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H. J. WEBB

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PHONOGRAPHIC THREAD REMOVER

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Fig. 1.

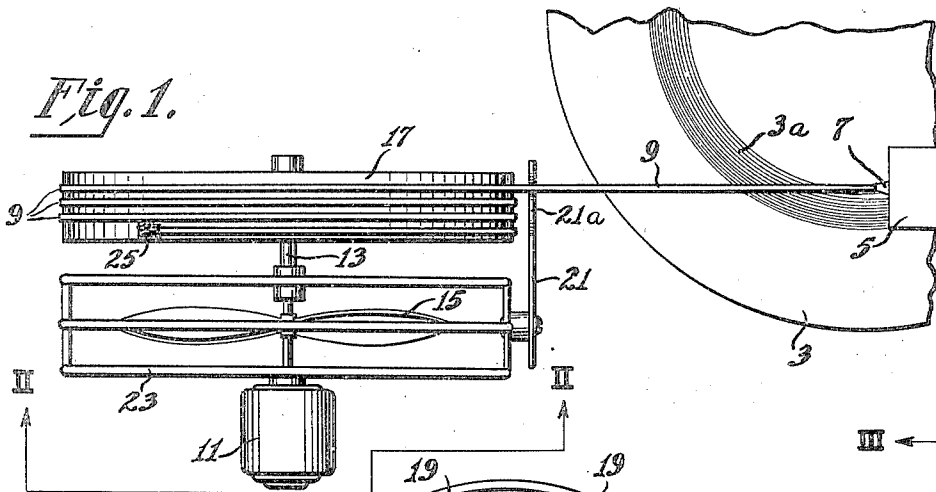


Fig. 2.

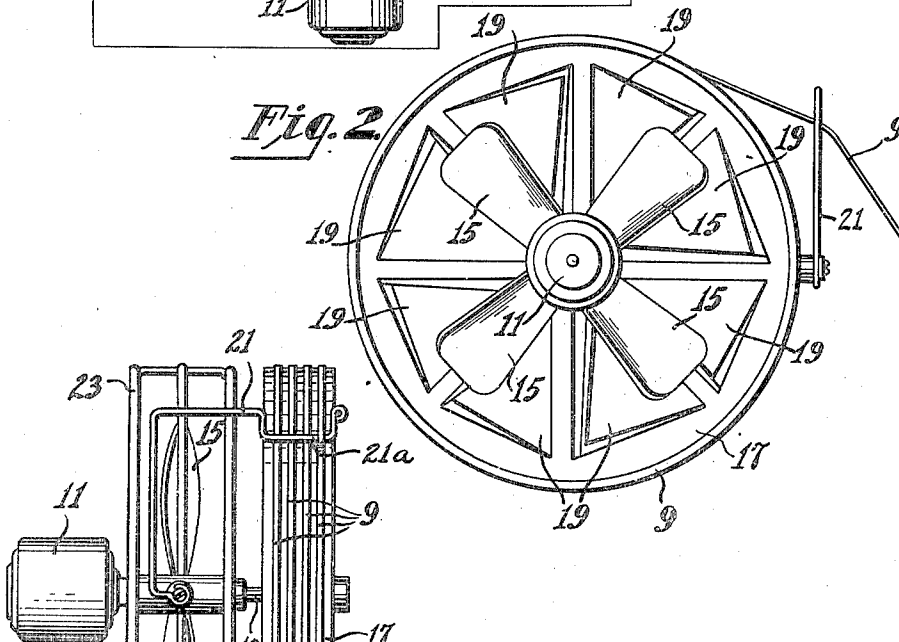
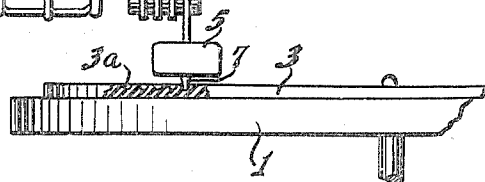


Fig. 3.



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PHONOGRAPHIC THREAD REMOVER

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8 Claims. (Cl. 274-47)

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This invention relates to phonographic apparatus of the type adapted to record sound upon a blank disc for immediate playback, and more particularly to mechanism therein for collecting the thread-like shavings produced during the groove cutting operation.

For a number of years, there have been in rather extensive use, particularly in radio broadcasting stations, sound recording machines employing blank discs in which sound grooves are cut by means of a suitable cutter which removes a thread-like shaving from the blank during the cutting operation. The blank discs in which the recordings are made are usually formed of a suitable base material, such as aluminum or glass, coated with several layers of a surface material, such as nitrocellulose lacquers or the like. These surface materials are of a nature such that the threads cut therefrom tend to kink and to curl up and gather around the cutter, and unless they are removed, they may accumulate around the cutter to an extent such as to interfere with the proper cutting operation.

Various mechanisms have been proposed heretofore for removing the shavings or thread produced during the cutting operation. These include felt or brush wipers placed on the surface of the record blank for the purpose of catching the cuttings as they come around. Thread removers of the wiper type invariably allow one or two threads to lag and slip back to the cutting needle where they become tangled and interfere with the proper cutting operation. Thus, thread removers of this type require constant and undivided attention on the part of the operator who, in many instances, must also pay attention to other details of the recording operation, such as monitoring or the like. Other devices heretofore proposed for removing the threads include suction devices for drawing the threads into a suitable container, or blowers for blowing them away from the region of the cutting needle. However, the equipment required for such thread removers is bulky, relatively complicated, quite expensive, and, in any case, not particularly applicable to many recording machines.

Perhaps the simplest method of avoiding tangling of the thread around the cutting needle is to catch the thread as the cut begins and to get it started falling into a circle on the surface of the disc. Ordinarily, the thread will continue to move in toward the center of the record and will tend to pile up there, but a sudden current of air, or even the centrifugal force on the gradually increasing bulk of thread, or a change in the way the thread kinks when coming off the needle may cause the cuttings to tangle back around the needle. If this occurs, the cutting head immediately bounces off the blank and the operator must usually work quickly to clear the

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cutting head and to get the thread coaxed back into its circular formation. Should this occur, it is apparent that the recording will not be continuous.

In recent years, because of the exigencies of the war and the consequent limitations upon the use of aluminum, recording engineers have been greatly hampered in their recording work by reason of the fact that aluminum has not been available as a base material for the recording discs. As a substitute, glass has been used in place of aluminum for the base material. Record blanks formed with a glass base are alleged to have certain advantages over the aluminum base discs, such as providing better frequency response and less surface noise, allowing a more even coating of the recording material which is applied thereon, etc. However, it has been found that, because of the insulating properties of glass, an electric charge is accumulated by the thread during recording and this causes the thread to curl and tangle and get into the path of the cutting stylus more often than threads cut from discs having aluminum, steel or other metal bases. In fact, this problem has been found to be so serious that many recording engineers have indicated a very decided preference for the aluminum base discs.

The primary object of my present invention is to provide an improved thread remover, in phonographic recording apparatus of the type set forth above, which will not be subject to the disadvantages of prior art thread removers.

More particularly, it is an object of my present invention to provide, in phonographic recording apparatus, an improved shaving or thread remover for collecting the shavings cut in the blank disc by the cutting stylus and which will operate satisfactorily to remove the cut thread in a positive manner regardless of the type of record that may be employed.

Another object of my present invention is to provide an improved shaving or thread remover for sound recording apparatus which will apply a constant or uniform force to the thread as it removes the same from the record.

It is also an object of my present invention to provide an improved thread remover as aforesaid which is simple in construction, inexpensive in cost, highly efficient in use, and which can be readily applied to existing recording machines.

In accordance with my present invention, I make use of a takeup reel or drum of very light material, such as plastic, Celluloid, paper, balsa wood, or the like, disposed in slightly spaced relation to the disc in which the recording is made. This reel or drum is formed with a set of air vanes in the space between its periphery and its hub. A fan, driven by any suitable means, is arranged

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to direct an air current through the vanes on the reel, thereby driving the reel.

In one particular arrangement, I have employed a small electric fan having an elongated shaft on which the drum or reel is loosely mounted for rotation in spaced relation to the fan blades, which act as an impeller for setting up an air stream toward the aforementioned vanes. This air stream or fluid coupling between the fan and the drum acts as the sole coupling means therebetween, so that the drum is free to slip relative to the fan. A strip of adhesive, such as Scotch tape, may be placed across a small section of the rim of the drum so that, when the operator is ready to record, he can either rotate the turntable by hand or start the machine operating and catch the first part of the thread and quickly attach it to the drum. An open guide, made of wire or the like, is mounted near the periphery of the drum to direct the thread onto the central region of its rim.

In most recording machines of the type under consideration, the cutter head is arranged to move substantially radially over the record blank, the blank rotating at a constant angular speed. Thus, the thread which is cut from the blank leaves the blank at a varying linear speed which is maximum near the periphery of the record and gradually reduces to a minimum speed near the center of the record by reason of the fact that the instantaneous linear speed of the record under the cutting needle changes correspondingly. It is apparent, therefore, that there is a greater length of cutting per revolution on the outside of the record than on the inside. Hence, the takeup reel or drum must turn faster when the stylus is cutting near the periphery of the disc, somewhat slower when the stylus is cutting part way through the recording, and slowest when the cutter is cutting at the inside of the record in order to take up the thread properly. Also, because of the fragility of the thread, the force applied thereto, although small, must be fairly constant or uniform, so that substantially uniform tension will always be applied to the thread, if snapping of the thread is to be avoided. The constant torque characteristic of my present invention, which employs fluid coupling between the driving means and the drum, accomplishes both of the aforementioned results. The amount of constant torque exerted by the drum is a function of the size, speed, proximity and direction of the fan.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description of one embodiment thereof, when read in connection with the accompanying drawing, in which

Figure 1 is a plan view, fragmentary in part, of a recording machine with a thread remover according to my present invention incorporated therein,

Figure 2 is an end elevation of the thread remover assembly of Fig. 1 as viewed from the line II—II of Fig. 1, and

Figure 3 is a side view as seen from the line III—III of Fig. 1.

Referring, now, more particularly to the drawing wherein similar reference characters designate corresponding parts throughout, there is shown a turntable 1 which supports and rotates

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a blank disc 3 in which the recording is made by means of a cutter head 5 arranged to move substantially radially over the disc 3 in well known manner. The recording head 5 carries a cutting needle 7 which cuts a spiral sound groove 3a in the disc 3. In forming the groove 3a, the cutter 7 cuts out or removes from the blank disc a thin, thread-like shaving 9 which must be removed from the vicinity of the cutting needle 7 to avoid tangling of the thread around the cutter.

The thread remover assembly according to my present invention comprises a motor 11 having an elongated shaft 13 to which is secured a set of fan blades 15 constituting a rotary blade impeller. Loosely mounted on the shaft 13 in spaced relation to the fan blades 15 is a thread or shaving collecting drum 17 formed with a set of air vanes 19 between its hub and its periphery. The blades 15 and the vanes 19 are thus juxtaposed in axial alignment with each other, the vanes 19 being disposed in the path of the air stream set up by the fan blades 15. The blades 15 and the vanes 19 are so pitched that the air stream produced by the impeller blades 15 will drive the drum 17 upon moving past the vanes 19. This air stream thus constitutes a fluid coupling between the blades 15 and the drum 17 which will permit the drum to slip relative to the blades 15 and constitutes the sole driving coupling therebetween. A guide wire 21 may be secured to the thread remover assembly in any suitable location, as to the cage or guard 23 around the fan blades 15, and is provided with a loop 21a in front of the drum 17 for guiding the thread 9 onto the central region of the drum rim.

The thread removing device may be placed in any suitable location on the recording machine, preferably in fairly close proximity to the record blank 3, with the drum 17 in spaced relation to the blank 3. When the recording operation is to start, the operator may either first rotate the turntable 1 by hand to initiate the groove 3a, or he may proceed at once with the recording of the signals. In any case, the operator grasps the leading end of the thread 9 and quickly attaches it to the drum 17. For this purpose, a spot of adhesive or a piece of Scotch tape 25 applied to the periphery of the drum may be employed. As the recording operation proceeds, the drum 17 will be rotated by the fan blades 15 to wind the thread 9 thereon. The slip coupling between the fan blades 15 and the vanes 19 permits the drum 17 to slip relative to the driving motor 11 or the blades 15 whereby the drum 17 is free to slow down as the cutter approaches the center of the record in the case of an "outside-in" recording, or to speed up gradually in the case of an "inside-out" recording to suit the requirements of the speed of the thread as it leaves the record. Thus, a constant, even pull is effected on the thread and breaking thereof is avoided.

From the foregoing description, it will undoubtedly be apparent to those skilled in the art that I have provided a novel thread remover for phonograph disc recording apparatus which will remove the cut thread in a positive manner and without danger of breaking or tearing the same. Although I have shown and described only a single modification of my invention, it will be apparent that many other variations thereof, as well as changes in the particular modification described, are possible. For example, instead of the particular assembly shown in the accompanying drawing and described above, a drum driven by a hysteresis

motor may be employed, as is common practice in automotive speedometers. This type of drive will also provide the required slip between the motor and the thread collecting drum. Other changes of a similar nature will, no doubt, readily suggest themselves to those skilled in the art. I therefore desire that my invention shall not be limited except insofar as is made necessary by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. A thread remover for phonographic recording apparatus comprising, in combination, a driving device including a rotary blade impeller for setting up a fluid stream, a rotatable drum associated with said driving means around which the thread may be wound, means carried by said driving device in proximity to said drum for guiding said thread to said drum, said drum having vane means disposed in the path of said stream whereby to be driven thereby, and said fluid stream constituting a slip coupling between said driving device and said drum, and means on said drum for anchoring the leading end of said thread thereto.

2. A thread remover for phonographic recording apparatus comprising, in combination, a rotary drum adapted to be disposed in proximity to a blank disc from which the thread is formed and to receive said thread thereon during its rotation, said drum including a set of vanes capable of being driven by an air stream, driving means including a rotary blade impeller for setting up an air stream, said driving means and said drum being juxtaposed with the vanes on said drums disposed in the air stream set up by said impeller to thereby effect rotation of said drum, guide means carried by said driving means in proximity to said drum for guiding the thread to said drum, and means on said drum for anchoring the leading end of said thread thereto.

3. The invention set forth in claim 2 characterized in that said impeller and said vanes are axially aligned with each other.

4. The invention set forth in claim 2 characterized in that said impeller and said vanes are axially aligned with each other and are mounted on a common shaft.

5. The invention set forth in claim 2 characterized in that said impeller and said vanes are axially aligned with each other on a common shaft, and characterized further in that said drum is loosely mounted on said shaft whereby said drum is free to rotate relative to said driving means.

6. A thread remover for phonograph recording apparatus comprising, in combination, a driving motor having a shaft, a set of fan blades secured to said shaft and rotatable therewith, a guard member around said fan blades, a drum for receiving the thread, said drum being loosely

carried by said shaft in spaced relation to said blades, and including a set of vanes disposed in the air stream set up by said fan blades when said blades are rotating to thereby rotate said drum and cause the thread to wind up on said drum, guide means carried by said guard member in proximity to said drum for guiding the thread to said drum, and means on said drum for anchoring the leading end of said thread thereto.

7. A thread remover for phonograph recording apparatus comprising, in combination, an assembly consisting of a driving motor having a shaft, a set of fan blades secured to said shaft and rotatable therewith, a guard member around said fan blades, and a drum loosely carried by said shaft in spaced relation to said blades and adapted to receive the thread thereon, said drum including a set of vanes disposed in the air stream set up by said fan blades when said blades are rotating to thereby rotate said drum and cause said thread to wind up on said drum, guide means carried by said guard member in association with said drum for directing the thread onto said drum, and means on the drum for attaching the leading end of the thread thereto.

8. A thread remover for phonograph recording apparatus comprising, in combination, an assembly consisting of a driving motor having a shaft, a set of fan blades secured to said shaft and rotatable therewith, and a drum loosely carried by said shaft in spaced relation to said blades and adapted to receive the thread thereon, said drum including a set of vanes disposed in the air stream set up by said fan blades when said blades are rotating to thereby rotate said drum and cause said thread to wind up on said drum, means on said drum for anchoring the leading end of said thread thereto, and guide means carried by said assembly in association with said drum for directing the thread onto said drum.

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