United States Patent

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[33] Great Britain
[31] 31670/68 and 31673/68

[54] FILM MOUNTING AND DRIVING APPARATUS
6 Claims, 9 Drawing Figs.

[52] U.S. Cl. 242/200
[51] Int. Cl. G03b 1/04, G11b 15/32, G11b 23/04
[50] Field of Search 242/181-186, 200-204, 67.4, 68.3

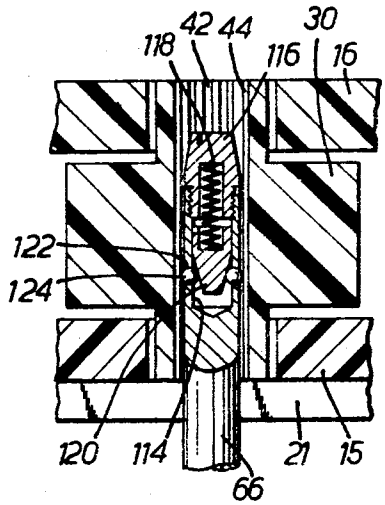
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ABSTRACT: Apparatus for mounting film strip, such as microfilm strip, and for driving the film past a reading or viewing position, is disclosed in which the film is mounted on one spool in a cassette which also supports a takeup spool. The cassette, which is removable from the driving apparatus, is positively located by spigot means so that each spool engages a respective spindle of the apparatus, there being radial play between each spool and the cassette. Different forms of the driving means for the spindles are disclosed, each driving means enabling either of the spindles to be driven. Means are also disclosed which locate the spools in positive driving engagement with the spindles but enable the cassette to be placed in position on the driving apparatus without the necessity for angularly aligning the spools with the spindles.



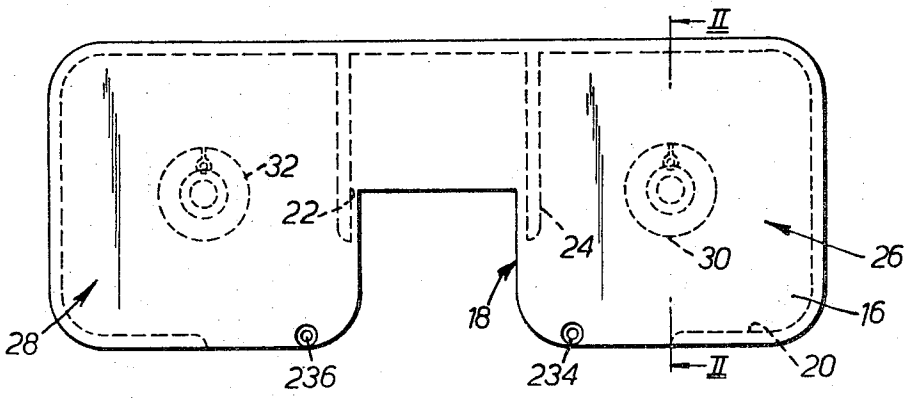


FIG. 1.

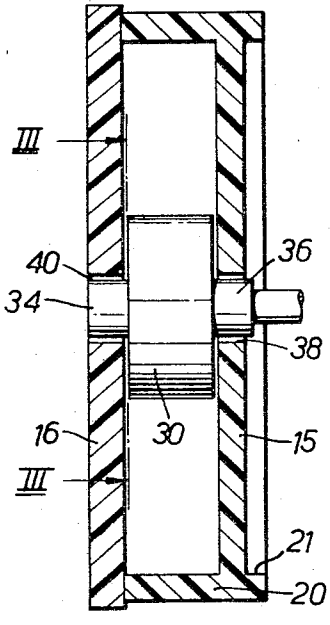


FIG. 2.

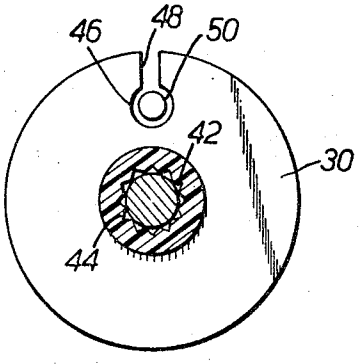


FIG. 3.

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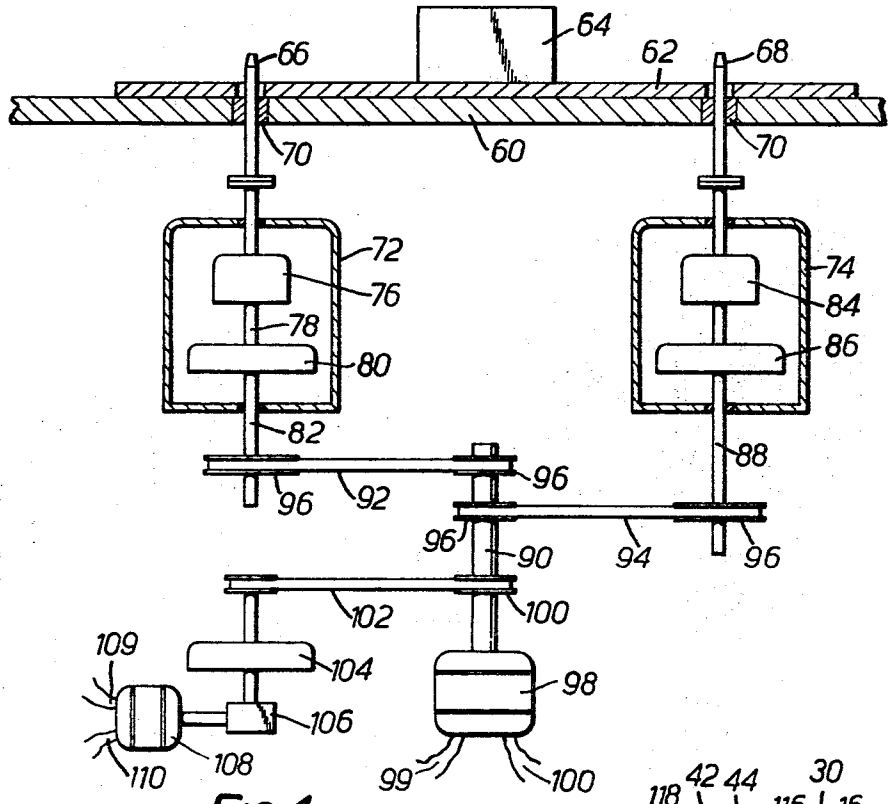


FIG.4.

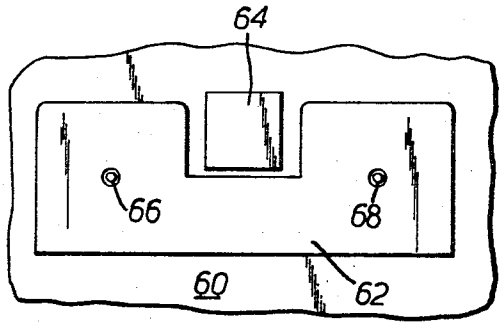


FIG.5.

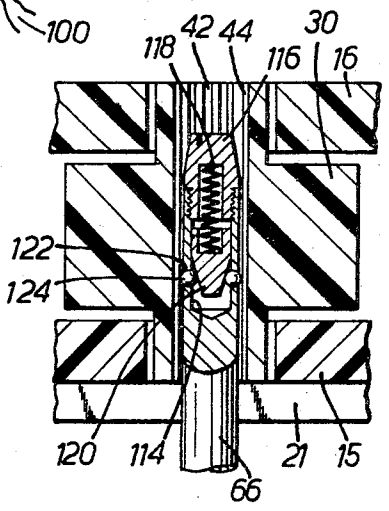


FIG.6.

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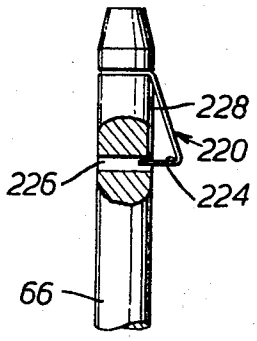


FIG. 7.

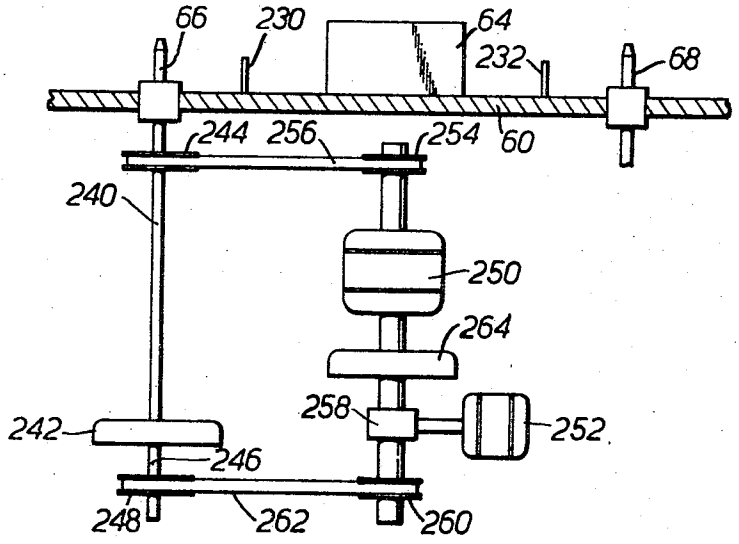


FIG. 8.

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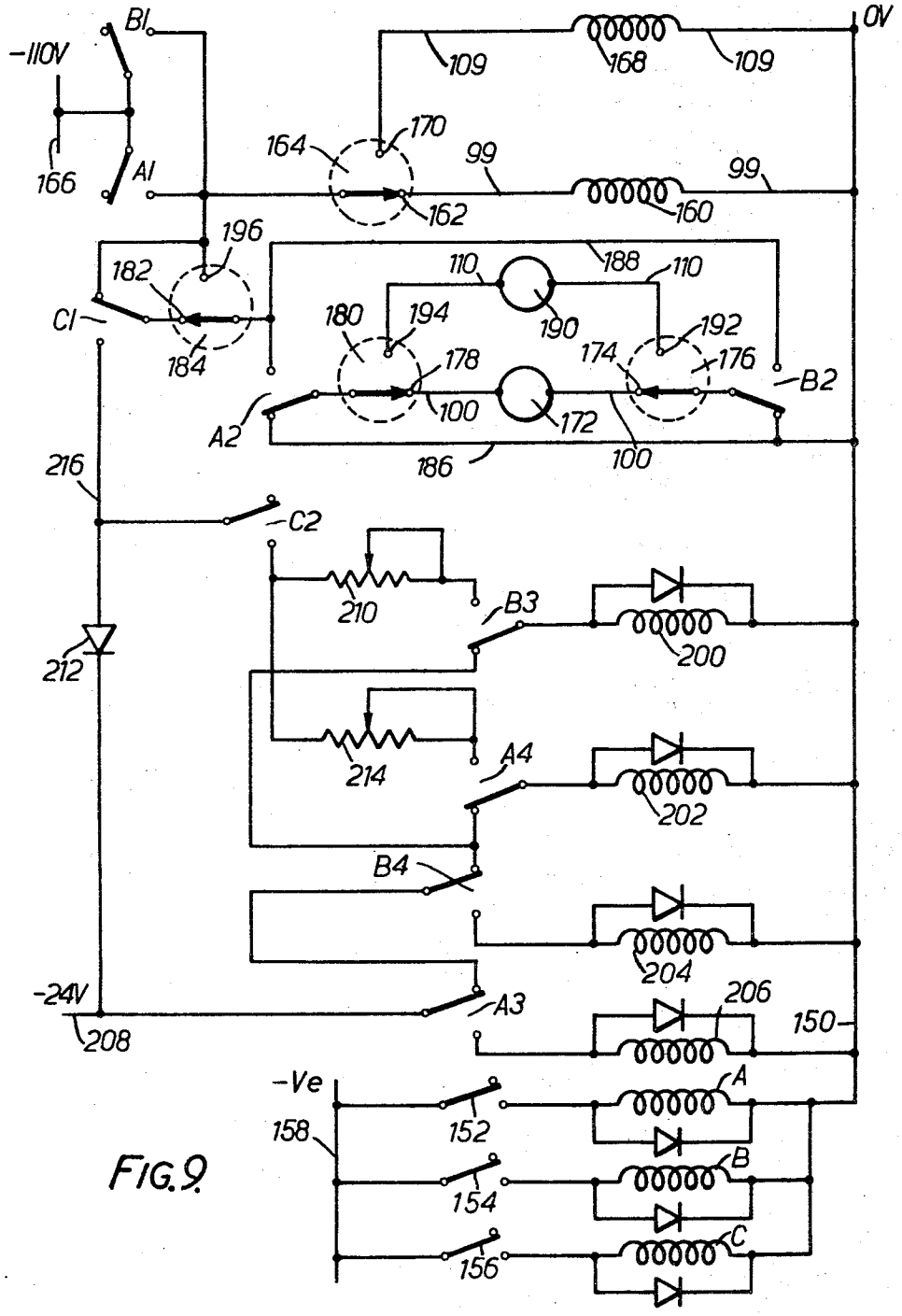


FIG. 9

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FILM MOUNTING AND DRIVING APPARATUS

BRIEF SUMMARY OF THE INVENTION

The invention relates to film-driving and -mounting apparatus; the term "film" includes microfilm strip and other elongated flexible media.

According to the invention, there is provided film-driving apparatus, comprising first and second rotatable means, first and second film spool means, means respectively drivingly connecting the first and second rotatable means to the first and second spool means, driving means operatively arranged to drive a selected one of the two rotatable means and thereby to drive the corresponding one of the spool means so as to transfer film to that spool means from the other of the spool means, and braking means selectively operative to apply light braking to the said other spool means so as to maintain the bight of film between the spool means in controlled tension.

According to the invention, there is also provided film-driving apparatus, comprising, first and second rotatable means, first and second film spools, means respectively drivingly connecting the first and second rotatable means to the first and second spools, a motive power source, first and second clutch means each having an input and output, means drivingly connecting the output of each clutch means to a respective one of the rotatable means, means drivingly connecting the power source to the inputs of the two clutch means, first braking means mounted for selectively braking the rotation of the first rotatable means, second braking means mounted for selectively braking rotation of the second rotatable means, and control means selectively operative to engage a selected one of the two clutch means, whereby to transmit the drive from the motive power source to the rotatable means connected to that clutch means, and to actuate the braking means of the other rotatable means, whereby to cause light braking of the other rotatable means so as to maintain the bight of film between the spools in controlled tension.

According to the invention there is further provided film-mounting apparatus, comprising a base, a pair of driving spindles rotatably mounted on the base for rotation about parallel axes separated by a predetermined spacing, a film cassette, two film spools, locating means on the base for positively locating the cassette relative to the spindle axes, means respectively rotatably mounting the spools in the cassette for rotation about parallel axes and permitting limited movement of the spools in directions transverse to the axes, the nominal spacing between the spool axes and the range of limited movement thereof being such that the two spindles respectively engage the two spools, and coupling means for coupling each spool to the respective one of the spindles.

According to the invention, there is still further provided film-driving apparatus, comprising a base, a spindle mounted on the base for rotation relative thereto, a motive power source, means operative to couple the motive power source to the spindle, a film spool defining a bore for receiving the spindle, spring-biased means mounted on one of the spindle and spool and biased in a direction which is transverse to the axis of rotation of the spindle and towards the other of the spindle and spool, and means defining a recess in the other of the spindle and spool in which recess the spring means is recieved to drivingly couple the spindle and spool when they are angularly aligned.

According to the invention, there is yet further provided film-driving apparatus, comprising rotatable means, a film spool, means drivingly connecting the rotatable means and the film spool, a first driving motor, first driving means drivingly connecting the first driving motor and the rotatable means, a second driving motor, clutch means, second driving means including the clutch means and drivingly connecting the second driving motor to the rotatable means through the first driving motor and the first driving means, and control means for selectively energizing the driving motors and controlling the engagement of the clutch means whereby the first driving motor is energized, and the clutch means disengaged, to drive the rotatable means through the first driving means, and the second driving motor is energized with the clutch means engaged and the first driving motor unenergised to drive the rotatable means through the second driving means, the first driving motor, and the first driving means.

BRIEF DESCRIPTION OF THE DRAWINGS

Apparatus embodying the invention, for mounting and driving microfilm, will now be described, by the way of example, with reference to the accompanying drawings in which:

FIG. 1 is a plan view of one form of a microfilm cassette embodying the invention;

FIG. 2 is a section on the line II–II of FIG. 1; III–FIG. 3 is a section on the line III–III of FIG. 1;

FIG. 4 is a diagrammatic side elevation, partly in section, of one form of driving apparatus embodying the invention;

FIG. 5 is a plan view of the apparatus of FIG. 4;

FIG. 6 is a scrap sectional side elevation showing part of the cassette of FIGS. 1 to 3 located on the driving apparatus of FIGS. 4 and 5;

FIG. 7 is a scrap section of a modified form of spindle for use with driving apparatus embodying the invention;

FIG. 8 is a diagrammatic side elevation, partly in section, corresponding to FIG. 4, of a modified form of driving apparatus embodying the invention; and

FIG. 9 is a circuit diagram of the driving apparatus of FIGS. 4 and 5.

DETAILED DESCRIPTION

The apparatus to be described is for mounting a microfilm strip, comprising a plurality of longitudinally spaced frames, and for driving the microfilm strip past a viewing or reading location. As each frame comes into position at the reading or viewing location, a magnified image of the frame is projected onto a viewing screen for the operator's attention; instead, or in addition, an image of the frame is projected onto a photographic film for providing an enlarged visual record of the frame.

The cassette of FIG. 1 to 3 is for supporting a roll of microfilm and enables it to be mounted on the driving apparatus to be described. The cassette is made from a moulded plastics material, preferably transparent, and comprises a base **15** and a lid **16**. As shown in FIG. 1, both the lid and the base are generally oblong in plan view but have a reentrant portion **18**. As shown dotted in FIG. 1, the base **15** has an integral sidewall **20** which extends around the greater part of the periphery of the base **15** and supports the lid **16**. The wall **20**, besides extending upwardly to support the lid **16**, also extends downwardly from the base **15** so as to provide a lip **21** (FIG. 2) extending around the greater of the underface of the cassette. Subsidiary wall portions **22** and **24** are also integrally moulded with the base **15** so that the cassette is partially divided into two chambers **26** and **28** each of which contains a respective microfilm spool **30, 32**.

Each spool **30, 32**, is cylindrical in shape and has upper and lower shaft portions **34, 36** (FIG. 2) which extend into respective holes **38, 40**, in the base **15** and the lid **16**. Each shaft portion **34, 36** has a diameter such as to provide substantial radial clearance between it and its respective hole in the cassette. A through bore **42** extends through the two shaft portions and the cylindrical center of each spool, and the wall of this is provided with axial serrations **44** (FIG. 3). Each spool also has an eccentrically positioned, axially directed, through bore **46** (FIG. 3) which merges into an axially directed slot **48** in the periphery of the spool. A small solid cylinder **50** is located within the bore **46** with its axis parallel to the axis of the spool. The cylinder **50** has a diameter which is substantially less than the diameter of the bore **46** but is greater than the width of the slot **48**. The cylinder **50** is mounted in the bore **46** by means which allows it to move freely in a radial direction but locates it positively in an axial direction.

FIGS. 4 and 5 show driving apparatus suitable for receiving the cassette of FIGS. 1 to 3. The driving apparatus comprises a fixed base plate 60 on which is mounted a raised portion 62 which acts as a spigot and whose periphery is accurately sized to match the internal periphery of the lip 21 provided by the downwardly extending portion of the wall 20 (see FIG. 2) of the cassette. Also supported on the platform 60 is a viewing assembly 64 together with a pair of spindles 66 and 68 which can rotate, relative to the base 60, in bearings 70. From each spindle, a respective shaft, rigidly coupled thereto, extends downwardly into a respective clutch and brake assembly 72, 74.

The clutch and brake assembly 72 comprises an electrically energizable magnetic brake 76 which, when electrically energized in a manner to be explained, brakes rotation of the spindle 66. From the brake assembly 76, a shaft 78, which is a mechanical extension of the spindle 66, extends downwardly to an electrically energizable magnetic clutch 80 and form the output shaft thereof. The clutch 80 has an input shaft 82 and, when electrically energized in a manner to be explained, the clutch 80 rigidly connects the shaft 78 to the shaft 82. The clutch and brake assembly 74 is similar in construction to the assembly 72 and contains an electrically energizable magnetic brake 84 and an electrically energizable magnetic clutch 86, the latter having an input shaft 88. As in the case of the unit 72, electrical energization of the brake 84 brakes the rotation of the spindle 68 and electrical energization of the clutch 86 mechanically interconnects the shaft 88 with the spindle 68. The brake units 76 and 84 may conveniently be commercially available proprietary items.

The shafts 82 and 88 are coupled to a main shaft 90 by means of belts 92 and 94 and pulleys 96, and the shaft 90 is connected to be driven by an electrical DC shunt motor 98 having field connections 99 and armature connections 100.

The shaft 90 also carries a further pulley 101 which is linked by a belt 102 through a further electrically energizable magnetic clutch unit 104 to a high ratio gearbox 106 and a very slow speed electric motor 108, the latter having field connections 109 and armature connections 110.

The various parts of the driving mechanism may be supported on a rigid plate or other support which is attached to the base 60 and has been omitted from the FIG. 4 to aid clarity.

In use, the cassette is placed on top of the base 60 and is positively located on the base 60 by means of the spigot 62 (FIG. 4) which locates in the peripheral lip 21 of the cassette (FIG. 2). The spigot 62 is so positioned on the base 60 that the spindles 66 and 68, which respectively protrude into the bores 42 of the spools 30 and 32, locate the spools so that their upper and lower shaft portions 34, 36, are substantially centrally positioned within the respective holes in the base and the lid of the cassette. The substantial radial clearance between each shaft portion 34, 36 and the corresponding hole 38, 40 in the cassette obviates the necessity for high accuracy in the construction of the cassette and yet at the same time ensures free running of the spools.

FIG. 6 shows how the spindle 66 locates in the central bore 42 through the spool 30. As shown in FIG. 6 the upper end of the spindle 66 has an axial bore 114 whose open top is closed by a screw-in plug 116. The latter is counterbored to house a compression spring 118 which extends downwardly into the bore and downwardly biases a frustoconically shaped control member 120 which is slidable within the bore. A plurality of circumferentially spaced holes 122 extend through the wall of the bore 114 and provide seats in which are respectively located small balls 124. The relative diameters of the holes 122 and the balls 124 are such that the balls cannot pass completely through the holes 122 but can partially extend therethrough and are urged into such position by the downwardly biased control member 120. The spring biased control member 120 presses the balls 124 partially through the holes 122 in the spindle wall so that they engage in the serrations 44 in the bore 42 and in this way drivingly lock the spool to the spindle.

The spindle 68 is formed in a similar formation to spindle 66 and locates in the spool 32 in a similar way.

The spring biasing of the control members 120 of the two spindles enables the cassette to be pressed into position on the spindles irrespective of the angular positioning of the serrations in the spool bores relative to the balls in the spindles. Thus, if the relative angular position of the serrations 44 in a spool is such that their crests engage the balls 124, the latter are pressed inwardly, relative to the spindle, but spring outward, to locate in respective troughs of the serrations, as soon as any relative rotation takes place between the spindle and the spool.

In use, microfilm (not shown), which is wound on one of the spools 30, 32, is threaded therefrom, past the viewing assembly 64, and onto the other spool. On each spool, the respective end of the microfilm is threaded through the slot 48 (FIG. 3) and into the bore 46. In use, in a manner now to be explained in detail with reference to the circuit diagram of FIG. 9, one or other of the spindles 66, 68 is driven by the motor 98 (FIG. 4) to draw the microfilm in the appropriate direction past the viewing assembly 64. Any tension on the end of microfilm, tending to withdraw it from the bore 46 (FIG. 3), is resisted by the trapping action of the cylinder 50 which traps the film against one or other of the edges of the slot 48.

As each film frame moves into position in front of the viewing assembly 64, its image is optically presented, by a suitable optical system on to a viewing screen (not shown) and/or is recorded such as, for example, by photographic means. The viewing assembly, and associated optical and photographic equipment, may be provided by any suitable means such as would be obvious to a person skilled in the art. The circuitry of the driving apparatus may be controlled automatically, so as to locate any particular microfilm frame in front of the viewing assembly, by apparatus and circuitry such as, for example, is disclosed in copending Pat. Application Ser. No. 767,608 filed on Oct. 15, 1968, in the name of Douglas Leonard Steggall, assigned to the same assignees as this application.

The circuit (FIG. 9) for controlling the motors 98 and 108, and the drive to the spindles 66 and 68, is controlled by three relay coils A, B and C which are connected in parallel to a O-volt supply line 150 and are respectively energized through switches 152, 154 and 156 which connect to a negative supply line 158. Each relay coil is shunted by a respective diode. Each relay coil controls several sets of contacts which are indicated in the circuit diagram by the appropriate letter A, B or C followed by a serial number. The circuit diagram shows the contact sets in the positions assumed when none of the relay coils is energized.

The motor 98 has a field winding 160 which is connected directly to the O-volt line 150 and, through the contact 162 of a manually operable switch 164 and through contact sets A1 and B1, to a −110 v. line 166. The motor 108 has a field winding 168 which, when the switch 164 is set to connect with a contact 170 instead of the contact 162, is brought into circuit instead of winding 160. Motor 98 has an armature 172 which is connected to the O-volt line 150 through a contact 174 of a manually operable switch 176 and through the normally closed contacts of the contact set B2. The other side of the armature 172 is connected to the line 166 through a contact 178 of a manually operable switch 180, the normally open contacts of the contact set A2, a contact 182 of a manually operable switch 184, the normally open contacts of the contact set C1 and the normally open contacts of the contact sets A1 and B1. A line 186 interconnects the normally closed contacts of the contact sets A2 and B2 and a line 188 connects the normally open contacts of these two contact sets. The motor 108 has an armature 190 which is brought into circuit, instead of the armature 172, when the switches 176 and 180 are set to engage contacts 192 and 194. The switch 184 has a second contact 196 which, when engaged by the switch instead of the contact 182, bypasses the contact set C1.

The brake units 76 and 84 have respective energizing coils 200 and 202 which apply the respective brakes when ener-

gized. Similarly, the clutch assemblies **80** and **86** have energizing coils **204** and **206** which engage the respective clutches when energized. Each of the coils **200** and **206** is shunted by a respective diode. Each of the coils **200** and **202** has two possible energizing paths. Thus, the first path for coil **200** leads to a −24 v. line **208** through the normally open contacts of contact set B3, a preset resistor **210**, the normally open contacts of contact set C2 and diode **21**. The second path is through the normally closed contacts of contact set B3 and through normally closed contacts of contact sets B4 and A3. The coil **202** has a first energizing path through the normally open contacts of contact set A4, a preset resistor **214**, and the normally open contacts of contact set C2. The second energizing path for coil **202** leads through the normally closed contacts of contact set A4 and thence to the normally closed contacts of contact sets B4 and A3. Coil **204** is connected to the − 24 v. line **208** through the normally open contacts of contact set B4 and the normally closed contacts of contact set A3. The coil **206** is connected to the − 24 v. line through the normally open contacts of contact set A3.

A line **216** connects the normally open contacts of contact set C1 to the − 24 v. line **208** through the diode **212**.

In operation, one or other of the switches **152** and **154** is energized according to the desired direction of movement of the microfilm. If switch **152** is closed, coil A is energized and changes over the contacts of contact sets A1, A2, A3, and A4. Assuming that switches **164**, **176**, **178**, and **184** are in positions illustrated, the field winding **160** of motor **98** is connected to the 31 110 v. line **166** through the contact set A1 and is thus energized. At the same time, the armature **172** is connected to the − 110 v. line through the normally closed contact of contact set B2, the now-closed contacts of contact set A2, the normally closed contacts of contact set C1, and the now-closed contacts of contact set A1. The motor **98** therefore commences to run in the forward direction.

At the same time, the coil **206** is energized through the now-closed contacts of contact set A3. The coils **200**, **202**, and **204** remain unenergized. Therefore, the clutch assembly **80** is engaged, and the clutch assembly **86** is held disengaged; both brake **76** and **84** are in the released state. Motor **98** thus drives the spindle **66** at high speed so as to draw the film in the forward direction past the viewing assembly **64**.

When the particular desired film frame is approaching assembly **64**, switch **156** is closed to reduce the film speed as will now be described. Closure of switch **156** may be done manually, or may be done automatically as disclosed in the above-mentioned copending Application in the name of Douglas Leonard Steggall, and assigned to the same Assignees as this Application.

When switch **156** is closed (switch **152** remaining closed), contact set C1 changes over so that the armature **172** is now fed from the − 24 v. line **208** instead of from the − 110 v. **166**. Spindle **66** therefore continues to rotate in the same direction but at a slower speed. Closure of switch **156** also changes over contact set C2. Therefore, coil **202** (controlling the brake **84**) becomes energized through the closed contacts of contact set A4, the resistor **214**, and the now-closed contacts of contact set C2. Resistor **214** limits the current flowing through the coil **202** so that the brake **84** is applied only lightly and thus does not prevent film movement but provides sufficient braking on spindle **68** to ensure that the bight of microfilm between the spools is kept in controlled tension.

When the desired film frame has been located, switches **152** and **156** are released (this may be carried out automatically as disclosed in the above-mentioned copending Application in the name of Douglas Leonard Steggall). Coils A and C are therefore deenergized so as to cut off the supply to the field winding and armature of motor **98**. The two brake coils **200** and **202** are now fully energized through, respectively, the normally closed contacts of contact sets B3 and A4, and thence through the normally closed contacts B4 and A3.

If the microfilm is to be driven in the reverse direction, switch **154** is closed so as to change over the contact sets B1, B2, B3 and B4. Field winding **160** is therefore energized through the now-closed contacts of contact set B1, and the armature **172** is energized through line **186**, the normally closed contacts of contact set A2, the now-closed contacts of contact set B2, and through line **188**. The armature current is thus the reverse of that flowing previously, and motor **98** therefore runs in the opposite direction. At the same time, coil **204** is energized through the now-closed contacts of contact set B4 so as to engage the clutch **86**. Clutch **80** remains disengaged and both brake **76** and **84** are held in the released state. Spindle **68** is therefore driven rapidly in the reverse direction and draws the microfilm past the viewing assembly. If switch **156** is closed, it will be seen that a circuit is established for the braking coil **200** through the resistor **210** so as to provide light braking on the spindle **66** by means of the brake **76**, thus maintaining the bight of microfilm in controlled tension.

If the switches **164**, **176**, **178** and **184** (which may be ganged together) are changed over so as to connect contacts **170**, **192**, **194** and **196** in circuit, it will be seen that the field winding **168** and the armature **190** of the motor **108** are energized, the direction of energization, and thus the direction of rotation of the motor, being determined by which of the switches **152** and **154** is closed at this time. Motor **108** thus drives the microfilm through belt **102** and pulley **100** at a very slow speed. Motor **108** may thus be used to drive the microfilm very slowly passed the viewing assembly for searching purposes.

The diodes shunting the relay coils A, B and C and the coils **200**, **202**, **204** and **206** ensure rapid deenergization of the coils.

FIG. 7 shows a side elevation of modified form of the upper end of the spindle **66**. Instead of having the bore **114** (FIG. 6) with the spring-biased control member **120** therein, the spindle **66** of FIG. 7 has a spring wire member **220** which, at one end, is wrapped round the spindle. The wire member **220** extends downwards from the trapped end and inclines outwardly from the spindle to a sharp bend **224** whence it extends radially inwardly to the spindle and enters diametral bore **226**. The spindle **68** may take the same form.

When the cassette of FIGS. 1 to 3 is placed in position on the driving apparatus of FIGS. 4 and 5, the through bores **42** of the two spools **30** and **32** engage the outwardly inclined portion of the wire members **220** on the spindles **66** and **68** and force them inwardly so that the radially directed portions of the wire members move inwardly into the bores **226** of the spindles. The outwardly inclined portions of the wire members **220** are eventually forced into positions in which they lie along the respective spindles so as to engage one of the serrations **44** and in this way drivingly couple the spools to the spindles. If desired, the serrations **44** can be dispensed with, and replaced with single axial keyways through the bores **42** for engagement with the wire members **220**. It will be seen that, as with the spindle construction shown in FIG. 6, the spindle construction of FIG. 7 enables the cassette to be snapped into position onto the driving apparatus without there being any necessity for aligning the spools with the spindles; if the spools are initially misaligned, the wire members, **220** are forced into shallow troughs **228** (FIG. 8) whence they spring out into driving engagement with the bores **42** of the spools as soon as sufficient relative rotation has taken place.

FIG. 8 shows a modified form of driving apparatus embodying the invention. As in the case of the driving apparatus of FIGS. 4 and 5, the apparatus of FIG. 8 includes the base plate **60**, the viewing assembly **64**, and the spindles **66** and **68**. Instead of the spigot **62**, there are provided two fixed locating pins **230** and **232** which engage in appropriately positioned holes in the cassette, such as holes **234** and **236** (FIG. 1) and locate the cassette. The upper ends of the spindles **66** and **68** may be formed in the manner shown in FIG. 6 or in the manner shown in FIG. 7.

The driving mechanism for each of the spindles **66** and **68** of FIG. 8 is the same, and only that for spindle **66** will be described.

The driving mechanism comprises a shaft **240** which extends downwardly from the spindle **66** to an electrically energizable magnetic clutch **242** for which it forms the output shaft. The shaft **240** carries a pulley **244**. The clutch **242** has an input shaft **246** which carries a pulley **248**.

The driving mechanism for the spindle **66** includes two motors **250** and **252**. The output shaft of motor **250** carries a pulley **254** which is connected to pulley **244** by a belt **256**. The output shaft of motor **252** drives a reduction gear box **258**. The output shaft of the gear box **258** extends downwardly to carry a pulley **260** which is linked to the pulley **248** by a belt **262**, and extends upwardly to form the input shaft of an electrically energizable magnetic clutch **264**. The output shaft of the magnetic clutch **264** is rigidly connected to the shaft of the motor **250**.

In use, the spindle **66** is driven at high speed by electrically energizing the motor **250** and maintaining both magnetic clutches **242** and **264** unenergised and therefore disengaged. Motor **250** therefore drives the spindle **66** through pulley **254**, belt **256**, and pulley **244**. Rotation of the spindle **66** thus draws the microfilm rapidly passed the viewing assembly **64**.

When it is desired to reduce the speed of film transport, motor **250** is deenergized, and motor **252** and magnetic clutch **264** are energized. Spindle **66** now rotates at a slow speed, the drive being taken from the motor **252** through gear box **258**, clutch **264**, motor **250** (which is not energized and thus provides no motive power), pulley **254**, belt **256**, and pulley **244**.

If it is desired to move the microfilm at a very slow speed for searching purposes, then clutch **264** is deenergized, clutch **242** is energized, motor **250** is deenergized and motor **252** is energized. The drive now passes through gear box **258**, pulley **260**, belt **262**, pulley **248**, clutch **242**, and shaft **240**. The relative diameters of pulleys **260** and **248** provide the necessary speed reduction.

The driving mechanism of the spindle **68** operates in a similar fashion.

The various parts of the driving mechanisms may be supported on a rigid plate or other support attached to the base **60** and which has been omitted from FIG. **8** to aid clarity.

In order to provide light braking on the spindle which is not being directly driven by its driving mechanism at any time, the high speed motor therein can be electrically energized so as to provide light electrical braking to its spindle.

It will be appreciated that the embodiments described are merely exemplary of many forms the invention can take and it is intended to be limited only by the spirit and scope of the appended claims.

I claim:

1. Film-driving apparatus, comprising:
first and second rotatable means;
first and second film spool means;
means respectively drivingly connecting the first and second rotatable means to the first and second spool means;
driving means operatively arranged to drive a selected one of the two rotatable means and thereby to drive the corresponding one of the spool means so as to transfer film to that spool means from the other spool means;
braking means selectively operative to apply light braking to the said other spool means so as to maintain the bight of film between the spool means in controlled tension;
speed control means connected to the driving means and selectively operative to reduce the speed thereof; and
means operatively interconnecting the braking means with the speed control means so that the said light braking means is applied only when the speed of the driving means has been reduced.

2. Film-driving apparatus, comprising:
first and second rotatable means;
first and second film spools;
means respectively drivingly connecting the first and second rotatable means to the first and second spools;
a motive power source;
first and second clutch means each having an input and an output;
means drivingly connecting the output of each clutch means to a respective one of the rotatable means;
means drivingly connecting the power source to the inputs of the two clutch means;
first braking means mounted for selectively braking the rotation of the first rotatable means;
second braking means mounted for selectively braking rotation of the second rotatable means;
control means selectively operative to engage a selected one of the two clutch means, whereby to transmit the drive from the motive power source to the rotatable means connected to that clutch means, and to actuate the braking means of the other rotatable means, whereby to cause light braking of the other rotatable means so as to maintain the bight of film between the spools in controlled tension; and
the control means including speed reduction means operative, when activated, to reduce the speed of the motive power source whereby the rotatable means drivingly connected to the said selected one of the two clutch means is driven at a reduced speed, and interlock means operative to actuate the braking means of the other rotatable means only when the speed reduction means is operative.

3. Film-mounting apparatus, comprising:
a base;
a pair of driving spindles rotatably mounted on the base for rotation about parallel axes separated by a predetermined spacing;
a film cassette;
two film spools;
locating means on the base for positively locating the cassette relative to the spindle axes;
means respectively rotatably mounting the spools in the cassette for rotation about parallel axes and permitting limited movement of the spools in directions transverse to the axes, the nominal spacing between the spool axes and the range of limited movement thereof being such that the two spindles respectively engage the two spools;
coupling means for coupling each spool to the respective one of the spindles;
a motive power source;
first and second clutch means each having an input and an output;
means drivingly connecting the output of each clutch means to a respective one of the spindles;
means drivingly connecting the power source to the inputs of the two clutch means;
first braking means mounted for selectively braking the rotation of one of the spindles;
second braking means mounted for selectively braking rotation of the other of the spindles;
control means selectively operative to engage a selected one of the two clutch means, whereby to transmit the drive from the motive power source to the spindle connected to that clutch means, and to actuate the braking means of the other spindle, whereby to cause light braking of the other spindle so as to maintain the bight of film between the spools in controlled tension; and
the control means including speed reduction means operative, when actuated, to reduce the speed of the motive power source whereby the spindle drivingly coupled to the said selected one of the two clutch means is driven at a reduced speed and interlock means operative to actuate the braking means of the other spindle only when the speed reduction means is operative.

4. Film-driving apparatus, comprising:
a base;
a spindle mounted on the base for rotation relative thereto;
a motive power source;
means operative to couple the motive power source to the spindle;
a film spool defining a bore for receiving the spindle;
means defining a recess in the spool bore;

the spindle having an axial bore which meets an aperture defined in and extending through the wall of the spindle bore; and

the spring-biased means comprising a first member movable radially of the spindle bore and extending partially through the aperture and a second member spring-biased to move axially of the bore, the two members presenting mutually inclined contacting surfaces whereby the axial movement of the second member biases the first member radially outward through the aperture and into the said recess to drivingly couple the spindle and spool when they are angularly aligned.

5. Film-driving apparatus, comprising:

rotatable means;

a film spool;

means drivingly connecting the rotatable means and the film spool;

a first driving motor;

first driving means drivingly connecting the first driving motor and the rotatable means;

a second driving motor;

clutch means;

second driving means including the clutch means and drivingly connecting the second driving motor to the rotatable means through the first driving motor and the first driving means;

control means for selectively energizing the driving motors and controlling the engagement of the clutch means whereby the first driving motor is energized, and the clutch means disengaged, to drive the rotatable means through the first driving means, and the second driving motor is energized with the clutch means engaged and the first driving motor unenergised to drive the rotatable means through the second driving means, the first driving motor, and the first driving means; and

speed reduction means connected between the second driving motor and the second driving means.

6. Apparatus according to claim 5, including:

further clutch means;

further speed reduction means;

third driving means including the further clutch means and the further speed reduction means and drivingly connecting the second driving motor to the rotatable means through the two speed reduction means and the further clutch means; and

further control means operative to energize the second driving motor and to engage the further clutch means, with the first driving motor unenergised and the first-mentioned clutch means unengaged, whereby to drive the rotatable means through the two speed reductions means and the further clutch means.