

PATENT SPECIFICATION

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DRAWINGS ATTACHED



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(54) IMPROVEMENTS IN OR RELATING TO THE EXTRACTION OF COILED
 STRIPS FROM CARTRIDGES

(71) We, KARL VOCKENHUBER, of 118
 Potzleinsdorferstrasse, Vienna 18, and
 RAIMUND HAUSER, of 2, Goldegg-Gasse,
 Vienna 4, both in Austria, both citizens of
 Austria, do hereby declare the invention, for
 which we pray that a patent may be granted
 to us, and the method by which it is to be
 performed, to be particularly described in
 and by the following statement:—

This invention relates to apparatus such
 as a film projector which requires loading
 with a cartridge containing a reel having
 coiled upon it a length of strip material.
 Although the invention is particularly usable
 in conjunction with a film projector, it is
 also usable in any application where cart-
 ridge loading is required such as in tape
 recording equipment where the strip takes
 the form of a length of magnetic tape.

In our copending Applications Nos.
 23411/68 and 23413/68 (now Serial No.
 1,233,708 and 1,234,276) are described de-
 vices for assisting the extraction of an end-
 portion of a strip from a cartridge. To ex-
 tract the end-portion of the strip a belt-
 driven roller is passed through an aperture
 in the cartridge so that the periphery of the
 belt passing around the roller is brought
 into contact with the periphery of the coil
 of strip wound on the reel inside the cart-
 ridge. If the belt is now driven in the
 appropriate direction, the movement is im-
 parted to the roller and to the coil so that
 the end-portion of the coil can be fed along
 a predetermined path in the cartridge and
 leading towards an outlet opening from
 which the end-portion of the strip emerges.
 Once the end-portion of the strip is acces-
 sible outside the cartridge the roller can be
 withdrawn from the opening and the strip
 fed through a transporter system of the
 apparatus.

It will be appreciated that in order to
 extract an end-portion of a film from a
 cartridge it is necessary to perform three
 operations. The first is to insert the roller

which is to drive the film coil, through the
 opening in the cartridge so that it engages
 the film coil. The second operation is to
 drive the film coil so that the end-portion
 of the film strip is fed towards the outlet
 opening of the cartridge. The third operation
 is to withdraw the roller from the opening
 in the cartridge after the end-portion of
 the strip emerges from the cartridge.

In accordance with the present invention
 there is provided apparatus having a mount
 for a cartridge containing a reel rotatable
 about its axis and on which a length of strip
 material is coiled, a belt-driven first roller
 attached to a member which is movable to
 insert the roller through an opening in the
 cartridge and to move the roller in the direc-
 tion of the reel axis until a direct driving
 connection is established which rotates the
 coil and reel, a drive mechanism which is
 effectively fixed in position and engages a
 portion of the belt running between the first
 roller and a second roller, and a slipping
 brake which resists rotation of one of the
 rollers by the belt; said drive mechanism
 operating to drive the belt in a direction
 which initially shortens the length of belt
 running between the mechanism and the
 braked roller so that the member is moved
 towards the cartridge to insert the first
 roller through the opening and establish the
 driving connection after which further move-
 ment of the member ceases and the traction
 exerted by the mechanism on the belt there-
 after overcomes the frictional resistance of
 the brake to drive the belt between the two
 rollers and transmit rotational drive to the
 reel *via* the driving connection.

The driving connection may be established
 directly by abutment of the roller with the
 coil, or indirectly by way of a portion of
 the belt running around the first roller and
 sandwiched between it and the coil.

An advantage of the invention is that the
 operations of advancing the first roller to-
 wards the coil and then rotating the coil

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with it are conducted by a single drive motor or mechanism. Suitably the drive mechanism acts against a resilient bias provided, for example, by a spring so that as soon as the motor is de-energised, the spring takes charge and retracts the roller and member from the opening in the cartridge. As an alternative, the drive mechanism may be made reversible so that it can drive the belt in opposite directions one of which introduces the roller into the cartridge and drives the coil, while movement of the belt in the opposite direction withdraws the roller from the cartridge after the end-portion of the strip or film has emerged from its opening in the cartridge.

Conveniently the two rollers are mounted at opposite ends, respectively, of a reciprocable member, and the belt has parallel forward and return runs extending between the two rollers and one of which is engaged by a drive pulley rotated by an electric motor.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows portions of a film projector in side elevation;

Figure 2 is an enlarged sectional view through a cartridge and associated extraction devices; and,

Figure 3 is a detailed view of a mechanism used to rotate a coil of film inside the cartridge to extract its end-portion.

Referring to Figures 1 and 2, a film projector has a body partially shown at 25 and to which is fitted a cartridge 1 containing a rotatable reel 2 on which is wound a coil of film 4.

When first using the cartridge it is necessary to extract the free end-portion 5 of the film strip from the cartridge by way of an opening 6 formed in the cartridge wall. The amount the reel must be rotated to enable the free end-portion of the strip to emerge from the opening depends on the position occupied by the free end of the film when the cartridge is first fitted to the projector.

To eject the free end of the film from the cartridge, a support member 8 is inserted through an opening 7 in the cartridge wall. The inserted front portion of the member 8 carries a friction roller 9 which passes between the flanges of the reel 2 and presses a driven belt 15, which passes around the roller 9, against the outside surface of the outermost convolution of the coiled film. The belt is preferably made of rubber and provides a driving nip for rotating the coil 4. The belt is driven in a direction which rotates the roller 9 in a counterclockwise direction as shown in the drawing, so that the free end-portion of the film is moved along a predetermined curved path inside the cartridge in a clockwise direction and to-

wards an inner cylindrical wall 10 of the cartridge. The free end-portion then slides along the wall 10 until it is deflected by a stripper 24 towards the outlet opening 6. The support member 8 is guided during its longitudinal displacement by bolts 18 which pass through slots in the support member and one of which is shown in Figure 1.

The front portion of the support member 8 is L-shaped to provide an upwardly and rearwardly extending guiding surface 20. Upon inserting the support member 8 into the cartridge 1, the guiding surface 20 presses against a leaf spring 22 which is fastened to the inside surface of the cylindrical wall 10 of the cartridge by means of rivets 21 and which rests against the inside cylindrical wall before the member 8 is inserted. The insertion of the member 8 causes the free end of the leaf spring 22 to be deflected between the flanges of the reel 2 to the position shown in Figure 2 at which it provides a curved, outwardly spiralling guiding surface devoid of sharp corners and capable of guiding the free end-portion of the film leaving the nip without risk of buckling. The stripper 24 in the cartridge is constructed as a lever which engages the coil 4 tangentially at one end which is so shaped that it contacts the marginal perforated edges of the film only so that damage to the frames of the picture is avoided.

A friction wheel 12 coaxially arranged beneath the reel 3 is also disposed in the cartridge 1 and has a central pin 13 upon which the film reel 3 is fitted. For rewinding the film into the cartridge, a roller 26, shown in Figure 1, is provided on the projector body 25 and is driven by a belt 27 by a motor, not illustrated, to rotate the friction wheel 12.

Turning now to Figure 3 it will be seen that the belt 15 passes at the rear end of the member 8 around a second roller 16 which is held by a bolt 33 to the member 8. Beneath the head of the bolt 33 is a spring plate 34 having radial arms which bear against the end face of the roller 16 to provide a brake. Above the roller 16 is disposed a spring 30 which urges the member 8 towards its rest position which is towards the left-hand side of the drawing.

The belt 15 is driven in the direction of the arrow shown adjacent the lower run by a belt drive pulley 31 which is mounted on the shaft of a reversible electric motor 17. The motor has its electrical supply connections reversible by a switch 35. A pinch-wheel 32 holds the lower run of the belt 15 against the drive pulley 31 which is axially fixed with respect to the body of the projector.

The above described arrangement operates in the following manner.

If it is required to extract the end-portion

of the film coil, the electrical supply to the motor 17 is connected to drive the motor so that the belt travels in the direction of the arrow. The traction of the belt is sufficient to overcome the tension of the spring 30 which exerts a lesser force than the braking force exerted on the roller 16 by the brake 34. The belt 15 does not slip on the drive pulley 31 or either of the rollers 9, 16, so that the shortening of the section of the belt extending between the drive pulley 31 and the roller 16 moves the member 8 together with both rollers 9 and 16 bodily towards the right of the Figure.

The roller 9, or rather the belt 15 passing around it, is brought into contact with the outer convolution of the strip coil 4 and prevents further rightward movement of the member 8. The traction exerted by the drive pulley 31 is greater than the braking force applied to the roller 16 by the slipping brake 34 so that the drive belt 15 is now rotated against the resistance of the brake 34. The movement of the drive belt is transmitted to the outer convolution of the film coil 4 causing its end-portion to travel around the guiding path formed inside the cartridge and which leads to the outlet opening 6.

When the end-portion of the strip is seen emerging from the opening 6, the motor 17 is either de-energised or reversed, and the member 8 returns to its left-hand rest position under the influence of the spring 30 assisted, if necessary, by the reverse drive applied to the motor 17. The movement of the member 8 to its rest position automatically disengages the rotational drive to the film coil 4 while extracting the roller 9 from the cartridge.

It will be appreciated that the movement of the member 8 towards the right in Figure 3 is resisted only by the spring 30. However, once abutment of the belt on the roller 9 against the film coil 4 occurs, the roller 9 is held against the film coil 4 with a relatively greater force determined by the braking force on the roller 16.

It will be appreciated also that the spring 30 could be omitted if desired, and the reversing switch 35 used as the sole means for extracting the roller 9 from the opening in the cartridge. Alternatively, the motor 17 may be simply de-energised when extraction is required and this stops further rotation of the belt 15 as well as allowing the spring 30 to take charge and return the member 8 to its rest position.

The invention is not limited to use with projectors. It may equally well be applied to certain film cameras, sound reproduction apparatus such as tape-recorders and also certain microfilm instruments. Instead of a special motor 17 being provided for driving the belt 15, it will be appreciated that the

drive mechanism for the belt 15 may comprise a releasable driving connection running off a main driving motor of the apparatus. A clutch mechanism may be introduced to provide the release facility when the member 8 is to be retracted from the cartridge. The member 8 may also be arranged to pivot, instead of to reciprocate, if desired.

WHAT WE CLAIM IS:—

1. Apparatus having a mount for a cartridge containing a reel rotatable about its axis and on which a length of strip material is coiled, a belt-driven first roller attached to a member which is movable to insert the roller through an opening in the cartridge and to move the roller in the direction of the reel axis until a direct driving connection is established which rotates the coil and reel, a drive mechanism which is effectively fixed in position and engages a portion of the belt running between the first roller and a second roller, and a slipping brake which resists rotation of one of the rollers by the belt; said drive mechanism operating to drive the belt in a direction which initially shortens the length of belt running between the mechanism and the braked roller so that the member is moved towards the cartridge to insert the first roller through the opening and establish the driving connection after which further movement of the member ceases and the traction exerted by the mechanism on the belt thereafter overcomes the frictional resistance of the brake to drive the belt between the two rollers and transmit rotational drive to the reel via the driving connection.

2. Apparatus as claimed in Claim 1, in which a spring urges the member away from the cartridge opening with a force less than the braking force exerted on the braked roller.

3. Apparatus as claimed in Claim 1, in which the drive mechanism is a reversible motor for driving the belt in opposite directions to insert and withdraw the first roller from the cartridge opening, respectively.

4. Apparatus as claimed in Claim 1, Claim 2 or Claim 3, in which the two rollers are mounted at opposite ends, respectively, of the member which is reciprocable towards and away from the position of the coil.

5. Apparatus as claimed in Claim 4, in which the belt comprises an elongated end-less loop extending between rollers of which the second roller is braked, the driving connection is established by an arcuate portion of the belt travelling around the first roller and pressed by it against the coil to rotate the reel, and the drive mechanism comprises a motor-driven drive pulley which is axially fixed and engages one run of the belt between the two rollers.

6. Apparatus as claimed in Claim 1,

of the film coil, the electrical supply to the motor 17 is connected to drive the motor so that the belt travels in the direction of the arrow. The traction of the belt is sufficient to overcome the tension of the spring 30 which exerts a lesser force than the braking force exerted on the roller 16 by the brake 34. The belt 15 does not slip on the drive pulley 31 or either of the rollers 9, 16, so that the shortening of the section of the belt extending between the drive pulley 31 and the roller 16 moves the member 8 together with both rollers 9 and 16 bodily towards the right of the Figure.

The roller 9, or rather the belt 15 passing around it, is brought into contact with the outer convolution of the strip coil 4 and prevents further rightward movement of the member 8. The traction exerted by the drive pulley 31 is greater than the braking force applied to the roller 16 by the slipping brake 34 so that the drive belt 15 is now rotated against the resistance of the brake 34. The movement of the drive belt is transmitted to the outer convolution of the film coil 4 causing its end-portion to travel around the guiding path formed inside the cartridge and which leads to the outlet opening 6.

When the end-portion of the strip is seen emerging from the opening 6, the motor 17 is either de-energised or reversed, and the member 8 returns to its left-hand rest position under the influence of the spring 30 assisted, if necessary, by the reverse drive applied to the motor 17. The movement of the member 8 to its rest position automatically disengages the rotational drive to the film coil 4 while extracting the roller 9 from the cartridge.

It will be appreciated that the movement of the member 8 towards the right in Figure 3 is resisted only by the spring 30. However, once abutment of the belt on the roller 9 against the film coil 4 occurs, the roller 9 is held against the film coil 4 with a relatively greater force determined by the braking force on the roller 16.

It will be appreciated also that the spring 30 could be omitted if desired, and the reversing switch 35 used as the sole means for extracting the roller 9 from the opening in the cartridge. Alternatively, the motor 17 may be simply de-energised when extraction is required and this stops further rotation of the belt 15 as well as allowing the spring 30 to take charge and return the member 8 to its rest position.

The invention is not limited to use with projectors. It may equally well be applied to certain film cameras, sound reproduction apparatus such as tape-recorders and also certain microfilm instruments. Instead of a special motor 17 being provided for driving the belt 15, it will be appreciated that the

drive mechanism for the belt 15 may comprise a releasable driving connection running off a main driving motor of the apparatus. A clutch mechanism may be introduced to provide the release facility when the member 8 is to be retracted from the cartridge. The member 8 may also be arranged to pivot, instead of to reciprocate, if desired.

WHAT WE CLAIM IS:—

1. Apparatus having a mount for a cartridge containing a reel rotatable about its axis and on which a length of strip material is coiled, a belt-driven first roller attached to a member which is movable to insert the roller through an opening in the cartridge and to move the roller in the direction of the reel axis until a direct driving connection is established which rotates the coil and reel, a drive mechanism which is effectively fixed in position and engages a portion of the belt running between the first roller and a second roller, and a slipping brake which resists rotation of one of the rollers by the belt; said drive mechanism operating to drive the belt in a direction which initially shortens the length of belt running between the mechanism and the braked roller so that the member is moved towards the cartridge to insert the first roller through the opening and establish the driving connection after which further movement of the member ceases and the traction exerted by the mechanism on the belt thereafter overcomes the frictional resistance of the brake to drive the belt between the two rollers and transmit rotational drive to the reel *via* the driving connection.

2. Apparatus as claimed in Claim 1, in which a spring urges the member away from the cartridge opening with a force less than the braking force exerted on the braked roller.

3. Apparatus as claimed in Claim 1, in which the drive mechanism is a reversible motor for driving the belt in opposite directions to insert and withdraw the first roller from the cartridge opening, respectively.

4. Apparatus as claimed in Claim 1, Claim 2 or Claim 3, in which the two rollers are mounted at opposite ends, respectively, of the member which is reciprocable towards and away from the position of the coil.

5. Apparatus as claimed in Claim 4, in which the belt comprises an elongated endless loop extending between rollers of which the second roller is braked, the driving connection is established by an arcuate portion of the belt travelling around the first roller and pressed by it against the coil to rotate the reel, and the drive mechanism comprises a motor-driven drive pulley which is axially fixed and engages one run of the belt between the two rollers.

6. Apparatus as claimed in Claim 1,



arranged and adapted to operate substantially
as described with reference to the accom-
panying drawings.

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Agents for the Applicants.

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