May 6, 1958 M. ALDEN 2,833,611

FACSIMILE RECORDER

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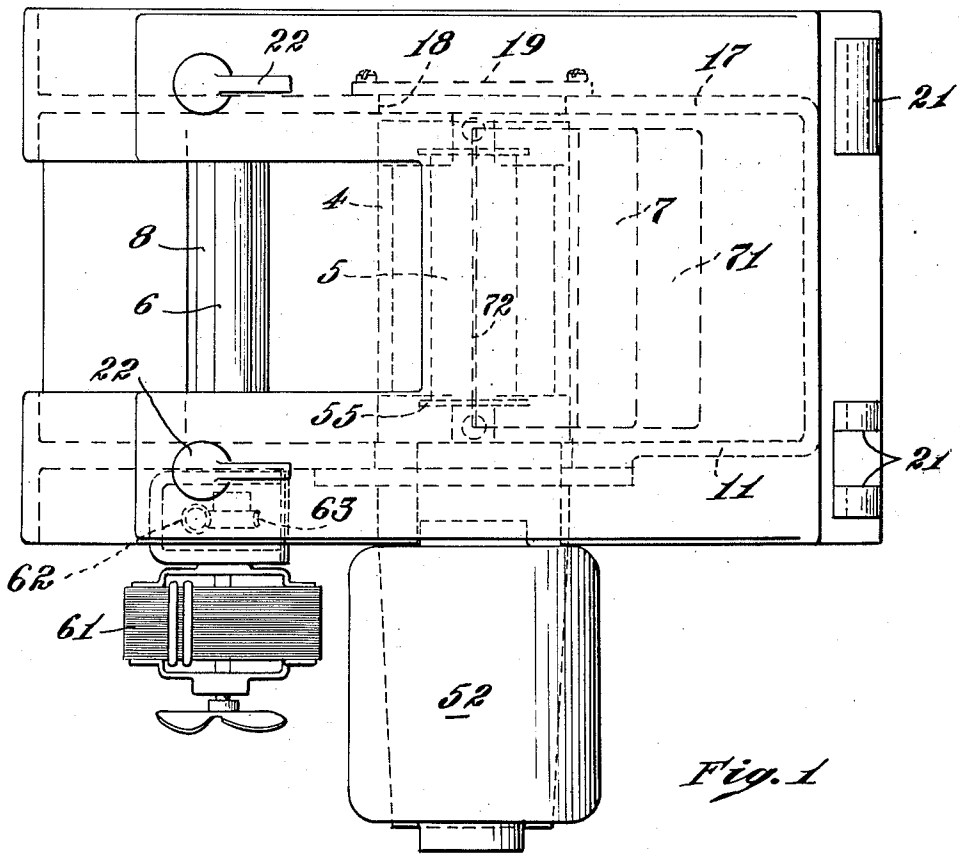


Fig. 1

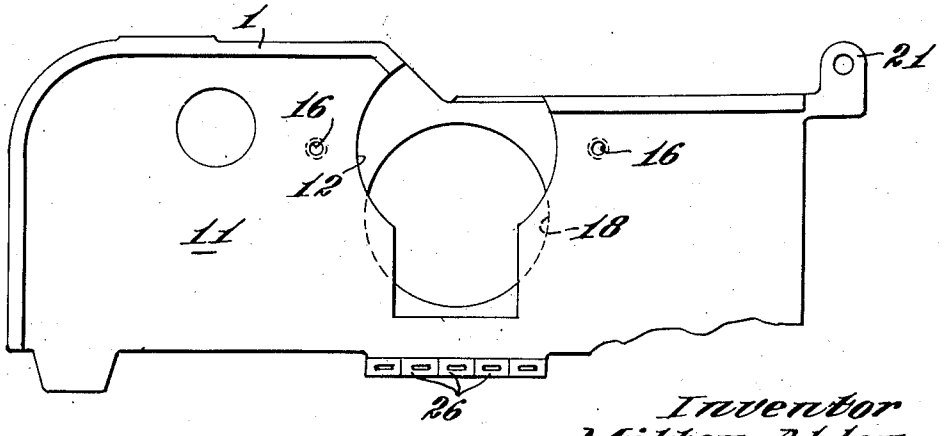


Fig. 2

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May 6, 1958 M. ALDEN 2,833,611

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Filed July 1, 1954 4 Sheets-Sheet 2

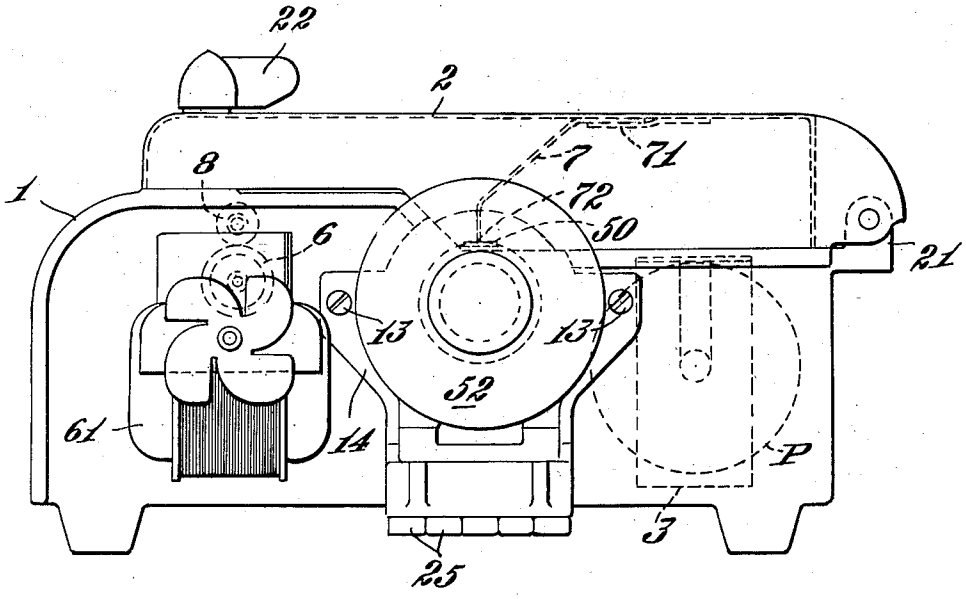


Fig. 3

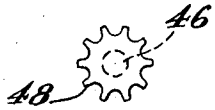


Fig. 11

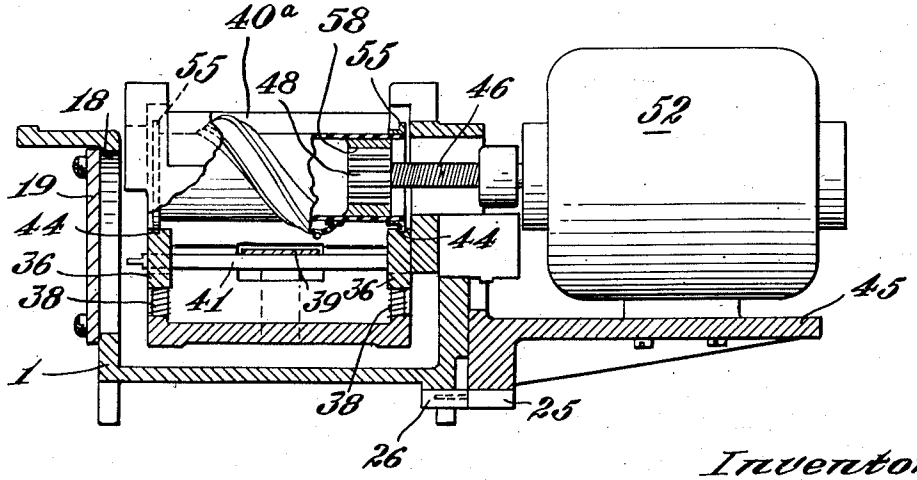


Fig. 5

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May 6, 1958 M. ALDEN 2,833,611

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Filed July 1, 1954 4 Sheets-Sheet 3

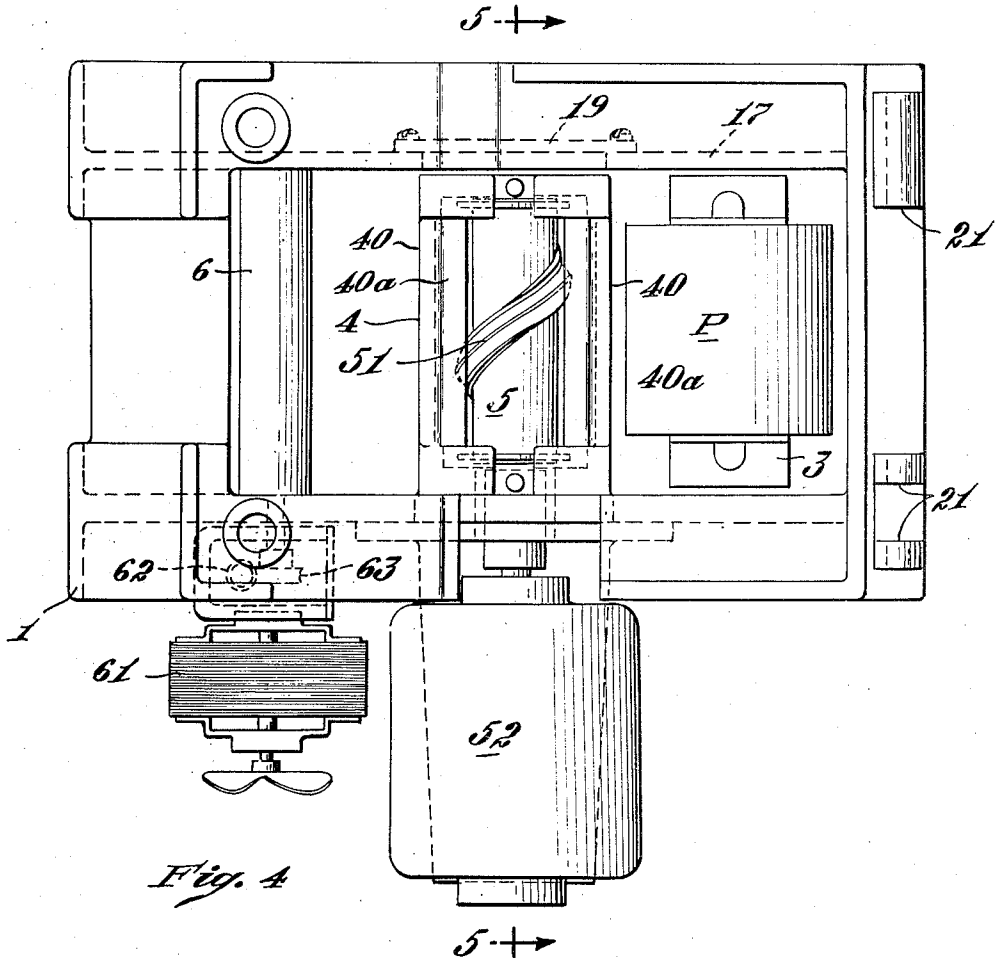


Fig. 4

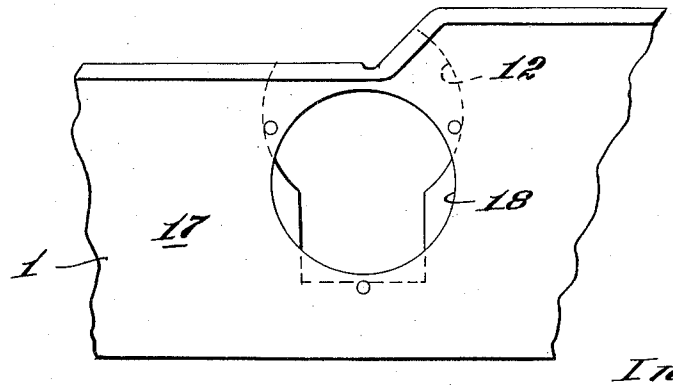


Fig. 6

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May 6, 1958 M. ALDEN 2,833,611

FACSIMILE RECORDER

Filed July 1, 1954 4 Sheets-Sheet 4

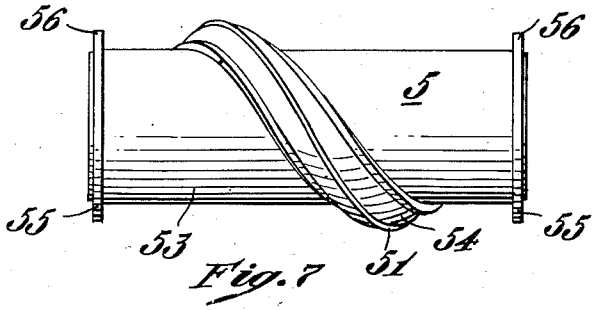


Fig. 7

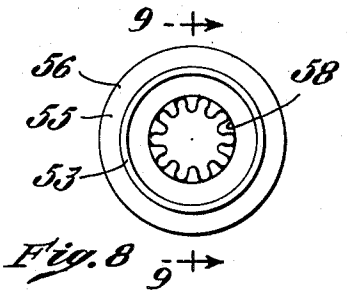


Fig. 8

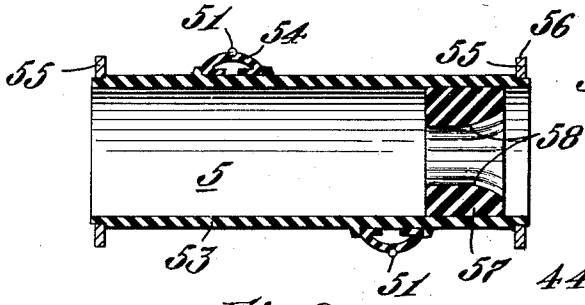


Fig. 9

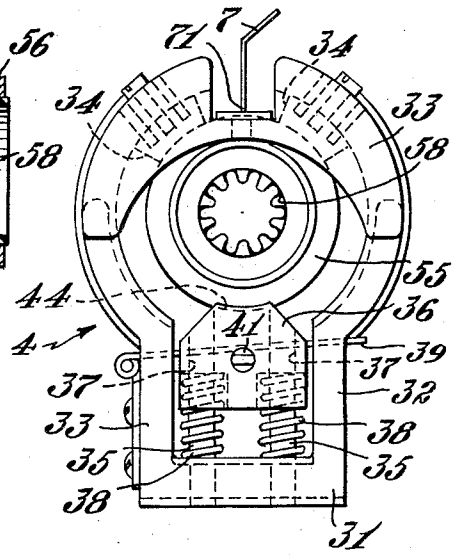


Fig. 10

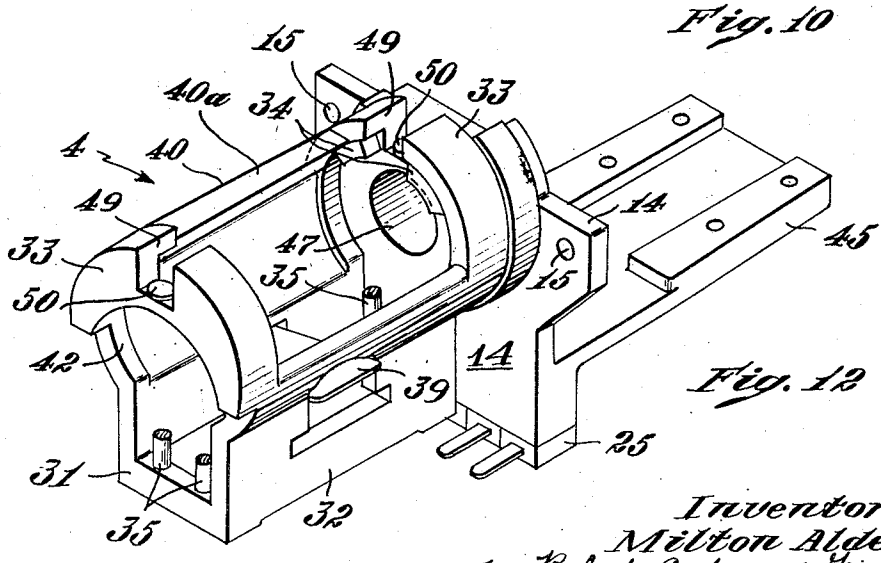


Fig. 12

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Patented May 6, 1958

2,833,611

FACSIMILE RECORDER

Milton Alden, Needham, Mass.

Application July 1, 1954, Serial No. 440,705

11 Claims. (Cl. 346—101)

This invention relates to facsimile recorders of the type in which recording paper is fed through a recording zone between a rotating helical electrode and an elongate electrode, and more particularly relates to a novel support for the helical electrode.

Prior to the present invention it was customary to dispose a helix of wire around the periphery of a drum and mount the drum on a motor shaft. With such a helix drum mount any eccentricity or vibration of the motor shaft was imparted to the helical electrode. The quality of the recording was thereby seriously affected since it has been found necessary to apply a closely limited pressure on the paper between the two electrodes. Excessive pressure damages the paper and prevents good definition while unduly light pressure causes weak and spotty recording.

A further problem was presented by the difficulty of aligning the motor shaft exactly parallel to the elongate electrode so that successive portions throughout the length of the helical electrode would apply an even pressure to the paper as they were rotated into an effective recording position in the recording zone.

Accordingly the main object of the present invention is to provide a mount for the helix drum which precisely locates the helical electrode on the drum periphery relative to the recording zone, and isolates the helical electrode from the effects of eccentricity, misalignment or vibration of the drum or its driving motor.

A further object is to provide a sturdy support for the helix drum which protects it from damage due to accidental shock to the motor.

A still further object is to provide a support from which the drum may be easily removed for replacement without the use of tools.

In a broad aspect the invention involves the combination in a facsimile recorder of a drum having a helical electrode around its periphery and means for coupling the drum to a motor, and a cradle for holding the drum comprising bearing means at each end of the cradle peripherally supporting each end of the drum. By supporting the drum at or adjacent its periphery where the helical electrode is disposed, the electrode may, during rotation be precisely positioned relative to the recording zone despite eccentricity, misalignment or vibration of the motor or drum. Preferably the bearing means includes surfaces facing away from the recording zone and a member yieldingly urging the drum periphery against the bearing surfaces so that the portion of the helical electrode in recording position is particularly precisely located. The yielding member may be retracted to permit detachment of the drum from the cradle without the use of tools. Preferably the cradle has means defining the recording zone such as abutments opposed to the elongate electrode for locating the elongate electrode in the recording zone.

For the purpose of illustration typical embodiments of the invention are shown in the accompanying drawings in which

Fig. 1 is a plan view of a facsimile recorder;

Fig. 2 is a right side elevation of the recorder housing;

Fig. 3 is a side elevation of the recorder;

Fig. 4 is a plan view of the recorder with its cover removed;

Fig. 5 is a section on line 5—5 of Fig. 4;

Fig. 6 is a fragmentary left side elevation of the recorder housing;

Fig. 7 is a side elevation of a helix drum;

Fig. 8 is an end elevation of the helix drum;

Fig. 9 is a section on line 9—9 of Fig. 8;

Fig. 10 is an end elevation showing the drum supported in a cradle;

Fig. 11 is an end view of a motor shaft; and

Fig. 12 is an isometric view of the helix cradle, parts being omitted.

As shown in Figs. 1 to 4 the present facsimile recorder comprises a housing **1** to which a cover **2** is attached by hinges **21**. Within the housing **1** is a bracket **3** supporting a roll of electrolytic recording paper P, a cradle **4** supporting a drum **5** with a helical electrode **51** and a paper feed roll **6**. Detachably secured to the cover **2** by a leaf spring **71** is a flexible blade electrode member **7** having an elongate recording edge **72**. Also mounted in the cover is an idler roll **8** which mates with the feed roll **6**. The feed roll **6** is driven by a motor **61** through reduction gears **62** and **63**. Preparatory to recording a web of paper P is drawn from the roll over the drum **5** and feed roll **6**. During recording the cover is locked closed by means of latch nuts **22** with the blade electrode **7** opposed to the helix drum **5** and the idler roll **8** pressing the paper P against the feed roll **6**. Rotation of the feed roll **6** draws the paper between the blade **7** and helix drum **5**. Since the paper roll and paper feed structure form no part of the present invention and are fully disclosed in my United States Patent No. 2,621,999, issued December 16, 1952, they need not be described in greater detail. As will be described more fully hereinafter the helix drum **5** carries a helical electrode **51** and is driven by a motor **52**. When facsimile signals are applied across the blade electrode **7** and the helical electrode **51** current will flow from one electrode to the other through the electrolytic paper P thereby marking the paper P which is pressed between the two electrodes. Rotation of the helical electrode causes it to scan lengthwise of the recording edge **72** so that the marks are distributed across the width of the paper P transversely of the direction of paper feed.

As shown in Figs. 7 to 9 the helix drum comprises a cylinder of insulating material **53** around which is disposed a resilient tube **54** of rubber-like material which yieldingly supports the helical wire or electrode **51**. At each end of the cylinder **53** are annular bearings **55** whose peripheral surfaces **56** are disposed concentrically with the helical electrode **51**. Secured within the cylinder **53** is a resilient coupling member **57** of rubber-like material having a tapered fluted socket **58**.

According to the present invention the helix drum **5** is detachably supported in the cradle **4** shown in detail in Figs. 5, 10 and 12. The cradle **4** comprises a base portion **31** from which side walls **32** extend upwardly to two yokes **33** at each end of the cradle which bridge the two side walls **32**. Secured to the yokes **33** are bearing blocks **34** having downwardly facing bearing surfaces. Extending upwardly from the base **31** are four guide posts **35**, a pair at each end of the base. Over each pair of guide posts fits a retractable bearing block **36**, the blocks **36** having spaced bores **37** slidingly receiving the posts **35**. The lower ends of the bores are enlarged to receive springs **38** yieldingly urging the bearing block upward. A connecting rod **41** extends between the two bearing blocks **36**. A cam lever **39** is hinged to one cradle side wall **33** and extends out through an opening in the op-

posite side wall. The lever 39 extends over the connecting rod so that manual pressure on the free end of the lever 39 forces the rod 41 and the two bearing blocks 36 downwardly against the pressure of the springs 38. With the bearing blocks retracted downwardly the helix drum 5 may be inserted through an access opening 42 at one end of the cradle to a position such that its annular end flanges 55 are between the fixed upper bearing blocks 34 and the retracted lower bearing block 36. Each of the lower bearing blocks 36 is provided with a curved groove 44 loosely receiving the respective end flange 55 of the drum 5 thereby positioning the drum axially. When the hand lever 39 is released the retracted bearing blocks 36 and the drum 5 are urged upwardly with the drum end flanges 55 bearing against the downwardly facing surfaces of the fixed bearing blocks 34. At the opposite end of the cradle from the drum access opening 42 there is secured to the cradle a bracket 45 for the scanning motor 52. Preferably the scanning motor is provided with a stiff coiled spring shaft 46 which extends through an opening 47 at the end of the cradle. Attached to the end of the shaft 46 is a gear-shaped coupling element 48, shown in detail in Fig. 11. When the drum 5 has been inserted in the cradle the coupling member 48 is received in the socket 58 of the resilient coupling member 57.

At the top of each yoke 33 is a recess 49 in which is seated a stop pin 50. The stop pins 50 are adapted to position the effective edge 72 of the blade electrode 7 at the recording zone between the helical electrode 51 on the drum 5, notwithstanding the fact that the blade 7 is flexible and is loosely mounted on the cover 2. Guide plates 40 of insulating material having upper surfaces 40*a* support the recording paper P between the yokes 33 and approximately in a plane passing through the recording zone defined by the stops 50. Both guide plates 40 are shown in Fig. 4.

As shown in Figs. 1 and 6 the cradle unit 4 is adapted to be separably attached in the housing 1. For this purpose the right-hand wall 11 of the housing 1 as shown in Fig. 2 is provided with an opening 12 through which the cradle 4 is inserted into the housing. A flange 14 on the cradle unit is secured to the right-hand wall 11 by machine screws 13 passing through openings 15 in the flange 14 and engaging in tapped holes 16 in the side wall 11. In the left-hand wall 17 of the housing 1 as shown in Fig. 6 is an access opening 18 normally covered by a plate 19 which may be removed to permit removal of the helix drum 5 from the cradle without necessitating removing the cradle from the housing.

While the electrical circuits form no part of the present invention, in Figs. 3, 5 and 12 there are shown male connectors 25 attached at the bottom of the cradle bracket 14 which interengage with female connectors 26 secured to the bottom of the right-hand wall 11 as shown in Figs. 2 and 5. The helix may be grounded in which case the blade 7 is insulated from the cover 2 and the stops 50 are insulated from the cradle 5. Or if preferred the blade electrode 7 may be grounded and the helical electrode connected to a signal source through a brush and commutator on the drum 5, not shown, to the male connectors 25. In the latter case the connections carrying the facsimile signal as well as other electrical circuits are preferably supplied by a cable entering the housing 1 and distributed through the contacts 25 and 26 to the helix and motor 52.

From the foregoing description it will be seen that the cradle of the present invention provides a convenient support detachably receiving the helix drum 5 and capable of locating the helical electrode 51 on the drum precisely with respect to the recording zone into which successive portions of the helical electrode are rotated. The upper bearing blocks at each end of the cradle are located with respect to the recording zone and hence the portions of the peripheral flanges of the drum which are nearest the recording more precisely locate the portion of the helical electrode in the recording zone than if the helix and drum were supported on an axial shaft connected to the guide motor or other guide means. The helix drum is effectively isolated from the vibrations of the motor as well as any misalignment of its shaft.

It should be understood that the foregoing description is for the purpose of illustration only and that this invention includes all modifications and equivalents within the scope of the following claims.

For example the present facsimile recorder may be used for recording various other electrical signals, one example of which is described in United States Patent No. 2,761,752.

I claim:

1. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into a recording zone, a cradle for holding the drum, means on said cradle defining one side of said recording zone, bearing means at opposite ends of said cradle peripherally supporting each end of said drum, each of said bearing means including first bearing means having surfaces facing away from said zone and precisely locating said drum periphery relative to said zone and a bearing member resiliently mounted in said cradle yieldingly urging one end of said drum against said surfaces, and motor coupling means at one end of said drum, whereby said electrode may be rotated with its successive recording portions securely and precisely positioned in said zone independently of vibration or misalignment of said motor and drum.

2. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into a recording zone, a cradle for holding the drum, means on said cradle defining one side of said recording zone, bearing means at opposite ends of said cradle peripherally supporting each end of said drum, each of said bearing means including a bearing surface precisely locating said drum periphery relative to said recording zone and an opposed resiliently mounted bearing member detachably receiving and yieldingly urging one end of said drum against said bearing surface, and motor coupling means at one end of said drum, whereby said electrode may be rotated with its successive portions securely and precisely positioned in said zone independently of vibration or misalignment of said motor and drum.

3. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into a recording zone, a cradle for holding the drum, means on said cradle defining one side of said recording zone, bearing means at opposite ends of said cradle peripherally supporting each end of said drum, each of said bearing means including a bearing surface precisely locating said drum periphery relative to said recording zone and an opposed resiliently mounted bearing member yieldingly urging one end of said drum against said bearing surface, manually operated means coupling said members for jointly retracting said members relative to said bearing surfaces to permit said drum to be inserted in and removed from said cradle, and motor coupling means at one end of said drum, whereby said electrode may be rotated with its recording portion securely and precisely positioned independently of vibration or misalignment of said motor and drum.

4. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into a recording zone, a cradle for holding the drum, annular bearing portions on each end of said drum, means on said cradle defining one side of said recording zone, bearing means at opposite ends of said cradle peripherally

supporting each end of said drum including bearing surfaces precisely locating said drum periphery relative to said recording zone and a resiliently mounted bearing shoe having opposed shoulders forming an annular recess for receiving one of said annular bearing portions thereby to restrain axial movement of the drum, and motor coupling means at one end of said drum, whereby said electrode may be rotated with its recording portion securely and precisely positioned independently of vibration or misalignment of said motor and drum.

5. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into recording position, a cradle for holding the drum, means on said cradle defining one side of said recording position, bearing means at opposite ends of said cradle peripherally supporting each end of said drum including bearing surfaces precisely locating said drum periphery relative to said recording position, and motor coupling means at one end of said drum, whereby said electrode may be rotated with its recording portion securely and precisely positioned independently of vibration or misalignment of said motor and drum, said cradle having an opening at one end thereof for receiving the drum therein.

6. In a motor driven facsimile recorder for facsimile paper, a frame, an elongate electrode for pressing on one side of the paper adjustably carried on the frame, a cradle adapted to be removably secured in said frame, abutment members on said cradle opposed to said elongate electrode and engaged by said electrode to hold the electrode in a recording zone, a drum having a helical electrode around its periphery for pressing on the other side of the paper, said drum being rotatable to bring successive portions of the helical electrode into said recording zone, bearing means at opposite ends of said cradle peripherally supporting each end of said drum including bearing surfaces precisely locating said drum periphery and helical electrode relative to said recording zone, and motor coupling means at one end of said drum whereby the pressure of said electrodes on said paper may be predetermined independently of vibration or misalignment of said motor and drum.

7. In a facsimile recorder the combination of a cradle having abutment members defining a recording zone, a drum carrying around its periphery a helical electrode, said drum being rotatable to bring successive portions of said helical electrode into an effective recording position in said zone, and bearing means at opposite ends of the cradle peripherally supporting each end of the drum including bearing surfaces precisely locating said drum periphery and electrode relative to said recording zone.

8. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into a recording zone, a cradle for holding the drum, bearing means at opposite ends of said cradle peripherally supporting each end of said drum including bearing surfaces precisely locating said drum periphery relative to said recording position, and resilient motor coupling means on said drum, whereby said electrode may be rotated with its recording portion securely and precisely positioned independently of vibration or misalignment of said motor or drum.

9. In a motor driven facsimile recorder, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the electrode into a recording zone, a cradle for holding the drum, and bearing means at opposite ends of said cradle peripherally supporting each end of said drum including bearing surfaces precisely locating said drum periphery relative to said recording zone, and a resilient socket on said drum for coupling the drum to the motor, whereby said electrode may be rotated with its successive recording portions securely and precisely positioned independently of vibration or misalignment of said motor and drum.

10. A facsimile recorder comprising a housing, a support movably mounted on the housing, a first electrode carried by the support, a cradle detachably mounted in the housing, a drum having a helical electrode around its periphery and adapted to be rotated to bring successive portions of the helical electrode into a recording zone between said electrodes, positioning means on said cradle for engaging the first electrode and positively locating it on one side of said zone, fixed bearing members at opposite ends of said cradle facing oppositely to said positioning means, and spring urged bearing means yieldingly urging the ends of said drum against said fixed bearing means thereby positively to locate the drum periphery on the opposite side of said zone, whereby the position of said two electrodes relative to said zone is precisely controlled independently of the position of the cradle in said housing.

11. The recorder according to claim 10 characterized in that drum has a resilient socket at one end for receiving a drive shaft, and said cradle has an opening at said end admitting the shaft to said drum socket, whereby said drum may be rotated in contact with said fixed bearing means despite vibration of said motor or shaft.

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