_3$  phase are fed to the associated doorbell line. Where a tamper switch is closed due to the opening of the panel on the control box referred to, control pulses having a  $t_3$  phase will appear on the associated doorbell line.

Thus, the presence of a first series of control pulse having a  $t_1$  phase on any given doorbell line indicates that the apartment involved is being monitored. The presence of a first series of control pulses on a doorbell line having a  $t_2$  phase indicates that the door involved has been opened once, and the presence of a second series of control pulses having a  $t_2$  phase on a doorbell line indicates that the door has been opened a second time. The presence of control pulses having a  $t_3$  phase on a doorbell line indicates that the control box in the apartment involved has been opened.

There is located at a central annunciator station in the building involved (usually in the building basement) a logic annunciator circuit for each apartment which responds to the various pulses on the associated doorbell line in the following way: The presence of pulses having a  $t_1$  phase resulting from the operation of the key switch

of the apartment to its alarm preparing position will activate a counter of the apartment involved so that presence of two spaced series of pulses having a  $t_2$  phase indicating two successive openings of the apartment door will initiate an alarm control signal which will result in the sounding of an audible alarm to alert the manager of the building involved and the signalling of a watch service or police station provided the  $t_1$  phase pulses on the doorbell line involved do not disappear within the time delay period referred to previously.

The presence of pulses at time  $t_3$  due to the operation of the tamper switch to an alarm position will immediately effect an alarm for that apartment involved independently of the position of the associated key switch. In this manner, close control is kept over the opening of the control box and maid help or others could not tamper with the control box while the key switch happened to be in a burglar alarm turn-off condition and disable the equipment without setting off an alarm. When authorized personnel are to gain access to the control box, notice of this fact will be given to the building management as well as a watch service so that any alarm will be ignored during the access period.

Still another aspect of the invention deals with the provision of a supervision control over the individual lines carrying the control signals from the various apartments, such as the doorbell lines. Pulses at a special reference phase, such as a time  $t_4$  each cycle are continuously coupled through a common line and an isolating rectifier in each apartment to each doorbell line. An annunciator circuit is provided at the aforesaid control annunciator station which gives a distinguishing alarm for the apartment involved when the  $t_4$  pulses are absent from a doorbell line evidencing the severing of a doorbell line or other defect in the alarm system.

Other aspects of the invention, including the manner in which interactions between the signalling circuits of the apartment building and the monitoring system of the invention superimposed thereon are minimized or prevented will be described in the specification to follow. Also, it will be appreciated that some aspects of the invention are applicable to individual homes and to fire alarm and other monitoring systems.

In the drawings:

FIGS. 1A and 1B together form a partial wiring diagram of an apartment house showing the wiring normally found therein and the exemplary burglar alarm system of the present invention superimposed thereon;

FIG. 2 is a cross-the-line diagram of part of the system shown in FIGS. 1A and 1B;

FIG. 3 is timing diagram showing various timing voltages utilized in the embodiments of FIGS. 1 and 2;

FIG. 4 is a basic block diagram of the annunciator circuit associated with each apartment;

FIG. 5 is a front view of the central enclosure which houses many of the basic components making up the annunciator and timing circuits;

FIG. 6 is a side view of the enclosure of FIG. 5;

FIG. 7 is a more detailed diagram of the logic circuit elements making up the annunciator circuit shown in FIG. 4;

FIG. 8 is a fragmentary view of FIG. 1 with a garage calling system added thereto;

FIG. 9 shows the logic circuit elements which are tied in with the circuit shown in FIG. 8 to complete the garage calling circuit; and

FIG. 10 is a circuit diagram for a part of the logic circuit shown in FIG. 5.

## GENERAL DESCRIPTION

Referring to FIGS. 1A and 1B which include a typical wiring diagram for the communication doorbell and door opening signalling circuits for a high-rise apartment building. These signalling circuits extend between the

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entrance hall 10 (FIG. 1A) of the building and various apartments identified by numbers 1, 2, etc. As is common, the entrance hall has an entrance door (not shown) on an inner wall thereof which blocks entrance to the interior of the apartment building beyond the entrance hall. The door is normally kept in a locked position by a lock operated by a solenoid 13. When the solenoid is energized, the lock is released which permits the door to be opened.

The bottommost terminal of the solenoid 13 in FIG. 1A is connected to a common front door solenoid line 14' extending to a terminal board 17 in the basement. A continuing section 14 of the common solenoid lines extend from the terminal board to the various apartments through individual branch lines 14-1, 14-2, etc. Normally, the branch lines 14-1, 14-2, etc. extend directly to the respective door solenoid operating pushbutton switches 16-1, 16-2, etc. in the various apartments which, when operated, place building ground on the line 14. However, in the present invention the branch lines 14-1, 14-2, etc. extend through isolating rectifiers 17-1, 17-2, etc. in alarm control boxes 18-1, 18-2, etc. in the respective apartments. The alarm control boxes contain various circuit elements to be described and all of the special burglar alarm wiring found in each apartment (except for a door switch to be described) which in conjunction with the conventional wiring extending between the apartment's entrance hall and basement and other special components preferably located in the basement of the building, complete the burglar alarm system.

Normally, the solenoid 13 is designed to operate on either alternating current or direct current, alternating current being the most commonly used source of power for operation of the solenoid 13. However, in the preferred form of the invention, the upper terminal of the solenoid 13 is connected through a line 20 and a relay contact F1 (FIG. 1B) or other switch to the negative terminal 24 of the direct current building power supply generally indicated by reference numeral 26. It should be understood that the present invention is not limited to the use of any particular power supply, but in the embodiment of the invention to be illustrated, the terminal 24 will be assumed to have a negative voltage, such as a negative 14 volts DC, with respect to building ground B. (Building ground is utilized to indicate a reference or ground point which is different from another ground point to be referred to as logic ground L.)

As will appear, the switch F1 is opened and closed for equal half cycle intervals at a relatively low frequency, such as 100 cycles per second. The closure time of the switch F1 and the frequency at which the switch is opened and closed is adjusted so that the average direct voltage appearing on the line 20 will provide the necessary voltage to operate the door solenoid 13 when any door solenoid switch 16 is closed.

Also located in the entrance hall 10 are individual doorbell ringing pushbutton switches 28. Each of the doorbell switches has one terminal connected to an individual doorbell line 30-1', 30-2', etc. extending through isolating rectifiers 31 to the basement terminal board 17 and through an extension line 30-1, 30-2, etc. to the particular apartment involved. In FIG. 1A doorbell line 30-1 extends to apartment No. 1 and doorbell line 30-2 extends to apartment No. 2, etc. The individual doorbell lines respectively extend through isolating rectifiers 29-1, 29-2, etc. in the respective control boxes 18-1, 18-2, etc. to the doorbells 31-1, 31-2, etc. which are connected to building ground. The other terminals of the doorbell switches 28 are connected by a common line 33 through an oscillating switch F2 opening and closing with the aforesaid switch F1 to the positive terminal 35 of the building power supply 26.

In the exemplary form of the invention, the voltage on the terminal 35 may be, for example, 20 volts positive with respect to building ground B. Assuming the switch F2 will be opened and closed for equal intervals, the

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average voltage on the common line 33 will be roughly 10 volts, which is sufficient to energize the usual doorbells. It is assumed that the doorbells 31 are conventional doorbells designed to operate on 60 cycles A.C. current. When the present invention is utilized in an already existing building having such doorbells, the periodically interrupted direct current on the common line 33 will operate such A.C. doorbells since the armatures of the doorbells are designed to oscillate at frequencies in the neighborhood of 60-120 cycles per second.

As will appear, the present invention utilizes individual control lines associated with the apartments, such as the doorbell lines 30, for carrying various control signals to annunciator circuits to be located preferably in the basement of the building.

In addition to the front door solenoid line 14, which is in common with all of the apartments, FIG. 1A shows three other common lines, namely a common listen line 32, a common talk line 34, and a rear listen line 36. The listen line 32 is connected to branch lines 32-1, 32-2, etc. to normally open manual switches 33-1, 33-2, etc. connected to grounded receiver units 40-1, 40-2, etc. in the various apartments. The listen line 32 extends to the terminal board 17 in the basement and an extension line 32' to the bottom terminal of a transmitter unit 38 in the entrance hall 10 which enables a visitor to talk to an occupant of an apartment. The upper terminal of the transmitter unit 38 is connected by a line 42 to a positive terminal 45 on the building power supply. The usual direct current voltage for operating the various transmitters and receiver units is present on the terminal 45. The terminal 45 of the building power supply may, for example, be in a positive voltage of 16 volts DC with respect to building ground.

The talk line 34 is connected by branch lines 34-1, 34-2, etc. to normally open manual switches 33-1, 33-2, etc. connected to grounded transmitter units 48-1, 48-2, etc. in the various apartments. The talk line 34 extends to the terminal board 17 in the basement and through an extension line 34' to the bottom terminal of a receiver unit 44 in the entrance hall whose upper terminal is connected to the common line 42 leading to building power supply terminal 45.

As previously indicated, when the occupant of a building hears the ringing of his doorbell, he goes to the location of his transmitter and receiver units 48 and 40 and presses a pushbutton or the like which simultaneously closes the switches 33-1 and 33-1'.

In the apartment building being described, in addition to a front entrance hall 10 there is a rear entrance 10' with similar communicating units, such as a transmitter unit 38'. The aforementioned rear listen line connects with the bottom terminal of the transmitter unit 38' through the basement terminal board 17 and extension line 36'. The upper terminal of the receiver unit is connected to the power supply conductor 42 leading to the power supply terminal 45. The rear door listen line 36 is connected by branch lines 36-1 and 36-2 to respective manually operable switches 49-1, 49-2, etc. in the various apartments which are connected to the ungrounded terminals of the receiver units 40-1, 40-2, etc. in the various apartments.

In a modern apartment building, the various common and individual lines 14, 30, 32, 34 and 36 are commonly carried in conduits embedded within concrete posts or risers extending down into the basement. In the preferred form of the invention, the conduits extend to a large enclosure 50 illustrated by the dashed box 50 in FIG. 1B and shown in FIGS. 5 and 6, which enclosure has a key locked front door 51. The building power supply 26, the terminal board 17 and various annunciators and other components for the burglar alarm system are locked in this enclosure. In a manner to be described, a normally energized conductor 53 is closely wrapped over the entire exposed area of the enclosure 50 and the door 51 thereof so that easy entry to the box requires severance of the

conductor and interruption of a supervisory current flowing therein.

In the description to follow, reference should first be made primarily to FIG. 2, which is a simplified across-the-line diagram of cost of the circuitry shown in FIG. 1A and some of the circuitry shown in FIG. 1B.

In the illustrated form of the present invention applied to a high-rise apartment, there is provided in each apartment at least one entry sensing means for each entry point to be monitored, such as a door switch DS-1 or DS-2, etc. an alarm preparing switch such as a key switch KS-1, or KS-2, etc. and a tamper switch TS-1 or TS-2, etc. In the broadest aspect of the invention, the switches could be electronic switches or mechanical switches as illustrated. The mechanical switches are open in their inoperative positions and closed in their operative control signal producing positions as will appear from the description to follow. In the claims, reference is made to a "condition" of a switch which term generically will represent a state of a mechanical and/or an electronic switch.) FIG. 2 also shows an additional entry sensing or door switch DS-1' or DS-2', etc. in parallel with each door switch and represents a back door, a window operated switch or the like which operates in the same way as the door switches DS-1 and DS-2, etc. Thus, each illustrated switch is closed when the door or window involved is opened and is open when the door or window is closed.

Each key switch KS as illustrated has two sets of contacts to be respectively identified by reference characters KS-1a and KS-1b or KS-2a and KS-2b, etc. Each key switch is provided with a key receiving lock exposed on the outside of the control box 18-1 or 18-2, etc. of the associated apartment. This lock is a much more expensive lock than the lock normally used on apartment doors, so that it would take even an expert burglar a much longer time to pick, such as a time in the neighborhood of one minute or longer. In the circuit being described, each of the key switch contacts will be open when the key switch is in a normal burglar turn-off position and will be closed when the key switch is turned to a burglar alarm preparing position.

The control box 18-1 or 18-2, etc. of each apartment is located in a position such that the occupant entering by a front or rear door could, without rushing, gain access thereto in a relatively short time which is much less than would be required for a burglar to enter the apartment by a window or door and then pick the lock of the key switch. The control box is most advantageously provided with a door (not shown) which in its opened condition opens the associated tamper switch TS-1 or TS-2, etc. and in its closed condition closes the tamper switch.

The key switch contacts KS-1b or KS-2b, etc. are connected through an isolating rectifier 56 between the front listen line 32 and the associated doorbell line. The rectifier 56 is arranged to pass a positive voltage appearing on the listen line 32 to the doorbell line. The entry sensing or door switch, such as DS-1 or DS-2, etc. of each apartment is connected through an isolating rectifier 58 and the key switch contacts KS-1b or KS-2b, etc. between the front talk line 34 and the associated doorbell line, the rectifier passing a positive voltage appearing on the talk line 34. The tamper switch TS-1 or TS-2, etc. in each apartment is connected through an isolating rectifier 60 between the front solenoid line 14 and the associated doorbell line, the rectifier passing a positive voltage appearing on the solenoid line 14. An isolating rectifier 68-1 or 68-2 is connected directly between the rear listen line 36 and each doorbell line.

Each apartment includes a test circuit connected between two of the common lines, such as the talk and listen lines 34 and 32. Each test circuit comprises a test buzzer 62-1 or 62-2, etc. located in each control box 18-1 or 18-2, etc. and associated key switch contacts KS-1a or KS-2a, etc. connected in series with the associated entry sensing or door switch DS-1 or DS-2, etc. Closure of this circuit connects the associated buzzer across the lines

32 and 34. A direct current test power supply 63 mounted in the basement enclosure 50 is connected across the common lines 32 and 34, the positive terminal thereof being connected to the talk line 34 and the negative terminal thereof being connected to the listen line 32. Thus, opening of a door or window in any apartment in which the key switch is in a burglar alarm preparing position will sound the associated test buzzer while the door or window involved remains open unless there is a broken line or other failure in the system.

In a manner to be described, positive control pulses of the same non-audible pulse repetition rate but of different phase are fed to the various common lines 14, 32, 34 and 36 referred to. Due to the non-audible rate of the pulses appearing on the talk and listen lines, the pulses will not be heard on the various receiver units referred to. Some isolation from these pulses is provided by utilizing a ground (logic ground L) isolated from building ground, but some interconnections of these grounds can occur and so the non-audible rate further minimizes the problems of noise introduction into the talk and listen lines. Thus, as shown in FIG. 2, a pulse generator circuit 70 is provided with output terminals T1, T2, T3 and T4 at which positive pulses appear relative to logic ground L having the various phases shown in waveforms *b*, *c*, *d* and *e* of FIG. 3 and referred to as phases *t1*, *t2*, *t3* and *t4*. The pulse generator also has an output terminal T at which reset pulses having a phase *t0* appear. The output terminals T1, T2, T3 and T4 are respectively connected to the respective common lines 32, 34, 14 and 36.

It is thus apparent that when any key switch KS is operated to its burglar alarm preparing position, positive pulses (relative to logic ground L) having phase *t1*, appear on the doorbell line of the apartment involved. Likewise, when a monitored door or window of any apartment is opened resulting in the closure of the associated entry sensing switch DS, positive pulses having phase *t2* appear on the associated doorbell line provided the associated key switch is in a burglar alarm preparing position, and when the door to any of the control boxes 18 of any apartment is opened, the associated tamper switch will close to couple positive pulses having phase *t3* to the associated doorbell line. The positive control pulses having the phase *t4* on the common line 36 are continuously coupled through the isolation rectifier 68 to the doorbell lines associated with each apartment.

As illustrated in FIG. 1B, the pulse generator circuit 70 includes an oscillator 71 connected to logic ground L and operating at a non-audible pulse, a repetition rate, such as 20 kilocycles per second. The output line of the oscillator 71 is fed to a conventional ring counter 73 having output terminals 73-0, 73-1, 73-2, 73-3, and 73-4, at which respective pulses appear shown in waveforms *a*, *b*, *c*, *d* and *e* in FIG. 3 at times *t0*, *t1*, *t2*, *t3* and *t4* each cycle. The *t0* phase pulses carry out a resetting operation in the annunciator system to be described in detail later on in the specification. The aforementioned output terminals of the ring counter 73 are connected respectively to the base electrodes or switching transistors 75-0, 75-1, 75-2, 75-3 and 75-4 whose emitter electrodes are connected to a positive terminal 77' of the logic power supply 78, operating with respect to logic ground L. The collector electrodes of the aforementioned transistors are connected to the aforesaid outputs terminals T0, T1, T2, T3 and T4 of the pulse generator circuit 70. At times, *t0*, *t1*, *t2*, *t3* and *t4* of each cycle of operation of the ring counter, a gating voltage sequentially appears at the output terminals thereof which effect momentary conduction of the transistors 75-0, 75-1, 75-2, 75-3 and 75-4 which couples the positive voltage of the power supply terminal 77' to the associated terminals T0, T1, T2, T3 and T4.

In a manner to be explained, a logic annunciator system to be described is connected to the various doorbell lines to provide various alarm operation, depending on the presence and absence of pulses of various phases on the doorbell lines.

As previously indicated, the various common lines 32, 34, 14 and 36 are energized from the building power supply 26 during the operation of the various doorbell, solenoid, and talk and listen switches in the entrance hall or the apartments. It is extremely important to avoid interaction between the signalling and annunciator circuits involved, such interaction being surprisingly possible under various circumstances (despite the use of isolating rectifiers and isolated grounds in the absence of features to be described through various circuit paths extending) through the various apartments, power supplied, etc. The sequential pulsing of the various common lines materially aids in preventing such interaction, but other features are further needed to minimize or eliminate this interaction.

In accordance with another aspect of the invention, a switching system is provided which alternately renders the signalling circuits and the annunciator system operative at a switching rate which is much lower than the pulse repetition rate of the pulses generated by the pulse generator circuit 70 so that a time sharing of the building wiring is achieved which permits both the signalling and annunciator to operate. As illustrated, this switching system includes an oscillator 74 which operates, for example, at 100 cycles per second. This oscillator alternately energizes and de-energizes relay F controlling the aforementioned contacts F1 and F2 to alternately connect and disconnect the terminals 24' and 35 of the building power supply to and from the associated common line 14 and the doorbell lines 30.

When the contacts F1 and F2 are closed to render the associated signalling circuits operative, it is important to disable the operation of the annunciator system. Accordingly, referring to FIG. 1B, the relay F has a set of contacts F3 which are open when contacts F1 and F2 are closed and are closed when the latter contacts are open. The contacts F3 alternately connect and disconnect the positive terminal 77 of the logic power supply 78 to and from one of the inputs 80-0, 80-1, 80-2, 80-3 and 80-4 of a series of "AND" gates 82-0, 82-1, 82-2, 82-3 and 82-4 having second inputs 80'-0, 80'-1, 80'-2, 80'-3 and 80'-4 respectively connected to the output terminals T0, T1, T2, T3 and T4 of the pulse generator circuit 70. The "AND" gates couple control pulses on the latter terminals only when the gate inputs 80-0, 80-1, etc. receive a positive gating voltage through the relay contact F3. The control pulses coupled through the "AND" gates are fed and gating lines T0', T1', T2', T3' and T4' to the various annunciator circuits 84-1, 84-2, etc. where they operate various circuits thereof to be described. The annunciator circuits cannot operate in the absence of these pulses.

To realize the necessity of disconnecting the building power supply 26 from the doorbell line 30 and the common line 14 while the annunciator circuits are operable, it must be recognized (see FIG. 2) that interline impedance exists between the common listen line 32 and a doorbell line 30 in the form of transmitter 38, when the associated doorbell switch 28 is depressed, and between common solenoid line 14 and common line 32 in the form of solenoid 13 and transmitter 38 in series. It should further be noted that an interline impedance exists between a first and a second doorbell line 30 in the form of the doorbell connected to the first doorbell line, when the doorbell switch 28 of the second doorbell line is closed.

If the contact F2 were closed while the annunciator circuit is operative, and if the input impedance of an annunciator circuit connected between a doorbell line 30 and logic ground L is much greater than the impedance of the transmitter 38, the  $t_1$  pulses at pulse generator terminal T1 will create a false signal on doorbell line by being coupled to said doorbell line of each apartment having its associated doorbell pushbutton 28 depressed through a path extending through transmitter 38 into power supply 26, out of power supply terminal 35 onto line 33, through the F2 contacts, through the closed pushbutton switch 28 and rectifier 31 of the apartment involved, irrespective of the condition of the associated key

switch. The undesirable path would of course be eliminated if contact F2 were open, or if the inherent interline impedance represented by transmitter 38 is not present.

If the F2 contact is closed while the annunciator circuits are operative, the key switch contact KS-1b of apartment No. 1 is closed, the KS-1b contact of apartment No. 2 is open, and the doorbell pushbutton switch 28 of apartment No. 2 is depressed, the  $t_1$  pulses at pulse generator terminal T1 will create a false signal for apartment No. 2 by being coupled to the doorbell line of apartment No. 2 through a path extending through isolating rectifier 56, closed contact KS-1b, rectifier 29-1 and doorbell 31-1 of apartment No. 1 onto building ground B, through the building power supply 26, out of its terminal 35, onto line 33, through the F2 contacts, through the closed pushbutton switch 28 and the rectifier 31 of apartment No. 2. This undesirable path would be eliminated if contacts F2 were open, or if the inherent interline impedance between doorbell lines represented by doorbell 31 is not present or is very large.

If the F1 contact is closed while the annunciator circuits are operative, the  $t_3$  pulses at pulse generator terminal T3 will initiate a false alarm from an apartment having its associated key switch closed, by being coupled to the associated doorbell line of said apartment through a path extending through solenoid 13, contacts F1, into power supply terminal 24, through the building power supply 26, out of power supply terminal 45, through the transmitter unit 38, onto the front listen line 32, through isolating rectifier 56 and the closed key switch contact KS-1b of the apartment involved, irrespective of the condition of the tamper switch contact TS of the apartment involved. This undesirable path would, of course, be eliminated if contacts F1 were open, or if the inherent interline impedance represented by solenoid 13 and in series with transmitter 38 is not present or is very large.

In addition to the possible interactions between the signalling and annunciator circuits occurring through the building power supply which are overcome by the switching system and other features previously described, interactions caused by mutual impedance and not involving the building power supply in the form of the transmitter and receiver unit, between common lines can occur and feed control pulses between the communication lines 34 and 32, 34 and 36 and 32 and 36, creating false alarm signals on the doorbell lines. Thus, in the absence of the test power supply 63, if the input impedance of an annunciator circuit connected between a doorbell line and logic ground is much greater than the combined impedance of the transmitter and receiver units 44 and 38 (see FIG. 2), the  $t_2$  pulses at pulse generator terminal T2 are coupled to the doorbell line of each apartment having a key switch in an alarm preparing (closed) position through a path extending through the front entrance hall receiver and transmitter units 44 and 38, the front door listen line 32, isolating rectifier 56 and the closed key switch contacts KS-1b of the apartment involved, said path forms a complete circuit because the doorbell line connects to the annunciator circuit which connects back to logic ground L as does the pulse generator. This undesired result is alleviated by the test power supply 63 which provides a voltage output which is greater than the amplitude of the positive pulses on the output thereof, and the positive terminal thereof is connected to the front door talk line 34 and the negative terminal thereof is connected to the front listen line 32. In such case, the test power supply is effectively connected across the front entrance hall receiver and transmitter units 44 and 38, forcing the voltage across the series combination of said receiver and transmitter units to be identical to the output voltage of test power supply 63. The  $t_2$  pulses now attempt to feed from logic ground L through the path extending through the pulse generator 70 onto line 34 through the parallel connection of the test power supply 63 and the series connected transmitter and re-

ceiver units 38 and 44, through isolating rectifier 56, the closed contacts KS-1b of the apartment involved, and the annunciator circuit impedance of the apartment involved. However, since the voltage of test power supply 63 is greater in magnitude than the voltage of the positive  $t_3$  pulses, and both of said voltages are connected with opposing polarity in a series circuit path, the net effective voltage of said series circuits is such as to back-bias isolating rectifier 56 against feed-through of the  $t_2$  pulses through the mutual impedance effected by the series connected transmitter and receivers 38 and 44. The test power supply 63 will have no effect on the rectifiers 56 with respect to the  $t_1$  phase pulses normally applied to the front listen line 32, since the terminals of the test power supply are not connected to effect the conduction of the isolating rectifiers 56 during the presence of the  $t_1$  pulses on the line 32.

If the rectifiers 58 are connected directly to their doorbell line 30 instead of through the alarm preparing switch contacts KS-1a or KS-1b, etc. a  $t_1$  pulse will appear on each doorbell line even though the associated key switch is in a burglar alarm turn-off position. This  $t_1$  pulse will be fed from line 32 through the test power supply 63, into line 34, and through each rectifier 58 to the associated annunciator circuit when the associated apartment door is opened, irrespective of whether the key switches KS-1, or KS-2, etc. are set to the alarm preparing position. Hence, the power supply 63 taken alone is not sufficient to prevent critical interactions between common lines 32 and 34, but must be combined with the series connection of the door switch DS-1 or KS-2, etc. and the associated key switch KS-1 or KS-2, etc., between lines 32 and 34.

In the absence of isolating power supply 63', the positive terminal of which connects to the front talk line 34, and the negative terminal of which connects to the rear listen line 36, the  $t_1$  pulses at pulse generator terminal T1 can also be coupled to the doorbell line through a path extending through the front entrance hall transmitter 38, rear entrance hall transmitter unit 38', the rear door listen line 36 and isolating rectifier 68. This undesirable result is alleviated by the isolating power supply 63' provided the output thereof is greater than the amplitude of the positive pulses on the listen line 32 added to the absolute magnitude of the test power supply 63. In such case, the isolating power supply 63' is effectively connected in series voltage opposition to the positive voltage of the  $t_1$  pulse added to the test power supply potential on line 34 applied with respect to logic ground. Thus in effect, isolating power supply 63' back-biases each isolating rectifier 68 against feed-through of  $t_1$  pulses through the transmitter units 38 and 38'. In a like manner, at time  $t_2$ , isolating power supply 63' back-biases isolating rectifier 68, thereby precluding feed-through of  $t_2$  pulses via front receiver unit 44, and rear transmitter unit 38'.

At time  $t_4$ , the alternate path that could be provided by isolating power supply 63' and either of the rectifiers 56 or 58 for the positive  $t_4$  pulses is of no consequence.

The isolating power supply 63' and the isolating feature of the test power supply 63 are used to nullify the interaction caused by the interline impedance inherent in the normal building wiring. In other environments this adverse effect may be overcome by employing means to disconnect all interline impedance during the time the monitoring system is operating.

Associated with each of the annunciator circuits 84-1, 84-2, 84-3, etc. in the preferred form of the invention is a red alarm light 90-1, 90-2, etc., and a white alarm light 90-1', 90-2', etc. These lights are located preferably either in the building managers office or, as illustrated in FIG. 5, within the enclosure 50 where the pairs of lights 90-1, and 90-1', etc. are visible through pairs of windows 91-91' on the front door panel 51. In a manner to be explained, when pulses appear at time  $t_2$  on any doorbell line, representing a second successive penetration or opening of a door or other entry point of an apartment and the

associated key switch which is not returned to its burglar alarm position within the delay period previously described, the red light 90-1 or 90-2, etc. of the apartment involved will be energized. The white light 90-1' or 90-2', etc. associated with any apartment will be energized whenever the  $t_4$  pulses disappear from the associated doorbell line at time  $t_4$ . When either a red or white light of an apartment is energized, an alarm signal appears on a common alarm line 92 which is fed to the set input terminals of an audible alarm bistable circuit 94 and a watch service bistable circuit 96. The setting of these bistable circuits will respectively sound an alarm 98 and deenergize a relay 100 both located within the enclosure 50. The sounding of an alarm 98 will attract the building manager or engineer to the panel 51 on which the various lights 90-1, 90-2, etc. are visible so that the location of the trouble can be immediately pin-pointed. The de-energization of the relay 100 will close a set of normally closed contacts 102 which will energize a line, usually a telephone line extending to a police station or watch service. A common lamp reset pushbutton switch 104 is provided which, when depressed, resets the annunciator circuits to turn-off any energized lights 90-1, 90-1', 90-2, etc. A similar pushbutton switch 106 is provided for resetting the audible alarm circuit 94 to terminate the sounding of the horn 98, and a common manual reset pushbutton switch 108 is provided for resetting the watch service bistable 96. The various pushbutton switches 104, 102, and 106 may be located at any secure convenient point, such as the inside of the enclosure 50 where an alarm would be sounded if someone tried to gain access to the reset pushbuttons. In the alternative, the pushbutton switches could be exposed and a tamper proof circuit could be added to the reset pushbutton switches of each apartment so that depression of any reset pushbutton switch in the absence of an alarm would itself set off an alarm.

Although the details of the various annunciator circuits 84-1, 84-2, etc. will be described in detail later on in the specification, it will be helpful at this point to briefly explain some of the basic components making up each annunciator circuit. For this purpose, reference should be made to FIG. 4 which shows annunciator circuit 84-1. As there shown, an input line 30-1" connected with each doorbell line 30-1, or 30-2, etc. at the basement terminal board 17 (FIG. 1B) extends in common to one of the inputs of a tamper switch signal circuit 110, a key switch signal circuit 112, a door switch signal circuit 114 and a supervisory signal circuit 116. The tamper switch signal circuit 110 has a second input extending to the gating line T3' of the pulse generator circuits 70; the key switch signal circuit 112 has a second input extending to the gating line T1'; the door switch signal circuit 114 has a second input extending to the gating line T2' and a reset input extending to the gating line T0' and the supervisory signal circuit 116 has a second input extending to the gating line T4'. Each of the aforesaid second inputs of the signal circuits 110 and 116 act as a gating input which results in the generation of a control signal at the output of the circuit involved if the pulses at the gating input coincides with the presence or absence of control pulses on the associated doorbell line.

The key switch signal circuit 112 has a third input connected to the gating line T0' of the pulse generator circuit which feeds the setting pulses at or near the beginning of each cycle to the key switch signal circuit 112. The circuit 112 generates a steady signal each cycle at the output 124 thereof until it is reset at or near the beginning of the next cycle, which signal indicating the position of the associated key switch. The door switch signal circuit 114 includes counter and integrating elements to be described which responds to groups of pulses by providing a control signal at the output 130 of the door switch circuit for every two groups of spaced pulses fed thereto. The opening of a door or window twice will result in two groups of spaced pulses because the period a door remains

opened as it is opened and closed encompasses many cycles of the 27 kilocycle control pulse frequently involved.

It can now be appreciated that when the tamper switch TS of an apartment is closed, the presence of  $t3$  pulses on the associated doorbell line results in a control signal on the output **111** of the tamper switch signal circuit which signal is fed to an alarm bistable circuit **122** to set the same which energizes the associated red light and provides an alarm signal on the common alarm line **92** which energizes the horn **98** and the watch service telephone line (FIG. 1B).

When the key switch of the apartment involved is in a burglar alarm preparing condition, the resulting presence of a  $t1$  pulse on the associated doorbell line **30** results in the generation on the output line **124** of the key switch signal circuit **112** of a continuous gate opening signal for the cycle involved which signal is fed to one of the inputs of and "AND" alarm gate circuit **126** whose other input is coupled through a delay circuit **128** to the output **130** of the door switch signal circuit **114**. The output of the "AND" gate circuit **126** is fed to the alarm bistable circuit **122**. When two series of  $t2$  pulses appear on the doorbell line **30** indicating two successive openings of a door or other monitored entry point involved, a control signal appears on the output line **130** of the door switch signal circuit **114** which is delayed in the circuit **128** for as much as 30 seconds to one minute before appearing at the input of the alarm gate **126**. If the key switch is by that time returned to a burglar alarm turn-off position the "AND" gate circuit **126** will have closed due to the termination of the aforesaid gate opening signal and the alarm bistable circuit **122** will not be triggered to its set alarm state.

The input of the supervisory signal circuit **116** is connected to an inverter circuit (not shown in FIG. 4) which provides an alarm control signal only in the absence of  $t4$  control pulses on the doorbell line **30**. Upon the absence of  $t4$  control signals at time  $t4$  on the doorbell line **30**, the supervisory circuit **116** generates a control signal on the output **132** thereof which signal is fed to an alarm bistable circuit **134** which energizes the associated white light **90-1'** and generates an alarm signal on the common line **92** which sounds the horn **98** and energizes the watch service telephone line.

Although the drawings disclose only a burglar alarm system which is the most important application of the invention, it should be understood that certain aspects of the invention are applicable to systems for monitoring temperature and other variables. For example, a fire alarm system can readily be super-imposed, on the circuit just described by, for example, placing a fusible lead or solder link **69** in each control box in series with each rectifier **68-1** or **68-2** connected between the rear listen line **36** used for supervisory purposes and the associated doorbell line. Thus, if a fire starts in the apartment, the line **69** will melt and thereby open the supervisory circuit cuts-off the  $t4$  pulses from the doorbell line involved and initiates the various alarm operations described above. Any number of such links **69** could be positioned throughout the apartment involved and connected in series circuit relation in the supervisory circuit involved so that a number of points in the apartment could be monitored for fire. Also, in a manner to be explained, a garage calling system can be readily incorporated with the burglar alarm of the present invention.

Other common lines (not shown) could also be used as a distributor of pulses of other phases and additional condition sensing switches could be added between each such common line and individual control lines (such as doorbell lines) to provide control signals having condition distinguishing phases to monitor various conditions in the sections of the building involved. The flexibility of the present invention is thus apparent.

It should also be appreciated that certain aspects of the present invention are applicable to office buildings,

and even individual homes as well as to apartment buildings.

A properly designed burglar alarm system should be tamper proof, employing protection means for the entire system. The protection means is illustrated in FIGS. 5 and 6. As previously explained, the basement of the building preferably contains the alarm system cabinet or enclosure **50**, which houses the alarm system and terminal board **17** and power supply **26**. The wires from and to the terminal board **17** are brought out from enclosure **50** in conduit pipe **203**, which extends to the various risers of the building. The AC power is brought into the alarm system on wires **209** and **210**, which connect to the 60 cycle AC supply line of the building. The wires **209**, **210** and **53** are brought to the enclosure **50** from a remote location in a conduit **223**. The watch service telephone line is also at a remote location from the housing **50**. A relay **211** having normally closed contacts **211-1** is also located remotely with respect to enclosure **50**. One terminal of the relay coil **211** is connected to AC line **210**. The other terminal is connected to conductor **53** which wraps around enclosure **50** and is then brought into enclosure **50** connected at AC power wire **209**. The conductor **53** extends spaced horizontal and vertical paths made possible by the rings **213** through which the conductor is threaded. Contact **211-1** has a terminal connected to watch service telephone line ground, and another terminal connected to the watch service telephone line. Conductor **53** and relay **211** taken together constitute a power line supervision system. When conductor **53** is intact, the relay **211** is connected across power line wires **209** and **210**, and is energized which results in the opening of contacts. If wire **53** should be cut for any reason, such as the unauthorized opening of the door **51** of enclosure **50**, then the relay will be de-energized. This results in the closure of contact **211-1** which will signal the watch service over the telephone line. If the AC power is removed from either wire **209** or **210**, then relay **211** will become de-energized, resulting in an alarm signal to the watch service, over the telephone line.

If someone tries to cut the pipe **203**, and in so doing severs any of the doorbell wires included within, then the supervision circuitry previously described will send out an alarm signal to the watch service.

#### EXEMPLARY LOGIC ANNUNCIATOR CIRCUIT OF FIGS. 7 AND 10

An individual apartment annunciator circuit **84-1** whose block diagram is depicted in FIG. 4 is exemplified by the detailed logic diagram of FIG. 7. Also shown is the audible alarm and watch service circuit which is comprised of bistable **94**, horn **98**, reset pushbutton switch **106**, bistable **96**, relay **100**, and pushbutton switch **108**. Also shown is the logic power supply **78**, and its various output terminals **77**, **77'** and **77''** which provide voltages of the polarities shown with respect to logic ground L.

The key switch signal circuit **112** is comprised of bistable **212**, and "AND" gate **208**. The door switch signal circuit comprises "AND" gate **214**, integrating capacitor **215**, resistor **213**, level detector unit **216**, counter **218** (which may be a single scale-of-two bistable pulse counter), differentiating network **220**, "AND" gate **219**, and signal inverter circuit **249**.

The tamper switch signal circuit **110** is comprised of "AND" gate **232**. The burglar alarm output circuit is composed of "OR" gate **234**, bistable **122**, differentiating network **238**, and alarm lamp **90-1**.

The supervision signal circuit comprises signal inverter **240**, and "AND" gate **242**. The supervision alarm circuit is composed of bistable **134**, differentiating network **246**, and supervision alarm lamp **90-1'**.

Each of the bistables (**94**, **96**, **134**, **212**, **122** and **218**) have two usable outputs, and set and reset inputs. When a positive signal is applied to a set input, the output on that side (the set output) will become not positive. The

reset side will become positive. Similarly, if a positive signal is applied to a reset input, the reset output will become not positive. The set side output will become positive. All "AND" gates have two inputs. Any "AND" gate will deliver a positive voltage at its output only if both of its inputs are positive. The "OR" gate 234 will deliver a positive voltage at its output if any of its inputs are positive. The time delay means 128 is illustrated in the form of a monostable multivibrator having two usable outputs, and one set input, resetting being accomplished internally. The counter bistable 218 has two states, and reverts to its original state on every second input signal fed thereto.

Consider the system when the key switch KS-1 is in its burglar alarm turn-off position (door may be opened or closed), and the tamper switch TS-1 open and bistables 122 and 134 are initially in their reset states. As described earlier, under these conditions, the doorbell line receives no positive control pulses at times  $t_1$ ,  $t_2$  and  $t_3$ . The doorbell line constitutes the input to signal inverter 240, and the first of input connections to "AND" gates 208, 214 and 232. Therefore, under the above assumptions, the "AND" gates 208, 214, and 232 are not in a condition to supply positive voltage at their outputs.

At time  $t_0$ , a positive gating pulse will appear on gate line  $T_0'$  which is connected to the reset input of bistable 212 and the input to inverter 249. The set input of bistable 212, which joins to the output of "AND" gate 208, has no positive voltage on it; hence, bistable 212 will be reset, and remain so during all times, as long as the key switch is not in the alarm preparing position.

The inverter 249 as illustrated includes an NPN transistor 256 and associated base circuit resistors 248 and 250, and collector resistor 258. The emitter 254 of the transistor is connected directly to logic ground L. The output from the inverter 249 extends from the collector 260 to one of the inputs of "AND" gate 219 whose output is connected to their set input of the counter bistable.

The positive potential (at this time  $t_0$ ) on inverter circuit resistor 248 causes a positive potential on base 252 of the transistor 256, due to the potential divider effected by resistor 248 and resistor 250. Resistor 250 has one side connected to the negative power supply terminal 77 and has its other side connected to base 252, to which resistor 248 is also connected. Hence, transistor 256 is rendered conductive during time  $t_0$  and its collector 260, which constitutes one input to "AND" gate 219, is at logic ground potential. Therefore, the output of "AND" gate 219, which connects the reset input of counter 218, cannot supply positive voltage to reset the counter 218, at time  $t_0$ .

For all times other than  $t_0$ , the lack of positive potential on the terminal of the base circuit resistor 248 allows the base 252 of the transistor 256 to become negative with respect to emitter 254, causing transistor 256 to be non-conductive. The negative potential is supplied from power supply terminal 77 via resistor 250, to the base 252. Hence, for times  $t_1$ ,  $t_2$ ,  $t_3$  and  $t_4$ , a positive potential appears at the output of inverter 249 which potential is obtained from power supply terminal 77" which is connected to resistor 258 which terminates at collector 160. Since bistable 212 remains reset when the key switch KS is not in the alarm preparing position, its set output, which connects to the second input of "AND" gate 219 will be positive. Thus, "AND" gate 219 has both inputs positive, which applies a positive voltage from its output to the reset input of the counter 218, causing the counter to reset to its normal state.

Assume that the key switch KS, is now turned to the alarm preparing position by the tenant. At time  $t_1$  a positive gating pulse will appear on the gate line  $T_1'$  of "AND" gate 208 which constitutes the second input to "AND" gate 208. The other input thereof will also have a positive control pulse present at this time. A positive voltage will then appear at the output of "AND" gate

208 which will appear on the set input of bistable 212, rendering its set output not positive. At time  $t_0$ , bistable 212 will again be reset, but at time  $t_1$  will again be set, and remain set until the  $t_0$  gating pulse again occurs. Hence, during times  $t_1$ ,  $t_2$ ,  $t_3$  and  $t_4$ , when the key switch is turned to the alarm preparing position, the input to "AND" gate 219 connected to the set output of bistable 212 is not positive. At time  $t_0$ , as explained above, the input to "AND" gate 219 from transistor 256 is not positive. Therefore, at no time are both inputs to "AND" gate 219 positive under the conditions now being described. And no reset signal will be applied to the counter 218 reset input.

Now, suppose the tenant leaves his apartment for the first time. While the door is open, positive control pulses will be fed into the first input of "AND" gate 214, at each time  $t_2$ . At time  $t_2$ , a positive gating pulse is fed into the second input of "AND" gate 214. A series of positive voltage pulses results at the output of "AND" gate 214 occurring at each time  $t_2$ . The output pulses of "AND" gate 214 will be collected upon integrating capacitor 215 via its connection to resistor 213, connected to the output of gate 214. The ungrounded side of capacitor 215 is connected to the set input of normally reset monostable circuit 216. The voltage will build up on capacitor 215; when it reaches a sufficient potential above logic ground, the monostable multivibrator level detector circuit 216 will be set through its set input connected to the capacitor 215 and will remain set until the voltage on capacitor 215 discharges below a circuit setting value. A sudden positive going output of the level detector 216 caused by the setting thereof is fed to the pulse input 217 of the counter 218 where it is differentiated, the resulting positive pulse being directed to the set input of the counter. The counter 218 now changes state, indicating that the door in the apartment has been opened for the first time. The level detector 218 remains switched until the door is closed, at which time the voltage on capacitor 215 decays, because no more pulses emanate from the output of gate 214, since its first input is no longer fed positive control pulses from the doorbell line at time  $t_2$ .

Assume that the tenant returns home. When the door is opened for the second time, the level detector monostable 216 will again be set as described above. The change in its output will be applied to the pulse input 217 of the counter 218, where it is differentiated and fed as a positive pulse to the reset input of the counter 218. The counter now transmits to its original reset state. During this transmission, the set output of the counter 218 is positive going, and will be fed through differentiating network 220 to the set input of the time delay circuit 128 as a positive pulse. The time delay circuit is a monostable multivibrator which in the act of returning to its reset state after many seconds (like 30-40 seconds later) feeds a positive going pulse to the differentiating network 230. This time delay is of sufficient duration to allow the tenant to remove the key switch from its alarm preparing position. When the tenant does so, bistable 212 will be reset, as previously described. Upon termination of the time delay the positive going output of the monostable 128 is fed through differentiating network 230, is converted to a positive pulse fed to the first input of the alarm "AND" gate 126, the second input of the alarm "AND" gate 126 is connected to the reset output of bistable 212 in the key switch signal circuit which is now not positive, since the system is not in the alarm preparing condition. Hence, alarm gate 126 will block the positive pulse originating from the delay circuit 128.

Assume that a burglar enters the apartment. The burglar will not be able to remove the key switch from the alarm preparing condition, in sufficient time. Hence, bistable 212 will remain in its set condition (its reset output being at positive potential). This time, upon termination of the time delay, the positive pulse from the delay monostable 128 at the first input of the alarm gate 126 will

cause a positive pulse at the output of alarm "AND" gate 126, since the second input to the alarm gate is now positive also. The output of alarm gate 126 feeds the positive signal to the first input of "OR" gate 234 which feeds a positive pulse to the set input of bistable 122. The reset output of bistable 122 is then a positive going voltage which is passed through differentiating network 238 as a positive pulse to the common alarm line 92. The set inputs of the bistables 94 and 96 are connected to this line. Hence, both of these bistables are set, causing the horn 98, which is connected between the set side of bistable 94, and the power supply terminal 77" to sound. The reset side of bistable 96 goes from ground to positive potential. This will cause the normally energized relay 100, which is connected between the reset output of bistable 96 and power supply terminal 77" to become de-energized. The relay contact 102 will then connect the watch service telephone line to the telephone system grounds T. This will summon the watch service patrolman to the building being burglarized. Alarm lamp 90-1, which is connected between the reset output of bistable 122 and the power supply terminal 77 will be energized, giving a visual indication of the exact apartment being burglarized.

When indication of a burglary is no longer required, the reset pushbutton switches, all of which have one side connected to power supply terminal 77" may be depressed.

When the pushbutton switch 106 is depressed, it will apply positive potential to the reset input of bistable 94. This will cause the horn to be silenced. When pushbutton switch 108 is depressed, it will apply a positive potential to the reset input of bistable 96. This will cause relay 100 to become energized, thus removing the telephone line from the telephone ground T.

When the lamp reset pushbutton switch 104 is depressed it will apply a positive potential on a common reset line 105, which is connected to the reset inputs of bistables 122 and 134. Bistable 122 will return to its reset state, and the alarm lamp 90-1 will be extinguished.

Suppose that upon entering the apartment the burglar immediately tries to disable the alarm system by removing the control box panel from the wall of the apartment. Upon doing so the tamper switch TS-1 will close. At time  $t_3$ , which will occur within a fraction of a second, a positive control pulse will appear on doorbell line 30-1" which is connected to the first input of "AND" gate 232. At this time the second input of "AND" gate 232, which connects to gate line T3' will also receive a positive pulse. This will result in a positive pulse at the output of "AND" gate 232, which will be fed into the second input of "OR" gate 234. Bistable 122 is then triggered as before. This results in energization of alarm lamp 90-1, the horn 98 and a grounding of the telephone line, just as before. In this instance, however, the alarm conditions were introduced without any time delays.

The supervision feature of the system will determine and indicate whether or not the associated doorbell line has been severed. When the doorbell line is intact, a positive control pulse will appear on the doorbell line 30-1" at time  $t_4$ . This pulse is fed into the input of signal inverter 240 which is like inverter 249 previously described. The output of inverter 240 then produces ground potential, which will appear at the first input of "AND" gate 242. The output of "AND" gate 242, which connects to the set input of bistable 134, will not produce a positive pulse. Hence, bistable 134 will remain reset. Assume that the doorbell line is cut. At time  $t_4$  no signal will appear at the input of inverter 240, and its output will appear as a positive potential at the first input of "AND" gate 242. At time  $t_4$ , a positive gating signal appears on gate line T4' which connects the second input of "AND" gate 242. The resulting positive output of "AND" gate 242, will set bistable 134. The potential at the reset output of bistable 134 will transfer from negative polarity to ground. This positive voltage transition will be fed through

differentiating network 246, onto the common alarm line 92 as a positive pulse. The bistables 94 and 96 will be set as described earlier. The supervision lamp 90-1" which is connected between the reset output of bistable 134 and the power supply terminal 77 will light up, thereby indicating that the doorbell wire has been cut.

The door switch signal circuit 114 which is depicted in FIG. 7 by symbolic elements 214, 215, 216, 218, 220, 219, and 249, is detailed in FIG. 10, where like elements have been given like reference.

When the key switch of the associated apartment is in the alarm preparing position, positive control pulses will be for through a rectifier 280 to one side of a resistor 281 from the associated doorbell line at time  $t_1$ . However, the output of "AND" gate 214, which is at the junction of the anode of rectifier 283 and the other side of resistor 281, will not be positive during time  $t_1$  since the gate line T2' which connects to the cathode of the rectifier 283 is not positive at this time. If the associated door is not open at time  $t_2$ , no positive control pulse will be on the associated doorbell line 30-1" at that time and the output of "AND" gate 214 will not be positive even when a positive pulse appears at time  $t_2$  on the gate line T2'; this pulse is blocked by rectifier 283. However, when the monitored door of the apartment is opened at any time  $t_2$ , a positive control pulse will be fed to the resistor 281 which is the first input to "AND" gate 214, at the same time a  $t_2$  pulse is fed to the second input to the "AND" gate 214 at the input to rectifier 283. The output of "AND" gate 214 will then be a positive potential. A negative or ground potential at the anode of rectifier 283 at times other than  $t_2$  would pass through the rectifier to make the output of the "AND" gate at this negative or ground potential. Thus, both inputs to "AND" gate 214 must be positive to provide a positive potential at its output. At a pulse repetition rate of 20,000 pulses per second a large number of pulses will appear at the output of "AND" gate 214 even when the door is momentarily opened. This series of pulses will pass through diode 282 and charge the integrating capacitor 215 to a positive potential with respect to logic ground.

The level detector monostable circuit 216 has a PNP transistor 292 which is conducting when the level detector 216 is in its normal reset state because it is forwardly biased from the negative potential of power supply terminal 77, which is fed to base 291 through resistor 284. When transistor 292 is conducting, a PNP transistor 294 forming part of the monostable circuit will be non-conductive due to the positive potential fed to its base from the power supply terminal 77".

When the voltage in capacitor 215 becomes sufficiently positive it will back bias the base to emitter junction of transistor 292 and cause it to cease conduction. This increases the negative voltage on the collector of transistor 292 which causes transistor 294 to start conducting due to the more negative voltage connected to its base through resistors 290 and 286.

To insure that transistor 292 becomes and stays non-conductive until the positive pulses from "AND" gate 214 cease, transistor 294 institutes a positive feedback potential as it becomes conductive, which is applied to the base 291. This signal is applied via capacitor 288 connected between the collector of transistor 294 and the base 291 of transistor 292 and renders base 291 more positive until capacitor 215 has been able to more fully charge positively. This positive feedback potential will finally decay as capacitor 288 discharges through resistor 284; the decay time being greater than the period between the positive pulses feeding through diode 282. Thus, the transistor 292 is rendered completely non-conductive, and the transistor 294 fully conductive. The level detector 216 is now in its set state, and remains so as long as positive pulses continue on the doorbell line involved at time  $t_2$  (when these pulses cease, the capacitor 215 discharges and recharges to a negative voltage which returns transistor 292

to a conductive state forcing transistor 294 to a non-conductive state).

At the inception of the set state, the voltage on the collector of transistor 294 is positive going, since a change from negative to ground potential occurs.

As transistor 294 becomes conductive in the set state of the level detector, the voltage on its collector is applied to the pulse input terminal 217 of the binary counter 218 by a conductor 275. The counter is a scale of two counters composed of PNP transistors 296 and 298 which are cross coupled to form a bistable circuit having the control inputs thereof fed from input terminals 217 through capacitors 295 and 297, and diodes 293 and 299. Each time the level detector is triggered into its set state by the opening of the associated apartment door, the transistors 296 and 298 will reverse states of conduction, one being conductive and the other non-conductive.

If the associated key switch KS is in its alarm preparing positions, the associated door is opened by the tenant as he leaves the apartment, transistor 296 becomes non-conductive. The network 220, comprising resistor 289, and capacitor 285, which is connected to the collector of transistor 296, develops a negative pulse which is blocked by diode 287.

When the door is opened for the second time, transistor 296 will go into conduction. The positive change in potential at the collector of this transistor will be relayed as a positive pulse to line 300, via the differentiating network 220, thereby initiating the time delay.

Signal inverter 249 has previously been described in detail in conjunction with FIG. 7. A positive  $t_0$  pulse fed to the inverter resistor 248 from gate line  $T0'$  will force inverter transistor 256 into conduction, applying ground potential at its collector 260. At other times, the voltage on terminal  $T0'$  is at ground potential and collector 260 will be positive only if the set output of bistable 212 of the key switch signal circuit (FIG. 7) is positive. This output will be positive when the key switch is in its burglar alarm turn-off position. At this time transistor 298 of the counter 218 is turned off due to the positive potential fed to its base from the power supply terminal 77" through resistors 258 and 279. The counter is now in its reset state, indicating that the associated door has not been opened at all. When the key switch KS is turned on, the set output of the bistable 212 of the key switch signal circuit goes to ground potential, thereby holding collector 260 at ground potential through diode 277. The counter is now free to leave its normal state, upon receipt of the proper signal at its pulse input 217.

#### GARAGE CALL CIRCUIT (FIGS. 8 AND 9)

An additional feature that can readily be added to the existing burglar alarm system is a garage calling system. With this system the tenant may signal the garage, when the key switch KS is not in the alarm preparing position, indicating that he will shortly be coming there for his car.

An additional signalling line of the building, the rear talk line 35 can be utilized for transmitting positive control pulses at time  $t5$  which is not in phase with times  $t0$ ,  $t1$ ,  $t2$ ,  $t3$ , and  $t4$ , to all the apartments. The control pulse at time phase  $t5$  can be generated by merely adding a sixth position to the ring counter 73 and an output line 72-5 (see FIG. 9) which feeds the base of transistor 75-5, and causes said transistor, the emitter of which is connected to positive power supply terminal 77", to apply a positive control pulse at the pulse generating terminal T5 at time  $t5$ . The pulse generating terminal T5 is connected to the rear talk line 35.

When the rear talk line 35 is utilized, an additional isolating power supply 63" having a voltage output greater than the magnitude of the  $t5$  control pulses is required, and is connected at its negative terminal to the rear listen line 36, and at its positive terminal to the rear talk line 35 to which is also connected the negative terminal of

isolating power supply 63', which has been moved from its previous connection on line 36. The isolating power supply 63" will prevent a feed-through of the  $t5$  control pulse, from the rear talk line 35 to the rear listen line 36 via the mutual impedance between them.

To further implement the garage calling system a garage call switch 260 is added to the apartment control box 18, and is connected at its first terminal to branch line 35-1 or 35-2, etc. which connects to the rear talk line 35, and at its second terminal to the anode of isolating rectifier 262, the cathode thereof connecting the associated doorbell line 30 (see FIG. 8). When the garage call pushbutton switch 260 is depressed, a positive control pulse will be coupled from rear talk line 35 to the associated doorbell line.

Additional logic circuitry like that depicted in FIG. 9 must be introduced, the purpose of which is to respond to the presence of  $t5$  control pulses. This additional circuitry is exemplified by the logic diagram of FIG. 9. The garage call logic circuitry of each apartment is comprised of "AND" gate 264 and bistable 266 and "OR" gate 265. Located in the garage is display panel 270, which houses lamps 271. Also in the garage is a reset pushbutton switch 269 which is connected between common reset line 267 and logic power supply terminal 77". The common reset line is connected to the first input terminal of all "OR" gate 265. The second input of "OR" gate 265 is connected to the reset output of bistable 212. The first input of "AND" gate 264 is connected to the associated doorbell line; the second input thereof is connected to a gate line T5' which is connected to the output of a gate circuit 82-5 which acts like the aforesaid "AND" gates 82-0 etc. The reset output of bistable 266 is connected to one of the terminals of the associated signal lamp 271, which is housed in annunciator display panel 270. The other terminal of each lamp 271 is connected to power supply terminal 77. Line 272 connects the other signal lamps with the associated garage call logic circuitry of the other apartments.

If the key switch KS of the apartment involved, is in its alarm preparing condition, the reset output of bistable 212 will be positive and will thus apply a positive signal to the reset input of bistable 266 at all times other than  $t_0$ , thereby holding its reset output reset at negative potential irrespective of the signals appearing at its set input. At time  $t5$ , if the key switch KS of an apartment is closed,  $t5$  control pulses will feed through isolating power supplies 63", 63', and the test power supply 63 onto the first listen line 32 and to the associated doorbell line via isolating rectifier 56. This will apply positive pulses at the first input of "AND" gate 264 at time  $t5$ , even though the garage call switch 260 has not been depressed. However, the reset output of bistable 266 will still remain reset because of the positive signal applied to its reset input, as described above.

When the key switch KS is not in its alarm preparing condition, and the garage call pushbutton switch 260 is not activated, no control pulse will appear on the associated doorbell line at time  $t5$ , and the first input of "AND" gate 264 will not be positive, resulting in no output.

If the occupant of an apartment now depresses garage call switch 260, positive control pulses will appear at the first input of "AND" gate 264 at time  $t5$  simultaneously with the feeding of  $t5$  gating pulses to the second input of "AND" gate 264. Therefore, the output of "AND" gate 264 will feed a positive pulse into the set input of bistable 266, at time  $t5$ , which will set bistable 266. The reset output of bistable 266 is now at ground potential, and will energize the associated lamp 271, which indicates to the garage attendant, that the occupant of the apartment involved wants his car. After the garage attendant has obtained the tenant's car he can extinguish lamp 271 by depressing reset pushbutton switch 269. This will apply a positive potential at the first input of "OR" gate 265 which results in a positive signal on the reset input

of bistable 266, causing the reset output to go negative, which results in turning off lamp 271.

It should be understood that numerous variations may be made in the forms of the invention described above without deviating from the broader aspects thereof.

We claim:

1. In a building or the like including a number of sections having a first common line extending therebetween and forming part of a first common circuit, a second common line extending between said building sections and forming part of a second common circuit and an individual line extending to each section of the building and completing an individual circuit associated with the building section, and power supply means for providing energizing power on said common and individual lines for said circuits, the improvement comprising a monitoring system superimposed on said common and individual lines for monitoring a given condition in each section of the building comprising: a separate condition sensing switch means for each section of the building operated to an alarm condition when the condition to be monitored is present in the associated building section; a preparing switch means for each section of the building having an alarm preparing and an alarm disabling condition; control signal generating means for applying a first control signal having a first distinguishing characteristic to said first common line and a second control signal having a second distinguishing characteristic to said second common line; means coupling each of said separate condition sensing switch means between said first common line and the individual line extending to the associated building section for providing on the individual line involved said first control signal only when the associated condition sensing switch means is in its alarm condition; means coupling each preparing switch means between said second common line and the individual line extending to the associated building section for providing on the individual line involved said second control signal only when the preparing switch means is in its alarm preparing condition; and control signal responsive annunciator means responsive only to the combined presence of said first and second control signals on any of said individual lines for signalling an alarm for the section of the building involved.

2. The monitoring system of claim 1 wherein said first and second control signals are respectively pulses of the same pulse repetition rate but different phase, and there is further provided means for preventing interaction between said energizing power and said control signals respectively on the annunciator means and the signalling circuits, said interaction preventing means comprising means for cyclically disconnecting said power supply means from said lines for limited time intervals during which the monitoring system is operable, and means for inhibiting operation of said monitoring system during the intervening time intervals.

3. In an electrical system including a first, second and third line forming part of an electrical system; and power supply means providing energizing power on said lines for said electrical system; the improvement comprising an annunciator system superimposed on said electrical system for determining when a first and/or a second specified condition occurs comprising: (a) a first condition alerting switch means operated to a notifying condition when said first specified condition occurs; (b) a second condition alerting switch means operated to a notifying condition when said second specified condition occurs; (c) means for respectively cyclically coupling first and second control pulses to said first and second respective lines which pulses respectively have a first and a second predetermined phase, at least one first and one second control pulse occurring in each cycle of said first and second control pulses; (d) means coupling said first condition alerting switch means between said first line and the third line for providing on the third line involved said first control

pulses only when the associated first condition alerting switch means is in its notifying condition; (e) means coupling said separate second condition alerting switch means between said second line and the third line for providing on the third line involved said second control pulses only when the second condition alerting switch means is in its notifying condition; (f) annunciator means responsive to said first and second control pulses on said third line; (g) and means for preventing interaction of said electrical system on said annunciator system, said interaction preventing means comprising continuously operating automatic switching means for cyclically disconnecting said power supply means from said lines for limited time intervals during which the annunciator system is operable, said annunciator system being inoperative during the intervening time intervals, and the electrical system being non-responsive to said control signals during said intervening time intervals.

4. The combination of claim 3 wherein the pulse repetition rate of said control pulses are at least as high as the frequency of disconnection of said power supply means.

5. The combination of claim 3 wherein said electrical system includes momentarily operable manual switch means for momentarily connecting said power supply means to at least one of said lines at the will of the operator, and the switching rate of said automatic switching means being sufficiently high that at least one cycle of operation thereof will always occur during the momentary operation of said manual switch means.

6. The combination of claim 3 wherein said electrical system includes an audible communication system, and said control pulses being at a non-audible pulse repetition rate.

7. A burglar alarm system for a building having individual apartments or sections each with a door leading thereto, said burglar alarm system comprising: a door switch opposite each door which switch has a first condition when the door is closed and a second condition when the door is opened; a manually operable prepare means for each apartment or section of the building for preparing the alarm system for operation thereat when operated to a given condition; signal counting means for each section of the building for providing an alarm operating signal for each two control signals fed thereto; means associated with each door switch and responsive each time the associated door switch is operated from said first to said second condition for feeding a control signal to the signal counting means of the associated section of the building provided the prepare means is in said given condition; and annunciator means for each section of the building responsive to the alarm operating signal of the associated signal counting means for signalling an alarm for such section of the building.

8. The burglar alarm system of claim 7 wherein each building section has additional points of entry to be monitored other than said door, an entry switch like said door switch at each entry point which has first and second conditions like said door switch when the entry points are respectively closed and opened and said entry switches being connected in parallel with said door switch wherein said door switch responsive means responds in the same way to successive openings of any point of entry to the apartment.

9. A burglar alarm system for a building having at least one point of entry, said burglar alarm system comprising: an entry sensing means at said entry point having an alarm condition when the entry point is crossed; a manually operable prepare means for said point of entry for preparing the alarm system for operation independently of the condition of said entry sensing means when operated to a given prepare condition; signal counting means for providing an alarm operating signal for each two control signals fed thereto; means responsive each time any entry sensing means is operated to said alarm condition and said prepare means is in said prepare condition by

feeding a control signal to the signal counting means; and annunciator means responsive to the alarm operating signal of the signal counting means for signalling an alarm condition for the building.

10. The burglar alarm system of claim 9 wherein said annunciator means includes means preventing the signalling of said alarm unless said prepare means is in said prepare condition for a period in excess of the time required for an occupant passing said entry point to operate the prepare means to said prepare condition.

11. A burglar alarm system for monitoring the unauthorized entry of a person through an entry point thereof, said burglar alarm system comprising: entry sensing switch means opposite said entry point which switch means has a first normal condition and a second condition when a person passes said entry point; an alarm preparing switch operable to a first burglar alarm preparing condition and a second burglar alarm turn-off condition; an audible device; and means responsive to the simultaneous operation of an entry sensing means to said second condition and the associated alarm preparing switch to its burglar alarm preparing condition for operating the associated audible device during every passage of the entry point, wherein a person is automatically alerted to the operating condition of the burglar alarm as he passes said entry point while entering or leaving the same; means responsive to said second condition of the entry sensing means every second time the entry point is passed and the burglar alarm preparing condition of the alarm preparing switch for signalling an alarm for the section of the building involved after a delay period sufficient to enable a person making lawful entry to operate said alarm preparing switch to said burglar alarm turn-off condition, if the switch is not so operated said alarm being independent and distinguishable from the audible alarm of said audible device.

12. In a building or the like having individual sections each having an entrance door with a key operated lock which can be picked by an expert lock picker in a given time; at least two common lines extending between the apartments; individual lines extending respectively to the different sections of the building, a burglar alarm system, said burglar alarm system comprising:

- (a) a door switch at each building section entrance door which has a first condition when the door is closed and a second condition when the door is opened;
- (b) an alarm preparing key switch within each building section, the key switch including a key operated lock which requires a much greater picking time than said given time and operable by insertion of a key in the associated lock to a first burglar alarm preparing condition or a second burglar alarm turn-off condition;
- (c) means for respectively cyclically coupling control pulses to said common lines respectively having a first and a second predetermined phase;
- (d) means connecting said alarm preparing means in each building section between one of said common lines and the individual line extending to the building section involved for coupling control pulses of said first predetermined phase to the associated individual line only when the associated alarm preparing switch is in said alarm preparing condition;
- (e) means for connecting said door switch of each building section between the other of said common lines and the individual line extending to the associated building section involved for coupling control pulses of said second predetermined phase to the associated individual line only when the associated door switch is operated to said second condition by the opening of the associated door;
- (f) and annunciator means responsive to only the combined presence of the control pulses of said first and second predetermined phase on any of said individual lines by signalling an alarm for the building section

involved, if such pulses persist after a predetermined delay interval greater than said given period which enables a building occupant re-entering his section to operate the associated alarm preparing switch to a burglar alarm turn-off condition.

13. In a building having different sections with an entrance door closing off each section, a first common line extending between the various sections of the building, and individual control lines extending to the various sections of the building, a burglar alarm system comprising: (a) a door switch opposite each said entrance door which door switch has a first condition when the door is closed and a second condition when the door is opened; (b) means for cyclically applying control pulses of a first predetermined phase to said first common line; (c) means connecting the door switch in each section of the building between said first common line and the individual control line extending to the section of the building involved for coupling control pulses of said first phase to the individual control line only when the associated door switch is operated to said second condition by the opening of the associated door; (d) a door switch responsive circuit for each building section and having a first input connected to the associated individual control line and a second input, means connecting control pulses having said first phase to the second inputs of all the alarm preparing switch responsive circuits, gate means for providing a control signal each time there is coincidence between the pulses at said first and second inputs of the door switch responsive circuit, pulse integrating means selectively responsive only to closely following repetitive control pulses provided by said gate means resulting from each door opening by producing a voltage which rises to a given threshold level, a first scale of two counter bistable circuit responsive to said voltage output of said pulse integrating means by changing from one state to another each time said voltage output rises to said threshold level, wherein the latter bistable circuit is triggered into a set state every two times the door of the associated apartment is opened; and (e) means responsive to the set state of said first bistable circuit by signalling an alarm for the building section involved.

14. In a building having different sections with an entrance door closing off each section, a first and a second common line extending between the various sections of the building, and individual control lines extending to the various sections of the building, a burglar alarm system comprising: (a) a door switch opposite each said entrance door which door switch has a first condition when the door is closed and a second condition when the door is opened; (b) an alarm preparing switch for each section of the building operable to a burglar alarm setting condition and a burglar alarm turn-off condition; (c) means for cyclically applying control pulses of a first predetermined phase to said first common line and of a second predetermined phase to said second common line; (d) means connecting the door switch in each section of the building between said first common line and the individual control line extending to the section of the building involved for coupling control pulses of said first phase to the individual control line only when the associated door switch is operated to said second condition by the opening of the associated door; (e) means connecting the alarm preparing switch in each section of the building between said second common line and the associated individual control line extending to the section of the building for coupling control pulses of said second phase to the control line involved only when the associated alarm preparing switch is in said alarm setting condition; (f) a door switch responsive circuit for each building section and having a first input connected to the associated individual control line and a second input, means feeding control pulses having said first phase to the second inputs of all the alarm preparing switch responsive circuits, gate means in each door switch responsive circuit for providing a control signal each time there is coincidence between the pulses at said first and

second inputs of the door switch responsive circuit, pulse integrating means selectively responsive only to closely following repetitive control pulses provided by said gate means resulting from each door opening by producing a voltage which rises to a given threshold level, a first scale of two counter bistable circuit responsive to said voltage output of said pulse integrating means by changing from one state to another each time said voltage output rises to said threshold level, wherein the latter bistable circuit is triggered into a set state every two times the door of the associated apartment is opened; (g) an alarm preparing switch responsive circuit for each apartment section of the building having a first input connected to the associated individual control line and a second input, means connecting control pulses having said second phase to all the second inputs of said alarm preparing switch responsive circuits, and a second bistable circuit operated in a stable reset state when there is no coincidence between the control pulses at said first and second signal inputs thereof and operated in a stable set state when there is coincidence between said control pulses at said first and second signal inputs thereof; (h) and means responsive to the coinciding of the set state of said first and second bistable circuits of the associated alarm preparing and door switch responsive circuits by signalling an alarm for the building section involved provided the second bistable circuit is not reset during a predetermined delay interval permitting an occupant of a building section entering the same to operate said alarm preparing switch to said burglar alarm turn-off condition.

15. In an apartment building including: (1) an entrance hall with individual manually operable apartment doorbell switches, a transmitter unit and a receiver unit, an entrance hall door on an inside wall of said entrance hall blocking the entrance into the building from the hallway; (2) individual apartments each having an entrance door blocking entry to the apartments each having an entrance door blocking entry to the apartment, a transmitter and a receiver unit, and a doorbell; (3) common power supply means; (4) a common listen line connected with said power supply means, all the apartments receiver units and the hallway transmitter units for enabling the apartment occupants to hear a visitor speaking into the hallway transmitter unit; (5) a common talk line connected with said power supply means, all the apartment transmitter units and the hallway receiver unit for enabling the apartment occupants to talk to a visitor listening to the hallway receiver unit; (6) and individual doorbell lines each connected with said power supply means, a different apartment doorbell and a different hallway doorbell switch for energizing the associated doorbell when the associated hallway doorbell switch is operated; the improvement in a burglar alarm system comprising:

- (a) a door switch at each apartment entrance door which has a first condition when the front door is closed and a second condition when the front door is opened;
- (b) an alarm preparing switch in each apartment operable to a first burglar alarm preparing condition and a second burglar alarm turn-off condition;
- (c) means for respectively cyclically coupling to said common lines control pulses having a first and second phase;
- (d) means connecting the alarm preparing switch in each apartment between one of said common lines and the associated doorbell line for coupling pulses of a first predetermined phase to the associated doorbell line only when the associated alarm preparing switch is in said alarm preparing condition;
- (e) means connecting said door switch of each apartment between another of said common lines and the associated doorbell line for coupling pulses of a second predetermined phase to the associated doorbell line only when the door switch is operated to said second condition by the opening of the associated door;

(f) and an annunciator means responsive only to the combined presence of pulses of said first and second predetermined phase on any of said doorbell lines for signalling an alarm for the apartment if such pulses persist after a predetermined delay which enables an apartment occupant re-entering his own apartment to operate said alarm preparing switch and means.

16. In an apartment building including: (1) an entrance hall with individual manually operable apartment doorbell switches, a transmitter unit and a receiver unit, an entrance hall door on an inside wall of said entrance hall blocking the entrance into the building from the hallway, and a solenoid operated lock for the door which enables the door to be opened when energized; (2) individual apartments each having an entrance door blocking entry to the apartment, a transmitter and a receiver unit, a doorbell, and a manually operable solenoid operating switch; (3) common power supply means; (4) a common solenoid line connected with said power supply means, all the apartment solenoid operating switches and said solenoid operated lock for effecting energization of the solenoid operable lock when a solenoid operating switch in any apartment is operated; (5) a common listen line connected with said power supply means, all the apartments receiver units and the hallway transmitter units for enabling the apartment occupants to hear a visitor speaking into the hallway transmitter unit; (6) a common talk line connected with said power supply means, all the apartment transmitter units and the hallway receiver unit for enabling the apartment occupants to talk to a visitor listening to the hallway receiver unit; (7) and individual doorbell lines each connected with said power supply means, a different apartment doorbell and a different hallway doorbell switch for energizing the associated doorbell when the associated hallway doorbell switch is operated; the improvement in a burglar alarm system comprising:

- (a) a door switch at each apartment entrance door which has a first condition when the front door is closed and a second condition when the front door is opened;
- (b) an alarm control box in each apartment, the box having a removable panel thereon;
- (c) an alarm preparing key switch exposed for the outside of each alarm control box in each apartment and operable by the insertion thereto and movement of a key to a first burglar alarm preparing condition and a second burglar alarm turn-off condition;
- (d) a tamper switch in each alarm control box which has an alarm condition when the removable panel is moved to an alarm box opening condition and an inoperative condition when the panel is in an alarm box closing condition;
- (e) means for respectively cyclically coupling to said common lines control pulses having a first, and a second, and a third phase;
- (f) means connecting the alarm preparing key switch in each apartment between one of said common lines and the associated doorbell line for coupling pulses of a first predetermined phase to the associated doorbell line only when the associated alarm preparing switch is in said alarm preparing condition;
- (g) means connecting said door switch of each apartment between another of said common lines and the associated doorbell line for coupling pulses of a second predetermined phase to the associated doorbell line only when the door switch is operated to said second condition by the opening of the associated door;
- (h) means connecting said tamper switch in each apartment between still another of said common lines and the associated doorbell line for coupling pulses of a third predetermined phase to the associated doorbell line when the tamper switch is operated to its alarm condition;
- (i) an annunciator means responsive only to the com-

combined presence of pulses of said first and second predetermined phase on any of said doorbell lines for signalling an alarm for the apartment if such pulses persist after a predetermined delay which enables an apartment occupant re-entering his own apartment to operate said alarm preparing key switch and means;

- (j) and annunciator means responsive only to the combined presence of pulses of said first and third predetermined phase on any of said doorbell lines for immediately signalling an alarm for that apartment.

17. In a building or the like including a number of sections having a first and second common line extending between the various sections of the building, and an individual control line extending to each section for monitoring a given condition in each section of the building comprising: a condition sensing switch means for each section of the building operated to an alarm condition when the condition to be monitored is present in the associated building section; control signal generating means for cyclically applying control pulses of a first phase to said first common line and control pulses of a second phase to said second common line; means coupling each said condition sensing means between said first common line and the individual control line extending to the associated building section for providing on the individual control line involved control pulses of said first phase only when the associated condition sensing switch means is in its alarm condition; means continuously connecting the pulses on said second common line to all of the individual control lines extending to the various sections of the building; and pulse responsive-annunciator means for each section of the building responsive to the presence of control pulses of said first phase on the associated individual control line for signalling a first alarm for the associated section of the building indicating the presence of the monitored condition and responsive to the absence of control pulses of said second phase on the associated individual control line for signalling a second alarm for the associated section of the building indicating a defect in the alarm system.

18. A burglar alarm system for monitoring the unauthorized entry of a person through an entry point thereof, said burglar alarm system comprising: entry sensing switch means opposite said entry point which switch means has a first normal condition and a second condition when a person passes said entry point; an alarm preparing switch operable to first burglar alarm preparing condition and a second burglar alarm turn-off condition; an audible device; and means responsive to the simultaneous operation of an entry sensing means to said second condition and the associated alarm preparing switch to its burglar alarm preparing condition for operating the associated audible device only during the passage of the entry point, wherein a person is automatically alerted to the operating condition of the burglar alarm as he passes said entry point; a manual reset switch; means responsive to said second condition of the entry sensing means every second time the entry point is passed and the burglar alarm preparing condition of the alarm preparing switch for signalling an alarm for the section of the building involved after a delay period sufficient to enable a person making lawful entry to operate said alarm preparing switch to said burglar alarm turn-off condition, if the switch is not so operated, said alarm being independent and distinguishable from the audible alarm of said audible device, said alarm persisting until said reset switch is operated.

19. In an apartment building or the like including an entrance hall with individual manually operable apartment ringing switches; individual apartments each having an entrance door with a key operated lock which can be picked by an expert lock picker in a given time and ringing means to be operated by one of said manually

operable switches in the entrance hall; a signalling system between said apartments and the entrance hall including at least two common lines extending between the apartments and the entrance hall area; individual control lines completing apartment ringing circuits extending between the manually operable switches in the entrance hall and said ringing means in the individual apartments; and power supply means coupled to said common lines and said individual control lines for energizing said signalling system and ringing circuits; a burglar alarm system superimposed on said signalling system and the ringing circuits, said burglar alarm system comprising:

- (a) a door switch at each apartment entrance door which has a first condition when the door is closed and a second condition when the door is opened;
- (b) an alarm preparing key switch within each apartment, the key switch including a key operated lock which requires a much greater picking time than said given period of time and operable by insertion of a key in the associated lock to a first burglar alarm preparing condition or a second burglar alarm turn-off condition;
- (c) means for respectively cyclically coupling control pulses to said common lines respectively having a first and a second predetermined phase;
- (d) means connecting said alarm preparing means in each apartment between one of said common lines and the individual line extending to the apartment involved for coupling control pulses of said first predetermined phase to the associated individual control line only when the associated alarm preparing switch is in said alarm preparing condition;
- (e) means for connecting said door switch of each apartment between the other of said common lines and the individual control line extending to the apartment involved for coupling control pulses of said second predetermined phase to the associated individual control lines only when the associated door switch is operated to said second condition by the opening of the associated door;
- (f) an annunciator means responsive to only the combined presence of the control pulses of said first and second predetermined phase on any of said individual control lines for signalling an alarm for the apartment involved, if such pulses persist after a predetermined delay interval greater than said given period which enables an apartment occupant re-entering his own apartment to operate the alarm preparing switch in the apartment involved to a burglar alarm turn-off condition.

20. In a building or the like including a number of sections having a first and a second common line extending therebetween, and an individual line extending to each section of the building, the improvement comprising a monitoring system for monitoring a given condition in each section of the building comprising: a condition sensing switch means for each section of the building operated to an alarm condition when the condition to be monitored is present in the associated building section; separate preparing switch means for each section of the building having an alarm preparing and an alarm disabling condition; control pulse generating means for cyclically applying control pulses of a first phase and polarity to said first common line and control pulses of a second phase and said polarity to said second common line; isolating rectifier means for said common lines; means coupling each of said separate condition sensing switch means through a different one of said rectifier means arranged to pass said control pulses between said first common line and the individual control line extending to the associated building section for providing on the individual control line involved control pulses of said first phase only when the associated condition sensing switch means is in its alarm condition; means coupling each preparing switch means through a different one of rectifier

means arranged to pass said control pulses between said second common line and the individual control line extending to the associated building section for providing on the individual control line involved control pulses of said second phase only when the preparing switch means is in its alarm preparing condition, and pulse responsive annunciator means responsive only to the combined presence of said first and second control pulses on any of said individual control lines for signalling an alarm for the section of the building involved.

21. In a building having different sections with an entrance door closing off each section, a first and a second common line extending between the various sections of the building and individual lines extending to the various sections of the building, a burglar alarm system comprising: a door switch opposite each said entrance door which door switch has a first condition when the door is closed and a second condition when the door is opened; alarm preparing switch means for each section of the building operable to a burglar alarm preparing condition and a burglar alarm turn-off condition; means for cyclically applying control pulses of a first predetermined phase to said first common line and of a second predetermined phase to said second common line; means connecting the alarm preparing switch means in each section of the building between one of said common lines and the individual line extending to the associated section of the building, for coupling control pulses of said first phase to the associated individual line only when the associated alarm preparing switch means is in said alarm preparing condition; means connecting the door switch in each section of the building and said alarm preparing switch means between the other of said common lines and the individual line extending to the associated section of the building for coupling pulses of said second phase to the associated line only when the associated door switch is operated to said second condition by the opening of the associated door and the associated alarm preparing switch means is in said alarm preparing condition, and an annunciator circuit for each section of the building responsive only to the combined presence of the control pulses of said first and second predetermined phase on any of said individual lines for signalling an alarm for the section of the building involved.

22. The burglar alarm system of claim 21 wherein said annunciator means respond to said combined presence of the control pulses of said first and second phase on any individual line if the pulses of said first phase persist on the individual line involved after a predetermined delay interval which enables an occupant entering the section of the building involved to operate said alarm preparing switch to its alarm turn-off condition.

23. The burglar alarm system of claim 22 wherein said annunciator means comprise: (a) an alarm preparing switch signal circuit for each section of the building having a first input connected to the associated individual line and a second input, means connecting control pulses having said first phase to all the second inputs of said alarm preparing switch signal circuit, and a bistable circuit in each alarm preparing switch signal circuit having a normal stable reset state and operated to a set state when there is coincidence between said control pulses at said first and second signal inputs thereof, and means for cyclically resetting said first bistable circuit; (b) a door switch signal circuit for each building section having a first input connected to the associated individual line and a second input, means connecting control pulses having said second phase to the second inputs of all the alarm preparing switch circuits, gate means in each door switch signal circuit for providing a control pulse each time there is coincidence between the pulses at said first and second inputs of the door switch signal circuit, pulse integrating means selectively responsive only to closely following repetitive control pulses provided by said gate means resulting from each door opening by producing an output voltage which raises to a given threshold level, a scale of

two counter bistable circuit responsive to said voltage output of said pulse integrating means by changing from one state to another each time said output voltage rises to said threshold level, wherein the latter bistable circuit is triggered into a set state every two times the door of the associated sections of the building is opened; (c) and means responsive to the coinciding of the set states of said bistable circuits of the associated alarm preparing and door switch signal circuits by signalling an alarm for the building section involved provided the first bistable circuit is not reset during a predetermined delay interval permitting an occupant entering the building section involved to operate said alarm preparing switch to said burglar alarm turn-off condition.

24. The burglar alarm system of claim 22 wherein there is provided switch means responsive to the operation of the alarm preparing switch means in each section of the building to its alarm turn-off condition for preventing the coupling of the pulses on said other common line to the individual line involved, to prevent the operation of said scale of two bistable circuits except when the burglar system is operating.

25. In a building or the like including a number of sections having a first common line extending therebetween and forming part of a first common circuit, a second common line extending between said building sections and forming part of a second common circuit, said common lines being coupled by a finite electrical impedance of at least one of said common circuits, and an individual line extending to each section of the building; the improvement comprising an annunciator system superimposed on said common lines for determining when a first and/or a second specified condition occurs in each section of the building comprising: a separate first condition alerting switch means for each section of the building having a normal condition and operated to a notifying condition when said first specified condition occurs in the associated building section; a separate second condition alerting switch means for each section of the building having a normal condition and operated to a notifying condition when said second specified condition occurs in the associated building section; signal generating means for applying a first signal to said first common line and a second signal to said second common line; means coupling each of said separate first condition alerting switch means between said first common line and the individual line extending to the associated building section for providing on the individual line involved said first signal when the associated first condition alerting switch means is in one of said conditions and removing the same therefrom when the associated first condition alerting switch means is in the other of said conditions; means coupling each of said separate second condition alerting switch means between said second common line and the individual line extending to the associated building section for providing on the individual line involved said second signal when the associated second condition alerting switch means is in one of said conditions and removing the same therefrom when the associated second condition alerting switch means is in the other of said conditions; means for effectively decoupling said first common line with respect to said second signal and said second common line with respect to said first signal, and annunciator means responsive to the signal condition on any of said individual lines indicating a notifying condition of the associated condition alerting switch means.

26. The monitoring system of claim 25 wherein said decoupling means comprises voltage source means having a voltage output magnitude greater than said control signals, and means coupling said voltage source means in voltage opposition to one of said control signals at a circuit junction from which said control signal would otherwise couple from its associated common line to the other said common line to override the effect of said electrical impedance.

27. The annunciator system of claim 25 wherein there is provided excitation means for applying voltage of a given polarity relative to an associated first reference ground on said common lines; said common line coupling impedance path being completed through said excitation means; and said control signals have a given polarity relative to an associated second reference ground; said decoupling means comprising means for periodically disconnecting said excitation means from one or both said common lines for specified time intervals during which the annunciator system is operable, said annunciator system being inoperative during the intervening intervals.

28. In a building having different sections with at least one entryway to each of said sections, a first and a second common line extending between the various sections of the building, and interline impedance means connected between said first and second common lines, a burglar alarm system comprising: entry sensing switch means at said entryway to each section of the building which switch means has an alertive condition when a person passes through the entryway; alarm preparing switch means for each section of the building operable to burglar alarm preparing condition and a burglar alarm turn-off condition; means for cyclically applying control pulses of a first predetermined phase and a given polarity relative to a reference ground to said first common line and of a second predetermined phase and said given polarity relative to said reference ground to said common line; first and second isolating rectifier means for each section of the building; means connecting the alarm preparing switch means in each section of the building between one of said common lines and the individual line extending to the associated section of the building through the associated first isolating rectifier means arranged to pass said control pulses, for coupling control pulses of said first phase to the associated individual line only when the associated alarm preparing switch means is in said alarm preparing condition; means connecting the entry sensing switch means in each section of the building and said alarm preparing switch means between the other of said common lines and the individual line extending to the associated section of the building through the associated second isolating rectifier means arranged to pass said control pulses, for coupling control pulses of said second phase to the associated line only when the associated entry sensing switch means is operated to said alerting condition and the associated alarm preparing switch means is in said alarm preparing condition; and annunciator circuit for each section of the building having an input coupled between the associated individual line and said reference ground and having an input impedance which is significant relative to said interline impedance means each of said annunciator circuits being responsive only to the combined pressure of the control pulses of said first and second predetermined phase on any of said individual lines for signalling an alarm for the section of the building involved; and an isolating voltage supply having a direct current output connected between said first and second common lines and having a magnitude which is greater than and a polarity which opposes the control pulses of said second phase.

29. In an electrical system including a first, second and third line forming part of an electrical system; and power supply means providing energizing power on said lines for said electrical system; the improvement comprising an annunciator system superimposed on said electrical system for determining when a first and/or second specified condition occurs comprising: (a) a first condition alerting switch means having a normal condition and operated to a notifying condition when said first specified condition occurs; (b) a second condition alerting switch means having a normal condition and operated to a notifying condition when said second specified condition occurs; (c) means for respectively coupling first and second signals to said first and second respective lines; (d) means coupling

said first condition alerting switch means between said first line and the third line for providing on the third line involved said first signal when the associated first condition alerting switch means is in one of said conditions and removing the same therefrom when the associated first condition alerting switch means is in the other of said conditions; (e) means coupling said separate second condition alerting switch means between said second line and the third line for providing on the third line involved said second signal when the second condition alerting switch means is in one of said conditions and removing the same therefrom when the associated second condition alerting switch means is in the other of said conditions; (f) an annunciator control circuit responsive to the signal condition on said third line indicating a notifying condition of the associated condition alerting switch means; (g) and means for preventing interaction of said electrical system on said annunciator system, said interaction preventing means comprising continuously operating automatic switching means for cyclically disconnecting said power supply means from said lines for limited time intervals during which the annunciator system is operable, said annunciator system being inoperative during the intervening time intervals, and the electrical system being non-responsive to said signals during said intervening time intervals.

30. In a building or the like including a number of sections having a first common line extending therebetween and forming part of a first common circuit, a second common line extending between said building sections and forming part of a second common circuit, said common lines being coupled by a finite electrical impedance means, and an individual line extending to each section of the building and completing an individual circuit associated with the building section; the improvement comprising an annunciator system superimposed on said common and individual lines for determining when a first and/or a second specified condition occurs in each section of the building comprising: a separate first condition alerting switch means for each section of the building operated to a notifying condition when said first specified condition occurs in the associated building section; a separate second condition alerting switch means for each section of the building operated to a notifying condition when said second specified condition occurs in the associated building section; control signal generating means for applying a first control signal of a given polarity relative to a reference ground to said first common line and a second control signal relative to said reference ground to said second common line, a first and a second isolating rectifier for each section of the building means coupling said first condition alerting switch means in each section of the building between said first common line and the individual line extending to the associated section of the building through the associated first isolating rectifier; means for coupling said first control signal to the associated individual line only when the associated first condition alerting switch means is in said notifying condition; means connecting the second condition alerting switch means in each section of the building between said second common line and the individual line extending to the associated section of the building through the associated second isolating rectifier; means for coupling said second control signal to the associated line only when the associated second condition alerting switch means is operated to said notifying condition; an annunciator circuit for each section of the building having an input coupled between the associated individual line and said reference ground and having an input impedance which is significant relative to said finite electrical impedance means, each of said annunciator circuits being responsive to said control signals for signalling the presence of the condition involved for the associated section of the building; and an isolating voltage supply having a direct current output connected between said first and second common lines and having a magnitude

which is greater than and a polarity which opposes said first control signal.

31. In a building or the like including a number of sections having a common line extending therebetween, and individual lines extending to each section of the building and each completing an individual circuit for carrying out at least a first given function for each section of the building, and power supply means for providing energizing power on said individual lines for said individual circuits for carrying out said first given function, the improvement comprising a monitoring system superimposed on said individual circuits for carrying out a second function which is the monitoring of a given condition in each section of the building, said monitoring system comprising: a separate condition sensing switch means for each section of the building and having a normal condition and operated to an alarm condition when the condition to be monitored is present in the associated building section; a preparing switch means for each section of the building which switch means has alarm preparing and alarm disabling conditions which have no deactivating effect on the carrying out of said first given function by said individual circuits; signal generating means for applying a signal to said common line; means coupling each of said separate condition sensing switch means between said common line and the individual line extending to the associated building section for providing said signal on the individual line involved when the associated condition sensing switch means is in one of said conditions and for removing the same therefrom when the associated condition sensing means is in the other of said conditions; a control circuit for each section of the building responsive to the signal condition of the associated individual line when the associated condition sensing means is in said alarm preparing condition by signalling an alarm for the section of the building involved; and means separate from said preparing switch means for preventing interaction of said individual circuits on said control circuits without adverse effect on the carrying out of said first given function by said individual circuits.

32. The building and monitoring system of claim 31 wherein said individual lines are coupled by finite electrical impedance means of at least one of said individual circuits, and means for effectively preventing the coupling of said control signal between said individual lines through said impedance means.

33. The annunciator system of claim 32 wherein said control signal coupling occurs through said excitation means, and said excitation voltage has a given polarity relative to an associated first reference ground, and said control signal has a given polarity relative to an associated second reference ground; and said coupling preventing means comprises means for periodically disconnecting said excitation means from said individual lines for specified time intervals during which the annunciator system is operable, said annunciator system being inoperative during the intervening intervals.

34. The building and monitoring system of claim 31 wherein said common and individual lines are coupled by finite electrical impedance means of said common and individual circuits; and means for effectively preventing the coupling of said control signal between said common line and any of said individual lines through said impedance means.

35. The monitoring system of claim 31 wherein said interaction preventing means includes means for automatically cyclically disconnecting said power supply means from said individual lines for limited time intervals during which the monitoring system is operable and at a rate which does not adversely affect the carrying out of the first given function by said individual circuits, said monitoring system being inoperative during the intervening intervals.

36. The combination of claim 31 wherein there is a circuit associated with said common line which is part of a voice communication system; and said signal of said

signal generating means being pulses having a non-audible pulse repetition rate wherein the pulses cannot be heard in said communication system.

37. In combination with the building and monitoring system of claim 31 where the building is an apartment house where said sections of the building are apartments, and the building has a second common line extending to said apartments, and said individual lines of the building extend to the respective apartments of the building, a garage calling annunciator system superimposed on said circuits and monitoring system for alerting a garage attendant when the occupant of a given apartment is coming for his car, said garage calling system including a separate garage call switch means for each apartment of the building having a normal condition and operated to a notifying condition when the occupant of the apartment involved desires his car; signal generating means for applying a second signal to said second common line which is distinguishable from said first signal; means coupling each of said separate garage call switch means between said second common line and individual line extending to the associated building apartment for providing said second signal on the individual line involved when the associated garage call switch means is in one of said conditions and removing the same therefrom when the associated garage call switch means is in the other of said conditions; an annunciator circuit in the garage for each apartment of the building responsive to the signal condition of the associated individual line when the garage call switch means is in its notifying condition by signalling an indication in the garage that the occupant of the apartment involved is coming for his car.

38. The garage calling annunciator system of claim 37 wherein said interaction preventing means includes means for automatically cyclically disconnecting said power supply means from said individual lines for limited time intervals during which the annunciator system is operable and at a rate which does not adversely affect the carrying out of said first given function by said individual circuits.

39. The building and monitoring system of claim 31 wherein there is provided first indicating means for each section of the building for indicating the carrying out of said first function thereat and said control circuit including second indicating means for each section of the building for indicating the signalling of an alarm for the section of the building involved.

40. The building and monitoring system of claim 31 wherein said signal on said individual line is a unidirectional current and there is provided rectifier means in series with each condition sensing switch means for passing said signal.

41. The monitoring system of claim 31 wherein the condition of each section of the building to be monitored is the unauthorized entry of a person through an entry point thereof, each of said condition sensing switch means is opposite the entry point of the associated section of the building and is operated to said alarm condition when the person passes said entry point; said preparing switch means for each section of the building is operable to prepare the monitoring system for operation independently of the condition of the associated condition sensing switch means when operated to said alarm preparing condition; and there is provided a manual reset switch means operable from a normal inoperative condition to a reset condition; annunciator means associated with each condition sensing switch means responsive to the alarm condition thereof every second time the entry point is passed when the alarm preparing switch means is in said alarm preparing condition for signalling the alarm for the section of the building involved if the associated preparing switch means is not operated to said alarm disabling condition within a period sufficient to enable a person lawfully passing the entry point involved to operate the associated preparing switch means to said alarm disabling condition to prevent such alarm, said annunciator means including means for sustaining a signalled alarm inde-

pendently of the subsequent condition of the associated alarm preparing switch means and condition sensing switch means until the reset switch means is operated to said reset condition.

42. In a building or the like including a number of sections having a common line extending therebetween, individual lines extending to each section of the building and each completing an individual circuit forming a ringing circuit including a ringing means and an associated manually operable ringing switch for operating the associated ringing means at a ringing rate which is directly dependent on the frequency or pulse repetition rate of the current fed thereto, and power supply means for providing energizing power on said individual lines for energizing a ringing means whose associated ringing switch is operated, the improvement comprising: a monitoring system superimposed on said individual ringing circuits for monitoring a given condition in each section of the building, said monitoring system comprising: a separate condition sensing means for each section of the building and having a normal condition and operated to an alarm condition when the condition to be monitored is present in the associated building section; a preparing switch means for each section of the building having an alarm preparing and an alarm disabling condition; signal generating means for applying a signal to said common line; means coupling each of said separate condition sensing switch means between said common line and the individual line extending to the associated building section for providing said signal on the individual line involved when the associated condition sensing switch means is in one of said conditions and for removing the same therefrom when the associated condition sensing means is in the other of said conditions; a control circuit for each section of the building responsive to the signal condition of the associated individual line when the associated condition sensing means is in its alarm condition and the preparing switch means is in said alarm preparing condition by signalling an alarm for the section of the building involved; means for preventing interaction of said energizing power on said control circuit, said means for preventing interaction comprising means for cyclically disconnecting said power supply means from said individual lines at an audible rate at which the ringing means is operable; and means enabling the operation of said monitoring system during the disconnection of said power supply means from said individual control lines and inhibiting the operation thereof during the connection of said power supply means to said individual lines.

43. In a building or the like including a number of sections having a common line extending therebetween, an individual line extending to each section of the building and each completing an individual circuit, said individual lines being coupled by finite electrical impedance means of at least one of said individual circuits, and excitation means for providing voltage with respect to a first reference ground on said individual lines for said individual circuits, the improvement comprising: an annunciator system superimposed on said circuits for determining when a specified condition occurs in each section of the building, said annunciator system comprising: a separate condition alerting switch means for each section of the building operated to a notifying condition when said specified conditions occur in the associated building section; signal generating means for applying signals to said common line; means coupling each of said separate condition alerting switch means between said common line and individual lines extending to the associated building section for providing said signal on the individual line involved when the associated condition alerting switch means is in one of said conditions and for removing the same therefrom when the associated condition, alerting switch means is in the other of said condition; an annunciator circuit for each section of the building responsive to the signal condition on the associ-

ated individual line when the associated condition alerting switch means is in said notifying condition; and means for effectively preventing the coupling of said signal between said individual lines through said impedance means comprising means for automatically disconnecting said excitation means from said individual lines for specified time intervals during which the annunciator system is operable, said annunciator system being inoperative during the intervening intervals.

44. In a building or the like including a number of sections having a common line extending therebetween and forming part of a common circuit, an individual line extending to each section of the building and each completing an individual circuit and excitation means for providing voltage with respect to a first reference ground on said common and individual lines for said circuits, said common and individual lines being coupled by finite electrical impedance means of said common and individual circuits, the improvement comprising an annunciator system superimposed on said circuits for determining when a specified condition occurs in each section of the building, said annunciator system comprising: a separate condition alerting switch means for each section of the building operated to a notifying condition when said specified condition occurs in the associated building section; signal generating means for applying a signal to said common line; means coupling each of said separate condition alerting switch means between said common line and individual lines extending to the associated building section for providing said control signal on the individual line involved when the associated condition alerting switch means is in one of said conditions and for removing the same therefrom when the associated condition alerting switch means is in the other of said conditions; an annunciator circuit for each section of the building responsive to the signal condition on the associated individual line when the associated condition alerting switch means is in said notifying condition; and means for effectively preventing the coupling of said control signal between said common line and any of said individual lines through said impedance means comprising means for automatically periodically disconnecting said excitation means from said individual lines for specified time intervals during which the annunciator system is operable, said annunciator system being inoperative during the intervening intervals.

45. In a building or the like including first and second common lines extending in common to all sections of the building and individual line means extending to each section of the building, the improvement comprising an annunciator system for determining when a first condition to be monitored in any section of the building occurs when the section is prepared for a monitoring operation, said system comprising a prepare switch means for each section of the building operable from an inoperative condition to an operative prepare condition; a separate condition monitoring means for each section of the building having a normal condition and operated to a notifying condition when the condition to be monitored occurs in the associated building section; signal generating means for applying a first signal to said first common line and a second signal distinguishable from said first signal to said second common line; means coupling each prepare switch means between said first common line and the individual line means extending to the associated building section for providing on the individual line means involved said first signal when the associated prepare switch means is in one of said conditions and removing the same therefrom when the associated prepare switch means is in the other of said conditions; means coupling each condition monitoring switch means between said second common line and the individual line means extending to the associated building section for providing on the individual line means involved said second signal when the associated condition monitoring switch means is in one of its conditions and removing the same therefrom when the associated con-

dition monitoring switch means is in the other of said conditions; and annunciator means responsive to the simultaneous presence of a signal condition on said individual line means indicating the presence of a prepare condition of the associated prepare switch means and notifying condition of the associated condition monitoring switch means by giving an alarm.

46. The building and annunciator system of claim 45 wherein each prepare switch means in addition to being connected between said first common line and the associated individual line means, is also connected to the associated condition monitoring switch means to provide said signal condition on the associated individual line means indicating that the associated condition monitoring switch means is in said notifying condition only when the associated prepare switch means is in said operative prepare condition.

47. The building and monitoring system of claim 45 wherein the condition to be monitored is the passage of a person through an entry point at each section of the building, and said annunciator means includes means for delay-

ing said alarm for a given period sufficient to allow a person to pass the associated entry point and operate said prepare switch means to said inoperative condition and for inhibiting said alarm if the prepare switch means is so operated within said period.

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