Feb. 25, 1936. S. N. MEAD 2,031,970

SIGNALING SYSTEM

Filed July 21, 1931 2 Sheets-Sheet 1

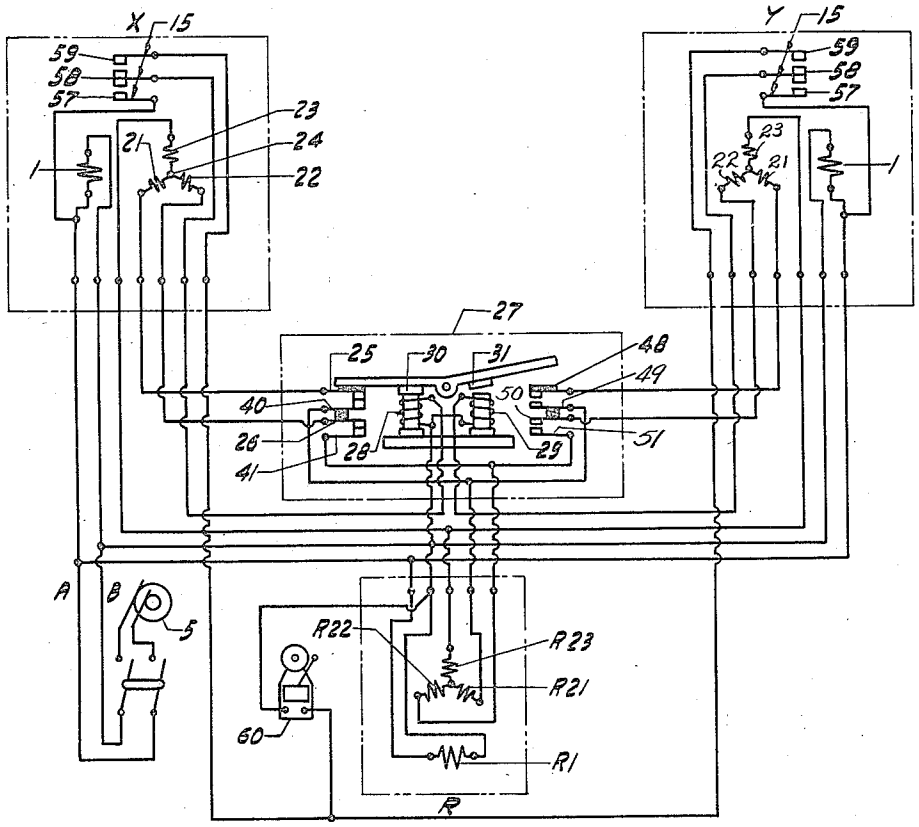

Fig. 1

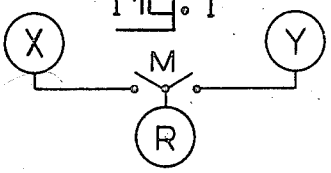

Fig. 7

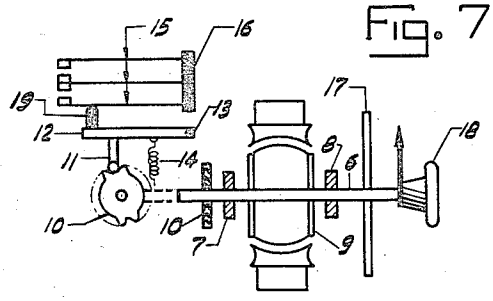

Fig. 3

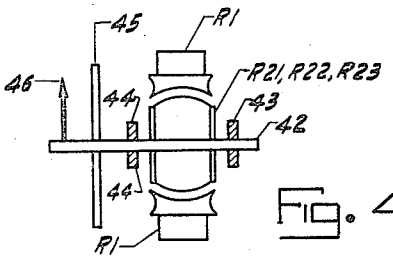

Fig. 4

Inventor
Samuel Nelson Mead

By Attorney
James N. Curtin

Feb. 25, 1936. S. N. MEAD 2,031,970

SIGNALING SYSTEM

Filed July 21, 1931 2 Sheets-Sheet 2

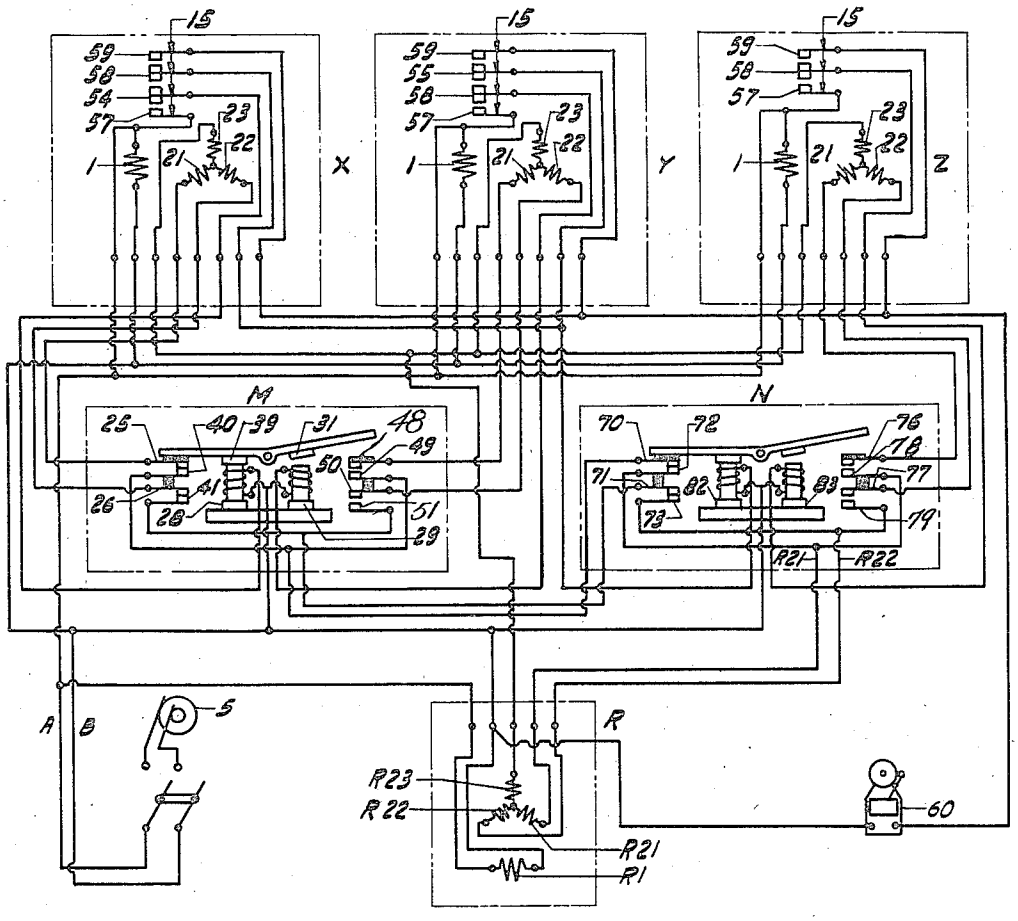

Fig. 2

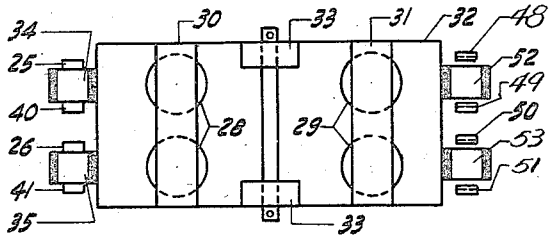

Fig. 5

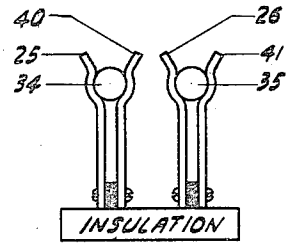

Fig. 6

INVENTOR
Samuel Nelson Mead

BY James N. Curtin

ATTORNEY

Patented Feb. 25, 1936 2,031,970

UNITED STATES PATENT OFFICE

2,031,970

SIGNALING SYSTEM

Samuel Nelson Mead, Amesbury, Mass., assignor to Chas. J. Henschel & Co., Inc., New York, N. Y., a corporation of New York

Application July 21, 1931, Serial No. 552,180

1 Claim. (Cl. 177—337)

This invention relates to a signaling system and more particularly to a signaling system wherein the desired signal is transmitted by a movement of a shaft in the transmitter and indicated at a receiver by the synchronous movement of a corresponding shaft carrying a pointer, or other indicating device.

The object of this invention is to provide a signaling system wherein a single receiver or plurality of receivers may be controlled at will by any one of a plurality of transmitters.

A further object of this invention is the provision of a system wherein any one of a plurality of transmitters is also effective to control the same receiver or a series of receivers without the necessity of manually operating a switching mechanism.

A preferred embodiment of the invention will now be described as applied to an engine order system for use on board ship for transmitting orders from the bridge to the engine room for the control of the engines.

It is customary on board ship to have two transmitters located on the bridge, one on the starboard side and one on the port side, and an indicator controlled by said transmitters in the engine room. In known systems it is not possible to change from one transmitter to the other without first throwing a switch or manually operating an interlocking mechanism for disabling one transmitter and cutting in the other as it is necessary to employ some retaining means which locks the transmitter in the various positions and if a transmitter were left in circuit while so locked it would prevent the proper operation of the rest of the system by another transmitter. The disadvantage of a manually operated switching system is that there is always a danger of forgetting to throw the switch, which in an emergency might cause delay in the reception of orders at the engine room and consequent damage of the vessel.

The present invention contemplates the use of polyphase motors of the well known synchronous type which have their fields energized by means of a common source of alternating current and the respective windings of the armature in one motor connected in series with the corresponding windings of the other motor, the arrangement being such that the movement of the handle or other device attached to the shaft of one motor and the resulting displacement of the armature will cause current to be induced in the coils of the armature of the other motor, producing a torque which will cause the second motor to move the same angular distance as the shaft of the first motor. Suitable pointers or other indicating means may be controlled by the shaft of the indicating unit and a handle or other operating means may be attached to the shaft of the transmitting unit.

Referring to the drawings of which there are two sheets,

Figure 1 shows a diagram of the circuits of one embodiment of this invention in which two transmitters are used to operate one indicating unit.

Figure 2 is a modification of Figure 1, showing a diagram of the circuits by which one indicating unit is controlled by any one of three transmitters.

Figure 3 is a schematic drawing showing a transmitter.

Figure 4 is a schematic drawing of an indicator.

Figure 5 is a top view of the relay employed in this invention.

Figure 6 shows the mechanical locking arrangement of the relay armature.

Figure 7 is an elementary diagram of a two transmitter system.

Referring to Figures 1 and 3, a transmitter has field coils 1 which are connected by circuits A and B to a suitable source of alternating current 5. A shaft 6 supported in suitable bearings 7 and 8 carries an armature 9 having a three phase Y connected winding.

The teeth of a star wheel 10 mounted on shaft 6 are engaged by a detent roller 11 carried by a supporting member 12 mounted on a suitable pivot 13. Spring 14 tends to hold roller 11 between the teeth of star wheel 10. A projection of insulating material carried by member 12 is arranged to operate a series of contacts 15 held by a block of insulating material 16. The transmitters X and Y are identical and the same reference characters are used to indicate the corresponding parts of the respective transmitters.

One end of shaft 6 passes through a dial 17 which may be laid out into a desired number of divisions or sections corresponding to those on a receiving dial in order that a handle 18 fixed to the end of shaft 6 may be turned into position with accuracy. One end of coils 21, 22 and 23 is joined together at 24 and the other ends of coils 21 and 22 are joined respectively to contacts 25 and 26 of a transfer relay 27.

A transfer relay which has been found suitable for the purpose comprises a pair of magnets 28 and 29 having respectively armatures 30 and 31 mounted on a common member or walking

beam 32 which is pivoted on an upright 33. At one end of the walking beam are mounted two members 34 and 35 both being made of a conducting material. The circuits which will be described in detail later on are such that only one of the transfer relay magnets may be operated at a time, and when either magnet is operated the corresponding end of the walking beam will be drawn down and so when magnet 28 attracts its armature 30 the members 34 and 35 will be brought into engagement with the contact members 25 and 26 respectively, and when magnet 29 is energized 34 and 35 will be drawn away from their respective contacts, and another pair of contact members at the other end of the walking beam will be brought into engagement with a similar set of contacts.

Associated with contact member 25 but insulated therefrom is a similar member 40 and likewise a contact 41 is paired with 26. The contact pairs just referred to are bulged out near their upper ends as shown in the drawings and above the rounded portion the contacts are bent away from each other forming two pairs of jaws.

By having the contacts so shaped the members 34 and 35 may be locked down whenever magnet 28 is operated since during their downward travel they will force the contacts apart on their initial engagement and when they reach the place where the contact blades are bulged the blades will tend to snap together retaining the armature and a circuit will be maintained across 25 and 40 and 26 and 41 even though magnet 28 is subsequently deenergized.

Contacts 40 and 41 are connected respectively with one terminal of the coils R21, and R22 of the armature of a motor in the receiving or indicating unit R. The motor in the unit R is the same as that in the transmitter X and its field coils R1 are energized from the same source of alternating current 5. Coils 23 and R23 are connected together while the remaining terminals of coils R21, and R23 are connected together.

Coils R21, R22, and R23 are mounted on the shaft 42 between the field magnets R1. The shaft is free to rotate in bearings 43 and 44. One end of the shaft 42 projects through a suitable dial 45 and the outer end of the shaft may carry a pointer 46 or be used to operate other indicating mechanism.

Contacts 40 and 41 are connected respectively to similar contacts 49 and 51 at the other end of the transfer relay. Contact 48 is paired with a contact 49 and associated with this contact pair is a contact member 52 carried by the walking beam and likewise contacts 50 and 51 are adapted to be engaged by the contact 53 on the walking beam. The contact members 52 and 53 are brought into engagement and retained by their respective contact pairs when magnet 29 of the transfer relay is operated.

As previously stated a star wheel 10 is mounted on shaft 6. There are as many teeth in the star wheel as there are indication positions on dial 17. The arrangement is such that when handle 18 is moved to the proper point for an indication the jockey roller 11 will rest between two teeth and act as a retaining means for the shaft 6. When the shaft is rotated in either direction by the handle 18 jockey roller 11 will ride up on a tooth and the insulated member 19 on 12 will engage the lowermost of a group of contact springs 15 causing all of the contacts to make with each other. Contact 57 is connected to circuit A of the alternating current supply 5. Contact 58 is connected to magnet 28 of the transfer relay, and the other side of said magnet is connected to circuit B of the alternating current supply. Contact 59 is connected to a signal bell 60 situated in the vicinity of the indicating unit R, the other side of the bell being connected to circuit B of the alternating current supply 5.

As previously stated transmitters X and Y are identical and operate in the same manner. One end of the coils 21 and 22 of transmitter Y leads respectively to contacts 48 and 50 of the transfer switch and one terminal of winding 23 is connected to the corresponding terminals of the other motors of the system, while the remaining terminals of all three coils are jointed together. As is the case with transmitter X, contact 57 is permanently connected to circuit A and contact 59 is permanently connected to signal bell 60. Contact 58 however is connected to the magnet 29 of the transfer relay while the other terminal of the magnet is connected to circuit B.

This invention operates as follows: Regardless of the position of the indicating unit R, or of the transmitter Y, assume that it is desired to send a signal from transmitter X. At the very beginning of the movement of the handle 18, the jockey roller 11 will start to ride up the face of a tooth in the star wheel 10 closing all the contacts and placing current from circuit A on all contacts of contact group 15. This will cause the operation of magnet 28 of the transfer relay by a circuit through contact 58 to circuit B. After magnet 28 is energized its armature 30 is held down by contact members 34 and 35 being locked mechanically by their respective contact pairs. The battery from circuit A will also be placed on contact 59 and the current will flow through bell 60 to circuit B giving a signal at the indicating unit to warn that the indication has been changed. Contact members 34 and 35 establish connection between armature windings 21 and 21R. Armature windings 23 and 23R are permanently connected to each other.

As handle 18 continues to be moved the shaft 42 and the pointer 46 will move in synchronism therewith until the desired position is reached, when the jockey roller 11 will drop in between another set of teeth, retaining handle 18 in position.

The circuits will retain this setting until it is necessary to transmit a signal from transmitter Y, in which case the operation is the same as that just described in connection with transmitter X, except that when transmitter Y is operated (Figs. 5 and 6) magnet 29 of the transfer relay is energized causing contact members 34 and 35 to break with their respective contacts and 52 and 53 to make with and remain locked in by their respective contacts, connecting the armature windings 21 and 22 of transmitter Y to windings R21 and R22 of the indicating unit. Winding 23 of transmitter Y is permanently connected to winding R23 of the indicating unit. The movement of the handle of transmitter Y will operate the bell in the same manner as transmitter X. It will be seen that this arrangement provides a positive and accurate method of controlling the indicating unit or series of indicating units, since a number of indicating units may be connected in parallel and operated by any one of a plurality of transmitters, and the various operations or changes may be made from any transmitter with the same security as when a single transmitter system is used.

Referring now to Figure 2 which illustrates

the arrangement by which three transmitters may operate a single indicator or series of indicators. Since the three transmitter system operates according to the same principle as the two transmitter system just described with the exception of a few minor changes, it is not believed necessary to describe the three transmitter system in detail.

Transmitters X, Y and Z are identical except that the star wheels of X and Y operate four contacts while the star wheel in Z operates but three contacts. Relays M and N are also alike. Windings 21 and 22 of transmitter X are connected with contacts 25 and 26 respectively of transfer relay M. Contacts 40 and 41 are connected to contacts 49 and 51, as is the case in the two transmitter system. The leads from these last named contacts, however, do not go directly to the indicator R, as in the two transmitter system, but extend to contacts 70 and 71 of the transfer relay N. Contacts 72 and 73 are associated respectively with contacts 70 and 71. Contact 72 is permanently connected to contact 78 and also the winding R21 of the indicator, likewise contact 73 is permanently connected to contact 79 and to winding R22 of the indicator armature. Contact 76 is associated with contact 78 but insulated therefrom, and connects with winding 21 of transmitter Z. Contact 77 is associated with contact 79 in the same manner and is connected to winding 22 of transmitter Z. Contact member 74 cooperates with contacts 70 and 72, and the contact member 75 cooperates with contacts 71 and 73. Both 74 and 75 (not shown) are mounted on the same end of the walking beam of transfer relay N and engage their respective contacts when magnet 82 is operated. At the other end of the walking beam of relay N another pair of contact members 80 and 81 (not shown, but similar to 34 and 35 of Figs. 5 and 6, as well as 74 and 75) are mounted in the same manner as those just described. Contact member 80 cooperates with contacts 76 and 78, while 81 cooperates with 77 and 79 the contact members being brought into engagement with their respective contacts when magnet 83 of the transfer relay is energized.

The circuit operates as follows: Assume it is desired to transmit a signal from transmitter X to the indicator R. The initial movement of the transmitter lever 18, will cause star wheel 10 to turn, causing detent roller 11 to ride up on to a tooth depending on the direction the handle is turned, closing contact group 15. Contact 57 connects circuit A from generator 5 to contacts 58, 54 and 59 causing the following operations: Magnet 28 of transfer relay M will be energized by a circuit from contact 57, contact 54, magnet 28, to circuit B, and this operation will establish a circuit between contacts 25 and 40 and also between contacts 26 and 41 which circuits extend to contact 70 and contact 71 of relay N. At the same time magnet 28 operated, magnet 82 of transfer relay N was operated by a circuit from circuit A, contact 57, contact 58, winding 82, to circuit B. The closing of contacts 70 and 72 by the contact member 74 established a circuit from winding 21 of transmitter X through to the winding R21 of the indicator R. Likewise when contact member 75 established a circuit from contact 71 to contact 73 armature winding 22 of transmitter X was connected with the winding R22 of the indicator R. Windings 23 and R23 are permanently connected together. Therefore, as the handle continues to be moved in the direction of any new indication the armature of indicator R will move the same distance in synchronism with the armature of transmitter X and the indicator 46 of R will take the same position as the handle 18. At each movement of the handle 18 bell 60 situated in the vicinity of the indicator will be operated as soon as contact is established between circuit A and the bell contact 59.

It will be seen from the foregoing that the initial movement of the handle of transmitter X operated relays M and N in such a manner that transmitters Y and Z were disconnected from the circuit and at the same time transmitter X was connected directly to the indicator R.

When transmitter Y is operated the contact group 15 is closed in the same manner as just described in connection with transmitter X except that when contacts 57 and 58 make magnet 29 of transfer M is energized and magnet 82 of transfer relay N is operated through contact 55. As is the case with transmitter X, the bell 60 is operated when battery is placed on contact 59.

The movement of the handle of transmitter Y causes the following circuits to be established between the armature of transmitter Y and the armature of the indicator R: Coil 21 of transmitter Y contacts 48, 52, 49 of relay M, 70, 74, 72 of relay N, and armature winding R21 of the indicator M. Winding 22 of transmitter Y, contacts 50, 53 and 51 of relay M, contacts 71, 75, 73 of relay N to winding of R22 of indicator R. As in the previous cases, winding 23 of transmitter Y is permanently connected to the corresponding windings of the other motors in the circuit. By referring to the drawings it will be seen that the windings on the armature of transmitter Y are now connected to the corresponding windings of the armature of relay R and both transmitters X and Z are disconnected from the circuit.

When transmitter Z is operated the initial movement of its handle 18 establishes a path from generator 5, through circuit A, contact 57, contact 58 to magnet 83 back to circuit B, operating magnet 83 of the transfer relay N. At the same time line A is put on contact 59 and the signal bell 60 is operated. The operation of magnet 83 of the transfer relay N causes contact member 80 to close the circuit between 76 and 78, connecting the armature winding 21 of transmitter Z to R21 of the indicator. Contacts 77 and 79 are also closed by their contact member 81 and this establishes the circuit from winding 22 of the transmitter Z to R22 of the indicator. As in the other cases windings 23 and R23 are permanently connected together. The windings on the armature of transmitter Z are thus connected to the corresponding windings of the indicator R and it will be seen by referring to the drawings that the operation of magnet 83 disconnected transmitters X and Y from the circuit.

Only one indicator R has been shown in the diagram but a number of similar indicators will operate in the same manner as a single indicator if their armature windings are connected in parallel and their field windings are supplied from the same source of alternating current.

I claim:

In a self synchronous signaling system, a plurality of transmitter units and a receiver unit, each unit comprising a motor having a field winding and a polyphase armature winding movable with respect to said field winding; a star wheel mounted for rotation with the armature winding of each transmitter, normally open switch means mounted adjacent each star wheel for closure by

the teeth of said star wheel on movement of said armature winding, means for energizing all of said field windings from a common source of current, relay means adapted to connect the phase windings of the transmitter armature which is moved to the corresponding phase windings of the armature of the receiver unit and to disconnect the phase windings of the other transmitter armatures from said armature winding of the receiver unit and means including said switch means for operating said relay means to so connect the transmitter armature winding which has been moved to the receiver armature winding.

SAMUEL NELSON MEAD.