March 29, 1949. A. N. GOLDSMITH 2,465,976

CENTERCASTING NETWORK SYSTEM

Filed Dec. 24, 1942 3 Sheets-Sheet 1

Fig. 1.

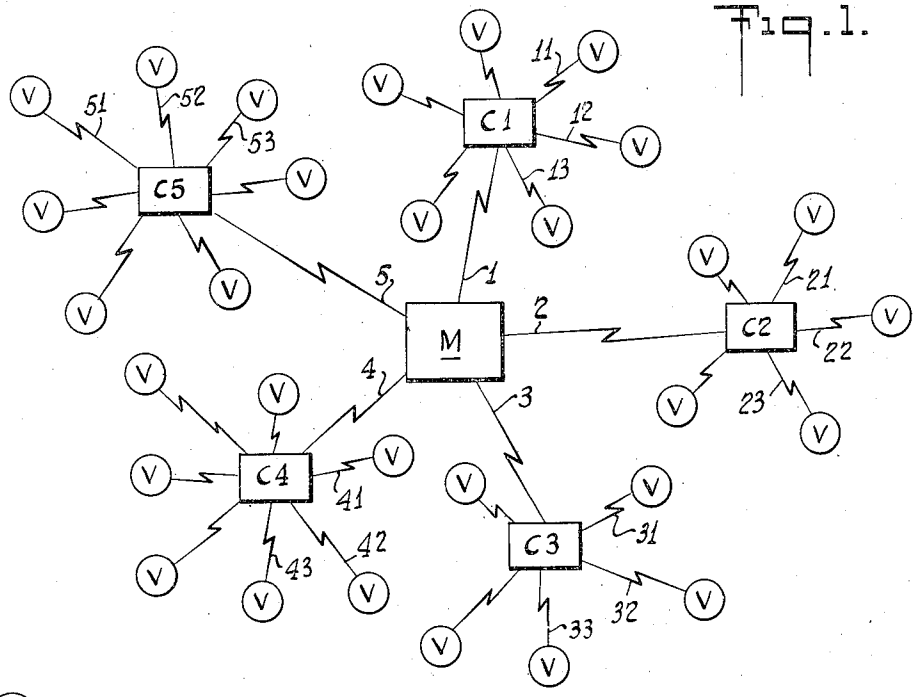
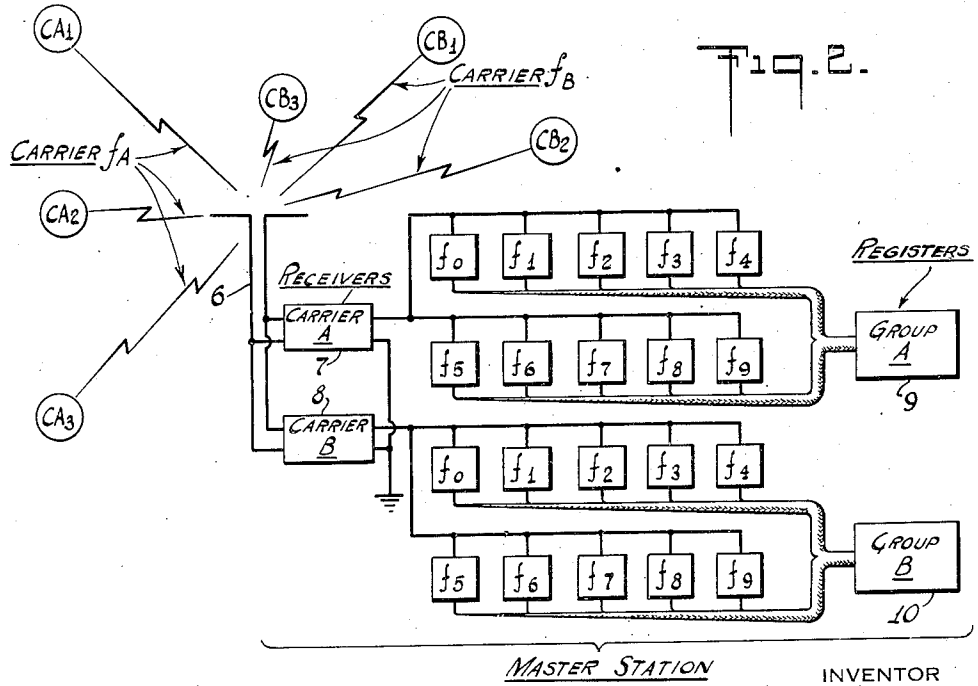



Fig. 2.




INVENTOR

ALFRED N. GOLDSMITH.

BY H. S. Grover

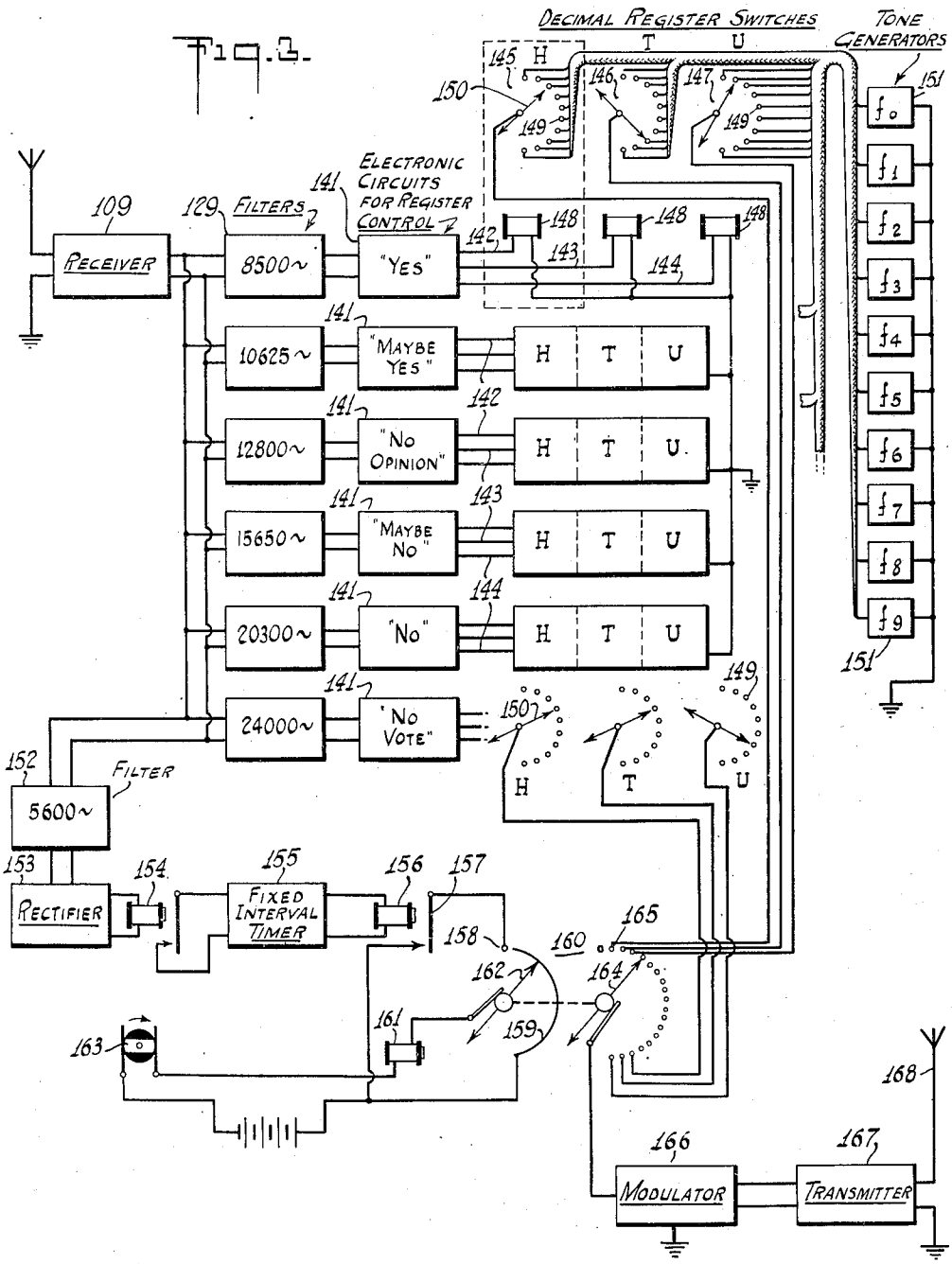
ATTORNEY

March 29, 1949. A. N. GOLDSMITH 2,465,976

CENTERCASTING NETWORK SYSTEM

Filed Dec. 24, 1942 3 Sheets-Sheet 2

Fig. 2.



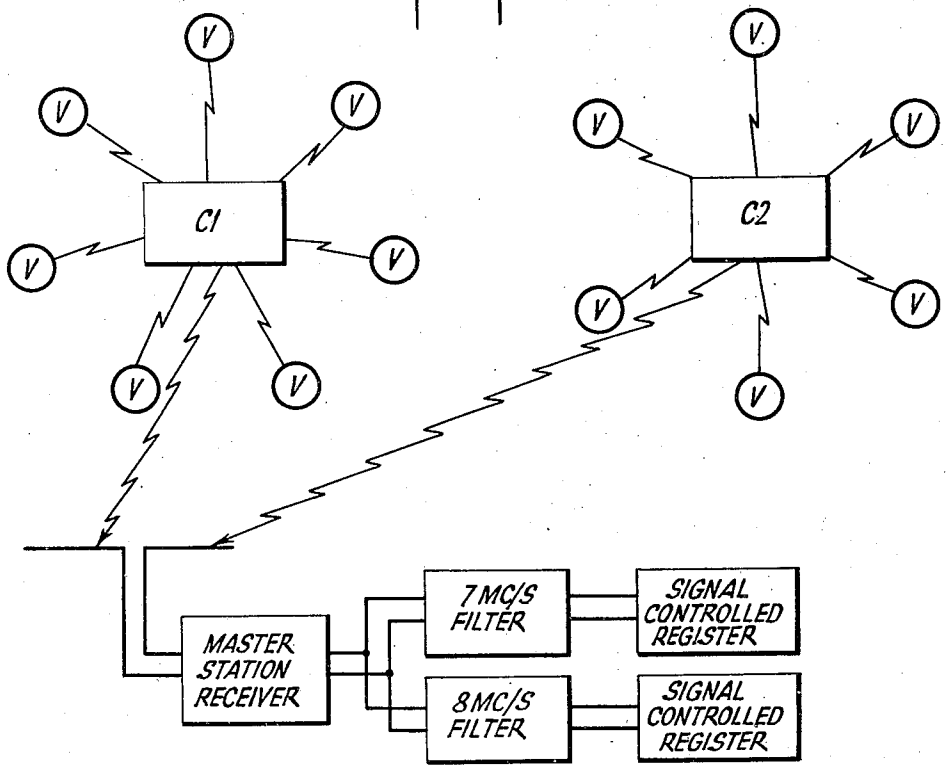

INVENTOR
ALFRED N. GOLDSMITH.
BY H. S. Grover
ATTORNEY

March 29, 1949. A. N. GOLDSMITH 2,465,976

CENTERCASTING NETWORK SYSTEM

Filed Dec. 24, 1942 3 Sheets-Sheet 3

Fig. 4




ILLUSTRATIVE FREQUENCY ASSIGNMENTS

| CHANNEL | MAIN CARRIER | SUB-CARRIER |
|---|---|---|
| V TO C1 | 110 MC/S | 7 MC/S |
| V TO C2 | 110 MC/S | 8 MC/S |
| C1 TO M | 100 MC/S | 7 MC/S |
| C2 TO M | 100 MC/S | 8 MC/S |

INVENTOR
ALFRED N. GOLDSMITH
BY Harry Tunnicliffe
ATTORNEY

Patented Mar. 29, 1949 2,465,976

# UNITED STATES PATENT OFFICE

2,465,976

## CENTERCASTING NETWORK SYSTEM

Alfred N. Goldsmith, New York, N. Y.

Application December 24, 1942, Serial No. 470,037

8 Claims. (Cl. 235—50)

1

This invention relates to polling systems and more particularly to a radio communication system which may appropriately be termed a "radio centercasting system" in contradistinction to a radio broadcasting system.

The improvements herein disclosed constitute a development of an art in which my earlier inventions are set forth in certain copending applications, particularly, Serial No. 421,898, filed December 6, 1941, now U. S. Patent 2,427,670; Serial No. 432,780, filed February 28, 1942, now U. S. Patent 2,413,965; Serial No. 445,859, filed June 5, 1942; and Serial No. 456,639, filed August 29, 1942, now abandoned.

In the above mentioned copending applications, I disclosed various embodiments of systems for obtaining polls of public opinion by means of radio apparatus installed in numerous outlying voting stations and placed in communication over radio channels with a central station where the votes to be obtained could be counted or tabulated in accordance with any desired classification of votes. These systems were so designed that upon announcement of a question on which an expression of public opinion might be desired, each voter, if he were present at his station, could actuate a presettable device, such as a keyboard, to indicate his opinion or choice. For example, it was shown that upon any question, the voter's answer might be any one of the following: "Yes," "Maybe yes," "No opinion," "Maybe no," and "No." When the voter was not present at his station, it would be possible according to my earlier disclosures to have the voting station automatically actuated so as to send a "No vote" signal. At the central station, therefore, it would be possible to account for reports from all voting stations in the system and to tabulate the votes numerically.

A factor which largely determined the selection of the methods to be used in carrying out my invention was the limited range of ultra high frequency transmitters such as would normally be used for centercasting operation in a given market area. As a result of this limitation of range, the central stations (subsidiary central stations) can provide for only a restricted area. Accordingly their conjoint findings as to a given vote must be combined by an additional network. Each central station develops its corresponding vote totals, and the totality of such votes is collected systematically by automatic means, as required, by a network.

Such a network in turn leads to the introduction of relay stations for interconnection purposes.

2

For convenient operation of such a network there is required a storage system for recording and holding available the numerical votes, a retransmitting system for such totalized numerical vote signals, and means for controlling the retransmissions by suitable signals from the main central station which is, so to speak, the nucleus and data-gathering point of the network.

Due to the fact that it was shown to be economical to utilize a low power transmitter at each voting station, it was found that vote signals could be transmitted on an ultra high frequency carrier wave emitted during a very brief moment and modulated by a tone frequency which was characteristic of the vote to be expressed. It is known, however, that the transmission range for ultra high frequency signals is quite limited. In carrying out a nation-wide poll of public opinion, therefore, it would be necessary to set up numerous central stations each serving a particular geographical area within a limited radius. Such an arrangement obviously presents the problem of coordinating the voting operations in various parts of the country so as to obtain a comprehensive tabulation of votes extending over a much wider range than the limited range of a single group of ultra high frequency voting stations.

In the following description as well as in the claims, I make use of the term "station" as a unit comprehending all necessary transmitting and receiving apparatus whereby the functions of a centercasting network system may be performed. Thus by "voting station" I mean a receiving and transmitting instrumentality which is capable of being conditioned for transmitting a vote signal and which responds through its receiver to a start signal capable of initiating the transmission of vote signals from separated voting stations sequentially.

By the term "master station," transmitting and receiving equipment is implied. As will be seen from the description to follow, such a master station is provided with equipment for sending out starting signals either to certain subsidiary central stations or directly to the voting stations so as to designate a suitable time for the collection and relaying of vote signals.

By "central station" or "subsidiary relay station," I mean to imply a coordinated system of receiving and transmitting units together with registering apparatus whereby individual vote signals may be received and registered, and the

totals of the registrations in different categories may be automatically applied as modulation signals to be sent out by the transmitter of such a central station for receipt and tabulation at the master station.

Accordingly, it is an object of the present invention to provide a centercasting network in which voting operations may be of a nation-wide scope.

It is another object of my invention to provide a master station cooperatively associated with a plurality of outlying subsidiary central stations, or relay stations, and in further cooperation with different groups of voting stations, each group of which is associated with a particular relay station, all arranged for obtaining polls of public opinion.

It is still another object of my invention to provide a comprehensive centercasting system which facilitates the rapid collection of voting statistics at a single master station, these statistics being first obtained by centercasting votes from different concurrently operated groups of voting stations.

Still another object of my invention is to provide for the relaying of voting signals through different relay stations so as to facilitate the transmission of original vote signals to a master station more remote from certain outlying voting stations than their ultra-high-frequency transmitting range.

Moreover, it is an object of my invention to provide a radio polling system in which the gathering and tabulation of votes is facilitated by first storing each voter's choice in a tangible medium at his voting station, causing all the voting stations within a given group to be operated sequentially for transmitting vote signals to a central station which serves this particular group, causing other groups of voting stations to transmit concurrently with the first group, storing the totals of votes of each designation at the central stations until a start signal is received thereat from a master station; and then causing the several central stations to transmit signals to the master station under control of the storage means at each central station, the signal output being sequential as to all of the central stations which have a common carrier frequency assignment, and concurrent as to central stations which have different carrier frequency assignments. And in furtherance of this object, it will be seen that by grouping the central stations according to their carrier frequency assignments, concurrent transmissions from central stations may be had, while the different central stations within a single group transmit sequentially.

The foregoing and other objects of my invention will be best understood in view of the description to follow. This description is accompanied by a drawing in which—

Fig. 1 represents in diagrammatic form an arrangement of voting stations in different groups where each group is served by a central station and the various central stations are in communication with a master station where all the voting statistics are finally accumulated.

Fig. 2 shows an association of a master station with two different groups of subsidiary central stations. Here a common carrier frequency is assigned to central stations of one group and these stations transmit sequentially. Stations of a second group have a different common carrier frequency, so that they may transmit concurrently with stations of the first group.

Fig. 3 shows diagrammatically how the storage and translation of voting statistics may be handled at a given subsidiary station.

Fig. 4 is a modification enabling simultaneous transmittal from central stations to master stations on carriers of the same frequency modulated by sub-carriers of different frequency.

In Fig. 1 I show a master station M which may include transmitting and receiving radio apparatus arranged to communicate with any desired number of outlying subsidiary central stations C. The communicating channels are indicated by the lines 1, 2, 3, 4, and 5. Communication may be had either by space radio waves, guided waves, or coaxial cables. The employment of an ultra-high-frequency carrier is preferred although conditions may dictate the use of carrier waves of lower frequencies, depending upon the authorized frequency assignment.

Furthermore, if the transmission of voting statistics is to be carried on from a subsidiary central station to a master station which is beyond the reach of the ultra-high-frequency wave assigned to said station, then the use of intermediate booster stations is advisable, as is well known in the art.

Each subsidiary central station C is preferably equipped with transmitting and receiving apparatus such as has been disclosed in my copending application Serial No. 421,898. Such apparatus includes devices for sending out a start signal in response to which each voting station is caused to answer back with a vote signal. The designation of such vote signal is determined by the selective setting of a key by the voter. The central station is also provided with receiving apparatus and frequency discriminating means whereby the vote signals when collected sequentially may be tabulated in one of a number of different ways. In my copending application Serial No. 432,780, I have shown how the vote signals may be first recorded by facsimile methods and then analyzed by re-runs on a facsimile machine, using a mask for selection of votes from stations which are classified in different categories. Other systems of counting and tabulating the votes are also set forth in my copending applications above cited, but since the instant disclosure is intended primarily to cover systems for storing and relaying voting statistics through a plurality of subsidiary central stations to a master station, I will now describe in some detail a preferred system suitable for this accomplishment.

Fig. 3 shows schematically an arrangement of receiving, registering, and relaying units which are useful at a subsidiary central station and are controlled by a special start signal originated at the master station M. The vote signals are counted and stored at a given central station and may be translated into a train of intelligence signals which are suitable for reporting to the master station the results of the public opinion poll.

The receiver 109 may, if desired, be of the type shown as a central station receiver in my copending application Serial No. 421,898. The output of this receiver is shown connected to a plurality of filters 129, each having a specified band pass characteristic such that vote signals of different designations may be passed to respectively different electronic circuits for register control. In accordance with my copending application Serial No. 421,898, I preferably employ six of these filters 129 and six associated electronic circuit units 141 so that vote signals may be counted to represent

the following classes of votes: "Yes," "Maybe yes," "No opinion," "Maybe no," "No," and "No vote."

As is well known in the art, the electronic circuits 141 may be of any suitable type. As herein shown, however, these units 141 are provided with three output circuits, each of which is arranged to deliver impulses which are decimally related. The three output circuits derive their pulses from different stages of an electronic counting chain. Thus circuit 142 delivers one impulse for every ten impulses delivered by circuit 143 and the latter delivers one impulse for every ten impulses delivered by circuit 144. The impulses in circuit 144 correspond in number with the vote signals passed through a single filter 141.

Three rotary switches 145, 146, and 147 are provided, each having a stepping magnet 148. The complete rotary switch unit 145 for the hundreds order is indicated within a broken line rectangle and includes a bank of ten segmental contacts which are wiped over by a brush 150. The stepping magnet 148 has its armature associated with a ratchet and pawl mechanism (not shown) for rotating the brush 150 step by step, as is well known. Such switches are sometimes referred to as Strowger switches.

Each of the six electronic circuit units 141 for register control is arranged to deliver its output impulses to an appropriate set of three Strowger switches, the functions of which are to accumulate and store the hundreds, tens, and units figures of the counted votes. These different sets of three Strowger switches each are indicated in block diagram except those for the "Yes" vote and the "No vote" signals. It will be understood, however, that all of these decimal register switches are alike and are merely indicated as blocks in order to simplify the drawing.

Each of the segmental contacts 149 in the rotary switches is fed with alternating current from one of the oscillation generators 151, which individually possess a distinguishable frequency. Ten of these generators 151 are shown and it will be understood that each may represent one of the numerals 0 to 9 inclusive. A set of distinguishable modulation frequencies which may characterize these numerals may, if desired, be the following:

| | |
|---|---|
| $f_0$=20300 | $f_5$=11700 |
| $f_1$=6600 | $f_6$=12500 |
| $f_2$=8500 | $f_7$=14500 |
| $f_3$=9500 | $f_8$=15600 |
| $f_4$=10600 | $f_9$=18000 |

Other frequencies might be chosen, but those stated have been found to be satisfactory because none of them is a harmonic of any other.

After the vote signals have been received through receiver 109, from the various outlying voting stations, and have been fed through the filters 129 for actuating the electronic circuits 141, it will be seen that, step by step, the votes will be counted according to different designations such as "Yes" and "No," representing the different opinions of the persons voting. These registrations are simultaneously transferred to register switches 145, 146, and 147 which are thereby set to positions corresponding to the hundreds, tens, and units digits respectively. Upon completion of this registration, it is necessary to condition the circuits of the digital register switches for translating the stored intelligence into signals suitable for transmission to the master station M. This step is preferably accomplished as follows:



A suitable signal is sent out by the master station M which is responded to by all the receivers 109 of the subsidiary central stations, wherever they may be located. Such a signal is preferably in the form of a brief tone modulation of the assigned carrier on which the master station M is arranged to transmit. The master station preferably sends out two characteristically different start signals, the first of which is responded to by the individual voting stations, to which it may be relayed by the subsidiary central stations, if desired. The function of the first of the two start signals is to cause the individual voting stations to send their votes to their corresponding central stations. The second start signal causes the totalized votes at the central stations to be sent to the master station. The technique employed for this purpose is similar to that described in my U. S. Patent 2,427,670, dated September 23, 1947. Between the first and second start signals a suitable time interval is provided for collecting the votes at the various subsidiary central stations from the various outlying voting stations. Response to the second start signal at a given central station must follow the setting of its decimal register switches 145, 146, and 147 to positions which indicate the totals of the votes of different designations.

The second start signal as received from the master station may be characterized, for example, by a modulation frequency of 5600 cycles which is passed by the filter 152. The output from this filter may be rectified in the rectifier unit 153 and fed to a relay 154. When the contacts of relay 154 are closed, the operation of a fixed interval timer 155 may be started. Such a timer is well known in the art and does not need to be herein described. Its function is to deliver an output impulse after a predetermined period of delay following the impulse which initiates its operation.

For different subsidiary central stations, it would be preferable to adjust the interval of operation of the timer unit 155 so that the different central stations will transmit their intelligence sequentially. Thus the first station to transmit the totals accumulated on the decimal register switches will complete its operation before the next reporting central station is permitted by its fixed interval timer 155 to begin transmitting.

On the output side of the timer unit 155 is a relay 156, the contacts 157 of which are in circuit with a single segment 158 on one bank of a dual bank rotary switch 160. On the same bank with segment 158 is a series of interconnected segments indicated by the arcuate line 159. The motor magnet 161 for this rotary switch 160 is in circuit with brush 162 which wipes over segments 158 and 159. This motor magnet 161 is periodically energized by a D. C. source working through a fixed cycle circuit interrupter 163. This circuit interrupter may, if desired, be motor driven at a constant rate. The motor magnet 161 starts impulsing only in response to the closing of contacts 157 by the relay 156. As soon as the brush 162 steps off of segment 158 the cadence of further steps is determined by periodic circuit closures through the circuit interrupting unit 163. It will thus be seen that means are herein shown for selectively and sequentially closing a plurality of circuits through the brush 164 on rotary switch 160 where this brush wipes over the arcuately disposed segments 165. Each individual segment 165

is connected in circuit with an individual one of the brush 150 in the decimal register switches.

Assuming that there are six classes of voting response and that the total count of votes in each class does not exceed 999, then it is sufficient to provide 19 segmental positions through which the brush 164 will be stepped. The first position may be considered a "homing" position.

The brush 164 is in circuit with the input of the modulator 166. The output of this modulator is preferably fed to a transmitter 167 and the output of the transmitter is deliverable to a suitable antenna 168 for transmitting signals to the master station M.

In the operation of the system shown in Fig. 3, it will be seen that different modulation frequencies generated by the units 151 and assignable to the ten different digits are arranged to be selectively fed through the brushes 150 of the decimal register switches depending upon the setting of the latter. Such feeding is sequential with respect to each individual switch. Eighteen of these switches are provided for the hundreds, tens, and units denominations of the six different vote registers. Thus a train of tone-modulated impulses is deliverable by the transmitter 167 to the antenna 168 in accordance with the successive steps taken by the wiper 164 passing over the bank of segments 165 at a periodicity determined by the rate of rotation of the circuit interrupter 163.

As shown in Fig. 1, it may be desirable to carry on the collection of votes from different groups of outlying voting stations V concurrently. However, it is necessary to arrange the subsidiary central stations C so that each one will collect appropriate vote signals exclusively. Thus certain of the voting stations are indicated as in communication with central station C1 through channels 11, 12, 13, etc. Other voting stations are in communication with central station C2 and communication is obtained through channels 21, 22, 23, etc. Central station C3 is fed with vote signals from certain voting stations which are in communication therewith on channels 31, 32, 33, etc. Likewise, central stations C4 and C5 are served with vote signals over channels 41, 42, and 43 in one case and channels 51, 52, and 53 in the other case.

In order to avoid the collection of any vote signals by two adjacent central stations such as C2 and C3, it is preferable that the receivers of these stations be tuned to different carrier wave frequencies. The group of voting stations V associated with station C2 will all operate on a single ultra-high-frequency channel which is different from the ultra-high-frequency channel used by stations in the group associated with central station C3. Likewise, different carrier frequency assignments may be had with respect to each of the other subsidiary central stations and their associated voting station. Differentiated carrier frequency assignments are, of course, especially necessary where the territories of different central stations overlap one another unavoidably.

As a modification of the system described in the foregoing paragraph, it may be desirable in certain cases to utilize a common carrier frequency for all of the voting stations, but discrimination as to the points of reception of the vote signals may be had by the use of different sub-carrier frequencies, as is well known in the art.

When the votes on any particular question that has been put before the public have been received



at the various central stations C1, C2, and C3, etc., it is possible according to my invention to relay the voting statistics or condensations thereof to a master station M by utilization of the channels 1, 2, 3, 4, and 5. The structure of this network may be of any desired form, such as a wire, cable, ether wave channel, coaxial cable, wave guide, or the equivalent. This communication network is preferably two-way and must be capable of handling without appreciable distortion or loss signals which are sent out or received by central stations C. The master station M may, if desired, be located at one of the central stations C or it may be located at any other convenient point, as shown in the drawing.

The master station M originates the questions of the radio poll which are sent out as sound signals, facsimile signals, or the like, over the entire centercasting network. They may in certain instances be broadcast over a wave which reaches the different voting stations V directly. Under other conditions, particularly where an ultra-high-frequency carrier wave is used, the broadcasting of the intelligence from station M may be received by stations C1, C2, C3, etc. and then relayed to the various voting stations so as to reach the latter through said subsidiary central stations.

It is also contemplated that the start signal, which according to my earlier disclosures was utilized to initiate the transmission of vote signals, may be transmitted from the master station M directly to the different voting stations, or this start signal may be relayed to them through the various subsidiary central stations.

When it is desired that different central stations shall be operated concurrently, then it is necessary to provide frequency discriminating transmitting and receiving apparatus so that the signals from different central stations shall not be confused, but may be identified as to their origin.

A convenient arrangement for carrying out the invention in this manner is illustrated in Fig. 2 where the central stations $CA_1$, $CA_2$, and $CA_3$ have an assigned carrier frequency $f_a$, and central stations $CB_1$, $CB_2$, and $CB_3$ have an assigned carrier frequency $f_b$. Since there are two groups of central stations, each group having a distinct carrier frequency assignment, it follows that these groups may be operated concurrently. Also the sequence of operation of the individual central stations of the A-group is independent of the sequence in which the stations of the B-group are to be operated.

At the master station, as shown in Fig. 2, reception of signals from the central stations of the A-group and of the B-group may be had by the use of two receivers 7 and 8, receiver 7 being tuned to the frequency $f_a$ and receiver 8 being tuned to the frequency $f_b$. An antenna system 6 may be used in common by the two receivers if desired, or separate antennas may be provided.

The output from each of the receivers 7 and 8 at the master station is selectively passed through different parallel-connected tone-frequency filters $f_0$, $f_1$, . . . $f_9$ corresponding to the tone frequency designations by which the numerical value of each signal impulse is identified. The output from each tone frequency filter is preferably carried separately to an appropriate unit of the recorders 9 and 10. The details of structure of these recorders may be in accordance with any well known design, and are not, therefore, herein given.

It will be noted that since the two receivers 7 and 8 are independent, the filter groups in their output circuits are also independent, and hence the recorders 9 and 10 are independent of each other and may be operated concurrently for economy of time.

According to an alternative arrangement such as shown in Fig. 2, the subsidiary central stations are arranged to operate simultaneously, each having suitable carrier frequency assignments. The receiving apparatus at the master station for assembling the voting statistics includes such frequency discriminating receiving circuits as will enable it to respond simultaneously to all of the trains of intelligence signals transmitted by the several subsidiary central stations. Thus, in Fig. 2, several central stations are on one carrier frequency ($f_A$), and these central stations are queried at mutually exclusive times. Several other central stations are on another carrier frequency ($f_B$) and are also queried, at mutually exclusive times, though as a group. The first group of central stations may send their stored data to the master station simultaneously with a similar transmission of stored data by the second group of central stations. In Fig. 4, each of the central stations is on the same identifiable carrier frequency (100 mc.), but its signals can be distinguishably separated from the other central-station signals by the use of its different sub-carrier frequency (7 or 8 mc.).

In connection with the description of Fig. 3, it will be noted that sequential operation of the different central stations enables the master station to receive a train of intelligence signals which needs no frequency discrimination for identifying the different sources. Each central station has its predetermined position in the sequence, which is sufficient to identify the signals sent out therefrom. In this connection each central station is intended to use equipment of the same type as used by the respondent stations when actuated at mutually exclusive times from a central station. This technique is set forth in my U. S. Patent 2,427,670, dated September 23, 1947, referred hereinabove.

In the system illustrated in Fig. 4, C1 and C2 represent outlying central stations. The letter "V" represent groups of respondent voting stations transmitting votes to the central stations C1 and C2. The integrated votes at stations C1 and C2 are simultaneously transmitted to the master station receiver at the same carrier frequency but, by the use of sub-carriers of different frequency, the votes may be separated and registered at the signal control registers shown. The signal controlled registers as represented in Fig. 4 are merely tabulating machines with totalizing counters activated by incoming signals. The outlying voting stations V about their central stations C1 and C2 work on the same carrier frequencies as indicated, but are distinguishable at stations C1 and C2 by virtue of the use of sub-carriers of different frequency, also as indicated.

In passing it may be noted that the recorder of Fig. 2 may be, for example, a facsimile recorder such as shown in my U. S. Patent 2,413,965. This recorder is an essential part of or may constitute the entire tabulating machine at the particular point in the system at which it is used.

As indicated in the foregoing description, it is possible to utilize the master station either for transmission of start signals directly to the various voting stations, or indirectly through the several central stations C1, C2, C3, etc. using the latter as relay stations. Likewise, it is possible to utilize stations C merely as relay stations for sequential transmission of vote signals from all the outlying voting stations to the master station. In this case, the stations C would operate merely as relay stations and would not be called upon to tabulate the voting statistics. All tabulations would then be obtained at the master station.

It will be clear to those skilled in the art that numerous variants to the above embodiments will fall within the scope of the present invention.

I claim:

1. A voting system comprising a master station, a plurality of subsidiary central stations, a group of outlying voting stations about and in operative association with each central station, means controlled from the central station for causing transmission of a starting impulse to said voting stations, said voting stations in response to said starting impulse operating to transmit voting signals to their associated central stations, means at said central stations for storing the voting signals transmitted thereto, and means subsequently operable at the master station to transmit a control signal to said central stations for causing said central stations to transmit the voting signals stored thereat to said master station.

2. A voting system comprising a master station, a plurality of subsidiary central stations, a group of outlying voting stations about and in operative association with each central station, means controlled from the central station for causing transmission of a starting impulse to said voting stations, said voting stations in response to said starting impulse operating to transmit, at mutually exclusive times, voting signals to their associated central stations, means at said central stations for storing the voting signals transmitted thereto and means subsequently operable at the master station to transmit a control signal to said central stations for causing said central stations to transmit, at mutually exclusive times, the voting signals stored thereat to said master station.

3. A voting system comprising a master station having a radio transmitter and a radio receiver, a plurality of outlying relay stations, a plurality of groups of voting stations, said relay stations and voting stations each having a radio transmitter and a radio receiver, each said voting station having settable means for registering a voter's opinion or choice, means at said master station for causing its transmitter to broadcast an initiatory signal in response to which said voting stations are caused to centercast their vote signals at mutually exclusive times to said relay stations, means at each voting station for causing its vote signal when centercast by its transmitter to be characterized in accordance with the setting of its settable means, means storing the vote signals at the relaying stations and means responsive to control signals transmitted by said master station for automatically causing transmission of the stored signals at said relay stations to said master station.

4. A voting system in accordance with claim 3 wherein each relay station is arranged to transmit on a carrier frequency exclusive thereto, and including frequency discriminating means at said master station thereby enabling simultaneous receipt of vote signals from said relay stations at said master station.

5. In a voting system which serves to assemble voting statistics at a master station, said system being of the type which comprises a plurality of

groups of outlying voting stations and each voting station of a particular group is operable in response to a control signal transmitted from said master station to transmit vote signals by radio waves to an appropriate relay station, a radio receiver at each relay station, means connected to the output of each receiver for selectively registering a series of received vote signals in accordance with the voting significance of each signal, said means being operable to separately store the count of vote signals of like significance, a plurality of tone generators and a radio transmitter at each relay station, means including a sequence switch for performing a read-out function whereby the radiated output from said transmitter is caused to be modulated by different ones of said tone generators in dependence upon the registered count of vote signals as set up in said selective registering means, and means at each relay station responsive to a start signal which is originated at said master station for causing said read-out function to be performed by different ones of said relay stations at mutually exclusive times.

6. In a voting system of the type which comprises a master station, a plurality of relay stations and separate groups of voting stations, radio communication being maintained exclusively between the voting stations of each group and a respective one of said relay stations, said voting stations being responsive to a control signal from said master station to automatically transmit votes to said relay stations, a radio receiver at each relay station responsive to signals from said voting stations and from said master station, the signals from said voting stations being so characterized as to express a voter's opinion or choice, and the signals from said master station being effective for performing a timing function, means at each relay station effective to separately count the vote signals of each choice, a high frequency energy-controlled transmitter at each relay station for transmitting signals to said master station, means for so modulating the output of said transmitters as to cause the radiation of signals which carry voting statistics, said statistics being in accordance with the respective counts of vote signals of each choice, and means responsive to a signal from said master station for controlling the times of signal transmission from each relay station, thereby to obtain operation at mutually exclusive times of the relay station transmitters.

7. In a voting system of the type which comprises a master station, a plurality of relay stations, and separate groups of voting stations, a group of said voting stations being in operative radio communication with one relay station, another group being in operative radio communication with another relay station and so on, said master station being in operative radio communication with all of said relay stations and said voting stations being under operative control of separate, characteristic control signals from said master station, a radio receiver at each relay station responsive to signals from said voting stations and from said master station, the signals from said voting stations being so characterized as to express a voter's opinion or choice, and the signals from said master station being effective for performing a timing function, means at each relay station effective to separately count the vote signals of each choice, a high frequency energy-controlled transmitter at each relay station for transmitting signals to said master station, means for so modulating the output of said transmitters as to cause the radiation of signals which carry voting statistics, said statistics being in accordance with the respective counts of vote signals of each choice, means for differently characterizing the signal radiation from each separate transmitter, and means responsive to said characteristic control signal from said master station for causing concurrent operation of all the relay station transmitters.

8. In a relay station for reception and transmission of radio signals, where the incoming signals are differently characterized in accordance with a plurality of voting expressions, and the outgoing signals represent the numerical values of resultant accumulations obtained by automatically counting the incoming signals of like characterization, means selectively responsive to incoming signals of different characterization for separately counting the same, means for storing the effects of the resultant counts of said signals, a plurality of tone generators for variably characterizing the outgoing signals, and sequentially operable read-out means for selectively applying the output energies from said tone generators as modulations of the outgoing signals, thereby to cause said outgoing signals to convey the intelligence which comprehends said numerical values.

ALFRED N. GOLDSMITH.




## REFERENCES CITED

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

### UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 2,188,165 | Thomas | Jan. 23, 1940 |
| 2,206,702 | LaPierre | July 2, 1940 |
| 2,219,347 | Thompson | Oct. 29, 1940 |