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CARD AND SHEET FEEDING APPARATUS

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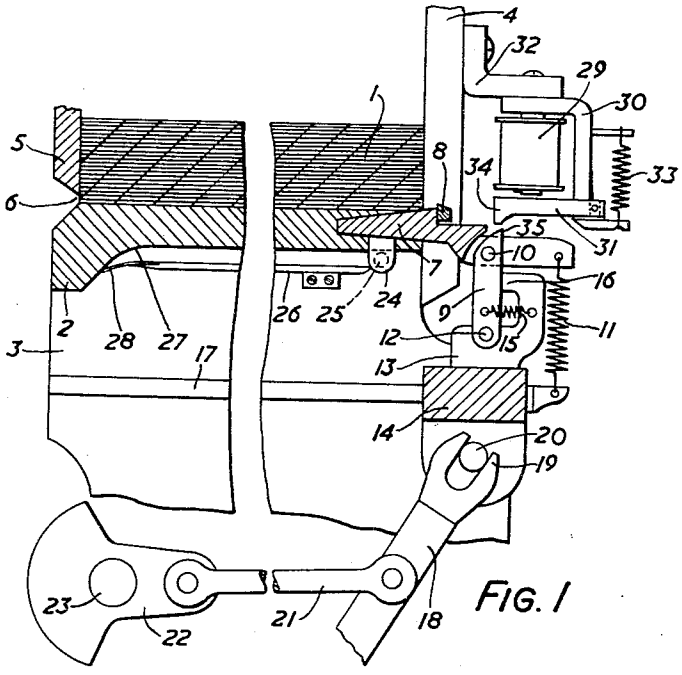

FIG. 1

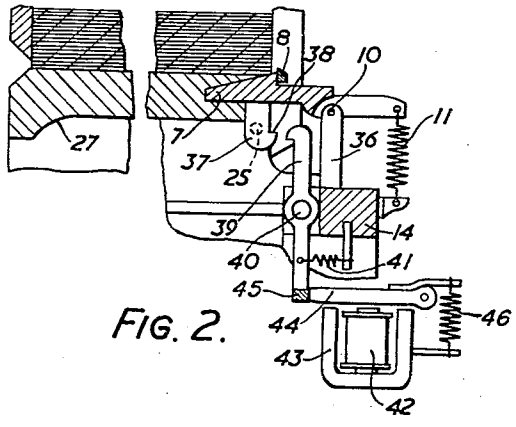

FIG. 2.

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CARD AND SHEET FEEDING APPARATUS

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This invention relates to apparatus for feeding record cards, sheets or the like.

Devices for feeding cards or shetts from the bottom of a stack by means of feed knives, or other feed members, which are mounted on a reciprocating carrier are well known. The knives engage and feed out the bottom card during the forward stroke of reciprocation. The stack rests upon the feed knife during the return stroke. The carrier is usually driven through a clutch so that feeding may be stopped by disengaging the clutch.

It is an object of the invention to provide a record feeding apparatus having a reciprocating record feeding member arranged to perform, alternately, a feeding stroke and a return stroke, in which the feeding member is held in a retracted position during the return stroke.

It is another object of the invention to provide means for restoring the feeding member into a record engaging position at the end of the return stroke, if a record is to be fed during the next succeeding feeding stroke, and for retaining the member in retracted position if no record is to be fed.

It is a further object of the invention to provide means for moving the feeding member between a retratced position and a record engaging position at a time when the feeding member is nearing the end of a stroke, the velocity of the feeding member in the direction of deciprocation then being relatively small.

According to the invention apparatus for feeding records from the bottom of a record stack comprises a record feeding member, means for repeatedly reciprocating the member over a forward and a return stroke, control means settable to first and second positions to cause the member to move in first and second paths, respectively, during a forward stroke, the member being effective to engage and feed a record from the stock only when it is moving in the first path, and means adapted to cause the member to move in the second path only during each return stroke.

The invention will now be described, by way of example, with reference to the accompanying drawing, in which,

FIGURE 1 is a sectional view of a record feeding device, and

FIGURE 2 shows a modified form of feeding device.

FIGURE 1 is a sectional view of a record feeding device. A stack of records **1** is held in a feeding hopper consisting of a base member **2** supported on side plates **3** of which one is shown, rear plates **4**, of which one is shown, and a front member **5**. The front member **5** and base **2** are shaped to form a throat **6** which allows only one record to pass at a time. A feed knife carrier **7** carries a feed knife **8**, the edge of the knife being adjusted to project above the top surface of the carrier so that it advances only one record from the bottom of the stack through the throat **6** as the carrier **7** is advanced on a feeding stroke.

The carrier **7** is mounted on a link **9** by means of a pivot **10** and is urged in a clockwise direction by the action of a spring **11**. The link **9** is, in turn, pivotally mounted at **12** on a support bracket **13** carried on a slider **14**. A spring **15** is provided to maintain the link **9** normally in contact with a stop **16** on the bracket **13**. The slider **14** runs in grooves **17** in the side plates **3** and is

oscillated from left to right and back again by a driving means including a link **18** mounted on a pivot (not shown). The link **18** has a forked end **19** engaging with a pin **20** carried by the slider **14**. The link **18** is rocked by means of a connecting rod **21** driven by a rotating plate **22**. The plate **22** is mounted on a shaft **23** driven in synchronism with feed rollers (not shown) which receive the record fed by the feed knife **8**. Thus, a record is fed from the bottom of the stack **1** as the slider **14** is advanced from right to left. Since the slider is driven from the rotating plate, it follows that the motion imparted to the feed knife carrier **7** is approximately harmonic, that is, the carrier starts from the position shown and accelerates smoothly to its maximum speed, decelerating again until it stops momentarily at the end of the forward stroke before reversing and repeating its acceleration and deceleration on the return stroke. Thus the feed knife engages the bottom record of the stack at low speed, thus minimising damage to the records.

A projection **24** depending from the carrier **7** carries a roller **25** which is maintained in contact with a cam face, formed by the underside of the base **2**, by the action of the spring **11**. As the carrier **7** is advanced on a feeding stroke to the point at which the knife **8** engages the bottom record, the roller **25** enters a channel formed by the underside of the base **2** and a guide member **26**, so that during the forward stroke the carrier follows a path conforming to this channel.

As the carrier nears the end of the forward stroke the roller **25** is moved downwards by the face **27** formed in the underside of the base, and the carrier is therefore rotated in an anticlockwise direction about the pivot **10** so that the knife **8** and the upper face of the carrier are withdrawn from contact with the record pack.

The continued movement of the slide **14** to the left carries the roller **25** into contact with end **28** of the guide **26**. The end **28** is sufficiently flexible to allow it to be deflected and the roller passes between it and the surface **27**. The end **28** then returns to the position shown, but the roller **25** is now below it. The direction of movement of the slide **14** reverses at this point and the roller **25** starts to move upwardly along the surface **27**. This brings the roller into contact with the lower side of the end **28** of the guide. Continued movement of the slide causes the roller to travel along the lower side of the guide **26**. The position of the guide is such that the feed knife **8** is maintained out of contact with the bottom record of the stack **1**. The roller reaches the right-hand end of the guide **26** near the end of the return stroke of the carrier and the carrier is then returned to the position shown by the action of the spring **11**.

In this way, the feed knife **8** follows one path, defined by the cam surface of the base **2**, in which it engages and feeds a record during the forward stroke and a different path, defined by the cam surface formed by the lower surface of the guide **26**, during the return stroke. The knife has moved beyond the end of the stack before the roller clears the guide **26** so that the knife is out of contact with the stack during the whole of the return stroke.

It may be required, where data is sensed from a record for processing in a computing device, for example, to suppress the feeding of a card during one or more forward strokes. For this purpose, means are provided to retain the feeding knife and carrier in a retracted position by ensuring that the roller **25** remains in engagement with the underside of the guide **26** during a forward stroke for which card feeding is to be suppressed. An electromagnet assembly including a coil **29**, a yoke **30** and an armature **31** is secured by means of a bracket **32** to the rear plate **4**. During those forward strokes on which card feeding is required the coil **29** is maintained energized, and the armature **31** remains in the upward position

shown. However, if card feeding is to be suppressed, the coil **29** is de-energized during the return stroke immediately preceding the forward stroke which is to be ineffective. The armature **31** then drops, being assisted by a spring **33**, and as the carrier **7** returns a face **34** on the armature engages a face **35** on the link **9**. The link is thus forced to turn on its pivot **12** against the tension of the spring **15**. Since the link is held from full restoration, the carrier is similarly restricted, with the result that the roller **25** is prevented from reaching the end of the guide **26** and cannot restore to the underside of the base **2**. Thus, on the next feeding stroke the feed knife remains retracted.

The slide will continue to reciprocate without feeding of a record until the coil **29** is energized once again. The coil **29** can be energized or de-energized near the end of the return stroke, since it is necessary only that the armature **31** should be in the correct position when the link **9** reaches it. This feature is particularly advantageous where, for example, a record is fed and data carried by it is subjected to variable length processing, in that the maximum processing time is available for each record before selection to non-feeding operation is required in the event that processing of data from one record has not been completed.

Wear and damage of the records is minimised because the knife is not in contact with the stack during the return stroke. This is particularly important when relatively high feeding rates are employed. If the knife is allowed to remain in contact during both strokes it may exert sufficient force to slide the stack backwards and forwards in the hopper and damage the edges of the records. It is even possible for the disturbance of the stack to be sufficient to produce a failure to feed.

In a modified form of construction (not shown) a mechanical gate member is normally disposed to form a continuation of the guide **26**. The gate is connected to the armature of the electromagnet so that energization of the electromagnet coil holds the gate in this position. Under normal feeding conditions, when the coil is de-energized, the gate member is lifted by the roller **25** as the knife carrier restores to its starting position, and the roller is allowed to return to the underside of the base **2**. When record feeding is to be suppressed, the coil is energized, and the roller is unable to lift the gate member, with the result that the carrier and knife remain retracted. This construction has the advantage that no parts are required to be moved in order to prevent feeding.

It will be appreciated that although the apparatus described above uses a single guide and relies upon spring tension for the feed knife to restore to the position in which it engages the record stack, it is possible to use an arrangement of guide plates having channels in which the roller **25** is positively guided over a fixed path which may, for example, resemble a flattened ellipse. In one such embodiment the roller **25** is retained by a friction device in a hole in the depending projection **24**, and may be positioned to extend beyond one side or the other of the projection. A cam plate is mounted adjacent to each side of the projection and carries a slot which may be engaged by the roller. One plate carries a slot defining the upper part of the knife path and the other carries a slot defining the lower part. Ramps are provided in the slots to cause the roller to transfer from one side of the projection **24** to the other. Thus, during a feeding stroke the roller engages with the slot corresponding to the upper part of the knife path, and the knife engages the bottom record of the pack and causes this record to be fed. Towards the end of this stroke the roller is engaged by the ramp in the slot and is caused to transfer to its second position, where it engages the slot in the second plate. The knife is thus held retracted on the return stroke. At the end of the return stroke the roller engages a moveable ramp controlled by the electromagnet. This ramp is effective or ineffective to transfer the roller in dependence on whether or not the electromagnet is energized, so that on the succeeding feeding stroke either the upper or lower part of the path is selected in dependence upon whether a record is to be fed or not.

Selection of the feed knife position in the various embodiments takes place at the end of the return stroke when the speed of its motion in the direction of card travel is at a minimum, and the greatest time is therefore available for the selection to be performed while the knife is moving over only a short length of guide.

An alternative means for retracting the feed knife during a return stroke is shown in FIGURE 2. As before, the feed knife **8** is carried by the carrier **7** which is pivotally mounted at **10** on a projection **36** extending upwards from the slider **14**. The carrier is biased in a clock wise direction by the spring **11** and has a downwardly projecting member **37** carrying the roller **25**. The member **37** has a latching face **38** and the slider **14** carries a latch member **39** which is pivoted at **40** and biased in an anticlockwise direction by a spring **41**. As the roller **25** follows the cam face **27** at the end of a feeding stroke the carrier is caused to move downwards and the latch member **39** engages the latching face **38** of the member **37** so that the knife and carrier are retained in the retracted position during the return stroke. An electromagnet assembly having a coil **42**, a yoke **43** and an armature **44** is positioned so that if the coil is energized the armature engages the end **45** of the latching member **39** as the slider **14** returns to its original position, thereby releasing the latching member from the member **37** and allowing the knife and carrier to restore to a record-engaging position. In order to suppress a record feeding operation the coil **42** is de-energized and the armature then moves upward under the influence of a spring **46** out of the path of the latching member **39**. The carrier and knife then remain latched in the retracted position throughout the following feeding and return strokes.

It will be appreciated that, in order to ensure accurate operation at very high speeds, a mechanical bail may be provided to restore the armatures of the electromagnets shown in FIGURES 1 and 2 during a feeding stroke, so that the time taken to move the armatures when the coils are re-energized is reduced to a minimum, the energization of the coils then merely serving to retain the armatures in the positions shown.

The carrier **7** may be held against a stop by the spring **11**, so that the roller need not engage the horizontal undersurface of the base **2**. The carrier is retracted towards the end of the forward stroke by the roller engaging the portion **27**, or a similarly shaped cam surface secured to the base.

The feed knife **8** has been shown as the kind conventionally used on punched record card feeds. It will be appreciated that the carrier **7** may carry other forms of feeding member, such as metal fingers or a rubber friction pad, suitable to the particular form of record to be fed. The term "record" is used in the generic sense to describe punched record cards, ledger sheets and similar sheets which are sufficiently rigid to enable them to be fed from the bottom of a stack.

We claim:

1. In apparatus for feeding records sequentially from the bottom of a stack by means of a record feeding member reciprocated through alternate forward and return strokes relative to said stack along the line of feeding, a record being fed by the engagement of the feeding member therewith during a forward stroke, control means for said record feeding member comprising a first fixed cam surface, a cam follower on said feeding member normally engaging said first cam surface to cause the feeding member to be reciprocated in a first path in which it is inoperative to engage a record, a second fixed cam surface, selection means selectively operative to move the cam follower out of engagement with said first cam surface immediately adjacent the end of a return stroke and

into engagement with said second cam surface, the engagement of the cam follower by said second cam surface causing the record feeding member to move in a second path to engage and feed a record during the major part of the succeeding forward stroke and means operative to return the cam follower from the second to the first cam surface at the end of a forward stroke in said second path thereby returning the feeding member to an inoperative condition.

2. Apparatus for feeding records from the bottom of a record stack, the apparatus comprising a fixed framework, means for supporting a record stack on said framework, a record feeding member mounted for reciprocation relative to said framework beneath the record stack along the line of feeding, means for cyclically driving the record feeding member through a forward and a return stroke, means retaining said record feeding member in an inoperative retracted condition in which it is incapable of engaging a record, means for releasing the record feeding member immediately adjacent the end of a return stroke to an operative condition in which during the next succeeding forward stroke it engages the bottom record of said stack and causes feeding of said bottom record in the direction of the forward stroke said releasing means normally being inoperative, control means operable selectively at any instant in the cycle to render said releasing means operative, a cam follower mechanically linked with said record feeding member and moving therewith and a cam surface rigidly located on said framework to engage the cam follower when the record feeding member is in its operative condition, said cam surface having a part engaged by the cam follower towards the end of a forward stroke to cause the cam follower to return the record feeding member to its retracted condition.

3. Apparatus for feeding records from the bottom of a record stack, the apparatus comprising a fixed framework, means for supporting a record stack on said framework, a record feeding member mounted for reciprocation relative to said framework beneath the record stack along the line of feeding, means for cyclically driving the record feeding member through a forward and a return stroke, a guide surface rigidly located on the framework a cam follower mechanically linked with the record feeding member and moving therewith, said cam follower engaging with said guide surface to retain the record feeding member in a retracted inoperative condition, means for releasing the cam follower from the guide means immediately the end of a return stroke to permit the record feeding member to move into an operative condition in which during the next succeeding forward stroke it engages the bottom record of said stack and causes feeding of said bottom record in the direction of the forward stroke, said releasing means normally being inoperative, control means operable to render said releasing means operative, a cam surface rigidly located on the framework and having a part engaging the cam follower toward the end of a forward stroke with the record feeding member in the operative condition to cause the cam follower to return the record feeding member to its retracted condition.

4. Apparatus according to claim 2 in which said retaining means comprises a mechanical latch mounted to move with said record feeding member, the latch being positioned to engage and hold the record feeding member in its retracted condition whenever it is moved into it and said releasing means comprises a trip member for engaging and releasing said latch immediately adjacent the end of a return stroke, said control means being operable to move said trip member to a position in which it engages the latch.

5. Apparatus according to claim 4 in which the control means includes an electromagnet having energised and unenergised conditions and an armature having different positions according to the condition of the electromagnet, means mechanically linking the armature to said trip member so that in one of said positions it moves said trip member to its retracted position, and means for controlling the condition of the electromagnet.

6. Apparatus according to claim 2 in which the control means includes an electromagnet having energised and unenergised conditions and an armature having different positions according to the condition of the electromagnet, means linking the armature to said releasing means so that in one of said positions it prevents operation of said releasing means, and means for controlling the condition of the electromagnet.

7. Apparatus according to claim 2 in which said retaining means includes a guide member engaged by said cam follower, a part of said guide member being flexible and normally bearing against the cam surface, movement of the cam follower between the cam surface and the guide member during a forward stroke forcing the flexible guide member part away from the cam surface to permit passage of the cam follower but entry of the cam follower into said passage during a return stroke being prevented by the flexible guide member part, the cam follower thus engaging the guide member during a return stroke.

8. Apparatus according to claim 7 in which said guide member terminates short of the beginning of a forward stroke and the apparatus further includes a spring biasing the record feeding member to its operative position, the guide member thus permitting return of the record feeding member to its operative position under the action of said spring towards the end of a return stroke.

9. Apparatus according to claim 8 in which said control means includes a stop member movable between operative and retracted positions, the stop member when in its operative position engaging the record feeding member towards the end of a return stroke and preventing the record feeding member returning to its operative condition, the stop member remaining thus engaged until the cam follower is again engaged with outer surface of the guide member in the subsequent forward stroke.

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