April 20, 1948. L. F. REINHOLD ET AL 2,440,118

INDICATOR CONTROL MECHANISM

Filed Jan. 12, 1946 3 Sheets-Sheet 1

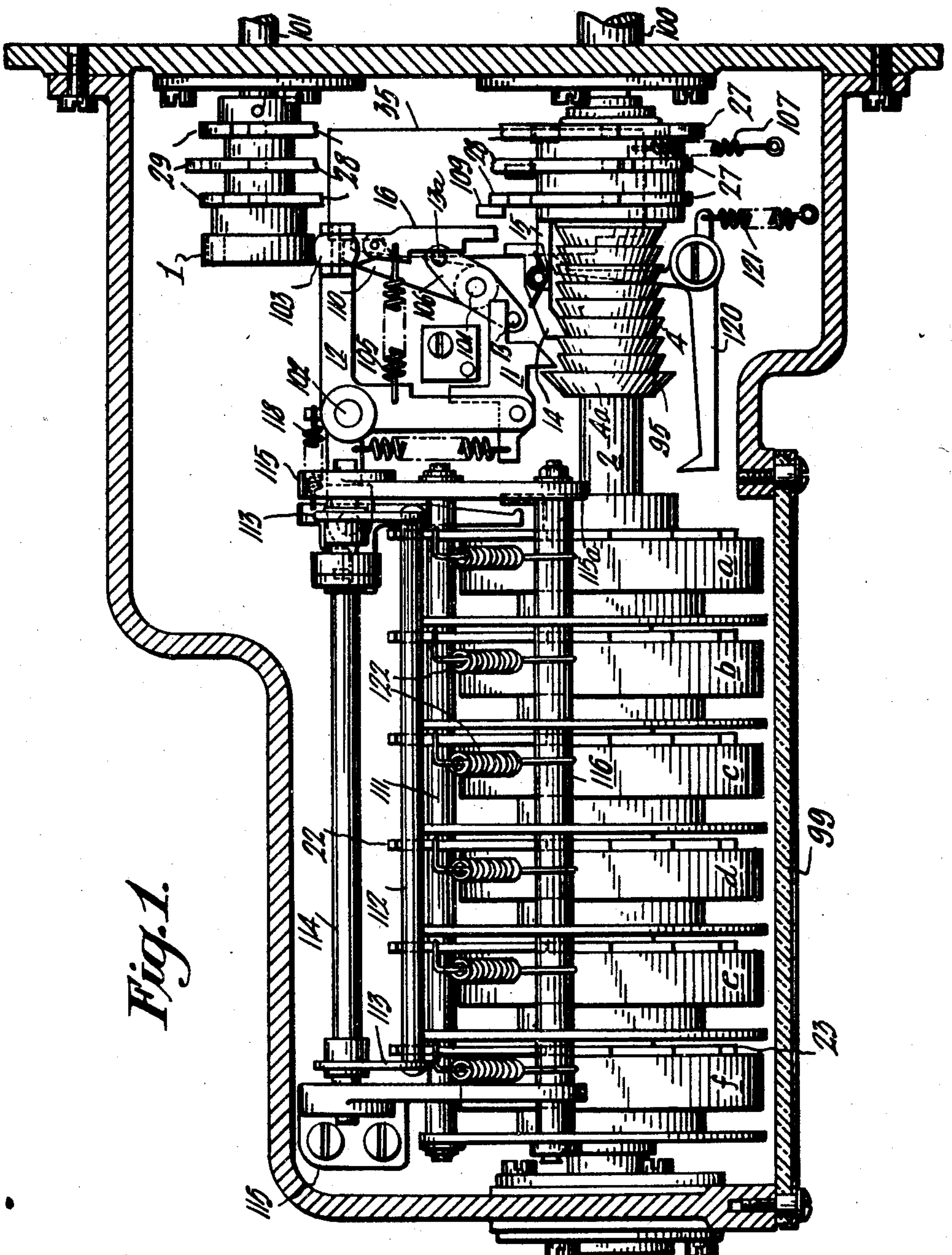

Fig. 1.

INVENTORS
LEONHARD F. REINHOLD
& JAMES A. SPENCER
BY H. G. Grover
ATTORNEY

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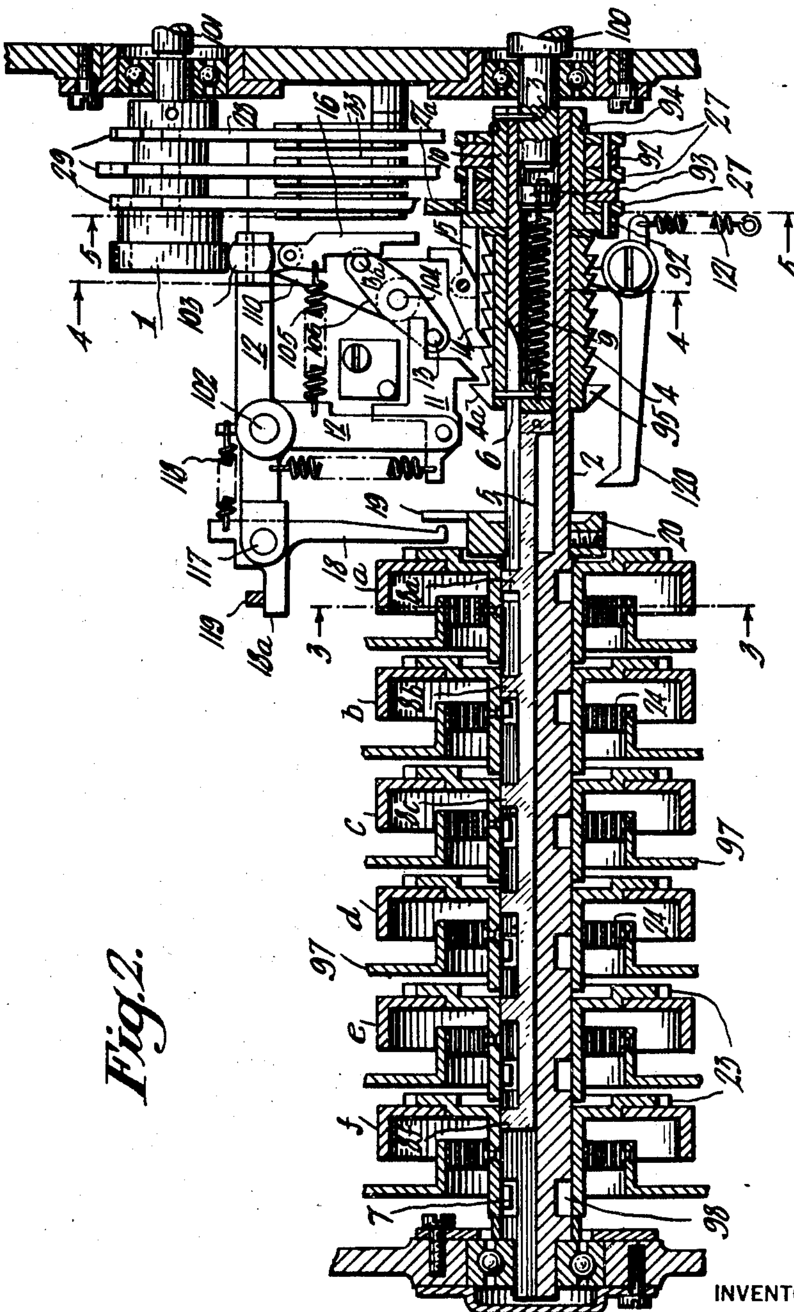

Fig. 2.

INVENTORS
LEONHARD F. REINHOLD
BY & JAMES A. SPENCER

H. S. Grover
ATTORNEY

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Fig. 3.

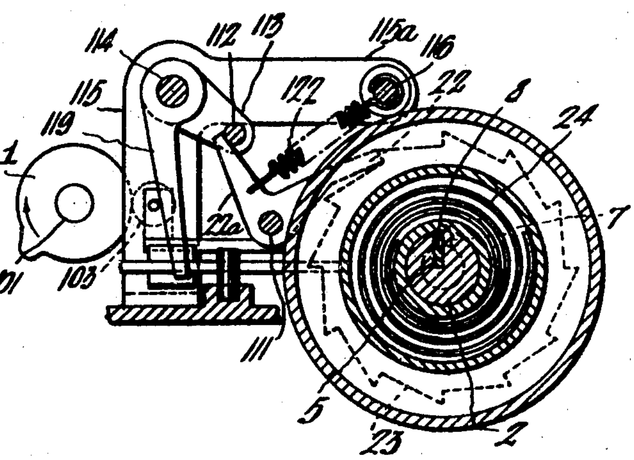


Fig. 4.

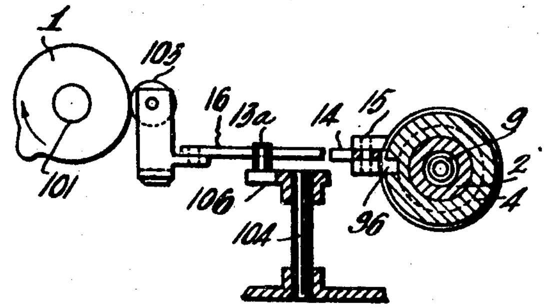


Fig. 5.

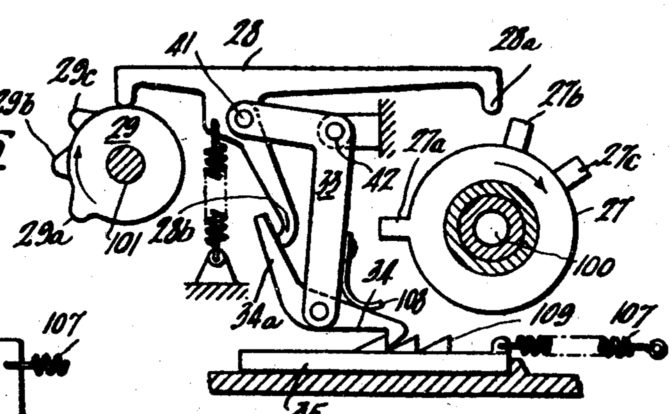
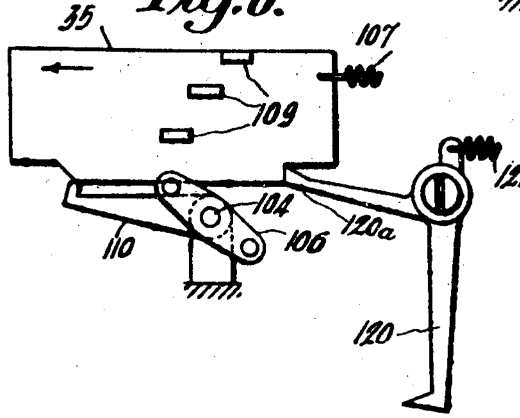


Fig. 6.



INVENTORS
LEONHARD F. REINHOLD
& JAMES A. SPENCER
BY H. S. Grover
ATTORNEY

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UNITED STATES PATENT OFFICE

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INDICATOR CONTROL MECHANISM

Leonhard Florens Reinhold, Staten Island, N. Y., and James Albert Spencer, Teaneck, N. J., assignors to Radio Corporation of America, a corporation of Delaware

Application January 12, 1946, Serial No. 640,839

9 Claims. (Cl. 177—353)

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This invention relates to indicator control mechanisms and more particularly to a device responsive to code signals for setting up visual indications on an indicator having a plurality of rotatable drums with letters, numerals or other symbols on their peripheries.

Remotely controlled indicators have in the past been made settable through the medium of telegraph code signals transmitted from a central station. The indicators are usually associated with telegraph receiving apparatus which responds to the code signals. Such systems have found considerable utility in stock quotation reporting services, as well as for specialized fields of remote visual indication. It is now contemplated that indicators of this type may find utility in giving information from a ground station to an airborne installation; for communications between ships in a fleet; and for posting orders at any point remote from a commanding station.

The indicator control mechanism of the present invention is designed for operation through the medium of telegraph receiving equipment of the type which includes code selecting mechanism for orienting a rotary member. This member is arranged to start from a homing position and to be arrested after rotating through a preselected arc. Our Patent 2,375,828, which issued May 15, 1945, illustrates the operating principles of such a selecting mechanism as applied to a telegraph printer. The same shaft which would carry a type wheel in that case may be used in the present invention for selectively orienting the drums of a multiple drum indicator as herein shown and described.

Accordingly, it is an object of our invention to provide a multiple drum indicator control mechanism which will facilitate the setting of its drums one by one in response to the reception of code signals working upon a selecting mechanism.

It is another object of our invention to improve upon the heretofore known mechanical means for setting indicator drums to exhibit any desired array of symbols or other intelligible characters through window openings in front of these drums.

Other objects and advantages of our invention will be made apparent in the detailed description to follow. This description is accompanied by drawings in which

Fig. 1 shows a plan view of a set of indicator drums and control mechanism therefor. A sectional view of the housing shows a window behind which selected peripheral portions of the drums are to appear;

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Fig. 2 shows a horizontal cross-section through the drums of the multiple drum indicator and through a common shaft on which these drums are rotatably mounted;

Fig. 3 shows a vertical section transverse to the main shaft and through one of the indicator drums, taken along the line 3—3 in Fig. 2;

Fig. 4 shows another vertical section along the line 4—4 in Fig. 2;

Fig. 5 shows still another vertical section along the line 5—5 in Fig. 2; and

Fig. 6 is a plan view of a portion of certain mechanism which in Figs. 1 and 2 is somewhat hidden by other parts.

It should be stated at the outset that the indicator control mechanism as shown in the instant embodiment is one which is designed to function advantageously in response to the selective setting of a main indexing shaft 100 to successively different positions of orientation. Each selecting operation is concurrent with the rotation of a second shaft 101 through a single cycle. The two shafts 100 and 101 correspond to the indexing shaft and the cam shaft of a selecting mechanism such as shown and described in our Patent 2,375,828 above mentioned. Alternatively the operation of the indexing shaft and the cam shaft may be as shown and described in our Patent No. 2,406,044, granted August 20, 1946.

In the instant embodiment of our invention, we utilize the orientation of shaft 100 to drive a shaft extension 2 which commonly supports and individually sets the several indicator drums *a*, *b*, *c*, *d*, *e* and *f*. These drums are singly rotated with the shaft extension, being sequentially keyed thereto by means of a longitudinally adjustable key bar 5. The selecting mechanism which we utilize for individually setting the different drums is under control of a cam 1 mounted on the shaft 101. A release mechanism is also actuated from this same cam.

In order that indicator installations at different points may be selected for control from a single transmitting station we combine with the indicator control mechanism certain other structure which constitutes a station selector mechanism. This enables a transmitting operator to send code signals which first select the receiving station with which he desires to communicate and after this selection is made he transmits message signals which are responded to at the selected station and at no other. The response to such signals is that of setting the drums one by one until a certain manifestation of intelligence appears through the window 99 in front of the drums.

Referring now to Figs. 1 and 2, we show the indicator drums *a*, *b*, *c*, *d*, *e* and *f* mounted for free rotation on a hollow shaft 2. Shaft 2, however, is slotted at the right end so as to be keyed by means of a pin 3 to the indexing shaft 100 of the selector mechanism. Shaft 2 is longitudinally channelled. Within the channel a selector bar 5 is slideably held. This bar has lugs 8 which are so spaced apart as to be engageable one at a time with other lugs 7 extending inwardly from the hub portions of the drums. See Figs. 2 and 3. Shaft 2 has ring-grooves 98 which afford passage-ways for the lugs 7 so that the shaft may turn freely within the hubs of the drums that are to be held stationary.

Each of the drums *a* to *f* inclusive is provided with a ratchet wheel portion having teeth 23. These teeth are engaged by pawls 22 so as to hold each drum in an appropriate indicating position depending upon the degree of advancement to which it is brought in the selective setting operation. A helical spring 24 urges the drum to return to its initial or homing position when released, by the uplifting of a pawl 22. The inner end of each spring 24 is attached to the hub portion of its drum while the outer end of the spring 24 is attached to a ring member that is integral with a fixed separating plate 97 intervening between adjacent drums.

A ratchet sleeve 4 is mounted on the outside of the hollow shaft 2 and is coupled by means of a pin 6 to one end of the drum selector bar 5. This same pin 6 provides anchorage for a coiled spring 9 at one end thereof, the other end being attached to a plug 93 inside the shaft 2. The purpose of spring 9 is to urge the bar 5 to a longitudinal homing position when released by a tripping action of a pawl 14.

The bar 5 is arranged to be advanced step-by-step under control of a feed pawl 11 which engages with the ratchet teeth on the sleeve 4. Pawl 11 is mounted on a bell crank lever 12, the latter being pivoted at 102. One end of the bell crank 12 carries a roller 103 which engages with the periphery of a cam 1 mounted on the end of the shaft 101. A stop pin 13 is mounted on an arm 106 and, as shown in Figs. 1 and 2, it holds the pawl 11 out of engagement with the teeth of the ratchet sleeve 4 during the reception of station selecting signals. The arm 106, however, eventually swings on a pivot center 104 and displaces the pin 13 so as to permit functioning of the pawl 11 during the operation of step-wise advancement of the members 4 and 5. A retaining pawl 14 engages with the ratchet sleeve and can be released during a resetting operation, as will be hereinafter explained. This retaining pawl 14 is mounted on a bracket 15 which is integral with a sleeve member 10. The pawl, bracket and sleeve all rotate with the shaft 2.

A link 16 is hinged to lever 12 and is held in its normal position against a pin 13a under the urge of a spring 105. A pivot shaft 104 supports the arm 106 on which the two pins 13 and 13a are mounted. A lever arm 110 (Fig. 6) is also affixed to the pivot shaft 104 and swings through a slight angle under control of a movable plate 35 which operates in response to the reception of station selecting signals.

The station selecting steps may be performed, if desired, by means of a structure such as shown in our co-pending application Ser. No. 574,288, which was filed January 24, 1945, now Patent

No. 2,404,814 granted July 30, 1946. A functionally equivalent structure for station selection is, however, shown in the instant application. This portion of the apparatus includes cams 29 mounted on the shaft 101 and cam follower levers 28 which are pivoted as at 41 to supporting bell crank levers 33. These levers 33 are all mounted on a fixed pivot pin 42.

Mounted on the bushing 10 is a set of code cams 27. These cams are keyed together and one of them is keyed to the bushing 10 by means of pins 92. A snap ring 94 serves to retain the cams on the bushing 10. The digital portions 27*a*, 27*b* and 27*c* may be set in any desired position of orientation with respect to the shaft 100 in order to translate a series of code signals into selecting or non-selecting responses at different stations for purposes of station selection.

It will be observed by reference to our aforementioned Patent 2,375,828 or to the station selecting mechanism shown in our co-pending application Ser. No. 574,288 (aforementioned) that the indexing shaft corresponding to the one herein referenced 100 is adapted for orientation by a primary code translating mechanism which responds directly to and interprets the incoming code signals whatever their significance may be. Consistent with that patent and that co-pending application the herein shown indexing shaft 100 and cam shaft 101 are motor-driven through clutches in a start-stop manner, the rotation of shaft 100 being at greater velocity than shaft 101 in order to reach its selected position of orientation before the cam humps on cams 29 are required to function in controlling their associated cam followers.

It is essential that station selecting signals be received and responded to prior to the performance of the indicator re-setting function. Therefore, the station selecting mechanism is arranged to function while the rod 5 stands with its lug 8*f* extended one step further than its position of engagement with the cooperating lug 7, the one that extends inwardly from the hub of drum *f*. Under this condition the indexing shaft 100 can rotate freely and the setup of the indicator drums remains undisturbed.

Plate 35 is a component of the station selecting mechanism which responds to proper code signals in a step-by-step manner. See Figs. 5 and 6. It slides on a base under the driving force of one after another of three pawls 34 which are respectively pivoted at the lower ends of the three bell crank levers 33. Springs 108 urge each of these pawls 34 into engagement with one of the ratchet teeth on the plate 35. Spring 107 retracts the plate when released by a detent formed as one arm of a lever system 120.

The plate 35, as shown in Figs. 5 and 6 is provided with three ratchet teeth 109 each arranged to be individually engaged by a different one of the pawls 34 depending upon the selective actuation of different ones of the radial projections 27*a*, 27*b* and 27*c* on the code cams 27. The arrest of the shaft 100 in response to station selecting code signals is such that for a given station selection the ratchet and pawl action between members 34 and 109 will be in a pdedetermined order and will advance the plate 35 in the direction of the arrow by three successive steps. This is accomplished as follows: Cam projection 27*a* is arrested directly beneath a toe piece 28*a* on one of the levers 28, thus providing a fulcrum for lever 28 when its left end rides over a hump 29*a* on one of the cams 29. This action causes the elbow lever 33 to rotate clockwise on its pivot center 42, and to produce a stepping motion of pawl 34 for advancing the plate 35 in a lefthand direction. Plate 35 after completing the third step is held in place by a detent 120a which is pressed against a shouldered edge by means of a spring 121.

The same operation as described in the preceding paragraph is repeated by again responding to a selective code signal such as will orient the shaft 100 to a point where cam projection 27b underlies its associated toe piece 28a on a different lever 28. This lever is actuated by a hump 29b on one of the cams 29 and delivers a second step of advancement of its pawl 34 such as will further advance the plate 35 in a left-hand direction. Likewise, the same operation is repeated with cam projection 27c underlying its associated toe piece 28a of the third lever 28.

While a single station is being selected in the manner described above, other stations will not fully respond to the same code signals because of different pre-arranged phase relations of their station selecting cams 27 with respect to shaft 100. Such stations will have their station selecting cams arrested at points where one at least of the projections 27a, 27b and 27c will be ineffective. In such cases the levers 28 will pivot on fulcrums 41 when the respective humps 29a, 29b and 29c rotate beneath the tracer ends of the levers 28. Hence levers 33 will remain inactive. Where a station is not to be selected and in case of a partial advancement of the plate 35 thereat through one or more steps, a tripping action will be performed by virtue of the engagement of a downwardly extending portion 28b of lever 28 with a heel piece 34a which is integral with the pawl 34, thus lifting the pawl out of engagement with its associated ratchet tooth 109. Thus, by varying the combinations of angular adjustments of the cam projections 27a, 27b and 27c so as to have unlike combinations at each station, the various stations in a system may be independently selected.

The function of the plate 35 when advanced to the limit of three steps is to actuate the cam follower lever 110 which is fastened to shaft 104, lever member 106 being also fastened thereto. This shaft and its levers are, therefore, rotated through a small angle in order to give effect to the station selection. The pawl member 11 and the link 16 (Fig. 2) are now both permitted to operate in accordance with the respective requirements for setting and resetting the indicators. The setting operation is accomplished as will be described hereinafter through the cyclic operation of the bell crank lever 12 in response to repeated revolutions of the cam 1. The resetting function performed by the link 16 is rendered possible only when the pawl 14 is so oriented as to place its heel piece directly under the free end of link 16. For this purpose it is necessary to orient the shaft 100 in a position reserved exclusively for the resetting function.

In Figs. 1 and 3 mechanism is shown for releasing the pawls 22 from engagement with their respective ratchet wheels as used to retain the drums in selected indicating positions. It will be noted that all of the pawls 22 are pivoted at 111 and are provided with tail pieces 22a which are engaged by a rod 112 extending between two supporting levers 113 at the two ends thereof. The rod 112 is swung by the levers 113 on a pivotal shaft 114 which in turn is mounted on bearings in posts 115 attached to the frame of the

machine. These posts 115 have extensions 115a which support a rod 116, the latter being employed to anchor a plurality of springs each individual to one of the pawls 22. By means of these springs the pawls are normally held in engagement with the ratchet teeth 23. The pawls may, however, be lifted out of that engagement by a slight rocking motion applied to the shaft 114. This is accomplished by suitable orientation of a stop finger 19 (Fig. 2) which projects from a hub 20 and is rotated into an operable position in response to the translation of the re-set signal. In that position lever 18 is prevented from turning on its pivot 117 when lever 12 is operated by the hump on cam 1. Therefore, lever 119 yields to the motion of the lever extension 18a and rocks the shaft 114 clockwise, as viewed in Fig. 3. This motion drives the rod 112 against all of the heel portions 22a of the retaining pawls 22 and causes the indicator drums to be released for return to their homing positions under the stored power of the springs 24. At other times of actuation of the lever 12, that is, when lever 18 is unopposed by the projection 19, then the lever 119 resists movement despite the tension of spring 118 because this spring is weaker than the combined force of the opposing pawl springs 122.

Prior to the reception of the station selecting signals the indicator drums are presumed to be standing in the positions at which they were set in response to a preceding train of code signals. The operation of setting the last drum *f* was followed by a step applied to the pawl 11 which moved ratchet sleeve 4 and rod 5 to their extreme lefthand positions, thus allowing the lugs 8 to turn freely without coming into the orbits of any of the lugs 7 inside the hubs of the indicator drums. The ratchet tooth 4a is then advanced beyond the end of lever arm 120 and controls the latter for causing the plate 35 in the station selector mechanism to be released and drawn back by its spring 107. See Fig. 6.

The sequence of operational steps

As described above, the station selecting signals precede all other signals for control of the indicator setting mechanism. They also precede the operation of resetting the drums in response to a reset signal. The reset signal causes shaft 2 to be so oriented that release pawl 14 is aligned with the link 16 and upon the actuation of lever 12 by the cam 1 pawl 14 is lifted out of engagement with the ratchet sleeve 4. A channel 96 is cut through the teeth of the ratchet sleeve 4 which permits the sleeve to be drawn to the right by spring 9 without interference from pawl 11. Another channel is cut through the tooth 4a which permits this tooth to pass by the end of lever arm 120. It is only when the shaft 2 has been oriented for a resetting operation that pawl 11 and lever 120 would be freed in this manner from opposing the return motion of the sleeve 4. Rod 5 after being drawn back by spring 9 brings the lug 8a into the orbit of the associated lug 7 attached to the sleeve of drum *a*.

While the resetting operation is being performed in accordance with the foregoing paragraph further steps of resetting are simultaneously performed as described in a preceding part of this description where it was shown that the digital member 19 is opposed to lever arm 18 and causes lever 119 to be properly moved for lifting the pawls 22 out of engagement with the ratchet wheels 23, thus permitting all of the indicator drums to be returned to their homing positions.

Subsequent to the resetting operation signals are received for successively setting each of the dials *a* to *f* inclusive. Considering dial *a*, for example, shaft 2 is oriented by proper response to a code signal for displaying the desired symbol on this indicator drum through the window 99. After the drum has reached this position lever 12 operates to engage pawl 11 with one tooth of the ratchet sleeve 4 and to advance the rod 5 one step. This step having been taken, shaft 2 rotates further to its homing position but with lug 8*b* turning freely in the path of its associated lug 7. Since this lug 7 now stands in a homing position lug 8*b* has to rotate to a position behind it in order to commence a setting motion for drum *b*.

Then follows the reception of a code signal intended for setting drum *b*. Lug 8*b* on rod 5 is in position to drive the drum *b* into its predetermined setting according to the response which is to be made to the received code signal. This operation is again followed by actuation of the lever 12 and the further advancement of the ratchet sleeve 4 together with the rod 5 which brings lug 8*c* into the orbital plane of its associated lug 7 on the drum *c*. Each succeeding step of operation for setting the indicator drums *d*, *e* and *f* will be like those described above. Finally the ratchet sleeve 4 is advanced to the point where its tooth 4*a* engages the end of lever arm 120 and causes the restoration of the station selector plate 35. This operation prepares the station selector to respond to a subsequent train of code signals as described in the foregoing text.

It will be understood by those skilled in the art that the herein disclosed embodiment of our invention is capable of modification in various ways without departing from the spirit and scope of the invention itself. Modifications may be made in the lever mechanisms or in the mountings for the various parts and in other obvious ways. Any desired number of indicator drums may be used. The number of steps required for station selecting may be more or less than three, depending upon the requirements of a given system. The number of indexing positions, or selectable stops for the index shaft 100 may be so determined in the design of the apparatus as to provide for individual selection of a single station in a previously selected group of stations, so that selectivity is in geometric ratio to the number of disks 27 to be used and to the number of indexing points of arrest of the shaft 100.

Some installations may require that all stations respond simultaneously to a given station selecting signal. In this case the disks 27 may be provided with two digital extensions each, and the code signal for "calling all stations" would uniformly orient these disks in like manner at the different stations. Then for individual station selection the variably disposed digital extensions on the disks 27 would be called into play in order to select the wanted station and then to set up a message response at that station only.

We claim:

1. In a device for setting the drum dials of an indicator in response to the reception of code signals, an index shaft upon which said dials are mounted and a cam shaft, said shafts being subject to cyclic operation upon receiving each code signal, and the index shaft being arranged for arrest in different selected positions in which positions said cam shaft performs control operations upon said indicator, means extendable in varying degrees along the axis of said index shaft for mechanically coupling each drum dial individually and successively thereto, whereby the dials are set to display a visual translation of said code signals, and means operable by said cam shaft for causing said extendable means to be progressively advanced into coupling relation with each drum dial.

2. Apparatus according to claim 1 in combination with means operable by said cam shaft for causing the release of said drum dials and of said extendable means, each for spring-powered return to their respective homing positions.

3. In a system which includes a plurality of coaxially mounted indicator drums at each of a plurality of code signal receiving stations, an index shaft upon which said dials are mounted arranged for orientation into selected positions of arrest in response to the translation of received code signals, a cam shaft cyclically operable to perform controlling functions after each arrest of said index shaft in a selected position, a station selector mechanism operable by said index shaft in cooperation with said cam shaft, in response to the reception of station selecting signals, for conditioning the apparatus at a selected station to actuate the indicator drums thereat, a key slidably held in a channel in said index shaft internally of said drums, and means driven by said cam shaft for progressively positioning said key so as to cause rotation of said drums singly by said index shaft.

4. An indicator comprising a plurality of coaxially mounted drum dials each having a ratchet-and-pawl device for holding the same in a set position in opposition to spring tension, two shafts operable in discrete cycles for causing each of said dials to be independently positioned for displaying any desired character, the first of said shafts having a key-way which extends internally of the hubs of said dials, the second of said shafts having cam means mounted thereon for performance of control operations upon said indicator, a key-bar slidably held in said keyway, a ratchet and pawl mechanism arranged to advance said key-bar step-by-step into suitable positions for driving said dials singly and in succession, and lever means operable by the cam means on said second shaft for actuating said ratchet-and-pawl mechanism.

5. The combination according to claim 4 and including release mechanism operable by said cam means after arresting said first shaft in a "re-set" position, said release mechanism being arranged to up-set the ratchet-and-pawl device and the ratchet-and-pawl mechanism, thereby causing said drum dials and said key-bar to be returned to a homing position.

6. In a device for controlling the setting of a plurality of coaxially mounted drum dials in an indicator, an index shaft upon which said dials are mounted, said index shaft being subject to orientation into variably selectable positions of arrest and then into a homing position, a cam shaft cyclically operable to perform certain functions while the index shaft stands in a selected position of orientation, and means controlled by said cam shaft for causing a progressive engagement of individual drum dials with said index shaft, thereby to cause rotation of one drum at a time from its homing position to the selected position of arrest of said index shaft, and thereafter to free the rotated drum while the index shaft continues to rotate in the same direction to its homing position.

7. In a device according to claim 6 apparatus

for re-setting said drum dials to a homing position and for shifting the orientation control from one end dial to the other end dial, said apparatus comprising retaining pawls normally engaged with ratchet wheels mounted on said drum dials, a detent for holding said means which causes progressive engagement of individual drum dials, control digits extending radially with respect to said index shaft, and means driven by said cam shaft upon suitable orientation of said control digits for disengaging said pawls and said detent, thereby to fulfill the function of this apparatus.

8. In a setting mechanism for drum dials, a longitudinally channeled index shaft on which said dials are mounted for free rotation, a driven lug extending inwardly from the hub of each dial, a key member having a plurality of driving lugs which are arranged and adapted to engage with said driven lugs one at a time and progressively as the key member is advanced in and along the channel of said index shaft, means for causing stepwise advancement of said key member from engagement with one driven lug to engagement with another driven lug, a cam shaft rotatable in discrete cycles, each cycle being concurrent with an orientation of said index shaft to a position corresponding to a desired setting for one of said dials, said stepwise advancement means being actuated by a cam on said cam shaft at a time subsequent to the arrest of said index shaft in its

position of orientation, a plurality of coiled springs individually associated with said dials for re-setting the same to a homing position, ratchet and pawl means for retaining each of said dials in a selected indicating position after being driven thereto by said index shaft, and means jointly controlled by the two said shafts for causing the release of said ratchets by said retaining pawls, thereby to effect the re-setting of said dials, each by its respective coiled spring.

9. A device according to claim 8 in combination with a station selector which is subject to joint control by said index shaft and said cam shaft, said station selector constituting means for conditioning said setting mechanism to function in response to subsequent cyclic operation of the two said shafts.

LEONHARD FLORENS REINHOLD.
JAMES ALBERT SPENCER.

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