

PATENT SPECIFICATION

(11)

1 369 492

09

1 3 9 492

- (21) Application No. 46152/71 (22) Filed 4 Oct. 1971
 (31) Convention Application No. P 20 48 413-3 (32) Filed 2 Oct. 1970 in
 (33) Germany (DT)
 (44) Complete Specification published 9 Oct. 1974
 (51) International Classification B65H 17/22//17/44 27/00
 (52) Index at acceptance
 B8R 8D1A1 8D5 8G1E 8G1X 8G2B 8G3E 8P



(54) IMPROVEMENTS IN AND RELATING TO APPARATUS FOR INTERMITTENTLY ADVANCING STRIP MATERIAL

- (71) We, AGFA-GEVAERT AKTIEN-GESELLSCHAFT, a body corporate recognised under German Law, of Leverkusen, Germany, 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:—
- 10 The invention relates to apparatus for intermittently advancing strip material and especially to such apparatus for use in cutting pictures from a film strip.
- 15 Previously proposed forms of cutting apparatus have comprised driving means including a drive roller for driving the picture strip, a resiliently supported and freely rotatable counter-pressure roller, braking means (controlled by a scanning means which scans scannable marks spatially associated with dividing bars between pictures) having a braking surface for braking the picture strip, and a cutting blade which is arranged to be actuated after the film strip containing the pictures is braked. In such apparatus, however, as the operating speed increases it becomes more difficult to bring the paper strip to a halt exactly at the prescribed cutting point. In one previously proposed form of apparatus, the braking operation is in fact effected by the stopping or reversing of a drive motor, in which case the rotor of the motor, any gearing which might be provided, and the drive roller, must all be stopped in a very short time. Thus, for a braking operation of this kind, a considerable amount of kinetic energy has to be absorbed by friction. The running-on distance after the braking command is given is therefore dependent to a great extent on the friction value of the various braking surfaces. As the friction value is subject to fluctuations, however, a considerable spread in the running-on distance is unavoidable.
- The invention provides apparatus for intermittently advancing strip material which comprises a first roller provided with drive means and comprising two co-axial parts mounted on a spindle, each of which parts is arranged, in operation, to bear against a different one of the two marginal portions of the strip, a second roller which is freely rotatable and co-operates with the first roller, the second roller being movable away from the first roller against the action of a restoring force, a braking member arranged, in operation, to bear against the strip material on the same side as the first roller and to move the second roller away from the first roller and the strip material out of contact with the first roller, and a bifurcated plunger which is arranged between the said two parts of the first roller so as to be guided by the said spindle and is movable so as to operate the braking member.
- In the apparatus of the invention, the picture strip is moved away from the first roller so that continued rotation of the first roller has no effect on the accuracy of braking the strip. For this reason, braking of the first roller is not necessary so that greater uniformity in braking the strip can be obtained. At the same time as the strip is moved away from the first roller, braking commences as the braking surface presses the strip, preferably acting on the reverse side of the strip, against the second roller. The time of commencement and the force of the braking operation can be precisely defined so that the spread in the retarding sections is very small and may easily be compensated for by a correspondingly earlier or later emission of command signals for the braking operation.
- Apparatus for intermittently advancing strip material constructed in accordance with the invention will now be described, 90 by way of example, with reference to the accompanying drawings, in which:

[Price 25p]

Fig. 1 is a side view of the apparatus;

Fig. 2 is an end view of the apparatus shown in Fig. 1 viewed in the opposite direction to that indicated by the arrow 33 in Fig. 1; and

Fig. 3 is a side view of the apparatus as used in printing apparatus.

Referring to Fig. 1 of the accompanying drawings, a strip 1 has on its upper surface a series of pictures which are separated from one another by dividing bars. The pictures may, for example, have been exposed photographically onto an emulsion and developed. Marks, which can be scanned, are applied to the strip in association with the dividing bars between successive pictures. For example, graphite marks can be applied by a printing apparatus, and can be scanned by a device 2 either photo-electrically or according to the conductivity principle. There are a great number of known scanning devices suitable for this purpose, and they will not therefore be described in any greater detail.

The picture strip 1 is fed intermittently through the apparatus by a transport means 3, which is described in greater detail hereinafter, to a cutting point 4 at which a cutting blade 5, controlled by the scanning device 2, cuts through the picture strip at the prescribed point.

Referring to Fig. 1 and Fig. 2, the transport means 3 has an electric motor 6, which maintains a constant drive to a drive roller 7 by way of gearing and if necessary by way of other drive means, flat belts, for example, which are not shown. The drive roller 7 is rigidly supported in the machine housing which is also not shown. The drive roller 7 is coated on its periphery with a high-friction covering, of rubber, for example, the thickness of which is small in relation to the roller's diameter. Also, the roller 7 is divided so that it is formed substantially by two parallel disc-like sections 7a, 7b which fit on a common spindle 8.

As shown in Fig. 1, the drive roller 7 is in contact with a counter-pressure roller 9 which is situated vertically above the roller and is supported on a U-shaped support 10 which is pivotable about a fixed spindle 11. The support 10 is tensioned in an anti-clockwise direction by a spring 12, and the tension can be adjusted by means of an adjusting screw 13. The support 10 has an arm 14 which can be so rotated about a fixed spindle 17, by way of an eccentric 15 and a positioning lever 16, that the support 10 lifts the counter-pressure roller 9 away from the drive roller 7. The screws 18, which are provided with locking nuts, serve to adjust the size of the stroke which the pressure

roller 9 can execute in relation to the drive roller 7. The stroke of the pressure roller 9 is so determined that the support 10 rests against the stop screws 18 shortly before an electro-magnet 30 (which acts on the roller 9 to cause it to be lifted and which will be described hereinafter) reaches the end of its effective stroke.

A bifurcated plunger 19 is arranged between the two disc sections 7a and 7b of the drive roller 7 and engages around both sides of the spindle 8 of the drive roller 7. The two prongs of the plunger 19 are connected by a bridge 20 on which a spherical force-transmission surface or calotte 21 is arranged. The calotte 21 engages with a rocker 22 which is supported on the machine frame in the vicinity of the cutting edge of the blade 5. The rocker 22 is supported by means of leaf springs 23 in such a way that the rocker can rotate about a pair of mutually perpendicular axes lying in the plane of the strip 1, one axis being parallel to the direction of movement of the strip, but the rocker has practically no freedom of movement about the axis which is normal to both said axes. On the rocker 22 there is a support member 24 carrying a braking member 25. The braking member 25 is substantially cylindrical in shape and its axis runs parallel to the spindle 8. The member 25 is composed of a plastics material having a high resistance to abrasion and a high friction value, for example, a polyurethane of suitable hardness.

The lower portion of the plunger 19 which is outside the range of the drive roller 7 is guided, for example, in a sleeve 26 fixed to the apparatus, so that it is longitudinally movable. Engaging in a slot in the plunger 19 there is a pin 27 which is fitted onto an eccentric crank 28 which is rigidly connected to the shaft stub 29 of the rotary electro-magnet 30. The rotary magnet 30 is movably attached to a console 31 of the machine frame. A coupling spring 32, which is fixed at one end to the frame and at the other end to the crank 28, ensures that the armature of the rotary magnet together with the crank 28, when the magnet is currentless, does not run back under the influence of its return spring further than is absolutely necessary in order to disengage the plunger 19 and the braking surface 25 from the strip 1.

One method of operation of the apparatus described above is as follows:

At the beginning of operation, the pressure roller 9 is lifted away from the drive roller 7 by means of the lever 16. A strip 1 can then be fed to the cutting device 4 in the direction of the arrow 33, along a path under the scanning device 2 and between the rollers 7 and 9. The lever 16

is then returned to its initial position and the strip 1 is advanced by means of the drive roller 7. If after a certain travel time the scanning device 2 detects an image mark on the strip 1, the device delivers a command signal to actuate the magnet 30, whereupon the crank 28 rotates in a clockwise direction. The plunger 19 is thereby raised with considerable force, due to the limited distance between the magnet armature and the core produced by the coupling spring 32, and in turn the engagement surface 21 pushes the rocker 22 upwards. The result of this action is that the strip 1 is pressed against the pressure roller 9, and at the same time the roller 9 is lifted away from the drive roller 7. The roller 9 is lifted until the support 19 meets the screws 18. The strip 1 is thus disengaged from the drive roller 7, and the drive is interrupted immediately. At the same time, the strip 1 is braked because it is arranged between the braking member 25 which (having the full pressure force of the magnet which is acting with a very small gap in this position) is pushed against the counter-pressure roller 9 being raised as far as it will go. When the strip 1 is stopped, it is cut by the cutting device 4. The picture strip is protected from damage in spite of heavy braking since the braking surface 25 engages with the reverse side of the strip 1, and since the unbraked roller 9, which engages with the coated side of the strip, turns in such a direction that points on the roller in contact with the strip move in the direction of the strip. Since in this construction only the strip 1 and the counter-pressure roller 9 have to be braked, the movement of the strip can be stopped more rapidly. Consequently, the spread of the braking distance is very small.

The braking member 25 is arranged on the rocker so that the braking member can be aligned precisely with the pressure roller 9. Otherwise, accurate adjustment of the guide for the plunger 19 would be necessary in order to ensure that the strip 1 is braked evenly over its whole width.

The masses which have to be accelerated by the magnet 30 are as small as is feasible in the embodiment described, so that the delay in the response of the magnet (and therefore the brake) to the command signal can be reduced to very low values.

The driving and braking means described above may be used to advantage not only in conjunction with cutting apparatus, but also in other apparatus in which a material in strip form is to be advanced intermittently.

Referring to Fig. 3, which shows, by way of example, a photographic printing apparatus, a film strip 1 is fed through an exposure station 34, of which only one

lateral limit 35 of the field to be exposed, and the objective 36 is shown. A length-measuring device 37 is provided between the printing station 34 and the driving and braking means 3 for the strip 1 (as described above and as shown in Fig. 1). The measuring device 37 consists of a measuring roller 38 for pressing against the reverse side of the strip 1, a counter-pressure roller 39, and a perforated disc 40 which runs on the spindle of the measuring roller 38. The apertures of the disc 40 are scanned photoelectrically by means of a light source and a photo-receiver 41. The pulses from the photo-receiver 41 are led to a switching device 42 which supplies current to the magnet 30 when a prescribed number of pulses, corresponding to a particular step length is reached. Since the system comprising the roller 38 and the perforated disc 40, has a very low inertia, and since the pressure on the reverse side of the strip 1 is very firm, the photo-receiver 41 gives a very accurate measurement for the lengths of strip passing the measuring device 37. When the strip 1 is halted in this apparatus, namely after it has advanced a predetermined distance, part of the strip can be exposed or developed. In other respects the construction and operation of the transport means correspond to those described with reference to Figures 1 and 2. Those advantages of the apparatus constructed in accordance with the invention, such as restricted step spread and high response speed, also have an especially favourable effect in the printing apparatus.

WHAT WE CLAIM IS:—

1. Apparatus for intermittently advancing strip material, which comprises a first roller provided with drive means and comprising two co-axial parts mounted on a spindle, each of which parts is arranged, in operation, to bear against a different one of the two marginal portions of the strip, a second roller which is freely rotatable and co-operates with the first roller, the second roller being movable away from the first roller against the action of a restoring force, a braking member arranged, in operation, to bear against the strip material on the same side as the first roller and to move the second roller away from the first roller and the strip material out of contact with the first roller, and a bifurcated plunger which is arranged between the said two parts of the first roller so as to be guided by the said spindle and is movable so as to operate the braking member.

2. Apparatus as claimed in claim 1, in which movement of the second roller away from the first roller is positively

is then returned to its initial position and the strip 1 is advanced by means of the drive roller 7. If after a certain travel time the scanning device 2 detects an image mark on the strip 1, the device delivers a command signal to actuate the magnet 30, whereupon the crank 28 rotates in a clockwise direction. The plunger 19 is thereby raised with considerable force, due to the limited distance between the magnet armature and the core produced by the coupling spring 32, and in turn the engagement surface 21 pushes the rocker 22 upwards. The result of this action is that the strip 1 is pressed against the pressure roller 9, and at the same time the roller 9 is lifted away from the drive roller 7. The roller 9 is lifted until the support 19 meets the screws 18. The strip 1 is thus disengaged from the drive roller 7, and the drive is interrupted immediately. At the same time, the strip 1 is braked because it is arranged between the braking member 25 which (having the full pressure force of the magnet which is acting with a very small gap in this position) is pushed against the counter-pressure roller 9 being raised as far as it will go. When the strip 1 is stopped, it is cut by the cutting device 4. The picture strip is protected from damage in spite of heavy braking since the braking surface 25 engages with the reverse side of the strip 1, and since the unbraked roller 9, which engages with the coated side of the strip, turns in such a direction that points on the roller in contact with the strip move in the direction of the strip. Since in this construction only the strip 1 and the counter-pressure roller 9 have to be braked, the movement of the strip can be stopped more rapidly. Consequently, the spread of the braking distance is very small. The braking member 25 is arranged on the rocker so that the braking member can be aligned precisely with the pressure roller 9. Otherwise, accurate adjustment of the guide for the plunger 19 would be necessary in order to ensure that the strip 1 is braked evenly over its whole width. The masses which have to be accelerated by the magnet 30 are as small as is feasible in the embodiment described, so that the delay in the response of the magnet (and therefore the brake) to the command signal can be reduced to very low values.

The driving and braking means described above may be used to advantage not only in conjunction with cutting apparatus, but also in other apparatus in which a material in strip form is to be advanced intermittently.

Referring to Fig. 3, which shows, by way of example, a photographic printing apparatus, a film strip 1 is fed through an exposure station 34, of which only one

lateral limit 35 of the field to be exposed, and the objective 36 is shown. A length-measuring device 37 is provided between the printing station 34 and the driving and braking means 3 for the strip 1 (as described above and as shown in Fig. 1). The measuring device 37 consists of a measuring roller 38 for pressing against the reverse side of the strip 1, a counter-pressure roller 39, and a perforated disc 40 which runs on the spindle of the measuring roller 38. The apertures of the disc 40 are scanned photoelectrically by means of a light source and a photo-receiver 41. The pulses from the photo-receiver 41 are led to a switching device 42 which supplies current to the magnet 30 when a prescribed number of pulses, corresponding to a particular step length is reached. Since the system comprising the roller 38 and the perforated disc 40, has a very low inertia, and since the pressure on the reverse side of the strip 1 is very firm, the photo-receiver 41 gives a very accurate measurement for the lengths of strip passing the measuring device 37. When the strip 1 is halted in this apparatus, namely after it has advanced a predetermined distance, part of the strip can be exposed or developed. In other respects the construction and operation of the transport means correspond to those described with reference to Figures 1 and 2. Those advantages of the apparatus constructed in accordance with the invention, such as restricted step spread and high response speed, also have an especially favourable effect in the printing apparatus.

WHAT WE CLAIM IS:—

1. Apparatus for intermittently advancing strip material, which comprises a first roller provided with drive means and comprising two co-axial parts mounted on a spindle, each of which parts is arranged, in operation, to bear against a different one of the two marginal portions of the strip, a second roller which is freely rotatable and co-operates with the first roller, the second roller being movable away from the first roller against the action of a restoring force, a braking member arranged, in operation, to bear against the strip material on the same side as the first roller and to move the second roller away from the first roller and the strip material out of contact with the first roller, and a bifurcated plunger which is arranged between the said two parts of the first roller so as to be guided by the said spindle and is movable so as to operate the braking member.

2. Apparatus as claimed in claim 1, in which movement of the second roller away from the first roller is positively



limited and the braking member tends to urge the second roller beyond its limiting position.

3. Apparatus as claimed in claim 2, in which the limit of movement of the second roller away from the first roller is adjustable.

4. Apparatus as claimed in any one of claims 1 to 3, in which the first roller is coated with a material having a high friction value.

5. Apparatus as claimed in any one of claims 1 to 4, in which the plunger is operated by the armature of a rotary magnet.

6. Apparatus as claimed in claim 5, in which the plunger is connected to the armature of the magnet by means of an eccentric and a pin-and-slot coupling.

7. Apparatus as claimed in claim 6, which includes a resilient stop which co-operates with the eccentric to limit return movement of the magnet to the necessary magnitude.

8. Apparatus as claimed in any one of claims 1 to 7, in which the braking member comprises a cylindrical body so mounted that its axis is parallel to the axis of the said other roller, and the braking surface consists of a hard-wearing plastics material with a high friction value.

9. Apparatus as claimed in any one of claims 1 to 8, in which the braking member is supported on leaf springs and is pivotable about each of a pair of mutually perpendicular axes lying in the plane of the strip, one of the axes being parallel to the direction of travel of the strip.

10. Apparatus as claimed in claim 9, in which the braking member is not substantially pivotable about an axis perpendicular to the plane of the strip.

11. Apparatus as claimed in any one of claims 1 to 10, which includes a bridge connecting the two arms of the plunger so as to enclose the axis of the said spindle, the bridge being provided with a transmission surface arranged to contact the braking member substantially at a point so as to operate the braking member, the arrangement being such that the point of contact between the transmission surface and the braking member, and the line of contact between the braking surface and the strip, lie in the plane containing the axes of the first and second rollers.

12. Apparatus as claimed in any one of claims 1 to 11, which includes a manually-operable eccentric for lifting the second roller away from the first roller.

13. Apparatus as claimed in any one of claims 1 to 12, which includes cutting means arranged to cut the strip material when movement of the strip has been stopped by the braking member.

14. Apparatus as claimed in any one of claims 1 to 13, which includes detection means arranged to give a signal when the strip has reached a predetermined position in its path of advancement and the plunger is responsive to the said signal to operate the braking member.

15. Apparatus as claimed in claim 14, in which the detection means comprises a scanning device for detecting scannable marks on the strip and is arranged to give the said signal in response to the marks scanned.

16. Apparatus as claimed in claim 14, in which the detection means comprises means for obtaining a measure of the length of strip advanced, the detection means being arranged to give the said signal at intervals each corresponding to the advancement of a predetermined length of strip.

17. Apparatus as claimed in claim 16, in which the measuring means includes a roller arranged to be rotated by the strip as it advances.

18. Apparatus as claimed in claim 17, which includes a perforated disc coupled to the roller so as to rotate with the roller, and photoelectric means arranged to scan the disc and to cause the said signal to be given.

19. Apparatus as claimed in any one of claims 1 to 18, which is suitable for intermittently advancing photographic film and wherein the braking member is arranged to bear on the reverse side of the film.

20. Apparatus for intermittently advancing strip material substantially as hereinbefore described with reference to, and as shown in, Figs. 1 to 3 of the accompanying drawings.

21. Printing apparatus which comprises apparatus for intermittently advancing strip material as claimed in any one of claims 1 to 20.

ABEL & IMRAY,
Chartered Patent Agents,

Northumberland House,

303-306, High Holborn,

London, WC1V 7LH.

