Nov. 7, 1939. I. SERRURIER 2,178,673

MULTIPLE FILM RE-WINDER

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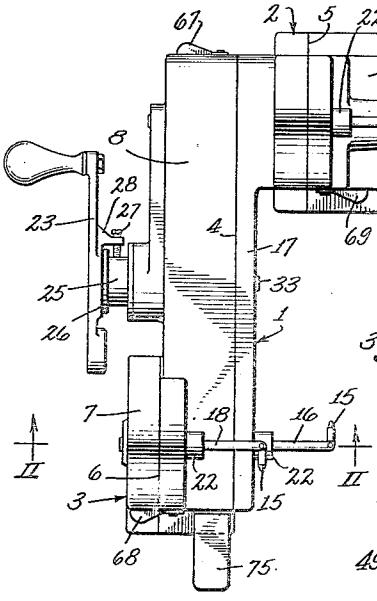


Fig. 1.

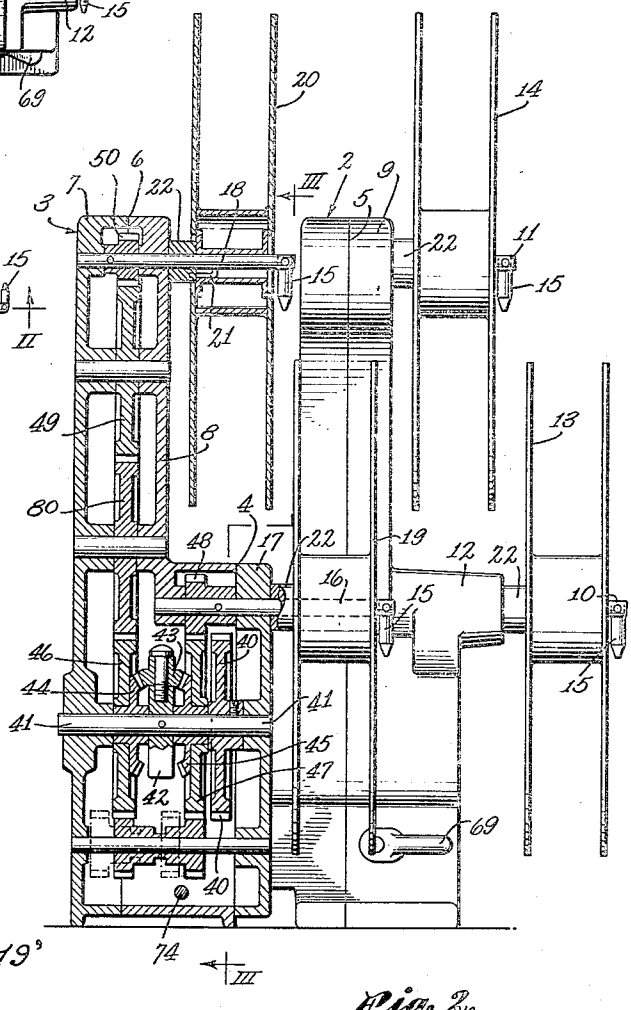


Fig. 2.

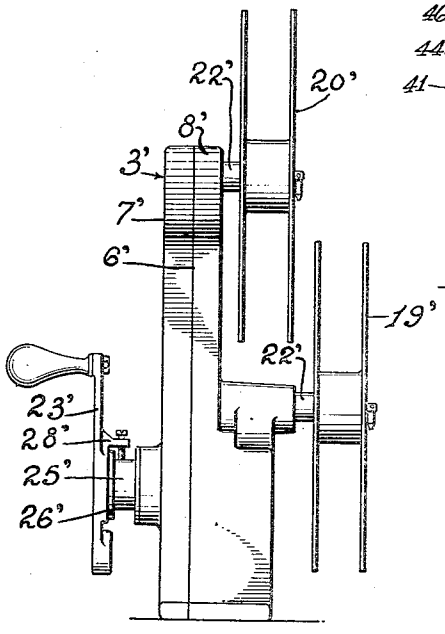


Fig. 6.

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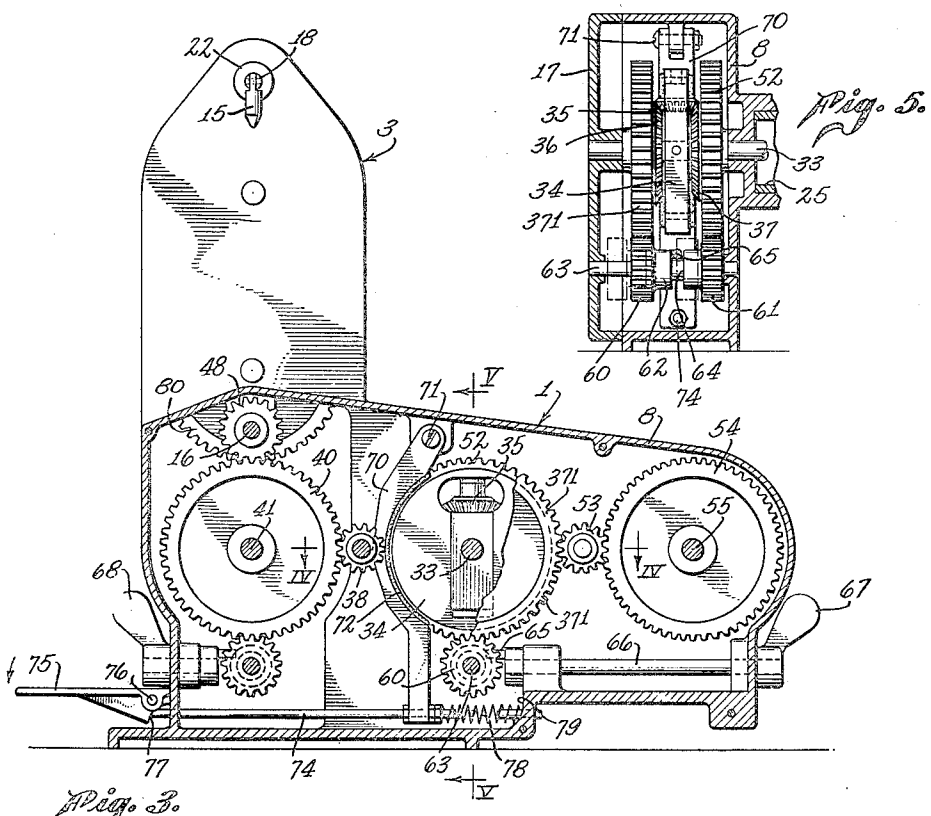


Fig. 3.

Fig. 5.

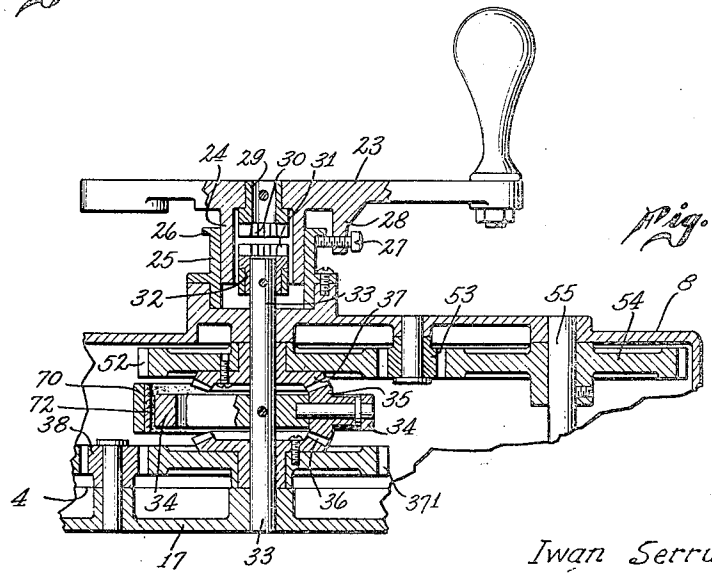


Fig. 4.

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MULTIPLE FILM RE-WINDER

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5 Claims. (Cl. 242—55)

This invention relates to winding devices for transferring motion picture film from one reel to another, and has to do more specifically with multiple re-winders capable of simultaneously winding film onto a plurality of reels.

An object of the invention is to provide a simple, rugged and reliable multiple re-winder.

Another object is to provide a practicable mechanism for a multiple re-winder of the differential type, whereby any reel may be positively rotated when desired.

Another object is to provide a simple re-winder structure whereby the reels may rotate without rotation of the driving handle and to provide a braking mechanism for frictionally retarding the rotation of the reels.

Still another object is to provide a multiple re-winder in which each reel is supported on an independent shaft with all of the reels spaced longitudinally from each other so that if desired they can re-wind a plurality of films over synchronizing sprockets positioned coaxially on a common shaft.

The manner in which the foregoing objects are achieved, together with other minor objects and specific features of the invention, will be explained by describing in detail a preferred embodiment of the invention with reference to the drawings.

In the drawings:

Fig. 1 is a plan view of a 4-reel film re-winder in accordance with the invention.

Fig. 2 is a vertical sectional view, taken in the plane II—II of Fig. 1.

Fig. 3 is a vertical sectional view taken substantially along the line III—III of Fig. 2.

Fig. 4 is a detail horizontal sectional view taken in the plane IV—IV of Fig. 3.

Fig. 5 is a detail vertical section taken approximately in the plane V—V of Fig. 3.

Fig. 6 is an end elevation of a 2-reel re-winder in accordance with the invention.

Referring first to Fig. 1, the re-winder therein therein depicted comprises a housing having a horizontal portion 1, the under side of which is shaped to constitute a base adapted to be secured to any convenient supporting surface, and two vertical sections 2 and 3, respectively, which rise from opposite ends of the horizontal portion 1. For convenience, the horizontal portion of the housing is split into two sections along the line 4, the two sections being secured together by screws, the vertical section 2 being split into two sections along the line 5 and the vertical portion 3 being split into two sections along the line 6. The entire housing, therefore, consists of a casing element 7 constituting one wall of the vertical portion 3, a housing section 8 constituting the main portion of the horizontal section 1 and the inner half of the vertical portion 3, a housing section 17 constituting one wall section of the horizontal portion 1 and the inner wall of the vertical portion 2, and a housing section 9 constituting the outer half of the vertical portion 2.

Projecting through the housing section 9 of the vertical portion 2 are two reel-supporting shafts 10 and 11, respectively, the shaft 10 extending outwardly from a boss 12 and the housing element 9 and shaft 11 extending out directly from the housing wall and being positioned above the shaft 10, whereby the two shafts are displaced longitudinally from each other and can support two reels in overlapping relation. Two such reels, 13 and 14 respectively, are shown positioned on the shaft in Fig. 2. Each of the shafts 10 and 11 is provided on its outer end with a lock 15 of conventional form for securing the reels in place.

On the other end of the machine there are also provided two vertically spaced reel-supporting shafts 16 and 18, the lower shaft 16 extending directly out from the wall surface of the housing member 17 and the shaft 18 positioned thereabove extending directly out from the surface of the housing section 8. The surfaces of the housing sections 17 and 8, from which the shafts 16 and 18 project, are so disposed that the shaft 16 is spaced longitudinally from the shaft 11 and the shaft 18 is spaced longitudinally from the shaft 16 so that, as shown in Fig. 2, a reel 19, mounted on the shaft 16 and a reel 20 mounted on the shaft 18, can overlap each other and overlap the reels 13 and 14. All four reels are displaced longitudinally from each other by substantially equal distances. At the same time each reel is supported on a relatively short shaft extending only a short distance from the housing so that the shafts are mechanically strong.

Each shaft 10, 11, 16 and 18 is provided with a key member 21 adapted to engage a slot in a standard reel to force the reel to rotate with the shaft. Each shaft is also provided with a hub member 22 rotatable therewith for spacing the reels from the housing and providing an abutting hub for each reel to prevent undesired longitudinal movement of the reels along the shafts.

The machine is provided with a crank 23 mounted on the side of the housing section 8 substantially half-way intermediate the vertical

sections 2 and 3, and the housing contains a mechanism for rotating the reel shafts in response to rotation of the crank 23. The mechanism within the housing for effecting this rotation, will now be described:

Referring first to Fig. 4, the crank 23 is provided with an inwardly extending annular flange 24 having a cylindrical exterior bearing surface, which bearing surface is rotatably fitted within a bushing 25 secured to the housing section 8 for free rotation. The hub 24, in addition to being rotatable within the bushing 25, is also slidable longitudinally therewithin. To prevent escape of the hub 24 from bushing 25, the bushing is provided at its outer end with a flange 26 and a screw 27 is mounted in an arm 28 on the crank 23 in such manner as to cause the end of the screw to contact the flange 26 and thereby limit outward movement of the hub 24 with respect to the bushing 25. However, the crank may be completely removed at any time by first removing the screw 27.

The crankarm 23 is drilled at its center and has secured therewithin a bushing 29, the inner end of which has a plurality of axially extending teeth or dogs 30 which are adapted to interengage with similar dogs 31 on the end of a juxtaposed bushing 32 on the end of the shaft 33, which is rotatably mounted in the walls of the housing sections 8 and 17, respectively.

The shaft 33 may therefore be rotated by pressing the crankarm 23 inwardly to engage the dogs 30 with the dogs 31 and rotating the crank. If desired, the shaft 33 may be initially brought up to speed and then the crankarm disengaged by pulling it outwardly to free the dogs 30 and 31, whereupon the shaft 33 can continue to rotate without rotation of the crankarm 23.

The shaft 33 is coupled to the four reel-supporting shafts 10, 11, 16 and 18 through differential mechanisms whereby equal torque is applied to each of the reel-supporting shafts in response to rotation of shaft 33. Thus shaft 33 has keyed thereto a disc 34 upon which there is rotatably mounted a bevel gear 35, the latter being rotated about an axis radial with respect to the shaft 33. The bevel gear 35, which is revolved in response to rotation of the shaft 33, meshes with two bevel gears 36 and 37, respectively, which are loosely mounted for free rotation about the shaft 33. The gear 36 is rigidly connected to a spur gear 371 which meshes with an idler gear 38, rotating the latter. The idler gear 38 meshes with and in turn rotates a gear 40 (Fig. 3) keyed to a shaft 41.

Referring now to Fig. 2, the shaft 41 has keyed thereto a carrier member 42 rotatably supporting a bevel gear 43 for free rotation about an axis extending radially from the shaft 41, the gear 43 being constrained to revolve with the shaft 41 in response to rotation of the gear 40. The bevel gear 43 in turn meshes with a pair of beveled gears 44 and 45, respectively, which are loosely mounted for free rotation on the shaft 41 and have attached thereto spur gears 46 and 47, respectively. The spur gear 47 meshes with a spur gear 48 keyed to the reel-supporting shaft 16 for rotating the latter. The spur gear 46 meshes with an idler gear 80 which in turn meshes with an idler gear 49 which in turn meshes with a gear 50 on the reel-supporting shaft 18 for driving the latter.

It will be apparent that in the structure described, when the shaft 41 is rotated, the gear 43 will apply equal torques to the gears 44 and 45. The torque applied to gear 45 will be transmitted through gear 47 and gear 48 to the reel-supporting shaft 16 and the torque applied to gear 44 will be applied through gears 46, 80, 49 and 50 to the reel-supporting shaft 18.

Referring again to Fig. 4, the bevel gear 37 which meshes with the gear 35 on the disc 34 is rigidly attached to a spur gear 52 which in turn meshes with an idler gear 53, the latter in turn meshing with a spur gear 54 keyed to a shaft 55. The shaft 55 in turn carries a gear assembly identical with that carried by shaft 41, previously described, and shaft 55 applies torque to the reel-supporting shafts 10 and 11 in exactly the same manner as the shaft 41 applies torque to the reel-supporting shafts 16 and 18. Since the mechanism is identical it has not been separately illustrated.

It will be observed that the mechanism described comprises three differential units, one consisting of the gears 35, 36 and 37 which apply equal torque from the main drive shaft 33 to the gears 371 and 52. The gear 371 in turn applies torque to the shaft 41 which in turn applies different torque through the differential mechanism comprising gears 43, 44 and 45 to reel-supporting shafts 16 and 18. The gear 52 applies its torque to the shaft 55 and the latter applies equal torque to the reel-supporting shafts 10 and 11. Therefore the three differential units constitute equalizing means for applying torque to all four of the reel-supporting shafts from the main drive shaft 33.

This equal torque is desirable when all four reel-supporting shafts are being employed to rotate the different reels since each reel can then run at a speed necessary to take up the film that is being supplied thereto.

It is desirable on occasion, however, to employ the machine described with less than four reels. With the normal adjustment, however, if there is no load on any one of the reel-supporting shafts, that shaft alone will rotate and the rest will remain stationary. To make possible the rotation of less than four reels, I therefore provide a locking mechanism for each of the differential units in the machine. When these locking mechanisms are all actuated, all four of the reel-supporting shafts are constrained to rotate in unison.

Referring now to Figs. 3 and 5, the locking mechanism for the differential unit associated with the shaft 33, comprises a pair of idler gears 60 and 61 slidably integrally formed on a common hub 62 mounted on a shaft 63 which is supported in the housing below the spur gears 371 and 52. The gears 60 and 61 are spaced from each other the same distance as the spur gears 371 and 52 are spaced and the shaft 63 is so spaced from the shaft 33 that when the gears 60 and 61 are juxtaposed to the gears 371 and 52 they mesh with the latter and force them to rotate in unison. However, by sliding the hub 62 longitudinally on its shaft 63 the gears 60 and 61 can be disengaged from the gears 371 and 52. To shift the hub member 62 the latter is provided with an annular groove 64 therein which is engaged by a crankpin 65 eccentrically mounted on the end of shaft 66, which shaft extends longitudinally through the horizontal portion 1 of the housing and through the end wall thereof, at which point it is provided with a handle 67. Suitable stops are provided to limit oscillation of the handle 67 to a value not exceeding 180°. When the handle 67 is in one extreme position, the crankpin 65 shifts the gears 60 and 61 into engagement with

the gears 37' and 52 and when the handle 67 is in its other extreme position the gears 60 and 61 are disengaged from the gears 37' and 52.

A mechanism exactly similar to that described is associated with the gears 46 and 47, this mechanism being actuated by a handle 68 at the opposite end of the machine from the handle 67. The differential unit driven by the shaft 55 (which has not been disclosed in the drawings) is likewise provided with a similar lock, the handle of which is indicated at 69 in Fig. 2.

The machine described may, if desired, be employed with only two reels and differential action be obtained between those two reels. Thus the two reels may be mounted upon the reel-supporting shafts 10 and 11, or 16 and 18, and the handle 67 actuated to lock the gears 37' and 52 against relative rotation. Each pair of reel-supporting shafts 9—10 and 16—18 will be positively rotated although equal torques will be applied to the two shafts in each pair and one shaft in each pair can go faster than the other, if necessary. The machine may also be employed with two reels only by mounting one reel on either the shaft 10 or the shaft 11, mounting the other reel either on shaft 16 or shaft 18, and actuating the handles 68 and 69 to lock the differential unit interconnecting shafts 10 and 11 and the differential unit interconnecting shafts 16 and 18. This applies equal torque to the unit consisting of the two shafts 10 and 11 and to the unit consisting of the two shafts 16 and 18 but prevents free rotation of the shaft on which no reels are mounted.

The machine described may also be employed with three reels and differential action be obtained between all three reels. Thus the reels may be mounted on shafts 10, 11 and either 16 or 18 or on 16 and 18 and either 10 or 11 and the differential associated with the end of the machine on which only one reel is mounted, locked. Assume that reels are mounted on shafts 10, 11 and 16 and that the differential associated with shafts 16 and 18 is locked. Equal torques will then be applied through the main differential associated with the crankarm 23 through the two ends of the machine and equal torque will be distributed to the two shafts 10 and 11 by the differential unit associated therewith. However, the differential associated with shafts 16 and 18 is locked so that the empty shaft 18 cannot spin and permit the shaft 16 to remain stationary, but instead shaft 16 must rotate with shaft 18.

In practice, it is usual to employ two multiple re-winders when synchronizing a plurality of films, the films being unwound from reels mounted on one reel winder, passed through a synchronizing device, and rewound on reels mounted on the other multiple re-winder. Under such conditions power is applied to only one of the re-winders, namely that one on which the takeup reels are mounted, and it is desirable to frictionally retard the rotation of the reels on the feed re-winder to prevent the latter from spinning and allowing the film to become slack when the rate at which the films are being rewound is reduced. To control the speed of the reels of the re-winder when they are being used as feed reels instead of takeup reels, I provide a friction brake. Referring to Fig. 3, this brake comprises a brakeshoe 70 pivotally supported at its upper end by a pivot screw 71 to the casing 4 and extending downwardly past the periphery of the disc 34 which is keyed to the shaft 33. The portion of the lever 70 juxtaposed to the disc 34 is recessed to define an arcuate surface which is preferably lined with a special friction material 72, such as brake lining, so that when the lever is pressed into engagement with the periphery of the disc 34, it presents a smooth frictional resistance to rotation of the latter. The lower end of the lever 70 extends down below the disc 34, and is connected to a rod 74 which extends longitudinally through the housing and out of the end wall thereof through a suitable aperture. Exterior of the end wall of the housing there is mounted a brake lever 75 pivotally supported on a pin 76 and having a shoulder 77 bearing against the end of the rod 74. By depressing the brake lever 75 the rod 74 is moved to the right to carry the lever 70 against the disc 34. A helical compression spring 78 is pressed between the right side of the lower end of lever 70 and a shoulder 79 in the housing to normally maintain the frictional lining 72 out of engagement with the disc 34.

It is desirable, when using the re-winder, to feed film from reels thereon to disconnect the crank 23 by pulling it outwardly to disengage the dogs 30 from the dogs 31.

Although the mechanism described with reference to Figs. 1, 2, 3, 4 and 5 has to do with a 4-reel re-winder, it is obvious that the essential principles involved may be employed to produce a superior 2-reel re-winder. Such a re-winder is shown in end elevation in Fig. 6, in which parts corresponding to those in Figs. 1 and 2 bear the same reference numerals primed. In effect, such a re-winder is equivalent to one end portion of the 4-reel re-winder shown in the remaining figures. Thus the mechanism for driving the two reel-supporting shafts of the machine shown in Fig. 6, is identical with the mechanism for driving the two reel-supporting shafts 16 and 18, as shown in Fig. 2, except that the shaft in the system of Fig. 6 corresponding to shaft 41 in Fig. 2, is driven directly by the crank 23' instead of through the gears 40, 36 and 37' from the shaft 33. Thus the crank 23' shown in Fig. 6 is coupled to the shaft therewithin corresponding to shaft 41 in Fig. 2 in exactly the same manner as the crank 23 is coupled to the shaft 33 in Fig. 4. The single differential unit in the model shown in Fig. 6 may be equipped with a disc and a braking mechanism corresponding exactly to the disc 34 and the brake lever 70 shown in Figs. 3 and 4, except that they would be associated with that shaft of Fig. 6 which corresponds to shaft 41 in Figs. 1 to 5.

As will be readily comprehended by those skilled in the art, the invention is not limited to a 4-reel re-winder as distinct from a re-winder for handling a larger number of reels, although ordinarily no more than four reels are rewound at a time. Thus a machine capable of rewinding eight reels could be constructed by employing two 4-reel units such as those disclosed with an extra differential mechanism for applying equal torque to each 4-reel unit. By interlocking some of the reels on one or both units, such a machine could be adapted to handle five, six or seven reels, if desired.

The invention has been explained by describing a certain particular embodiment thereof in detail. It is to be understood, however, that various changes other than those mentioned may be made without departing from the invention, and the latter is to be limited only as set forth in the appended claims.

I claim:

1. A film re-winder for simultaneously winding a plurality of films through paths spaced laterally from each other comprising a housing and a plurality of parallel reel-supporting shafts supported thereon, said shafts extending through one wall of said housing at spaced points thereon all of said shafts being unsupported exterior of said wall, and said housing wall being irregularly shaped whereby reels positioned on said different reel-shafts are longitudinally spaced from each other and at the same time are positioned close to said housing wall, and means including mechanism within said housing for rotating said shafts.

2. A multiple film re-winder comprising a housing including a horizontal section and a pair of vertical sections rising therefrom at opposite ends, a pair of vertically spaced apart reel-supporting shafts in each vertical section of said housing, a first, second, and a third coaxial gear in the lower part of each vertical section, and differential means for applying equal torque to the second and third gears in response to rotation of the first gear, gear means for coupling said second gear to one of said reel-supporting shafts, gear means for coupling said third gear to the other reel-supporting shaft, a drive shaft in said horizontal section, and differential means coupling said drive shaft to said first gears in each of said vertical sections.

3. A film re-winder as described in claim 5, with brake means for retarding said drive shaft.

4. A film re-winder as described in claim 5, with brake means for retarding said drive shaft comprising a drum on said drive shaft, a shoe hinged adjacent the top of said horizontal section extending downwardly past said drum, a brake lever at one end of said housing, and means coupling said brake shoe to said lever.

5. A film re-winder as described in claim 5, with means for independently locking each of said differential units for positive rotation in synchronism with the elements driven thereby.

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