June 4, 1957 F. J. CALDERONE, JR 2,794,852

MULTIPLEX DISTRIBUTOR

Filed Nov. 18, 1953

FIG. 1

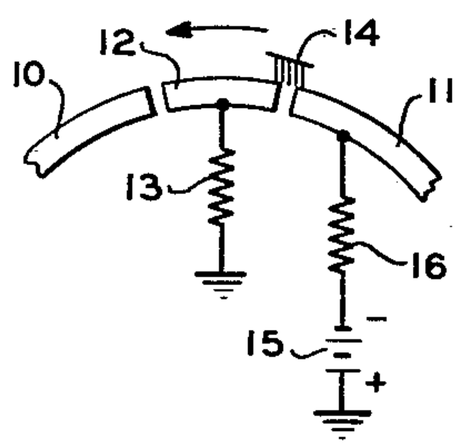


FIG. 2

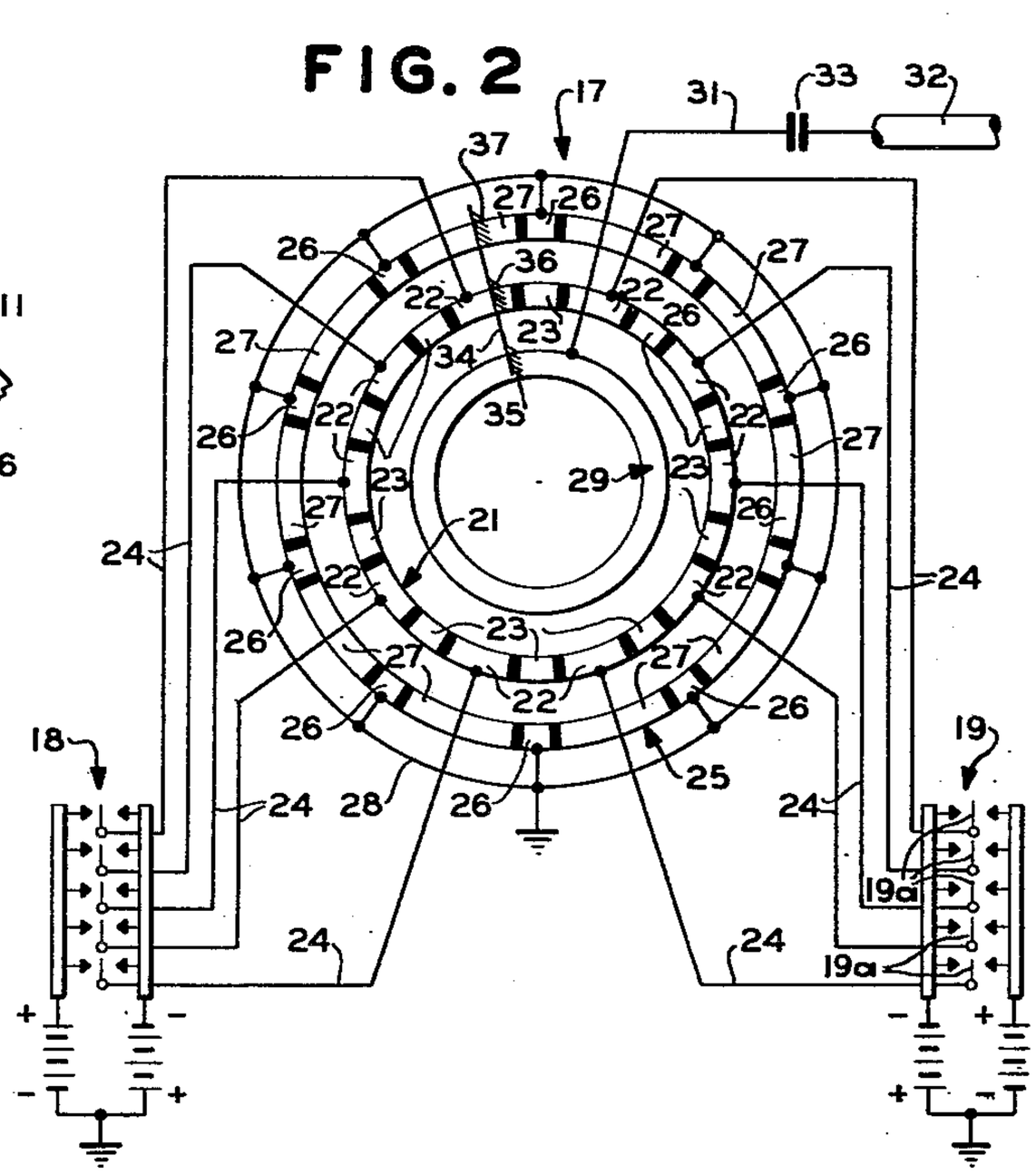
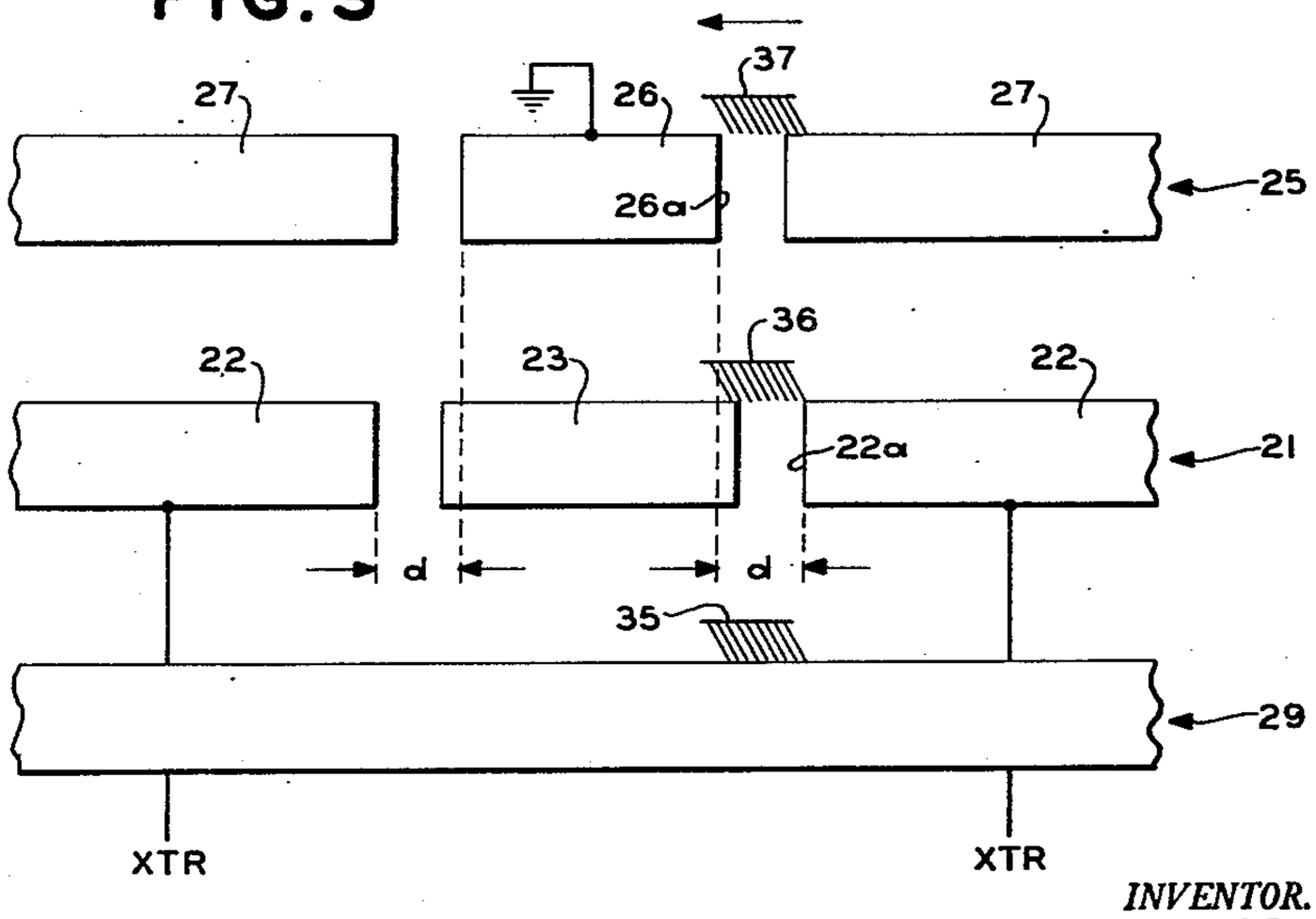


FIG. 3



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MULTIPLEX DISTRIBUTOR

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10 Claims. (Cl. 178—52)

This invention relates to improvements in telegraph signaling and more particularly to an improved segment arrangement for multiplex distributors.

In the transmission of messages over a cable, each impulse will cause energy to be absorbed and stored in the cable due to its capacitive characteristics. A portion of this absorbed energy is propagated toward the receiving terminal. In transmission the message signals at the receiver are distorted by the characteristics of the cable. It has long been recognized that a grounding interval between successive signal pulses will help minimize this distortion. This periodic grounding of the cable, or curbing as it has come to be known in the art, permits the stored energy from the preceding signal pulse to be dissipated by the cable resistance. Much of this stored energy is dissipated in the portion of the cable in the vicinity of the transmitter. The result of this is that smaller amounts of the low frequency components, which cause the recording distortion, do not reach the receiver. The advantages obtained from employing curbing are especially apparent in high speed transmission as when automatic type-printing machines are used. In such systems an interval between each impulse is needed to permit the discharge by the cable of the charge put thereon by the preceding impulse. Thus the cable is neutralized after each impulse in preparation for the succeeding one.

The result of this type transmission makes it possible to obtain higher signaling speeds which is of prime importance as an economy factor. The duration of the curbing interval may govern the signaling speed. In general, a larger curbing interval will make possible greater speeds. In multiplex typeprinting systems the necessity for curbing exists because of the high speed of transmission, and hence the advantages discussed above are particularly applicable.

In such systems, curbing is generally achieved by dividing the distributor ring into alternate sending segments and curbing segments. The curbing segments are connected together and grounded. The sending brush in traversing the distributor ring will thereby ground the cable between successive message impulses. Inasmuch as the sending brush must not be permitted to fall into the gap that electrically isolates adjacent segments, the brush must be of such width as to bridge this gap. With a double current ground return arrangement as employed in the modern telegraph system, the battery or other source of potential would be directly shorted during the time that the sending brush bridges any two adjacent segments, resulting in high current and arcing at the segments. In order to prevent this arcing and the consequent destruction of the segments, a battery tap resistor is customarily inserted in each battery circuit, and a curbing resistor is employed to couple the curbing segments to ground. While the battery tap resistor effectively aids in limiting the shorting current to prevent arcing, it presents the disadvantage of also limiting the transmission current.

It is therefore an object of this invention to provide

a telegraph system employing a segmented distributor wherein segment arcing is eliminated without a decrease of transmission current.

Another object of this invention is to provide an improved distributor face plate.

Another object of this invention is to eliminate arcing between segments of a telegraph distributor.

A further object is to obtain maximum transmission current in a multiplex telegraph system.

These and other objects will become apparent from the following description taken in view of the drawings in which:

Fig. 1 is a diagrammatic representation of a portion of a distributor ring and battery connections of a system of the prior art, which is illustrated to aid in the understanding of the present invention;

Fig. 2 is a schematic diagram of a two-channel multiplex transmitting terminal employing the principles of the present invention; and

Fig. 3 is an enlarged development of a portion of the distributor of Fig. 2.

Referring now to Fig. 1, sending segments **10** and **11** are separated by curbing segment **12** which is grounded through curbing resistor **13**. A brush **14** connected to the cable circuit (not shown) is caused to traverse the segmented ring. Each sending segment has a positive or negative potential selectively applied thereto. As seen in Fig. 1, battery **15** is supplying a negative potential to sending segment **11**. As the brush passes from segment **11** to curbing segment **12**, the gap between these segments is momentarily bridged and current flows from ground, through battery **15**, resistor **16**, segment **11**, brush **14**, segment **12**, resistor **13** back to ground. This current, which tends to cause arcing, is limited by resistor **16**. However, as is readily apparent, this resistor will also serve to limit the sending current since it is directly in series with the battery and cable when brush **14** is fully contacting segment **11**.

With improved cable system design employing submerged repeaters, higher signalling speeds are made possible. The higher frequencies resulting therefrom will be subject to greater attenuation than relatively lower frequencies, making it necessary to use a battery of higher potential. The bridging current that would result from the larger battery must of course be limited by a relatively larger battery tap resistor. However, this larger resistor in the battery circuit will cause a proportionately greater decrease in sending current. It is seen therefore that the desirability of having the battery tap resistor approach zero is ever present but especially necessary at higher frequencies.

Referring now to Fig. 2, there is shown a two-channel multiplex transmitting terminal comprising a distributor **17** and two transmitters **18** and **19**. The transmitters may be of any conventional type such as a keyboard or tape controlled machine employing the well known five-unit code. A distributor ring **21** is divided into alternate sending segments **22** and open segments **23** insulated from each other. In the embodiment illustrated, there are ten sending segments and ten open segments, the number being a function of the number of channels for which the system is designed. The five center contacts of transmitter **19** are connected by wires **24** to five successive sending segments **22** of the distributor ring **21**. Transmitter **18** is similarly connected to the remaining segments **22** of ring **21**. Another segmented ring **25** which for purposes of description will be called the curbing ring comprises alternate curbing segments **26** and open segments **27** suitably insulated from each other. The curbing segments are joined by wire **28** and grounded. A third contact ring **29** is connected by wire **31** to outgoing cable **32**. A sending capacitor **33** is interposed

in the output circuit to effect signal shaping by presenting a progressively higher impedance to lower frequency components. A brush arm **34** of conductive material is caused to rotate in a well known manner to cause brushes **35**, **36** and **37** to traverse the contact rings as shown.

Referring now to Fig. 3, portions of the rings **29**, **21** and **25** are shown in development. It is seen that curbing ring **25** is so constructed that the curbing segments **26** are somewhat shorter than the open segments **23** of distributor ring **21** and are centered with respect to segments **23**. The width of the air gap between any two adjacent segments is less than the width of the brushes in accordance with conventional practice to prevent the brush from descending into the gap in passing from one segment to the next. The distance *d* between the trailing edge **22***a* of a sending segment **22** and the leading edge **26***a* of a curbing segment **26** is made greater than the width of the brushes. As the brushes move from right to left as viewed in Fig. 3, brush **36** will ride off sending segment **22** before brush **37** contacts with curbing segment **26**. Since these two segments are at no time bridged, arcing and flashover is prevented. The same spacing and action occurs between the trailing edge of the curbing segment and the leading edge of the succeeding sending segment. Thus, it will be noted that a small interval exists at each end of a sending pulse during which the cable ring **29** is disconnected from both the sending segment **22** and the curbing segment **26**. It is desirable that these intervals be kept as short as possible in order to realize the maximum transmission time per revolution. Therefore, though *d* may be any size greater than brush width for purposes of preventing arcing, in practice *d* is made just slightly greater than the width of the brushes. The braided copper brushes commonly used will wear to a width of from .020 inch to .030 inch. It has been found that a distance *d* of .040 inch, thereby producing an interval of at least .010 inch during which the cable ring **29** is disconnected from both the curbing segment and sending segment, gives highly satisfactory results. Arcing is prevented and the interval is of negligible proportion relative to the duration of an impulse.

The cable **32** is connected to a distributor at the receiving terminal which is of identical construction as sending distributor **17**. The distributor or face plate of the present invention is therefore equally applicable as a sending distributor and receiving distributor.

It will be appreciated from the above description that the battery tap resistor of prior art systems is eliminated by the face plate arrangement of the present invention. This feature should be especially noted since it makes possible the greater transmitting current required by high speed systems. The high frequencies of such systems are subject to greater attenuation and hence require a battery source of greater potential. If it were necessary to resort to a battery tap resistor to prevent arcing, the loss in sending current would be of an order that would limit the high frequency transmission. The present invention, however, in effecting a battery tap resistance that approaches zero, permits signaling speeds that would otherwise be unobtainable.

While the present invention has been disclosed with reference to a specific embodiment thereof, it is understood that this is not to be considered as limiting the appended claims.

What is claimed is:

1. A distributor adapted to be employed with a telegraph system comprising a first segmented ring with an insulating gap between adjacent segments and wherein alternate message segments are adapted to be connected to message operating means, a second segmented ring with an insulating gap between adjacent segments and including alternate curbing segments corresponding to said message segments of said first ring, each of said message segments being angularly displaced with respect to the corresponding curbing segment, means to traverse said first and second rings, said traversing means being wider than the said gaps between segments, the distance from the trailing edge of a message segment to the leading edge of a curbing segment and the distance from the trailing edge of a curbing segment to the leading edge of the next succeeding message segment each being greater than the width of said traversing means.

2. A distributor adapted to be employed with a telegraph system comprising a first segmented ring with an insulating gap between adjacent segments and wherein alternate message segments are adapted to be connected to message operating means, a second segmented ring with an insulating gap between adjacent segments and including alternate curbing segments corresponding to and angularly displaced from said message segments of said first ring, means to traverse said first and second rings, said traversing means having a width greater than the gaps between said segments, the angular distance from the trailing edge of a message segment to the leading edge of a curbing segment being greater than the angle subtended by said traversing means and the angular distance from the trailing edge of a curbing segment to the leading edge of the next succeeding message segment being greater than the angle subtended by said traversing means.

3. A distributor for use with a telegraph system comprising a first segmented ring including alternate message segments and open segments with an insulating gap between adjacent segments, a second segmented ring including alternate curbing segments and open segments with an insulating gap between adjacent segments, each of said message segments of said first ring corresponding to a curbing segment of said second ring, and means of a width greater than said insulating gaps to traverse said first and second rings, said curbing segments being angularly displaced with respect to the corresponding message segments and of such relative lengths that said traversing means rides off each message segment before contacting the corresponding curbing segment and rides off each curbing segment before contacting the next succeeding message segment.

4. A distributor for use with a telegraph system comprising a first segmented ring including alternate message segments and open segments with an insulating gap between adjacent segments, a second segmented ring including alternate curbing and open segments with an insulating gap between adjacent segments, each of said message segments of said first ring corresponding to a curbing segment of said second ring and rotatable contact means of a width greater than said insulating gaps to traverse said first and second rings, said message segments being of such relative lengths and located with respect to the corresponding curbing segments whereby said rotatable contacting means breaks contact with each message segment before contacting the corresponding curbing segment and breaks contact with each curbing segment before contacting the next succeeding message segment.

5. A multiplex distributor for use with a telegraph transmitter comprising a first segmented ring including alternate sending segments and open segments with an air gap between adjacent segments, a second segmented ring including alternate curbing and open segments with an air gap between adjacent segments, each of said sending segments of said first ring corresponding to a curbing segment in said second ring and rotatable contact means of a width sufficient to bridge said air gaps to traverse said first and second rings, said sending segments being of such relative lengths and located with respect to the corresponding curbing segments whereby said rotatable means breaks contact with each sending segment before contacting the corresponding curbing segment and breaks contact with each curbing segment before contacting the next succeeding sending segment.

6. In a telegraph system comprising a sending distributor for applying intelligence signals to a cable, a first

segmented ring including alternate sending segments and open segments with an air gap between adjacent segments, a second segmented ring including alternate curbing segments and open segments with an air gap between adjacent segments, each of said sending segments of said first ring corresponding to a curbing segment in said second ring and angularly displaced with respect thereto and rotatable contact means of a width greater than said air gaps connected to said cable and adapted to traverse said first and second rings, said sending segments being located with respect to the corresponding curbing segments whereby the cable is alternately connected to sending and curbing segments upon rotation of said contact means.

7. A multiplex telegraph system comprising a distributor for applying signals to a cable, said distributor comprising a first segmented ring including alternate sending segments and open segments with an air gap between adjacent segments, a plurality of telegraph transmitters coupled to said sending segments, a second segmented ring including alternate grounded segments and open segments with an air gap between adjacent segments, each of said sending segments of said first ring corresponding to a grounded segment in said second ring, and rotatable contact means of a width larger than said air gaps connected to said cable and adapted to traverse said first and second rings, said sending segments being angularly located with respect to said grounded segments whereby the cable is alternately coupled to sending and grounded segments upon rotation of said contact means.

8. A distributor for use with a telegraph system comprising a first segmented ring including alternate message segments and open segments with an insulating gap between adjacent segments, a second segmented ring including alternate curbing segments and open segments with an insulating gap between adjacent segments, said message segments and curbing segments being angularly staggered and means to traverse said first and second rings, said means to traverse having a width larger than said insulating gaps and smaller than the angular distance from the

trailing edge of a message segment to the leading edge of a corresponding curbing segment.

9. A distributor adapted to be employed with a telegraph system comprising a first segmented ring including alternate message segments and open segments with an insulating gap between adjacent segments, a second segmented ring including alternate curbing segments and open segments with an insulating gap between adjacent segments, said first and second rings being oriented so that each curbing segment is angularly centered between successive message segments and rotatable means to traverse said first and second means subtending an angle greater than the angle subtended by said insulating gaps and less than either the angular distance between the trailing edge of a message segment and the leading edge of a curbing segment or the angular distance between the trailing edge of a curbing segment and the leading edge of the next successive message segment.

10. A distributor for use with a telegraph system comprising a first segmented ring including alternate message segments and open segments with an insulating gap between adjacent segments, a second segmented ring including alternate curbing segments and open segments with an insulating gap between adjacent segments and means to traverse said first and second rings, said rings being so oriented that each curbing segment is angularly located between successive message segments, said means to traverse subtending an angle larger than the angle subtended by the said insulating gaps and smaller than either the angle defined by the trailing edge of a message segment and the leading edge of the corresponding curbing segment or the angle defined by the trailing edge of a curbing segment and the leading edge of the next successive message segment.

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