Jan. 31, 1967 R. H. SHACKSON 3,301,500

COLLAPSIBLE REEL

Filed May 22, 1964

Fig. 1

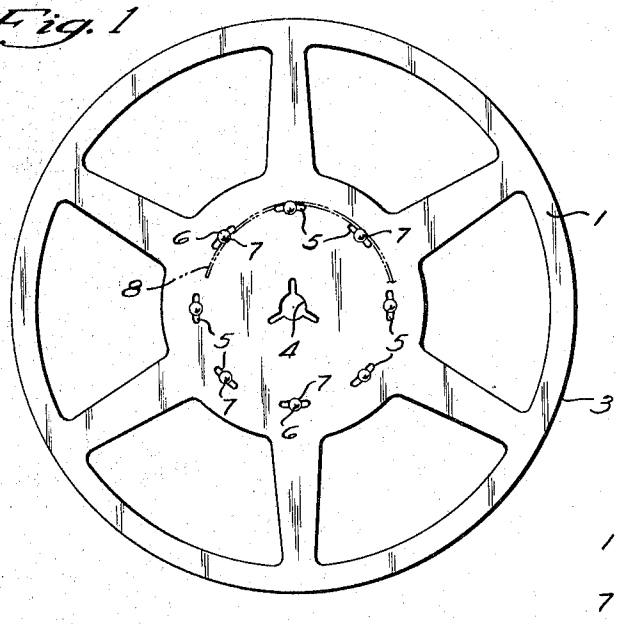
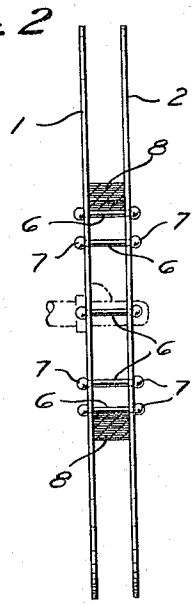


Fig. 2



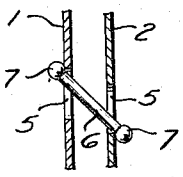


Fig. 4

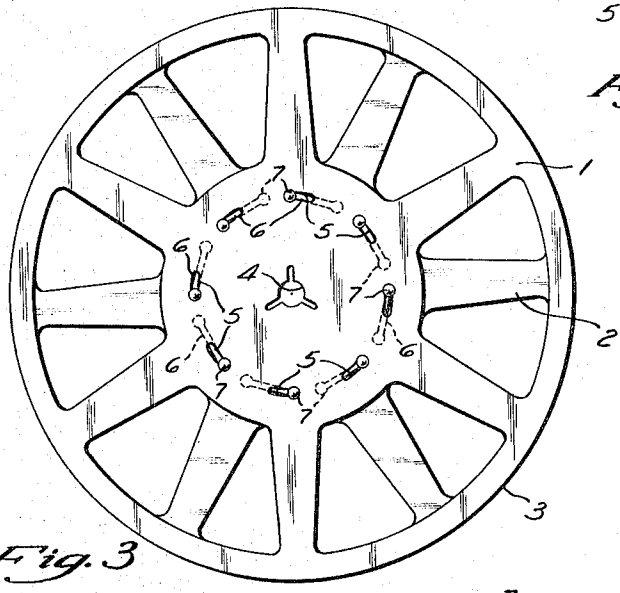


Fig. 3

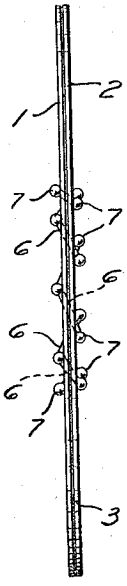


Fig. 5

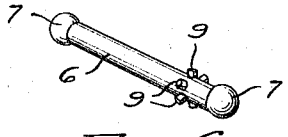


Fig. 6

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3,301,500
COLLAPSIBLE REEL

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This invention relates to reels on which strand material may be wound or from which strand material may be unwound, and more particularly to collapsible reels of this type.

Although the invention is capable of other applications, it provides particular advantages when used in connection with reels for taking up or paying off motion picture film, and therefore will be discussed in such association.

When a motion picture projector is operated, film from a payoff or supply reel passes through the projector mechanism to a takeup reel that receives the film. Ordinarily the takeup reel and the supply reel are identical, so that the takeup reel requires the same amount of space for storage and transportation as the supply reel wound with film. Often it is desirable, however, to have an extra takeup reel. Moreover, the usual takeup reel often is not large enough to handle all the film wound on the supply reel when the supply reel is larger than usual, as when an extra long film is to be shown.

The present invention provides a collapsible reel that may be used as a payoff or a takeup reel for motion picture film. The reel can collapse into such small space that, in most cases, it can be carried in the same container with a full reel, minimizing transportation and storage problems, and also assuring that a reel of the same diameter as that of the supply reel is always available. The reel of the present invention may be readily expanded to accommodate film, and may be easily collapsed into a space slightly if at all thicker than the thickness of the side flanges.

It is an object of the present invention to provide a reel for winding strand material that may be collapsed and expanded easily to accommodate strand material. Another object is the provision of such a reel that may be collapsed merely by angularly displacing one of the flanges substantially coaxially relatively to the other flange in one direction, and that may be opened by angularly displacing the flanges relatively to each other in the opposite direction. A further object is the provision of such a reel in which the strand material serves to hold the reel in its expanded position. A further object is the provision of such a reel that when collapsed will occupy a narrow space. Another object is the provision of such a reel that is simple and sturdy in construction and operation, and that may be manufactured at low cost.

These and other objects of the invention will become apparent from the following description of a preferred embodiment in connection with the accompanying drawings in which:

FIGURE 1 is a side view of the reel in its expanded condition;

FIGURE 2 is an end view of the expanded reel;

FIGURE 3 is a side view of the reel in its collapsed condition;

FIGURE 4 is a fragmentary view of one of the rods and the slots carrying it, as the reel is being collapsed;

FIGURE 5 is an end view of the collapsed reel; and

FIGURE 6 is a perspective of a modified rod that may be used.

The illustrated reel, which is a reel for winding or taking up motion picture film in portable motion projectors, comprises flanges **1** and **2**, made of sheet metal,

plastic, or other suitable material. Each of these flanges has a circular periphery **3**, and, coaxial with the periphery, an opening **4** by which it is mounted on the projector mandrel; the illustrated opening is shaped to fit on and provide driving relation from a mandrel of any one of a number of widely sold motion picture projectors.

Each of these flanges **1** and **2** has formed therethrough a number of identical slots **5** which are equidistantly and equiangularly spaced around the axis of the flange. The slots in each flange are identical in size, shape, number and spacing to the slots of the other flange. The radial distance of the slots from the axis of the flange is such that the slots define a circle having the diameter of a desired hub diameter around which film could be wound.

A rod **6**, preferably formed of stiff steel wire of about $\frac{3}{32}$" diameter, extends through each pair of corresponding slots in the flanges **1** and **2**; the number of rods employed is thus equal to the number of slots in one of the flanges. The design is such that when the flanges **1** and **2** are positioned so that flanges are in spaced essentially parallel and coaxial relation, corresponding slots **5** are substantially opposite each other in both flanges, and rods **6** are then essentially parallel to the axis to which the flanges are coaxial, which axis of course would be coincident with the axis of rotation of the mandrel carrying the reel. The number of rods is such that when the rods are parallel to the reel axis they define a hub on which the reel can be adequately supported and wound without causing undesirably sharp bends in the film.

The ends of the rods that extend through the slots in the flanges are provided with stop means, such as impact-formed heads **7**, shown to a larger scale in FIGURES 5 and 6. The heads are large enough to prevent the rods from pulling through the slots, and are preferably convexly shaped on their sides adjacent the flanges to permit the rods to tilt readily with respect to the flanges when the reel is collapsed. The distance between the heads on the ends of the rods is such that when the flanges bear against the heads on the rods when the rods are parallel to the axis to which flanges are coaxial, the space between the flanges is such as to receive conveniently the film **8** (FIGURES 1 and 2) that is wound around the rods. A film wound on such hub and located between the flanges holds the flanges apart and locks the reel in its expanded position, as shown in FIGURES 1 and 2.

After the film has been removed from the reel, and after the reel has been removed from its supporting mandrel, the reel can be easily collapsed merely by partially rotating the flanges **1** and **2** relative to each other substantially about a common axis through their openings **4** to which axis the flanges are substantially coaxial. As the flanges are thus angularly displaced, the rods **6** tilt with respect to the axis of the reel (FIGURE 4) until they extend substantially parallel to the flanges of the reel; at the limit of the angular displacement of the flanges, as shown in FIGURE 4, the reel flanges **1** and **2** are therefore spaced very closely together. The slots **5**, which can be relatively short, make this possible since they allow the rods partially to nest in the slots. Preferably, the slots are no longer and no more numerous than need be so that substantial amounts of material are left between the slots to provide strong reel flanges.

The collapsed reel can be readily expanded merely by rotating the flanges **1** and **2** in the opposite direction relatively to each other until the rods assume the position shown in FIGURE 1 in which they are substantially parallel to the axis of the reel, after which the reel can be placed on the reel mandrel, the end of the film inserted between the rods, as shown in dotted lines in FIGURE 1, and the reel rotated to wind film on the

reel. Even only one turn of the wound film locks the flanges in their expanded position.

If desired, the rods 6 may be provided with protuberances 9 (FIGURE 6) that are located so they lie between the flanges near at least one flange when the reel is expanded, so these protuberances can engage the sprocket holes of the film for facilitating engagement of the film with the reel, as in automatic threading and winding projectors. However, even without these protuberances the film can be easily engaged with the reel merely by passing the end of the film 8 between the rods 6, as shown in FIGURE 1.

It is obvious that similar reels may be used for winding tapes or other types of strand material.

Various modifications may be made in the illustrated embodiment without departing from the spirit of the invention. It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

I claim:

1. A collapsible reel comprising a pair of flanges each having an axis about which it is rotatable, said flanges being adapted to be disposed essentially coaxially relatively to each other about a common axis and having substantially identical circumferentially elongated slots disposed substantially equidistantly and equiangularly about the axes of said flanges, and a plurality of essentially rigid rods extending between said flanges with their end portions extending through said slots and having means limiting movement of said end portions of said rods inwardly of said flanges, said end portions of said rods being movably connected to said flanges at said slots, said rods and slots being of such length that when said rods are substantially parallel to said axis said flanges are axially

spaced, and when said flanges are rotated relatively to each other about their axes said rods are moved in said slots to extend between said flanges at angles to the axes of said flanges as said flanges are moved toward each other.

2. A reel according to claim 1 in which said rods nest in said slots and are disposed substantially transverse to the axis of said reel when said flanges are in their closest positions relative to each other.

3. A collapsible reel comprising a pair of parallel flanges having a common axis about which each flange is rotatable, said flanges being maintained essentially coaxially relatively to each other during rotation, a plurality of essentially rigid rods extending between said flanges, and means including cooperating portions of each of said rods and each of said flanges movably connecting said rods to said flanges for maintaining said flanges substantially parallel to each other and substantially perpendicular to said axis wherein by rotation of said flanges relative to each other about said common axis, said flanges can be moved axially relative to each other.

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