

Jan. 15, 1946.

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2,392,890

TELEPHONE TRAFFIC INDICATING AND RECORDING MEANS

Filed Feb. 3, 1944

2 Sheets-Sheet 1

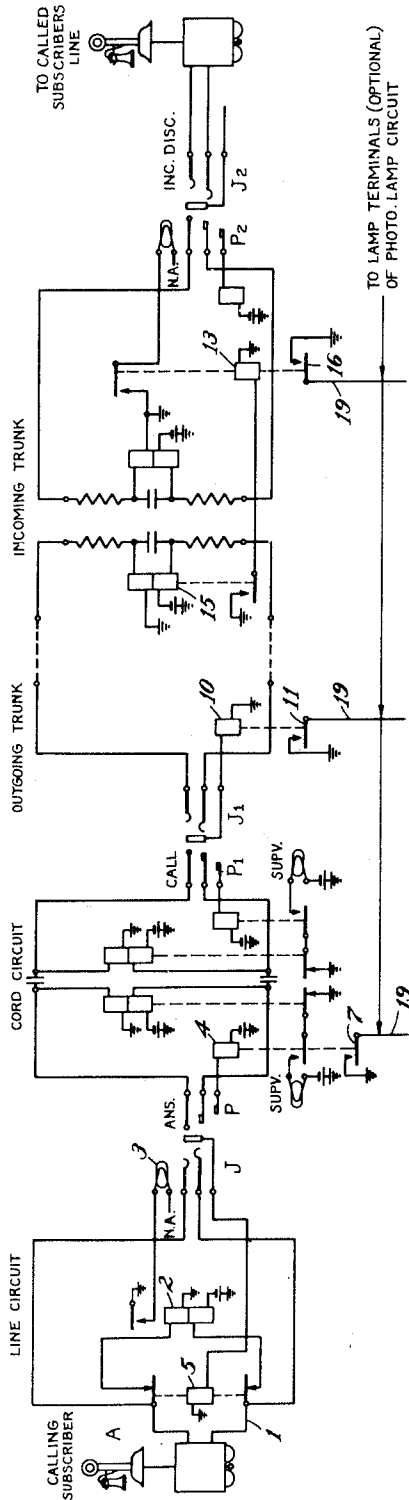


Fig. 1

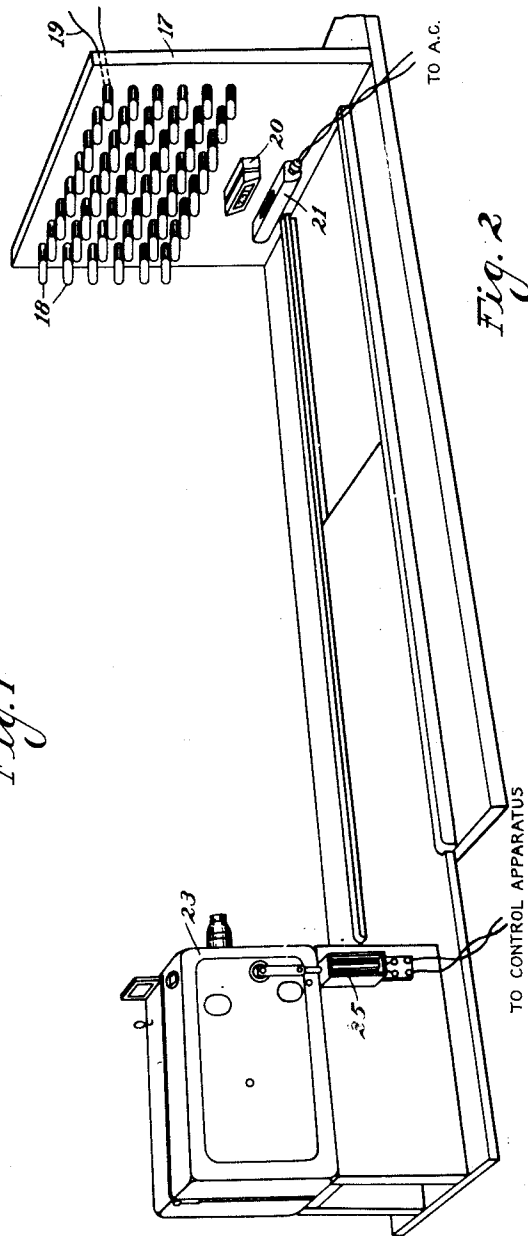


Fig. 2

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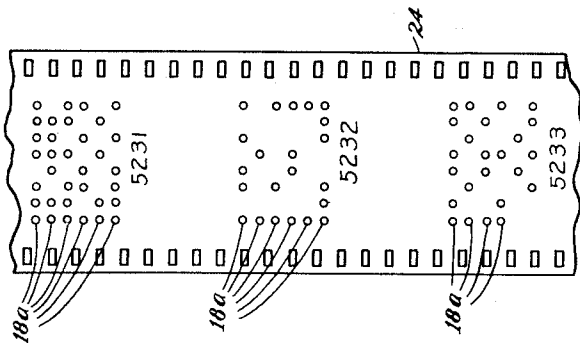


Fig. 3

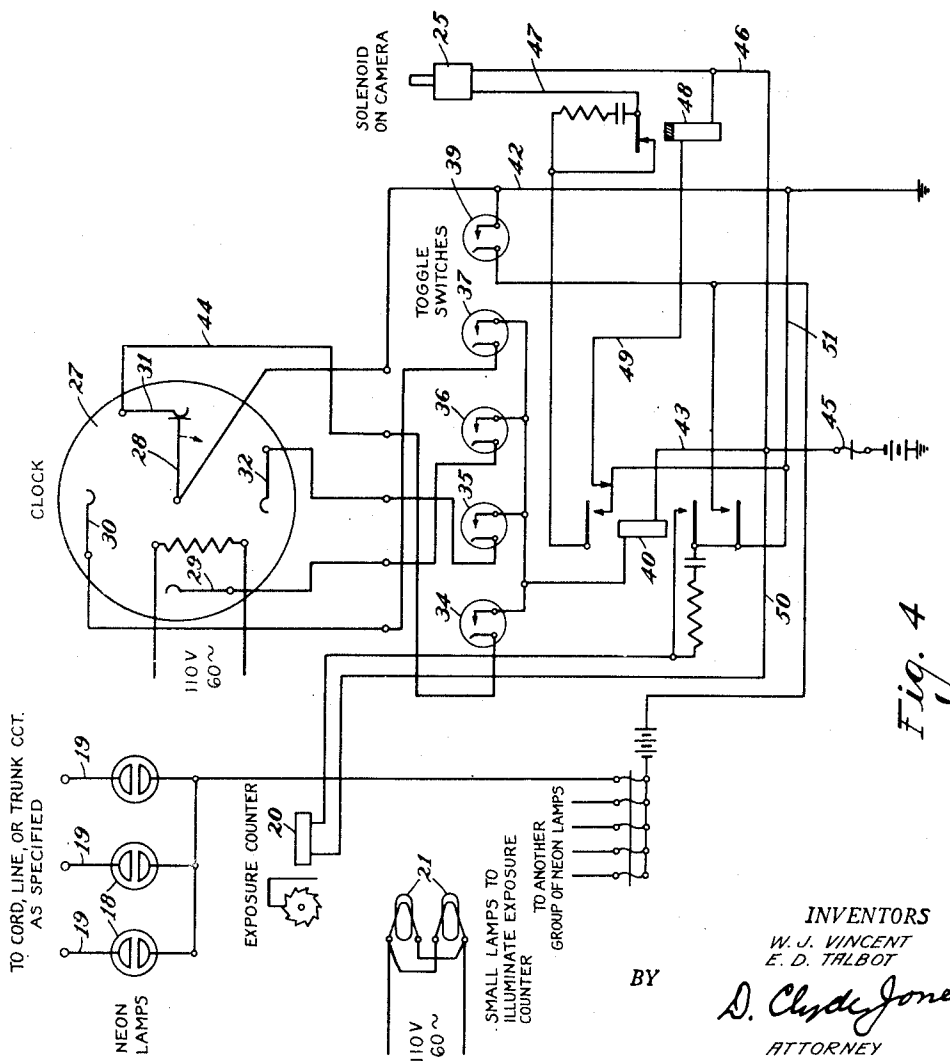


Fig. 4

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2,392,890

TELEPHONE TRAFFIC INDICATING AND
RECORDING MEANS

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Application February 3, 1944, Serial No. 520,984

7 Claims. (Cl. 179—7.1)

This invention relates to telephone systems and more particularly to means for automatically indicating and recording that portion of the time during an observation period, that a given telephone link or a group of such links, is in use.

In a telephone system it is frequently necessary in the making of traffic studies to obtain information as to the percentage of time that the several connection links such as cord circuits or trunks or lines of a group are in use. It will be appreciated that if these links are insufficient to carry the load during any given period, the service will suffer. On the other hand, if an excess of link circuits is provided, it will be uneconomical since each circuit involves a considerable investment. In the past, when such link traffic information was desired, it was necessary to have an observer note the duration of each use. Such observance was often inaccurate due to failure of the human factor.

In accordance with the main feature of the present invention, it is proposed to provide, in a suitable array, a signal for each link, which signal when actuated indicates that its link is in use and it is further proposed to photograph this array periodically to make a permanent record of the actuated signals.

In accordance with another feature of the invention, there is provided a neon lamp or the like for each link of a group which lamp is arranged to be optionally lighted either intermittently or continuously throughout the period that said link is in use. The lamps of a group are preferably compactly arranged in coordinate rows and have an illuminated counting meter associated therewith to show additionally the number of times that photographic exposures of the group of lamps have been made during a given period. A cooperating photographic device is arranged automatically to make intermittent exposures on a periodically advanced photographic strip. The images of the lighted lamps will appear in each exposure and since the rate of advance of the strip is known, it is possible to derive therefrom, what portion of a measured interval that each of the links under observation is in use.

For a clearer understanding of the invention, reference is made to the drawings in which:

Fig. 1 is a diagrammatic illustration of a portion of a telephone system including a calling and a called telephone line together with a skeleton cord circuit as well as an incoming trunk circuit and an outgoing trunk circuit, all gener-

ally referred to as links and functioning to interconnect a calling and a called subscriber;

Fig. 2 is a perspective view of the recording apparatus including a photographic device which faces a panel having mounted thereon an array of lamps, a lamp being individual to each link under observation and also having mounted thereon an exposure counting meter common to said array of lamps;

Fig. 3 is a fragment of a photographic strip with a record of link use indicated thereon; and

Fig. 4 is a diagrammatic showing of the electrical means and circuits for actuating the apparatus of Fig. 2.

Although the present invention is adapted to indicate traffic conditions on the lines or links of all types of telephone systems including both manual and automatic, it is herein illustrated in Fig. 1, as applied to a well-known manual telephone system. This system will best be understood by describing briefly the operation of extending a call to a wanted subscriber. When the subscriber at A initiates a call, the line relay 2 of calling telephone line 1 is energized in the well-known manner to light the line lamp 3. The operator on noting the lighting of the lamp 3 inserts the plug P of the cord circuit into the subscriber's line jack J. This operation energizes the sleeve relay 4 of the cord, in series with the cut-off relay 5 of the calling line, over an obvious circuit. The cut-off relay disconnects the line relay 2 from this line which results in the extinguishing of the line lamp 3. It will be noted that the sleeve relay 4 is provided with an armature and contact 7 which are closed as long as the relay 4 is operated, that is as long as the answering end of the cord circuit is in use. The operator, through suitable listening means, not shown, ascertains the number of the wanted line from the calling subscriber at A. On receiving this information, the operator inserts the plug P1 into the jack J1 of an out-going trunk leading to an incoming trunk at a distant office through which the called subscriber at station B can be reached. The incoming trunk terminates in a plug P2 at a B operator's position in the distant office where a B operator, in turn, receives the designation of the wanted line in the well-known manner and inserts the plug P2 of the incoming trunk into the jack J2 of the line 9 leading to the wanted subscriber's substation at B. It will be noted that the sleeve relay 10 associated with the outgoing trunk is energized in an obvious circuit as soon as plug P1 is inserted into the jack J1. The sleeve relay

10 is provided with an armature and contact 11 which are closed during the entire period of operation of this sleeve relay, that is, as long as the outgoing trunk is in use. The incoming trunk which is connected to the called line by inserting the plug P2 into the jack J2 of that line, is also provided with a sleeve relay 13 arranged to be operated in an obvious circuit completed at the battery feed relay 15. The sleeve relay 13 is likewise provided with an armature and contact 16 which are closed as long as this relay remains operated.

In accordance with the present invention, there is provided in combination with the telephone system of Fig. 1, the novel traffic indicating and recording apparatus illustrated in Fig. 2, as well as the novel electrical circuits and means for operating this apparatus, shown in Fig. 4. It should be pointed out that this apparatus and its operating means can be used to determine traffic conditions in a group of cord circuits, incoming trunks, or outgoing trunks, all herein generally referred to as links.

The mentioned apparatus includes a panel 17 on the face of which there are mounted in coordinate rows, a group of lamps 18 preferably of the neon type. Each of these lamps is individual to a link of a group under observation and is arranged to be periodically or continuously lighted while its related link is in use, as will be described. It will be understood that if a group of cord circuits are being observed, the observing apparatus (Fig. 2) will have a lamp 18 individual to each such cord circuit with its lighting circuit 19 controlled at the armature and contact such as 7 of the sleeve relay 4 (Fig. 1). However, if a group of outgoing trunks are under consideration, a lamp 18 individual to each trunk will have its lighting circuit controlled at the armature and contact such as 11 of a relay 10. On the other hand, if a group of incoming trunks is being studied, a lamp 18 individual to each trunk has its lighting circuit controlled at an armature and contact such as 16 of a relay 13.

For purposes of this description, it is assumed that there are forty-eight links in the group being observed and that the individual lamps 18 of these links are conveniently arranged on the panel 17 in eight vertical and six horizontal rows. There is also mounted on the face of the panel, an exposure counting meter 20, which is illuminated by a suitable light source 21 and which is actuated whenever a record is made. The lights and the meter on the face of the panel can be periodically photographed by a camera 23 normally focused on the panel. This camera is preferably arranged to utilize a strip of film 24 (Fig. 3) such as thirty-five millimeter film, and is further arranged to be actuated by a solenoid 25 which causes the camera to make an exposure as well as suitably advance the strip of film after each exposure, in readiness for a succeeding use.

The electrical means for actuating the solenoid 25 is indicated in Fig. 4 to which reference is now made. This electrical means preferably includes an electric clock 27, provided with a brush or contactor 28, which rotates continuously during the time that the electrical actuating means is in use. While the clock 27 can be arranged to rotate its brush in any desired time interval, it is herein illustrated that the brush completes each revolution in one minute of time. This brush is arranged to make successive contact with fixed contactors 29, 30, 31 and 32 positioned ninety degrees apart in the circular path of rota-

tion of the brush. Thus, the brush 28 will make contact with some one of these contactors every fifteen seconds. Since it may be desired to have the brush effectively make contact with only one of these contactors, four toggle switches 34, 35, 36 and 37 are provided for the purpose of selectively rendering effective or ineffective any of the mentioned contactors. It will be understood that if all four of the contactors are effective, then fifteen second or one-quarter minute intervals will be measured. However, if two opposite contactors are disconnected, then only one-half minute interval will be measured. For purposes of this description, it will be assumed that the toggle switches 34, 35, 36 and 37 are closed so that all of the mentioned contactors are rendered effective. The toggle switch 39, when open, places the lighting of the neon lamps under the control of relay 40 so that these lamps can be lighted only during the interval of exposure of the camera. When, however, the switch 39 is closed, the control of the neon lamps is independent of relay 40 and these lamps continue to be lighted during the periods that their related links are in use.

Whenever the traffic observing arrangement is in use, the electric motor clock 27 will rotate its brush 28 continuously. Since all the contactors 29, 30, 31 and 32 are now effective, a record will be made each time that the brush 28 engages a contactor. Thus, when the brush 28 engages the contactor 31, a circuit is completed from ground, conductor 42, brush 28, fixed contactor 31, conductor 44, toggle switch 34, winding of the relay 40, conductors 43, fuse 45, to grounded battery. The relay 40, thus energized, completes a circuit for operating the camera solenoid 25 which causes the camera to photograph the lighted lamps 18 on the film strip 24 as well as advances this strip for the next exposure. Relay 40 also completes a circuit for the exposure meter or counter 20. The circuit for the solenoid is traceable from grounded battery, conductor 46, winding of the solenoid 25, conductor 47, armature and front contact of the normally energized slow-releasing relay 48, conductor 49, the make-before-break contacts of the relay 40, conductor 51 to ground. It should be mentioned that the normally energized relay 48 is provided to insure a prompt action on the part of the solenoid 25 even if the make before break contacts of the relay 45 are somewhat out of accurate adjustment. The exposure meter counter 20 is energized from grounded battery, fuse 45, conductors 43 and 50, winding of the magnet of counter, lower front contact and armature of relay 40, conductor 51 to grounded battery. This counter is thus operated on each exposure of the camera. Consequently, if the counter numbers appearing in the successive exposures are not consecutive, it will show that there is an omission in the record, probably arising from the failure of the camera to make an exposure.

After the traffic observing period has ended, the film strip 24 is developed in the usual manner so that the images 18a of the lighted lamps 18 will appear in a regular pattern in successive pictures on the strip which is now ready for study. In effecting this study, a projector or film viewer is used. It will be remembered that the timing arrangement, including the clock 27, is so set up that a picture is taken on the film 24, every fifteen seconds. With this in mind, the record is easily interpreted, since the pictures show six lamp images 18a in the first vertical row of exposures

"5231" and "5232" but only the first four lamp images 18a appear in exposure "5233." This shows that the links corresponding to the first four of the first vertical row of the lamps 18 on the panel were lighted while all three exposures 5 were made, whereas the fifth and sixth lamps 18 in the mentioned vertical row were lighted only during exposures "5231" and "5232." From this information, it can be determined how much of the time the mentioned six links and the remain- 10 ing links of the group of forty-eight links, were in use during the observation period.

What we claim is:

1. The method of determining the traffic conditions in a group of telephone links which comprises providing an array of indications of links in use, periodically making photographic records of said indications and simultaneously indicat- 15 ing on said records serial designations therefore.

2. The method of determining the traffic conditions in a group of telephone links which comprises providing an array of light indications of links in use, periodically making a photographic record of said indications and simultaneously 20 photographing on each record a designation thereof.

3. The method of determining the traffic conditions in a group of telephone links which comprises providing an array of light indications of links in use, periodically making a photographic record of said indications on a continuous medium which is progressively movable at a given rate. 30

4. In combination with a telephone system, a group of link circuits over which telephone calls can be extended, a traffic recording arrangement for recording the periods of use of said link circuits, said arrangement comprising a panel provided with an indicator individual to each link circuit, said indicators having an operative and an inoperative condition, a counter associated 40 with said indicators, a camera directed on said panel, means for rendering operative the indi-

cators of link circuits in use, means for periodically operating said camera to photograph said counter and the operated indicators on said panel, and means for advancing the counter with each operation of said camera.

5. In combination with a telephone system including a group of link circuits over which telephone calls can be extended, a relay associated with each link circuit and normally functioning in the course of the use of its link circuit, a lamp individual to each link controlled by the relay individual to said link, the lamps of said link circuits being arranged in a group, a camera for photographing said group of lamps, a timing device, and means including said timing device for operating said camera.

6. In combination with a telephone system including a group of link circuits over which telephone calls can be extended, a relay associated with each link circuit and normally functioning in the course of the use of its link circuit, a glow discharge lamp individual to each link and controlled in part by the relay individual to its link, the lamps of said link circuits being arranged in a group, a counter device associated with said lamps, a camera for photographing said group of lamps and counter device, a timing device, and means including said timing device for operating said camera and counter device.

7. In a telephone system, telephone lines, a group of links for interconnecting said lines, an indicator individual to each trunk for indicating the busy or idle condition thereof, said indicators being mounted to present a symmetrical array, a photographic device provided with a film strip and with means for taking successive pictures of said array on said strip, and means including a timing device for actuating said camera at the conclusion of intervals of uniform duration.

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