March 21, 1939. L. S. WALLIS 2,151,629

MACHINE FOR RECORDING AND REPRODUCING SOUND MAGNETICALLY

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FIG. 1

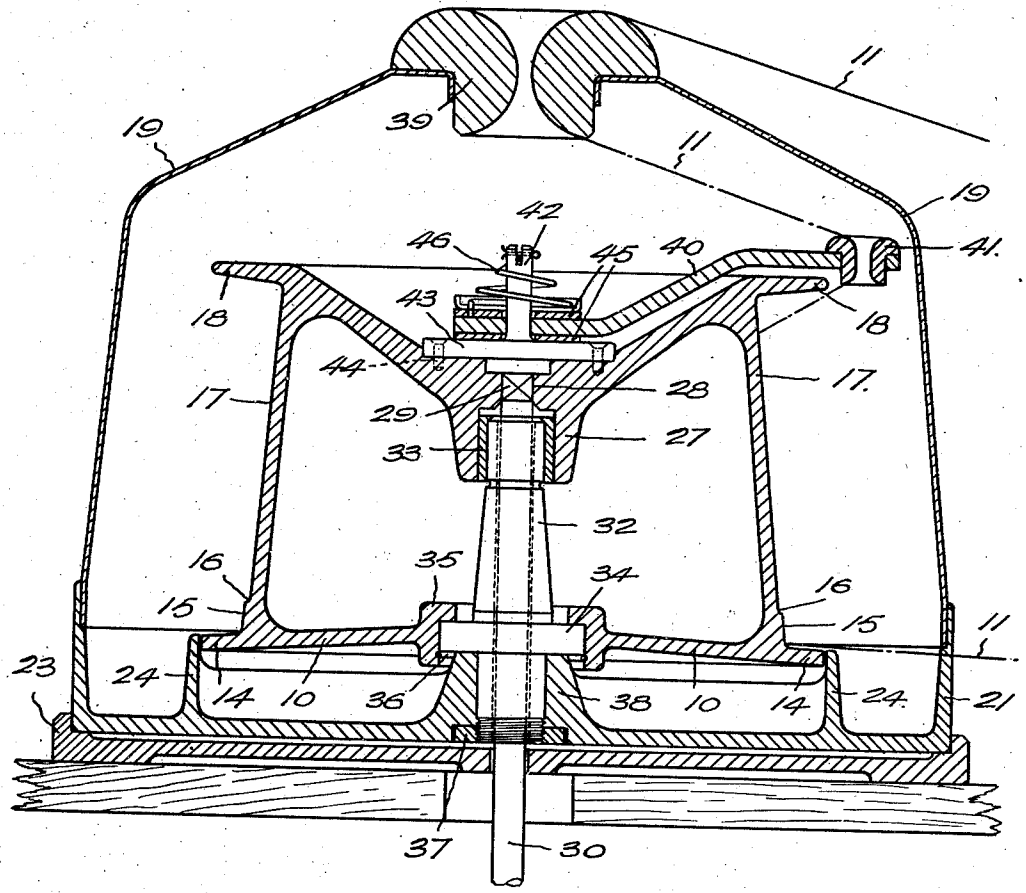
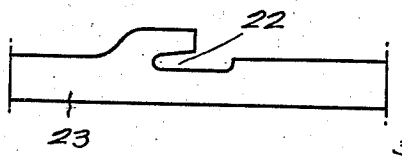


FIG. 4

FIG. 3



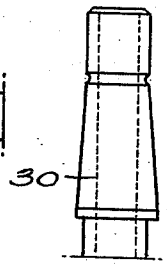
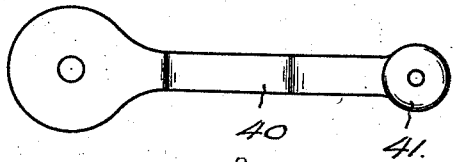


FIG. 5



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MACHINE FOR RECORDING AND REPRODUCING SOUND MAGNETICALLY

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FIG. 2

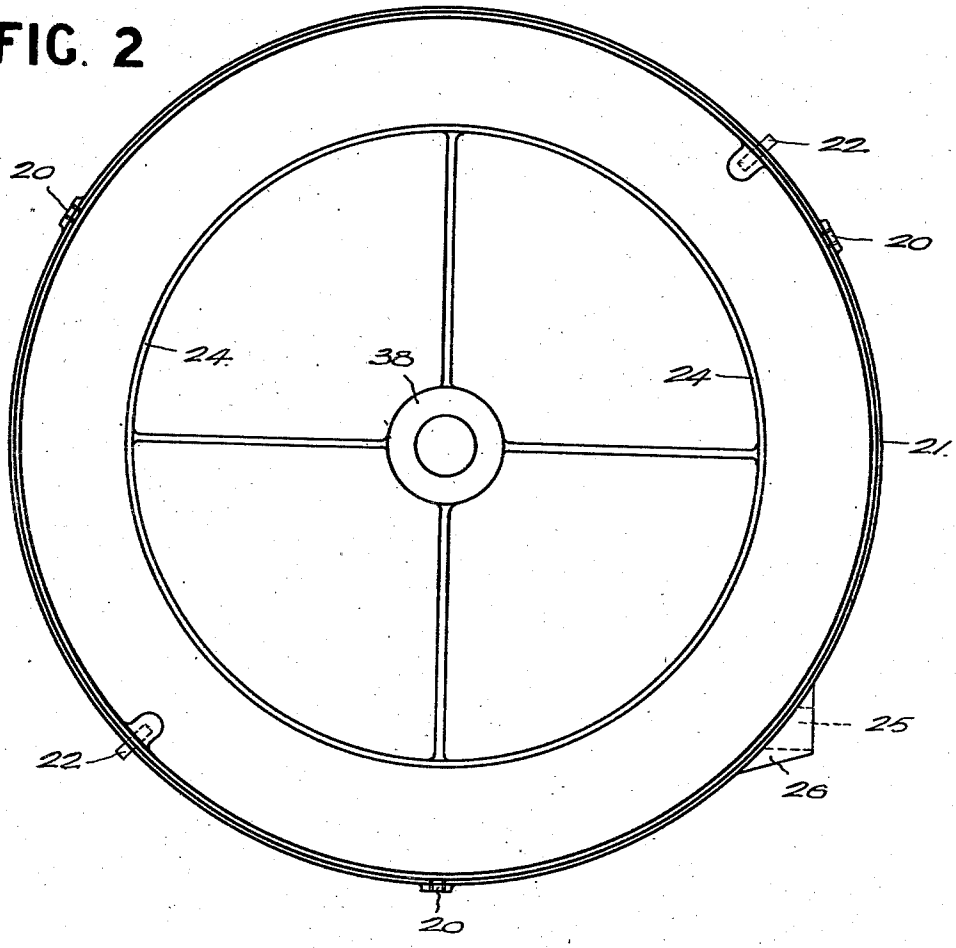
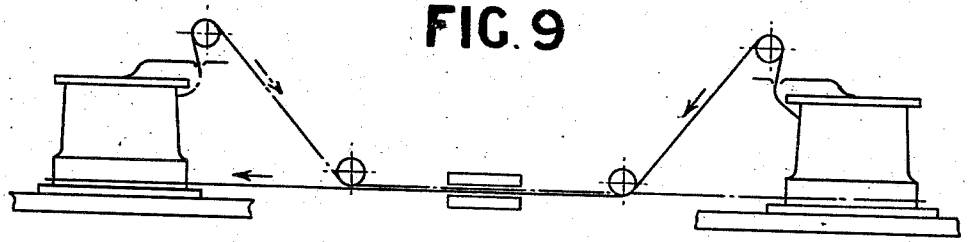


FIG. 9



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MACHINE FOR RECORDING AND REPRODUCING SOUND MAGNETICALLY

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FIG. 6

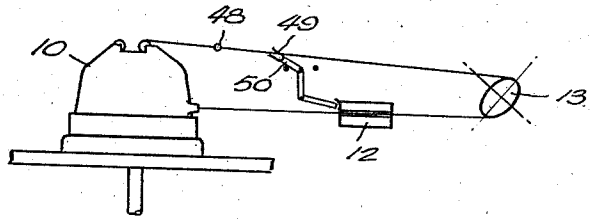


FIG. 7

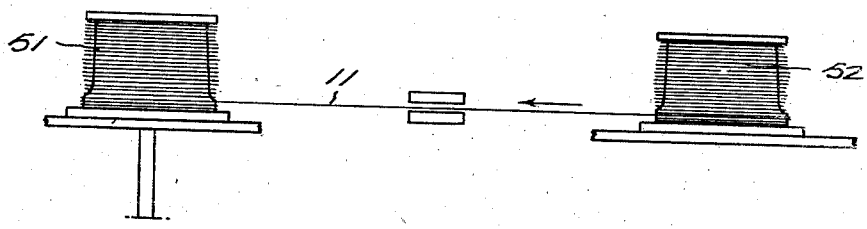
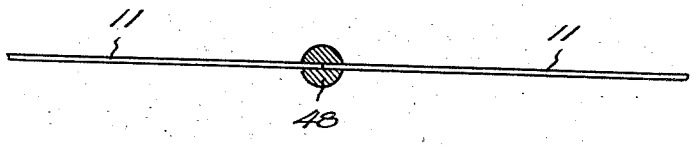


FIG. 8



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Patented Mar. 21, 1939

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UNITED STATES PATENT OFFICE

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MACHINE FOR RECORDING AND REPRODUCING SOUND MAGNETICALLY

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Application January 8, 1938, Serial No. 184,055
In Great Britain January 9, 1937

14 Claims. (Cl. 179—100.2)

The invention relates to a machine for recording and reproducing sound magnetically and its object is to provide improved means in such a machine for winding and feeding a wire carrying the sound record which will avoid difficulties hitherto experienced in the winding and feeding of the wire record, and to provide a preferred embodiment utilising such means in a particular and novel manner whereby a continuous winding and feeding of the record can take place without the necessity of having to stop the machine and reverse or rewind a reel or spool before the record can be repeated or used again.

In these magnetic recording and reproducing machines as hitherto proposed the wire is wound on a cylindrical reel or drum and is fed off under tension through the recorder or reproducer on to a second reel or drum, one or both of the reels or drums being driven, or a uniformly driven drum with which the wire record is in frictional contact is introduced into the feed of the wire from one reel through the recorder or reproducer to a second reel. Since the wire is hard and has a considerable degree of resilience it cannot be fed smoothly on to or off from an ordinary cylindrical reel or drum, and jerky movements of the wire are liable to take place with consequent distortion of the recording or reproduction; overlapping and entangling of the coils of the wire may also occur and necessitates stopping the machine and rewinding the wire.

With the objects of the invention in view I combine in a recording and reproducing machine a stepped or relieved drum which, or the greater part of which is of frusto-conical or equivalent form, on to which the wire may be wound without any of these difficulties. This drum may be used in combination with a second drum of like construction in a machine in which the wire record is wound backwardly and forwardly from drum to drum, similarly to existing machines; or I may arrange the improved construction of drum so that the wire is fed from it through the recorder or reproducer and back on to the drum in a continuous manner without any rewinding or reversing.

The improved winding and feeding arrangements for a machine of the character described are illustrated in the appended drawings in which:

Figure 1 is a sectional view of the drum for the winding and feeding of the wire record, in its casing.

Figure 2 is a plan of the base plate of the casing of the drum.

Figure 3 is a fragmentary elevation of a portion of the periphery of an attachment plate or bed plate on which the drum casing is secured.

Figure 4 is an elevation of a sleeve.

Figure 5 is a plan of a wire tensioning guide arm.

Figure 6 is a diagrammatic view of the machine in which the single drum works in a continuous manner.

Figure 7 is a diagrammatic view in which two drums of the improved construction are used on somewhat similar lines to existing machines.

Figure 8 is a detail view of a joint for the ends of the wires for use when the drum is used as in Figure 6.

Figure 9 is a diagrammatic illustration of a modified form, as compared with the disclosure of Fig. 6.

In these drawings 10 is a drum of the preferred construction according to the invention, 11 represents the wire on which the record is made, 12 represents diagrammatically the electromagnetic sound recording or reproducing device which may be of any suitable construction known to be effective in this art, and 13 is a guiding and tensioning pulley for the wire.

The drum 10 is similar in outline to the drum used in wire drawing machines and sometimes known as a drawing block. It has a flange 14; a portion 15 of major diameter and slightly tapered adjacent to this flange, which portion first receives the wire 11 as it is wound on to the drum, then a step or abrupt change of diameter 16 and a main body part 17 also slightly tapered with a flange 18 at its smaller end.

The drum 10 is enclosed in a casing comprising a domed box part 19 secured by means of screws at 20 into a flanged bottom plate 21 which has a bayonet connection at 22 with a fixed bed plate 23. The flange 14 at the base of the drum runs just within an annular wall 24 on the plate 21 of the casing which wall finishes level with the upper edge of the flange which is tapered to lead the wire onto the receiving part 15 of the drum.

A guide passage 25 cored in a boss 26 of the outer wall of the plate 21 of the casing leads the wire into the casing exactly tangential to the part of maximum diameter of the receiving part 15 of the drum just above the flange 14.

The drum has a hollow boss 27 to receive a bearing and above this is a lead into a part 28 of square cross section or other keying section which is to form a driving connection with a complementarily shaped end 29 of a shaft 30 driven by an electric motor (not shown) or in any suitable manner. The shaft 30 is conveniently made a running fit in a sleeve 32 around which is fitted a plain or other bearing 33 in the hollow boss 27 of the drum and on the lower part of which a ball or roller bearing ring 34 is a push fit, the outer element of which ring is secured in second hollow boss 35 on the drum by a spring ring or like means 36. The bearing sleeve 32 is held to the fixed base plate 21 of the

casing by a nut member 37 locking its cylindrical lower part in the boss 38.

To take off the wire again from the drum, the wire is led off from the upper end of the drum through a bell-mouthed bore in a hardened steel bush 39 mounted axially in the upper end of the casing.

When the wire is to be taken off from the drum to the recording or reproducing device and returned to the drum, it is desirable to apply a controlled tension to the wire as it leaves the drum. For this purpose, the wire as it leaves the drum is taken through a hardened steel bush 41 mounted in the outer end of an arm 40. The arm 40 is rotatably mounted on a short spindle 42 extending axially from a collar 43 secured by screws 44 to the upper end of the drum and the arm is frictionally coupled to the drum by arranging it between fibre or like washers 45 and providing a compression spring 46 on the spindle 42 above the arm. The arm thus tends to rotate with the drum but is normally held against rotation by the pull of the wire passing through the bush 41. If any slack develops in the wire between the drum and the recording or reproducing device, the arm swings around with the drum through a sufficient angle to take up the slack instantly so that the wire is kept under a substantially uniform tension.

The drum is driven at a constant speed and as the wire 11 is always being wound on to a constant diameter on the receiving part 15 of the drum it is always winding at a speed which is uniform as far as the winding apparatus is concerned. That is to say there is no change of diameter due to the wire winding on to the drum in layers with constantly increasing diameter. Owing to the short receiving part 15 with the relieved part or step 16 the wire winds smoothly thereon for a few turns and passes upwardly on to the part of less diameter in the form of a loose coil.

The method of obtaining continuous operation of the wire record from a single drum is shown diagrammatically in Figure 6.

The ends of the wire are joined together as, for example, by a small ball or bead 48 and the wire leaving the upper end of the drum is guided over to a spring-loaded pulley 13 and through the recording or reproducing device 12 and back on to the lower part of the drum on which it is wound. When the record is finished, the wire is disengaged from the pulley and the recording or reproducing device and the slack is wound on to the drum so that the wire is stored on the drum and the only part outside is the short length extending between the openings in the drum casing.

When winding the wire initially on the drum, several turns of the wire are first wound around the wire-receiving part of the drum and the free end is brought out through the bush 39 in the upper end of the casing. The drum is then rotated to wind the rest of the wire on to it and the free ends outside the casing are joined. It is found in practice that if several turns of the wire are wound initially by hand around the wire-receiving part of the drum, there is no need to connect any part of the wire to the drum.

If desired, advantage can be taken of the junction of the ends of the wire to operate a switch for stopping the record automatically at a given point. The ball or bead 48 can be made to engage in a shaped fork 49 of a spring blade or movable lever arm 50 and rock that over as the record travels thus operating through suitable connections a switch in the circuit of the motor which drives the drum. If desired the same means may apply a brake to the drum.

Whilst the continuous winding and taking off on the same drum is preferred, the drum 10 may be fed from any convenient form of reel or drum or from a second drum of like form as shown in Figure 7. In this case the wire is attached at one end to one drum 51 and at its other end to the second drum 52. After passing through the recording or reproducing apparatus 12 (see Fig. 6) the wire 11 is wound on to the drum 51. After completion of the record the drums can be changed over on to the driving spindle or means may be provided for detachably connecting each drum to a driving means.

In the arrangement illustrated in Figure 1 by disconnecting the bayonet joint between the casing and the bed plate 23 the drum and its casing can be bodily lifted off the driving spindle 30 and another drum with its record can be placed thereon.

If desired the wire may be stored on and fed off from an ordinary reel or the like, and as the wire is fed smoothly on to the drum 10 beyond the recording or reproducing device and tension is applied to the wire between the reel and that device irregularities in the feeding of the wire off the reel do not affect the uniformity of its movement through the recording or reproducing device. With this arrangement the wire after use can be wound back on to the reel for storage.

I claim:

1. The combination in a machine for recording and reproducing sound magnetically by means of a magnetically energized wire, of a driven drum having a relatively short wire-receiving part on to which the wire is wound and having an abruptly stepped reduction in diameter between this wire receiving part and a body part around which the wire forms in a loose coil, said body part tapering away from said step or change of diameter.

2. The combination in a machine for recording and reproducing sound magnetically by means of a wire record, of a drum having a flange or end, a relatively short portion of the drum periphery of major diameter adjacent to the flange, and a main drum part of smaller diameter and tapering away from said flange or end, said main drum part being abruptly stepped inwardly from said relatively short part.

3. The combination in a machine for recording and reproducing sound magnetically by means of a wire record, of a driven drum having a wire-receiving part and a main body part, a step in diameter between said wire receiving part and said body part and said body part tapering away from said step, a fixed casing around said drum and a guide opening in said casing leading the wire on to the said wire-receiving part of the drum.

4. The combination in a machine for recording and reproducing sound magnetically by means of a wire record, of a driven drum having a wire-receiving part and a main body part, a step in diameter between said wire-receiving part and said body part and said body part tapering away from said step, a fixed casing around said drum said casing being in two parts comprising a flanged bed plate carrying a bearing for the drum and a box part enclosing the drum and detachably engaged with the bed plate.

5. A machine for recording and reproducing sound magnetically by means of a wire record,

comprising means on which the wire record can be wound, driving means therefor, electro-magnetic sound recording or reproducing means through which said wire record is fed, tensioning means for the wire record as it is fed to the recording or reproducing means, and tensioning means for said record as it is carried to the means on which it is wound; the means on which the record is wound including a drum having an abrupt inward step between the part which first receives the wire, and the main part of the drum, which main part is of less diameter than said wire-receiving part.

6. The combination in a machine for recording or reproducing sound magnetically by means of a wire record, of a drum having a wire receiving part and a main body part, a step between said parts whereby the main body part is of the smaller diameter, the body part tapering away from the step; a rotatable shaft for driving the drum, a casing for the drum in two parts including a bed plate with a bearing for the drum and a box part enclosing the drum with a quickly detachable connection between the box part and the bed plate and a sliding driving connection between said shaft and said drum, whereby the casing may be bodily removed with said drum from said bed plate and changed.

7. The combination in a machine for recording sound magnetically by means of a wire record, of a drum having a wire-receiving part and a main body part and a step down in diameter from the wire-receiving part to the main body part, the main body part tapering away from said step, a casing around the drum and a driving shaft entering the casing and having a driving connection with the drum; a guide opening in said casing for the wire record through which the wire is led on to the wire-receiving part of the drum, and a guide arm floating with respect to the drum but suitably loaded so that it will guide the wire as it is fed off the opposite end of the drum to the receiving part and will apply tension to the wire.

8. A machine for recording sound magnetically by means of a wire record comprising in combination a drum on to which the wire is wound said drum having a wire-receiving part of major diameter and a main part, about which the wire record becomes loosely coiled, of smaller diameter and tapering from said wire-receiving part, a driving means for the drum and means for guiding and applying tension to the wire record as it is fed from the smaller end of the drum; a magnetic recording or reproducing device from which the wire record is fed to said drum and a guiding and tensioning pulley around which said wire record passes whereby during recording or reproducing the record the wire record is being continuously wound on to the one end of the driven drum and at the same time fed off from the other end of said drum.

9. In a machine for recording or reproducing sound magnetically by means of a wire record, the combination of a single driven means comprising a stepped drum on to the larger end of which the wire record is being wound continuously and from the smaller end of which it is being continuously fed from and to the magnetic sound recording or reproducing means during the recording or reproducing process, with means for guiding said wire record and applying tension to said record between its feeding off point on said drum and the point at which it is wound thereon.

10. In a machine for recording or reproducing sound magnetically by means of a wire record the combination of a driven drum having a short wire-receiving part which is slightly tapered and a tapered body part of smaller diameter on to which the wire passes from the wire-receiving part, there being an abrupt inward step between said wire-receiving part and said body part.

11. In a machine for recording or reproducing sound magnetically by means of a wire record the combination of a magnetic recording or reproducing device, means for feeding a wire record through said device, means for maintaining a constant tension in said wire, a rotating drum on to which the wire passes from said recording or reproducing device, and means for driving said drum at a constant speed, said drum having an annular surface on to which said wire is wound and a body part abruptly stepped inwardly of the annular surface and of smaller diameter on to which the wire passes from said annular surface and on which said wire may be stored.

12. In a machine for recording or reproducing sound magnetically by means of a wire record the combination of a magnetic recording or reproducing device, means for feeding a wire record through said device, means for maintaining a constant tension in said wire, a drum on to which said wire passes from said recording or reproducing device, means for driving said drum at a constant speed, said drum having an annular surface on to which said wire is wound and a body part of smaller diameter on to which the wire passes from said annular surface, a stop on said wire, a movable member through which the wire can pass, and a control actuated by the movable member when it is engaged by the stop on the wire to discontinue the drive for the drum and also if desired to apply a brake to the drum.

13. In a machine for recording or reproducing sound magnetically by means of a wire record the combination of a single driven means comprising a stepped drum on to the larger end of which the wire record is fed from a magnetic sound recording or reproducing device and from the smaller end of which the wire is fed to said device, means for guiding said wire and applying tension to it between the points at which it is fed on to and taken off from the drum, a stop on said wire, a movable member through which said wire can pass freely, and control means actuated by said movable member whereby when the stop engages said member the drive for the drum is discontinued and drum if desired is braked.

14. In a machine for recording or reproducing sound magnetically by means of a wire record, the combination of a driven drum on to which the wire is wound, said drum having a wire receiving part of major diameter and a main part of smaller diameter and tapering from said wire receiving part, an endless wire record, a means for guiding and applying tension to the wire record as it is fed from the smaller end of the drum, a magnetic recording or reproducing device from which the record is fed to said drum, and guiding and tensioning means for said wire record whereby during recording or reproducing the record the wire is being continuously wound on to one end of the drum and at the same time fed off from the other end of said drum.

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