

June 4, 1968

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3,386,676

CARTRIDGE FOR STRIP AND TAKE-UP MOTION THEREFOR

Filed June 23, 1966

3 Sheets-Sheet 1

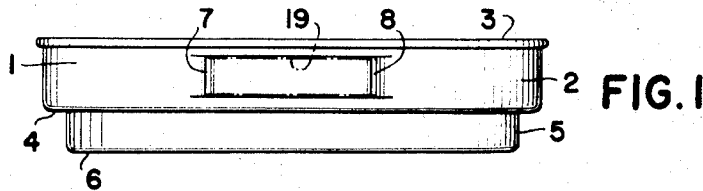


FIG. 2

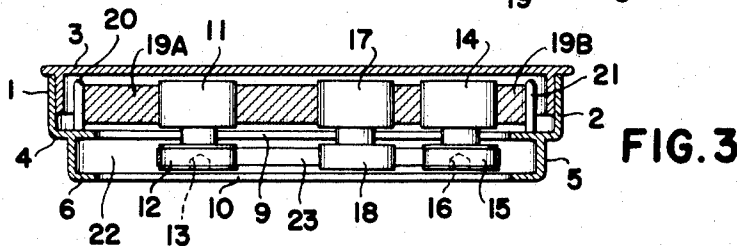
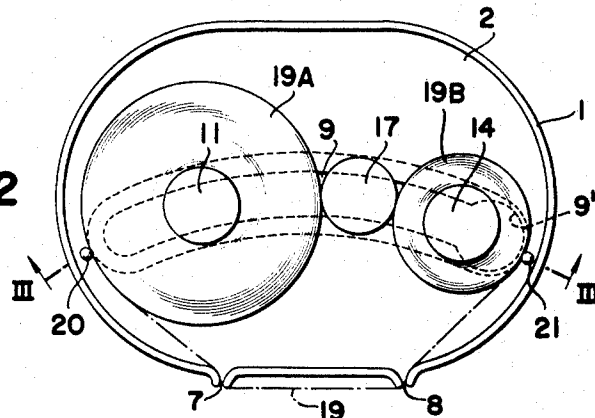
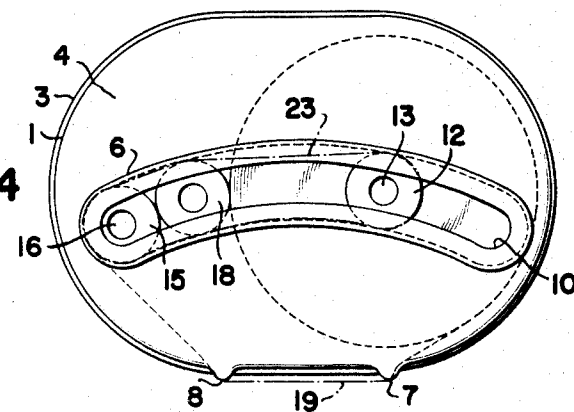


FIG. 4



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3 Sheets-Sheet 2

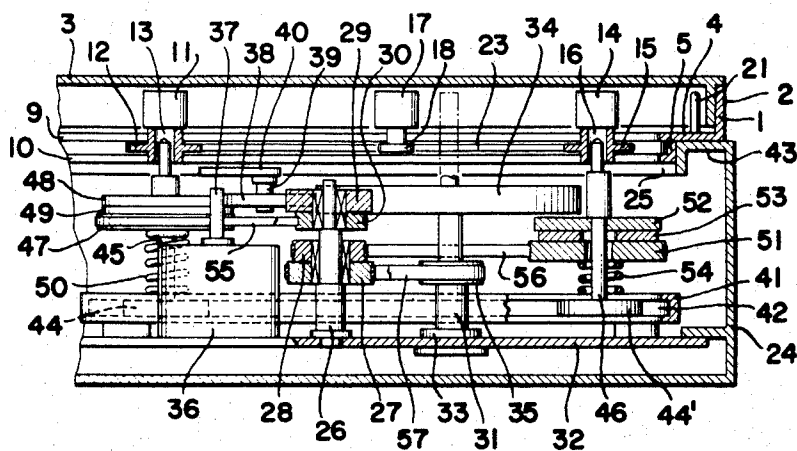


FIG. 5

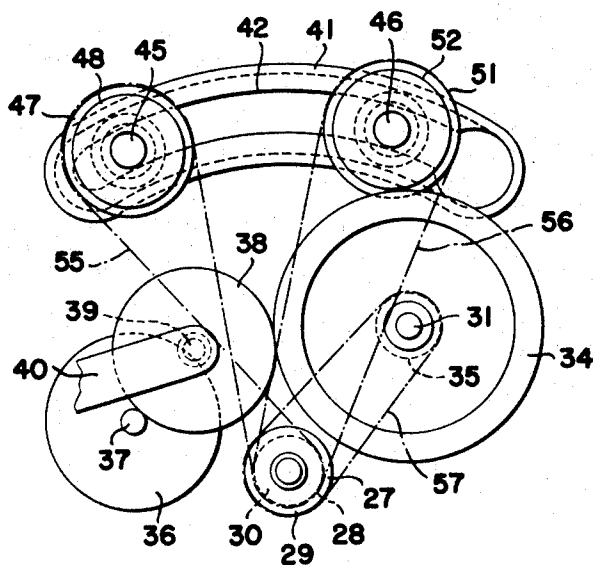


FIG. 6

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3 Sheets-Sheet 3

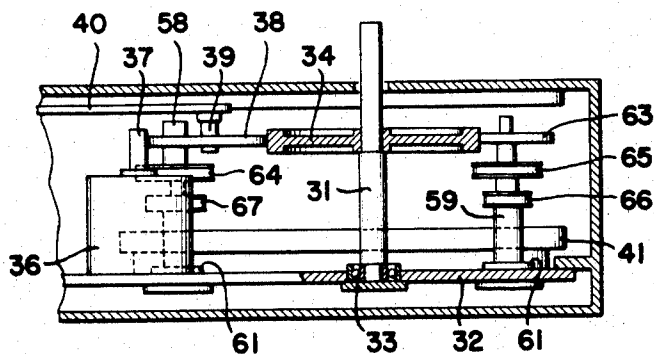


FIG. 7

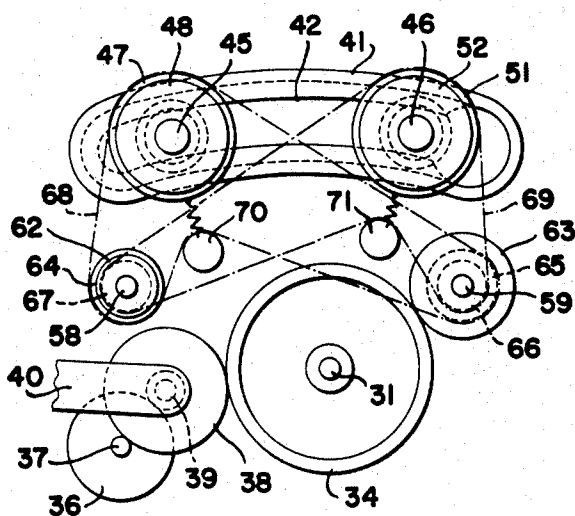


FIG. 8

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7 Claims. (Cl. 242-55.13)

ABSTRACT OF THE DISCLOSURE

A cartridge and a take-up motion therefor is provided for facilitating the winding and rewinding of tape, film or similar strip material. The cartridge includes a casing having a longitudinally extending slot therein terminating adjacent the casing edges. A pair of spools are shiftable along the slots such that the winding of the strip material on one spool increases while the winding on the other spool decreases. Drive means are also provided for transmitting rotational movement to the spools notwithstanding the relative positions of the spools along the slot whereby the strip material is adapted to be taken up from one spool to the other.

This invention relates to a cartridge adapted for containing a roll of strip such as tape or film and a take-up motion for use in such cartridge.

Because of great convenience it provides in accommodating a lengthy roll of tape, film, or other strip ready for use, cartridges have found broad applications in movie machines, tape recorders, dictation machines, and the like. In a cartridge a roll of strip on a supply reel is transferred to a take-up reel and therefore, at the beginning of the take-up, all the length of the strip is wound solely on the feeding reel and not a bit is wound around the take-up reel. Naturally, on completion of rewinding, the feeding reel is empty while the total length of the strip is on the take-up reel. Since conventional cartridges are so designed that each of the reels has an axis of rotation arranged in a fixed position with respect to the cartridge body, each cartridge must have a capacity large enough to contain the total length of a strip in both feeding and take-up sides. This means that the longitudinal dimension of the inner space of a cartridge should be at least twice the full roll size wound on either reel. Thus the greater the length of a cartridge the larger the take-up motion therein, with consequent increases in the overall dimensions of the movie machine, tape recorders, dictation machines and the like which incorporate such cartridges.

A principal object of the invention is therefore to provide a cartridge which can be considerably shortened in length as compared with conventional cartridges, without any reduction in its capacity storing basing for a strip of film, tape, and the like.

A further object of the invention is to provide a cartridge having two spools which are shiftable in positions according to changes in the amounts of a strip wound thereon.

A further object of the invention is to provide a cartridge wherein both of the spools are shiftable in positions, as the winding radius of strip upon one spool increases while that of strip upon the other spool decreases, from the side where the spool is gaining the winding radius toward the side where the winding radius of the other spool is dwindling.

Another object of the invention is to provide a cartridge comprising a casing having peripheral wall, a longitudinally extending slot formed in said casing and having ends adjacent peripheral wall of casing, two spools shiftable along said slot, and means provided adjacent

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the ends of slot for engaging with outer peripheries of wound strip on said spools so as to move said spools along said slot with radial increase of winding of strip on one spool and radial decrease of winding of strip on another spool.

A still another object of the invention is to provide a take-up motion which permits winding or rewinding of a strip on either of the spools in a cartridge and is capable of achieving the take-up functions irrespective of the spool positions which are shifted in response to changes in the amounts of the strip on the spools.

A yet another object of the invention is to provide a take-up motion comprising in combination a cartridge including a casing having peripheral wall, a longitudinally extending slot formed in said casing and having ends adjacent peripheral wall of casing, two spools shiftable along said slot, and means provided adjacent the ends of slot for engaging with outer peripheries of wound strip on said spools so as to move said spools along said slot with radial increase of winding of strip on one spool and radial decrease of winding of strip on another spool, and a drive device including means for transmitting rotation alternately to said spools irrespective of positions of spools along said slot to take-up strip wound on one spool on another spool or vice versa.

Another object of the invention is to provide a cartridge and a take-up motion therefor which are adapted for use with cine cameras, tape recorders, dictation machines, and the like.

Other objects and advantages of the present invention will be more fully understood from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a side view of a cartridge according to the invention;

FIGURE 2 is a plan view of the cartridge shown in FIGURE 1, a cover being removed from the cartridge;

FIGURE 3 is a sectional view taken along the line III-III of FIGURE 2;

FIGURE 4 is a bottom view of the cartridge shown in FIGURE 1;

FIGURE 5 is a sectional view of a cartridge and a take-up motion carrying the cartridge according to the invention;

FIGURE 6 is a plan view of the essential parts of the take-up motion of FIGURE 5;

FIGURE 7 is a sectional view showing a modified form of the take-up motion according to the invention; and

FIGURE 8 is a plan view of the essential parts of the take-up motion shown in FIGURE 7.

Referring now to the drawings, particularly to FIGURES 1 through 4, a generally oval-shaped cartridge comprises a casing 2 having a side wall 1 and bottom wall 4 and a cover 3 which fits the casing. The bottom wall 4 of the casing 2 is provided with an arcuate slot 9 which extends longitudinally over the bottom 4. The slot 9 is formed at one end with an enlarged circular opening 9'. A raised wall 5 having a bottom 6 is projected downwardly of the bottom wall 4 in a position where it surrounds the slot with a space therebetween. On the bottom 6 a slot 10 which corresponds to the slot 9 is formed. A feed port 7 for a strip and a take-up port 8 are formed on a straight portion of the side wall 1 of the casing, in spaced relationship. A feed spool 11 and take-up spool 14 have spindles extending through the slot 9 and also expanded bases 12 and 15, respectively, which are formed integrally with the spindles and have diameters greater than the widths of the slots 9 and 10. These spools are slidably disposed in the casing 2 by inserting the expanded bases 12 and 15 through enlarged circular opening 9' on one end of the slot 9 into a chamber 22 defined by the bottom wall 4, raised wall 5, and the bottom 6 of said

raised wall, for accommodating and guiding said expanded bases of spools, and by engaging the spindles with said slot 9. A spacer 17 of a material having a low friction coefficient is provided with a spindle extending through the slot 9 of the bottom wall 4 and also with an expanded base 18 jointly formed on the spindle. The expanded base 18 has the same configuration as those of the expanded bases 12 and 15 of the two reels. By introducing the expanded base 18 through the enlarged circular opening 9' into the guide chamber 22 and by engaging the spindle with the slot 9, the spacer 17 is slidably disposed between the spools 11 and 14 in the casing 2. Between these expanded bases 12 and 15, an endless elastic band 23 is stretched, so that the bases 12 and 15 may be urged together toward the base 18 of the spacer 17.

On the lower center portions of the expanded bases 12 and 15 of the two spools, there are formed spindle holes 13 and 16, respectively, so as to receive the corresponding spindles of the take-up motion. A strip 19, for example a tape or film, is wound by way of the feed port 7 and take-up port 8 upon the feed spool 11 and take-up spool 14 thereby to form wound portions 19A and 19B, which are urged securely in contact with the spacer 17 disposed therebetween, by means of the elastic band 23. As the outermost surfaces of the wound strip portions 19A and 19B are slidably in contact with slide pins 20 and 21, respectively, which are studded in the casing 2, the spools 11 and 14 can be moved slidingly along the slot 9 in proportion to the radii (amounts) of the wound strip portions 19A and 19B.

Description will now be made of the take-up motion for winding or rewinding the strip in the cartridge, by reference to FIGS. 5 and 6. The take-up motion includes a casing 24 which is formed with a groove 25 for receiving the raised wall 5 of the cartridge in detachable relation thereto. A supporting frame 32 is secured in the casing 24, and a stationary spindle 26 which is fixed at its lower end to the frame 32 has a pulley 27 integrally formed with a take-up pulley 28 rotatably journaled thereon by means of a bearing. A friction wheel 29 formed integrally with a rewinding pulley 30 is rotatably journaled on a portion of the stationary spindle 26 adjacent the take-up pulley 28. A rotatable spindle 31 for driving the strip is rotatably fitted to the frame 32 by bearing 33. A friction wheel 34 having a large diameter and a pulley 35 having a small diameter are both secured fixedly to the spindle 31, the pulley being disposed opposite to the lower pulley 27. An idler 38 is rotatably supported by the spindle 39 on a switching lever 40 and is arranged in such a position where it can contact the rotary shaft 37 of a driving motor 36. By the operation of the switching lever 40 the idler 38 is shifted from the position where it comes into contact with the motor shaft 37 and the large-diameter friction wheel 34 on the driving linking spindle 31 to the position where it contacts the motor shaft 37 and the friction wheel 29 on the stationary spindle 26, or vice versa. A guide member 41 of a material having a low friction coefficient is securely mounted on the supporting frame 32 and is provided with a longitudinal slot 42 which corresponds to the slots 9 and 10 on the cartridge. In the embodiment shown, these slots are positioned on an arc centered around the stationary spindle 26, and therefore the slots 9 and 10 come in registration with the slot 42 when the cartridge is mounted on the casing 24. A rewinding spindle 45 and winding spindle 46 are arranged so that they can slide sideways within the slot 42 of the guide member 41 by means of bearing bases 44 and 44', respectively, disposed in said slot 42. On the rewinding spindle 45 is mounted a pulley 47 which is rotatable with respect to said spindle and is also slidably upwardly and downwardly. A disc 48 is fixed to the rewinding spindle 45 and the pulley 47 is in opposite position to the frictional face 49 fitted to the under side of the disc and is pressed against said face by spring 50, thereby constituting a frictional clutch. Similarly, a pulley 51 fitted rotatably and

vertically slidably onto the winding spindle 46 is pressed by spring 54 against a frictional face 53 on the under-side of a disc 52 fixed to said spindle 46 and thereby forms another frictional clutch.

In FIGURE 6 there are shown the position and operative relations among the parts above referred to. An elastic belt 55 is stretched crosswise between the pulley 47 on the rewinding spindle 45 and the rewinding pulley 30 on the upper part of the stationary spindle 26, while another elastic belt 56 is stretched between the pulley 51 on the winding spindle 46 and the winding pulley 28 on the lower part of the stationary spindle 26. Still another elastic belt 57 is stretched between the pulley 27 on the lower part of the stationary spindle 26 and the small-diameter pulley 35 on the lower part of the driving linking spindle 31. The front tip of the rewinding spindle 45 can fit in the spindle hole 13 on the base 12 of the feed spool 11 in the cartridge, and the front tip of the winding spindle 46 can fit in the spindle hole 16 on the base 15 of the take-up spool 14.

Thus, when the cartridge is mounted on the casing 24 by fitting the upper ends of spindles 45 and 46, respectively, into the holes on the spools, the spool spindles 45 and 46 can occupy the same positions in the slot 42 as the spools 11 and 14 assume in the slots 9 and 10, respectively. Now, if the idler 38 is moved by the switching lever 40 into contact with the motor shaft 37 and the large-diameter friction wheel 34 of the driving linking spindle 31 and if the motor shaft runs in the counterclockwise direction as seen in FIG. 6, then the revolutions reduced in speed are transmitted to the driving linking spindle 31, thus permitting the latter spindle to rotate counterclockwise. The small-diameter pulley 35 on the upper part of the spindle 31 causes the belt 57 to turn the pulley 27 on the lower part of the stationary spindle 26, and the winding spindle 46 is forced to run at a reduced speed through the media of the pulley 28, belt 56, pulley 51, frictional face 53, and disc 52. By the rotation of the winding spindle 46, the strip is wound on the take-up spool 14 and, with the progress of winding, the winding radius 19A of the feed spool dwindles while the winding radius 19B of the takeup spool increases. Accordingly, the spools 11 and 14 move along the slot 9 toward the feeding side, that is, leftward as seen in FIG. 2, accompanied by leftward movements of the spindles 45 and 46 through the bearing bases 44 and 44' within the slot 42 of the guide member 41. However, inasmuch as the slot 42 forms an arc centered around the stationary spindle 26, the rotational transmission of power through the belts 55 and 56 is continued. In this way the whole length of the strip on the feed spool is unwound and taken over by the take-up spool and the feed spool is emptied, when the winding of film is completed.

In order to rewind strip roll, the switching lever is operated to shift the position of the idler 38 in such manner that the latter is brought into contact with the motor shaft 37 and the friction wheel 29 on the stationary spindle 26. The revolutions of the motor shaft 37 are then transmitted to the friction wheel 29 by way of the idler 38 without any reduction in the speed and the rewinding pulley 30 is turned counterclockwise. Thus, the rewinding pulley 30 causes high speed revolution of the pulley 47 on the rewinding spindle 45 through the medium of the crossed belt 55, drives the rewinding spindle 45 through the pulley 47, frictional face 49, and disc 48, and further causes high speed running of the spool 11 in the clockwise direction. As the spool 11 runs in this way, the strip can be rewound from the take-up spool 14 onto the spool 11. As the result of the rewinding, the wound portion 19A of the strip on the feed spool increases and the amount of winding 19B on the take-up spool decreases, thus permitting both of the spools to move rightward in the slot 9.

FIGS. 7 and 8 show another form of the take-up motion for cartridge according to the invention. In this

embodiment the slots 9 and 10 of the cartridge and the groove 25 on the upper wall of casing of the take-up motion and the slot 42 of the guide member 41 as in the former embodiment are made as straight in shape as possible.

Two rotary spindles 58 and 59 are rotatably fitted to a supporting frame 32 by bearings 61, and friction wheels 62 and 63 are secured fixedly, respectively, to the rotary spindles 58 and 59. In rewinding the friction wheel 62 comes in direct contact with an idler 38, while the friction wheel 63 is constantly in contact with the friction wheel 34. A pulley 64 is secured on the rotary spindle 58, and an idling pulley 65 is rotatably mounted on the rotary spindle 59 in the position corresponding to the pulley 64. A pulley 66 is fixed to the rotary spindle 59, and an idling pulley 67 is rotatably mounted on the rotary spindle 58 in a position corresponding to the pulley 66. An elastic belt 68 is stretched over the pulley 64, the pulley 47 on the rewinding spindle 45, and on the idling pulley 65. Another elastic belt 69 is stretched over the idling pulley 67, the pulley 51 on the take-up spindle 46, and the pulley 66. Tension rolls 70 and 71 are arranged in contact with these two belts in such manner as to give tension to the latter.

In taking up the strip, the power from the motor is transmitted through the rotary shaft 37 of the motor, idler 38, friction wheel 34, and friction wheel 59, to the rotary spindle 63, and thus the revolutions of the rotary spindle 59 is transmitted through the pulley 66, idling pulley 67, pulley 51 on the take-up spindle 46, and belt 69, to the take-up spindle 46 to thereby rotate the last-mentioned spindle.

In rewinding, the idler 38 is pressed against the friction wheel 62 to drive the rotary spindle 58, which in turn causes high-speed running of the rewinding spindle 45 by way of the pulley 64, idling pulley 65, pulley 47, and belt 68.

In the course of take-up or rewinding operation, the tension rolls 70 and 71 serve to preclude any sag on the transmission belts 68 and 69 regardless of shifting of the rewinding spindle 45 and take-up spindle 46 to any different positions within the slot 42 of the guide member 41 and hence of any change in the distance between these spindles and the rotary spindle.

With the construction and functions as hereinbefore described, the present invention is advantageous because it enables a lengthy roll of strip to be accommodated in a small-volume cartridge and therefore it is applicable to movie machines, particularly cine cameras, tape recorders, dictation machines, video cameras and equipment, computers, teletypes, and the like, permitting those devices to be made compact, portable, and easy to handle.

Although the present invention has been described with reference to specific embodiments thereof, it is to be understood of course that numerous modifications are possible without departing from the spirit of the invention.

What is claimed is:

1. A take-up motion comprising in combination a cartridge including a casing having a peripheral wall, a

longitudinally extending slot formed in said casing, and having ends adjacent the peripheral wall of the casing, two spools shiftable along said slot, and means provided adjacent the ends of the slot for engaging with the outer peripheries of the wound strip on said spools so as to move said spools along said slot with a radial increase of the winding of the strip on one spool and a radial decrease of the winding of the strip on the other spool, and a drive device including means for transmitting rotation alternately to said spools irrespectively of the positions of the spools along said slot to take up the strip wound on the one spool on the other spool or vice versa.

2. The invention in accordance with claim 1 wherein a spacer is shiftable along said slot between said spools and is engageable with the outer peripheries of wound strip on said spools.

3. The invention in accordance with claim 1 wherein the drive device means includes driving spindles interconnected with the spools of the cartridge and the drive device including a slot aligned with the slot of the cartridge and the drive spindles being shiftable along the slot of the drive device.

4. The invention in accordance with claim 3 wherein the drive device includes switching means for changing the rotation of the drive spindles and consequently the spools to take-up strip wound on one spool on another spool or vice versa.

5. The invention in accordance with claim 4 wherein the drive device includes a motor having an output shaft and said switch means operates to selectively interconnect the output shaft with the rotation transmitting means of the drive device for purposes of rotating the spools in one direction or another.

6. The invention in accordance with claim 5 wherein the drive device means includes stationary spindles and belt means for interconnecting all of said spindles for rotation with one another.

7. A take-up motion comprising in combination a cartridge including a casing having a peripheral wall, two spools, a longitudinally extending guide means in said casing for guiding the movement of said spools along a longitudinal path, means for urging said spools towards one another, means provided adjacent the guide means for engaging with the outer peripheries of the wound strip on said spools so as to move said spools along said guide means with a radial increase of the winding of the strip on one spool and a radial decrease of the winding of the strip on the other spool, and drive means including means for transmitting rotation alternately to said spools irrespectively of the position of the spool relative to said guide means to take-up the strip wound on the one spool on the other spool or vice versa.

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