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J. O'CONNOR.
SPOOL FOR PAPER.
APPLICATION FILED AUG. 1, 1901.

Fig. 1

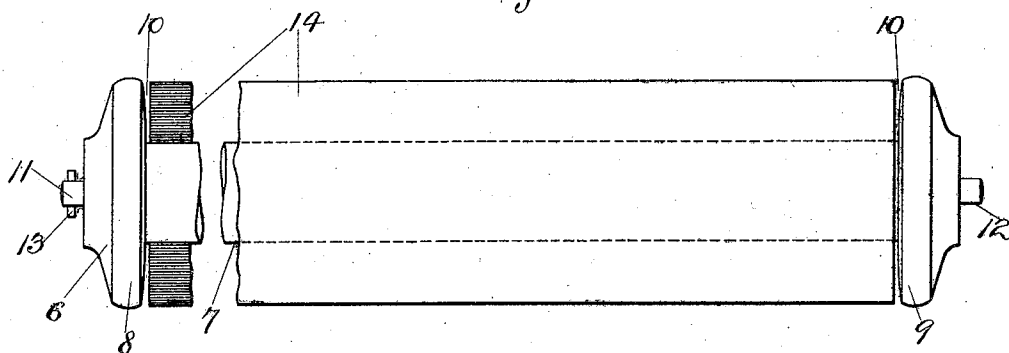
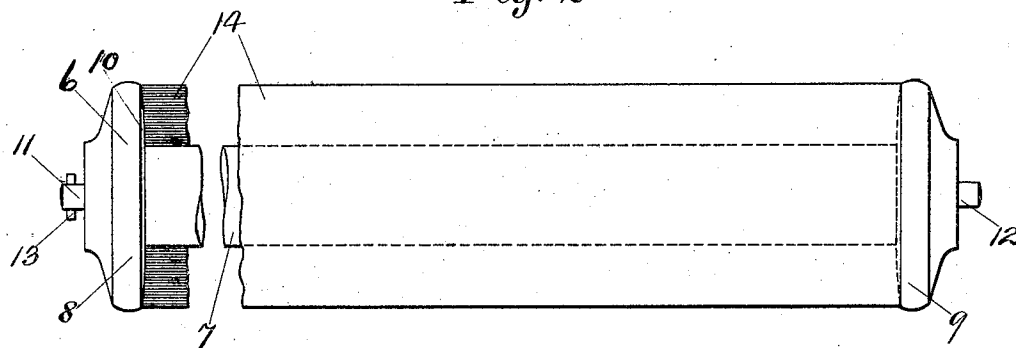


Fig. 2



Witnesses:

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UNITED STATES PATENT OFFICE.

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SPOOL FOR PAPER.

SPECIFICATION forming part of Letters Patent No. 778,995, dated January 3, 1905.

Application filed August 1, 1901. Serial No. 70,460.

To all whom it may concern:

Be it known that I, JAMES O'CONNOR, a citizen of the United States of America, and a resident of the borough of Manhattan, in the city and State of New York, have invented certain new and useful Improvements in Spools for Paper, of which the following is a specification.

This invention is an improved reel or spool for receiving a web of paper or other similar material liable to contract and expand under the influence of atmospheric changes, the object being to provide means for guiding or centralizing the web while it is being wound or unwound to protect the edges from being soiled or injured or displaced while the roll or package is being handled or transported, while allowing for the expansion to which the material is liable under atmospheric influences.

This invention is herein shown and described as being embodied in a spool for receiving a roll or web of perforated paper, commonly called a "music-sheet," for controlling the operation of automatically-operated musical instruments.

Figure 1 of the drawings is a side view showing my improved spool carrying a music sheet or roll, which in this figure is shown to be in its normal or contracted condition, a portion of the roll at one end being shown in section. Fig. 2 is a similar view showing the same spool with its contained music-roll in an expanded condition.

These rolls of music-paper are ordinarily wound upon a spool having end flanges substantially coincident with the width of the paper. These flanges serve to centralize the paper web when it is originally wound upon the spool and while it is being rewound in subsequent use upon the machine. The flanges serve also to protect the edges of the web from being soiled or injured in handling or transportation, it being customary to send these music-rolls to all parts of the country by mail or express. If the flanges are placed far enough apart to permit of the extreme expansion of the music-sheet, they do not properly serve their function of centralizing the sheet upon the spool during the initial stages of winding and rewinding, so as to properly locate the web of paper centrally with the

flanges, and, on the other hand, if the flanges are made substantially coincident with the edges of the sheet, so as to properly perform their centralizing function, they then are liable to crush or turn back the edges of the sheet or roll, which as it expands under the influence of a humid atmosphere are crowded against the flanges, and the continued expansion operates upon the roll to buckle, crease, or distort it at the weakest point or line. This, especially in the case of unperforated paper or the unperforated portions of a music-roll, might be at the edges themselves, so that the edges are turned up or turned over or matted together. In the case of perforated paper, however, the surplus width of the expanding web is liable to settle into the portions between the perforations, thereby forming longitudinal creases following the lines of least resistance. These creases or folds once formed, especially while the paper is in a moist condition, which accompanies and primarily causes the expansion, it does not become smoothed out when the paper returns to normal condition or in the subsequent use of the roll, but remains set in its creased or contracted condition, thus impairing the original accuracy and parallelism of the rows of perforations, so that they do not thereafter properly coincide with the cooperating fingers or tracker-bar apertures of the machine or properly cover or exclude the air from the remaining apertures. Where the edges of the web are turned over by being crowded against the sides of the flanges, this impairs the accuracy of the subsequent rewinding of the roll and in one way and another affects the accuracy of the travel of the music-sheet through the machine, increasing the difficulty of guiding it in a central and unvarying relation with its cooperating apparatus. This atmospheric effect is much greater upon the outer peripheral layers of the rolls, presumably because the inner layers adjacent to the core are exposed only at their edges at the ends of the roll. Therefore the portion of the roll adjacent to the core is found to be expanded lengthwise comparatively little. On the other hand, the outside or peripheral layers of the paper are more intimately exposed to the atmosphere over their

entire surface, thereby causing a lateral expansion far greater than that which takes place toward the center or core of the roll, the expansive effect being lessened toward the center, inasmuch as each layer serves in a measure to protect its adjacent inner layer from the action of the atmosphere.

The foregoing has reference to a roll which is assumed to be kept continually in a wound condition, and this effect is somewhat modified where, as in the case of music-rolls, the paper is occasionally unwound and then immediately or shortly thereafter rewound upon its spool. The effect of this unwinding in a humid atmosphere is to extend the expanding action somewhat farther toward the center or core of the roll; but does not by any means equalize the expanding action over the entire length of the sheet, inasmuch as the innermost layer of paper is only directly exposed to the atmosphere for a very short period. It will thus be seen that the expansive effect of the atmosphere upon the roll under the conditions of use to which a music sheet or roll is subjected would be greatest upon the peripheral surface of the roll and would decrease toward the center or core of the roll, reaching its minimum with the innermost layers of the paper.

In the light of the foregoing explanation of the conditions to be met I will now describe my invention, which is a spool provided with a flange having its inner face inclined away from the adjacent end of the roll when the latter is in normal condition, leaving space for the endwise expansion of the outer portion of the roll.

The spool itself consists of a core 7, upon which the roll is wound, and of end flanges 8 and 9. The inner faces 10 of the flanges are at their intersection with the surface of the core 7 located far enough apart to allow of the ascertained or probable expansion of the corresponding portion of the sheet wound upon the core, those faces being outwardly beveled or curved in accordance with the increasing expansion of the succeeding outer portions of the music-roll. The ends of the spool are provided in the customary way with pivots or bearings 11 and 12, by means of which the spool is supported for rotation. Means, as a cross-pin 13, is provided for driving the spool during the rewinding operation.

The relation of the music sheet or roll 14 to the flanges of the spool when the former is in normal condition is shown in Fig. 1. The annular space between the ends of the roll and the adjacent inner surfaces of the flanges represents the spaces provided for expansion of the roll to the extent represented in Fig. 2, which shows these spaces entirely taken up by the expanded roll. The amount of space and the contour of the side face of the flange should be adapted to the conditions of service, which are liable to be varied by the length and diameter of the roll, the character of the paper or other material of which the roll is made, and by the humidity or other characteristics of the atmosphere or climate to which the roll is to be exposed.

In some cases it may be permissible or desirable to make the contour of the inner face of one of the spools so as to provide at that end alone for the expansion of the entire width of the roll, the inner face of the opposite flange being square or at right angles to the axis of the spool; but for most purposes I consider it preferable to divide this provision for expansion, placing substantially half of it at each end of the roll, assuming that the roll will expand most freely and readily in opposite directions from substantially the center of its length.

I claim as my invention—

1. The combination, with a roll of expandible sheet material, of a spool provided with a flange having its inner face inclined away from the adjacent end of the roll when the latter is in normal condition, leaving space for the endwise expansion of the outer portion of the roll.

2. The combination with a roll of paper, of a spool provided with flanges having their inner faces inclined away from the adjacent ends of the spool, leaving between the flanges and those ends an annular space increasing in width toward the outside of the spool to provide space for the expansion of the outer portion of the roll, due to changes in the humidity of the atmosphere.

Signed at New York, N. Y., this 31st day of July, 1901.

JAMES O'CONNOR.

Witnesses:

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