

Feb. 18, 1969

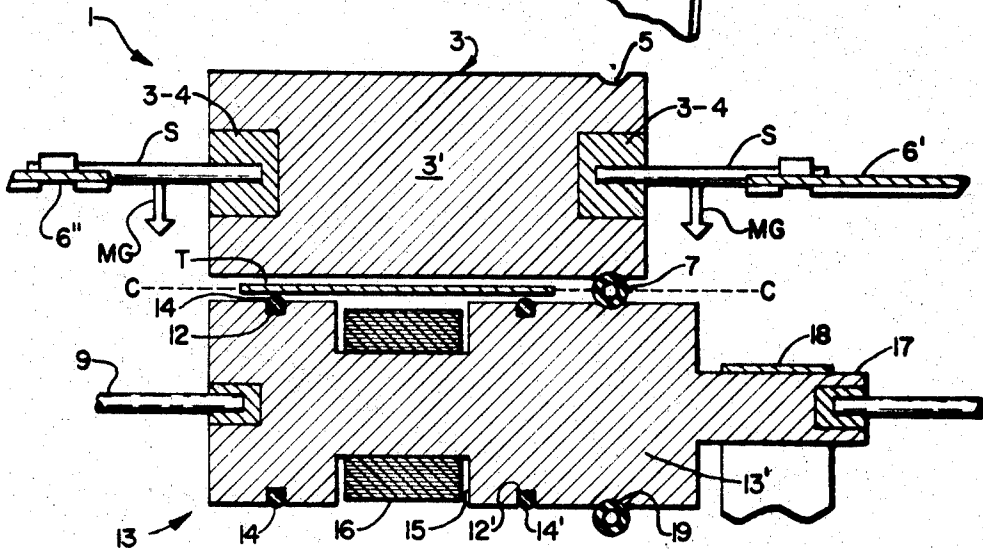
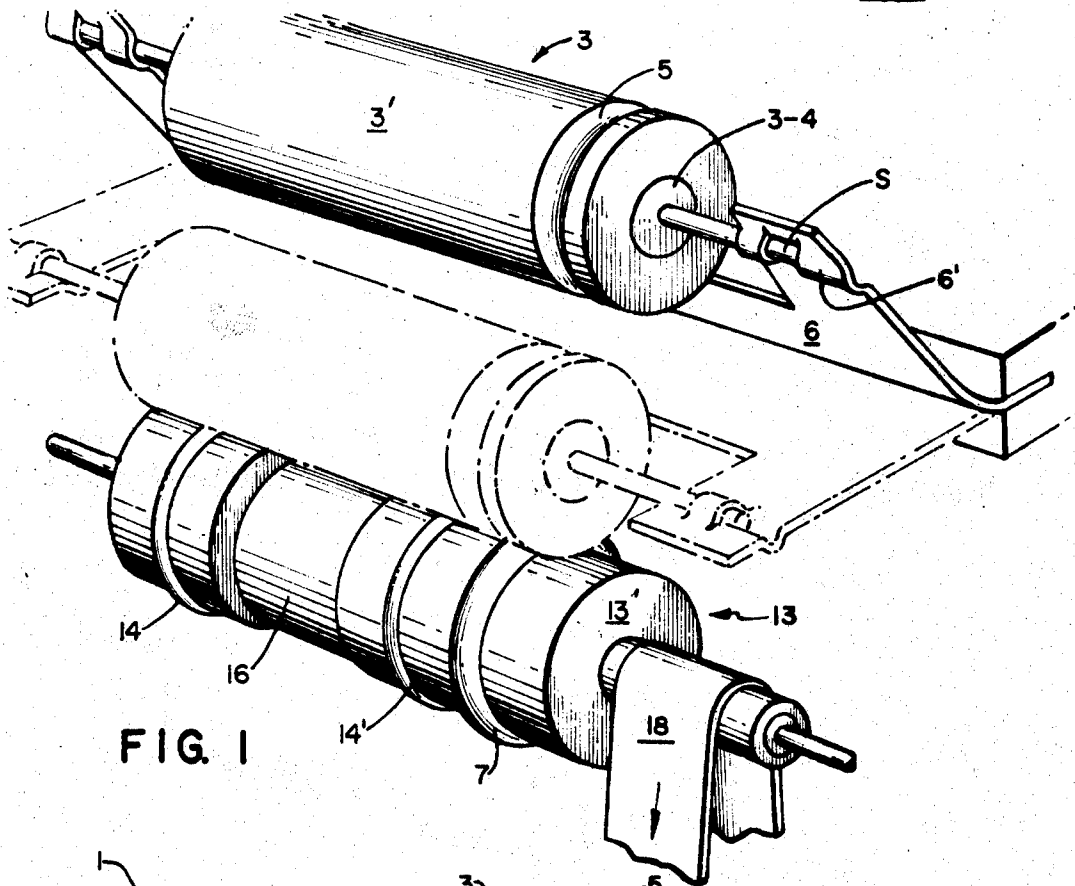
D. W. BERNARD

3,428,308

FLEXURE-MOUNTED MAGNETIC PINCH ROLL

Filed Jan. 3, 1967

Sheet 1 of 3



INVENTOR. ✓
DAVID W. BERNARD

BY *John J. McCormack*
ATTORNEY

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D. W. BERNARD

3,428,308

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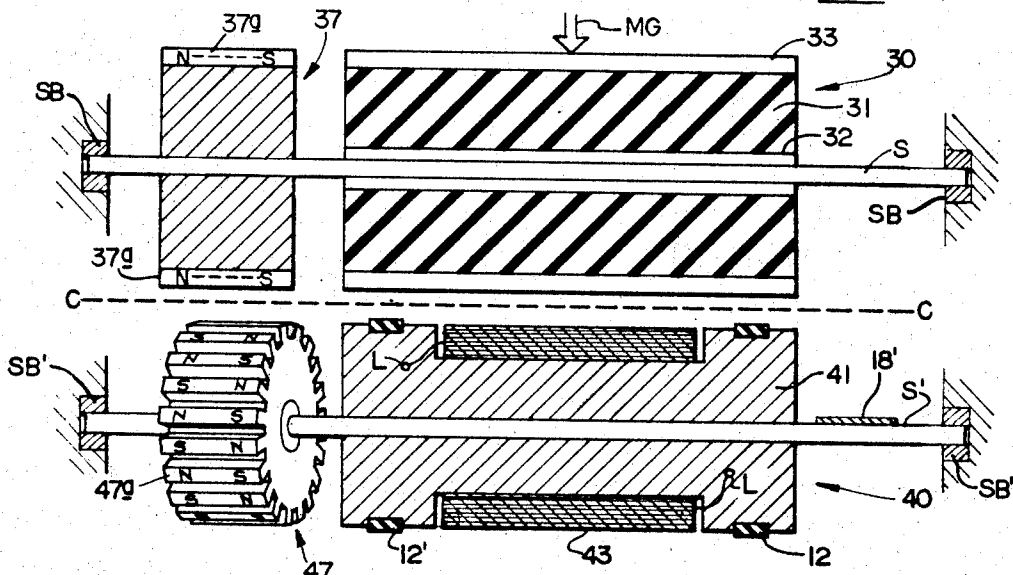


FIG. 3

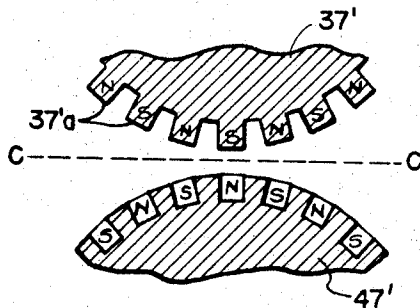


FIG. 3A

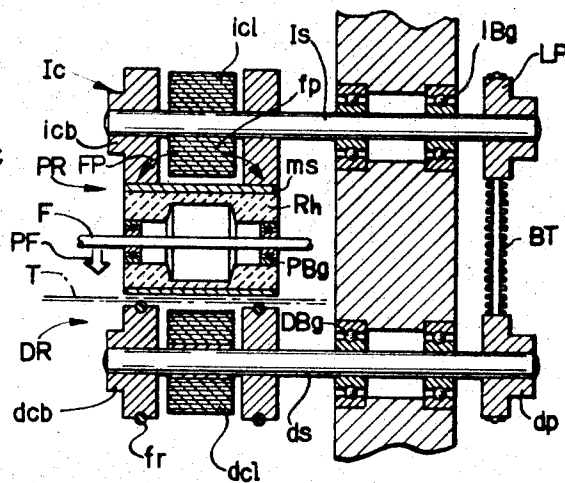


FIG. 4

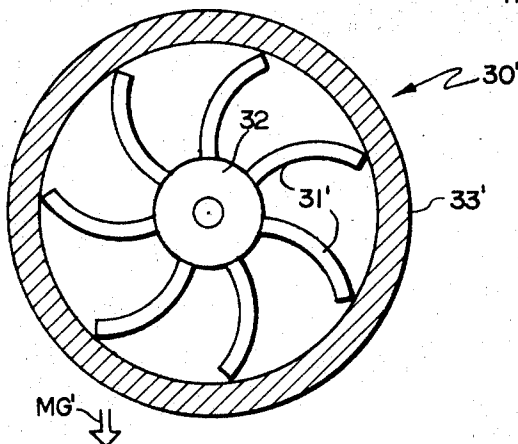


FIG. 3B

INVENTOR.

DAVID W. BERNARD

BY

John J. McCormack
ATTORNEY

ATTORNEY

Feb. 18, 1969

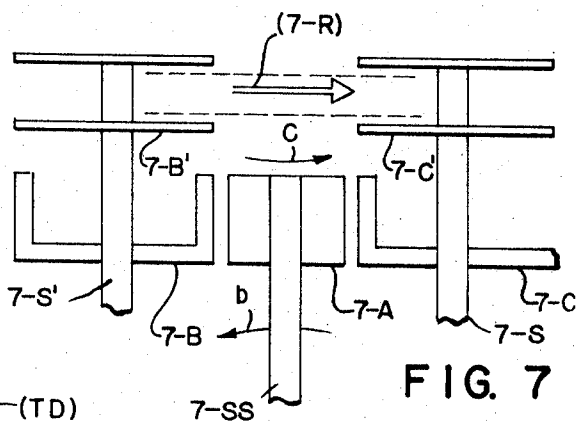
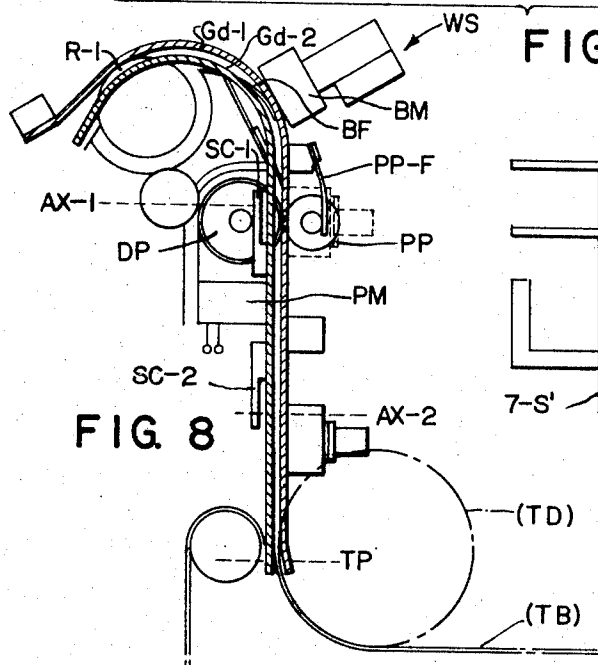
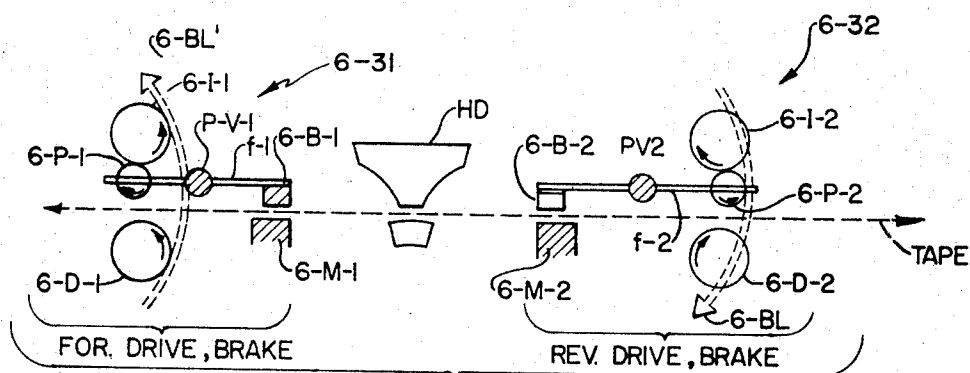
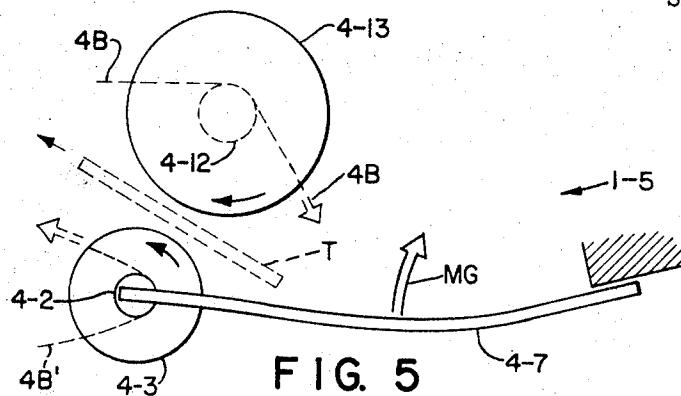
D. W. BERNARD

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Sheet 3 of 3



INVENTOR.
DAVID W. BERNARD
BY *John J. McPomert*
ATTORNEY

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3,428,308

FLEXURE-MOUNTED MAGNETIC PINCH ROLL
David W. Bernard, Sherborn, Mass., assignor to Honeywell
Inc., Minneapolis, Minn., a corporation of Delaware

Filed Jan. 3, 1967, Ser. No. 606,842

U.S. Cl. 271—51

Int. Cl. B65h 5/06, 29/12

9 Claims 5

ABSTRACT OF THE DISCLOSURE

A pinch-roll arrangement for selectively advancing unit records and generally including a fixed magnetic constantly-rotating drive roll and a magnetic pinch roll resiliently mounted to be selectively and resiliently pivoted toward the drive roll for driving engagement with an intermediate record, this mounting being provided preferably with a spring flexure plate or with a resilient hub. Preferably, idler driving means is also provided for the pinch roll comprising either a second fixed idling roll, magnetically or otherwise engageable with the pinch roll to keep it rotating when not in record-advancing condition. Alternatively, this idling is provided with an idler coupling to the pinch roll from the drive roll, such as a magnetic coupling, a common belt drive or a resilient frictional coupling like a hollow O-ring. In a further embodiment, two such pinch rolls may be spring mounted to be magnetically attracted against a common drive roll.

Background, invention features

In the art of selectively advancing web members such as punched cards through a record handling (data processing) machine, it is often desirable to arrest web advance at some operating station along the feed path, to later, at some selectable time, resume advancing it. Accordingly, it is a primary object of the present invention to provide a simple, efficient arrangement for selectively advancing a data document web with a magnetically engageable pinch roll arrangement. According to the invention, a continuously rotating drive roll is arranged to magnetic field generating means and a responsively magnetic pinch roll member is resiliently mounted to be magnetically attracted towards this drive roll for driving engagement with such an intermediate web at selectable times. With such an arrangement, it is quite advantageous to cantilever this pinch roll out on a unitary resilient mounting and make it very light and easily moved, being magnetically responsive to this drive roll field.

With such an arrangement it is also often desirable, according to another feature of the invention, to keep this magnetic, spring-pivoted pinch roll rotating when disengaged from the drive roll, so that when these two later engage an intermediate web, a minimum of rotational pinch-roll inertia will have to be overcome and the web may very quickly be accelerated up to drive roll speed. According to this feature of the invention, a number of idling means may, alternatively, be provided. One such means comprises a constantly rotating idler roll against which the pinch roll is engageable (e.g. spring-biased, magnetically attracted or the like). Another comprises a "non-rigid" idler coupling to the constantly rotating drive roll, such as coupling magnetic means (on both rolls), a resilient friction ring or the like. In certain cases even a common timing belt may be used to rotate both pinch roll and drive roll, with the pivot flexure for the pinch roll being arranged so as not to significantly affect the tension of this belt during engagement.

It is thus a general object of the invention to provide the foregoing features and advantages and others, such as those described below. A related object is to provide a magnetic pinch roll web advancing assembly including

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a constantly driven magnetic driving means and a spring-mounted magnetically-attractable pinching means arranged to be magnetically pulled into web-engaging relation with said driving means. A more particular object is to provide such a pinching means which is mounted on unitary resilient means such as a resilient hub or a spring flexure. A particular object is to provide such a means comprising a pinch roll cantilevered on a flexure plate.

Still another object is to provide such a pinch roll which is kept in idling rotation. A further related object is to so idle this pinch roll through non-rigid means coupling it with said constantly rotating drive roll. A still further object is to couple said rolls with a resilient idling friction ring. A related object is to couple said rolls with magnetic field means. Yet another object is to couple said rolls with a common belt drive, said pinch roll preferably being suspended so as to pivot without significantly affecting the tension in this belt drive. A further related object is to so idle said pinch roll using an idler roll means. A related object is to mount said pinch roll to be magnetically attractable into engagement with such idler roll means. Another object is to bias said pinch roll into engagement with one of these idler or drive rolls, being magnetically, selectively attractable to the other. Yet a further object is to arrange such idler and drive rolls to be driven in common.

Still another object is to provide a plurality of such pinch roll transport arrangements for driving a common web in different directions. Yet another object is to provide such a pinch roll arrangement wherein a magnetically attractable brake is also mounted on a related flexure strip to be pivoted into decelerating engagement with the web. Yet a further object is to spring-mount a plurality of said pinch rolls in engageable relation with a common constantly-rotating drive roll, each pinch roll being selectively pivotable into driven engagement with this common drive roll. A still further object is to make such rolls magnetically engageable. A very particular object is to provide such a flexure-strip-mounted magnetic pinch roll in magnetically engageable relation with such a magnetic drive roll in a wait station portion of a punched card machine along a curved card guide therein, also providing a magnetic flexure-brake magnetically attractable against these cards stoppingly, this brake being disposed cooperatively adjacent this pinch roll. Other objects of the invention, and features, will be pointed out in the following description and illustrated in the accompanying drawings which exemplify many features of the invention and teach the best mode contemplated for applying it.

In the drawings, wherein like numerals denote like parts:

FIGURE 1 is an isometric top view of a pinch roll arrangement according to the invention, the pinch roll being pivotally flexed far away from the drive roll for illustration purposes;

FIGURE 2 is a sectional view of the arrangement in FIGURE 1, the roll members being shown in "idling-coupled" relation with a web member (in phantom) therebetween;

FIGURE 3 is a sectional view of an arrangement like that of FIGURE 2, the pinch roll member, however, having a different resilient mounting and modified magnetic means, both roll members also including magnetic idler coupling means, FIGURES 3A and 3B show in very schematic sectional manner, respectively, an alternate magnetic coupling arrangement similar to that in FIGURE 3, and an alternate resilient hub arrangement similar to that in FIGURE 3;

FIGURE 4 is a very schematic sectional view of a pinch roll drive roll arrangement similar to that in FIGURES 1 through 3, also including an idler roll member,

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shown magnetically engaged with the pinch roll for idling thereof;

FIGURE 5 is a very schematic side view of an arrangement like that in FIGURES 1 and 2, indicating the pivoting mode of the pinch roll and the adaptability of both rolls for rotation with a common drive belt;

FIGURE 6 shows, in very schematic, partially-sectioned side-view, a pair of magnetic pinch-idler-drive roll assemblies, each similar to that of FIGURE 4 in a combined Forward-Reverse web driving arrangement, such as for a paper tape reading machine, both driving arrangements being indicated as being rotatable by common belt means and including flexure-mounted magnetic brake means;

FIGURE 7 indicates, in a very schematic top view, a pair of print ribbon spools with the ribbon reverse-wound therebetween, each spool including a magnetic pinch roll portion mounted to be selectively, magnetically attracted into driven flexible engagement with a common, constantly rotating magnetic drive roll; and

FIGURE 8 is a very schematic side section of a wait station portion of a punched card processing machine including a curved guide path, position detect means and a pinch roll arrangement similar to that in FIGURES 1 and 2, together with a magnetic flexure brake arrangement, all cooperatively arranged therein.

Referring now to FIGURES 1 and 2, there is here shown a magnetic pinch roll assembly 1 generally comprising a pinch roll unit 3 adapted to be magnetically pivotable (arrow MG) toward a second, constantly-rotating drive roll unit 13 so as to selectively, resiliently engage an intermediate record web T, such as a paper tape or the like, for advancing it along transport plane C—C as known in the art. More particularly, the magnetic pinch roll unit 3 comprises a pinch roll body 3' of magnetic material mounted, such as on a pair of roller bearings 3-4, to be rotatably suspended on a pair of fixed shafts S, each affixed on a respective projecting tab portion 6', 6'' of a flexure plate 6. Plate 6 is anchored on a machine frame rigidly to thus dispose roll 3' in magnetic coupled (pivotable) relation with magnetic drive roll 13' when magnetized by the field therefrom. Drive roll 13' includes a selectively energizable magnet coil 16 wrapped into an annulus 15 of a ferromagnetic, cylindrical body of roll 13' and arranged as known in the art so that when coil 16 is energized, an attracting magnetic field is projected through roll 3' to attract it into web-advancing relation therewith. Drive roll 13' is rotatably journaled on, and suspended on a pair of fixed shafts 9, being adapted to be driven rotatably at a relatively constant velocity by a flat drive belt 18, frictionally engaged against a pulley portion 17 of roll 13' or the like. Drive roll 13' also preferably includes one or more frictional web engaging members, such as elastomeric friction rings 14, 14', attached to web-engaging portions of roll 13', such as by insertion in angular grooves 12, 12' therein or the like. Roll 3' may be similarly provided to afford a positive frictional engagement with the driven web T.

Constantly-rotating roll 13' is also coupled to idle-rotate pinch roll 3' in an idling fashion, i.e. at same speed, with very little torque, etc. This coupling is preferably provided, according to a feature of the invention, by a resilient frictional member such as hollow elastomeric O-ring 7, frictionally engaged between grooved surface portions of rolls 3', 13' and radially compressible when these are squeezed about web T. Thus, it will be apparent that in the operation of pinch roll assembly 1, when a web member T (e.g. a punched card) is injected (by means not shown) along transport plane C—C to rest between rolls 3'-13', a selectable "advance-time" (current) signal through magnet coil 16 will generate a field which attractingly pivots pinch roll 3' toward driving roll 13' to squeeze web T therebetween advancingly, roll 3' pivoting easily and quickly on resilient flexure strip 6. A quick, positive engagement may thereby be effected and, similarly, disengagement effected upon cessation of this pulse through coil 16. Furthermore, unlike prior art devices,

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pinch roll 3' need not be constantly driven by any gear or other rigid type coupling means. This makes the usual pinch-roll drive train unnecessary and eliminates the associated mass, inertia, etc., thus greatly reducing the response time of the mechanism and simplifying it. Further, although pinch roll 3' need not be idled, it will be evident that such idling will maintain it at relatively the same speed as drive roll 13' just before engagement so that, upon engagement, little or no pinch-roll rotational inertia need be overcome to get the record T up to drive-roll-speed quickly. Further, the light, simple frictional idler coupling of ring 7, having a low-torque engagement and being easily compressed radially, will add no appreciable resistance to this quick pinching engagement.

A variant of the arrangement in FIGURES 1 and 2 is indicated in FIGURE 3 wherein a modified pinch roll arrangement 10 comprises a magnetic, spring mounted pinch roll unit 30 magnetically attractable toward an adjacent fixed, constantly-rotating magnetic drive roll unit 40, these being functionally like the analogous elements of assembly 1 above. Pinch roll unit 30 comprises a hollow cylindrical ferromagnetic body 33 affixed on a resilient (e.g. rubber, etc.) cylindrical hub 31, which, in turn, is affixed on a mounting sleeve 32. Sleeve 32 is fixedly mounted on a shaft S, which, in turn, is rotatably journaled and mounted between rigid support means. Drive roll unit 40 comprises a ferromagnetic cylindrical body, 41, affixed on a drive shaft S' rotatably journaled and mounted between rigid support means and driven by belt 18', etc. as known in the art and similar to unit 13 above. Body 41 includes an annular, relatively central cut-out in which is located a magnetizing coil 43 having leads L and functioning in the manner of coil 16 above. Thus, it will be apparent that a "select" (current) pulse through coil 43 will cause magnetic pinch roll cylinder 33 to be attracted toward rotating drive roll 41 (rings 12, 12' thereon) and thus squeeze an intermediate web (along plane C—C) advancingly and so provide the desired transport thrust. FIGURE 3B shows a functionally similar, somewhat modified pinch roll arrangement 30' having a modified resilient hub means, whereby magnetic cylinder 33' is relatively rigidly coupled to be rotated with sleeve 32' through a spider-like set of curved flexure strips 31' comprising an alternate radially-resilient hub. Arrangement 30' (or 30) can thus flex radially when cylinder 33' (33) is magnetically attracted (adjacent its tangent with plane C—C) by magnetic drive roll unit 40 in direction MG' (MG).

FIGURE 3 also indicate a modified "non-rigid" idler coupling arrangement, although as before, such idling is preferable, though not always necessary. Here, in place of the resilient frictional coupling between drive roll and pinch roll, the drive roll is instead provided with an idling magnet roll 47 affixed drivenly on shaft S' and including a uniformly-spaced, circumferentially-parallel set of bar magnets 47-a. Pinch roll assembly 30 similarly includes an idler magnet roll 37 affixed on shaft S so as to be idling rotated by roll 47 and, in turn, idle roller 33 etc. It will be understood that driving magnetic idler roll 47 is disposed in driving, magnetic field-coupled, relation with associated magnetic coupling roll 37, the magnets of roll 37 being arranged to be magnetically rotated by those of roll 47. Thus roll 37 comprises a cylinder of relatively non-magnetic material having a plurality of bar magnets 37A affixed circumferentially thereabout, each in opposite-poled, driven relation with a respective one of magnets 47-a on roll 47 to be attracted (or repelled) thereby and thus rotated therewith. This arrangement is better understood by reference to FIGURE 3A showing a somewhat modified structure, operating however, in relatively the same manner. Here, a driving magnetic idler roll 47' is arranged like roll 47 in FIGURE 3 with bar magnet portions (N, S) spaced circumferentially equidistant thereabout, in alternating opposite-poled fashion. A modified idler coupling magnet roll 37' includes gear-tooth-like magnets 37'-a arranged to come into driven, magnetic

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coupling relation each with a prescribed oppositely-poled one of magnets N, S on roll 47'. As known in the art, magnets 37'-a may thus be circumferentially spaced about roll 37' and disposed relative to an associated bar magnet on driving roll 47' so as to come into drivecoupling registry therewith about transport plane C-C when 47' is rotated and so provide the aforementioned magnetic idling result.

FIGURE 4 shows a pinch roll arrangement 1-4, functioning like that in FIGURE 3; however, also including, as an alternate idler means, a magnetic idler unit IC. Thus, as with pinch roll arrangement 10 in FIGURE 3, a magnetic drive roll unit DR is affixed on a shaft *ds* rotatably journaled in a rigid mounting panel P (on bearings DB_g) and includes a magnetic roller body *dcb* attached on one end of this shaft to be driven by a belt BT engaged on a pulley *dp* at the other shaft end. Body *dcb* includes a pair of frictional drive rings *fr* adapted to be advancingly pressed against a sheet member T and is arranged to be magnetized selectively by magnetic coil *dcl* to generate a field for squeezing a pinch roll unit PR advancingly against intermediate web T. In this case, however, coil *dcl* is journaled rotatably on shaft *ds* so as to so apply a magnetic field through body *dcb* yet without "loading down" the drive train. Roller *dcb* is thus constantly rotated at a prescribed speed by belt BT coupled to a driving source (not shown) as known in the art. Similarly, a magnetic pinch roll unit PR is journaled on a rigidly supported shaft F to be rotatable and flexibly attracted in direction FP to press sheet T against roll *dcb* as before. Unit PR comprises a magnetic cylinder *ms* affixed on a resilient hub *rh* (e.g. of rubber, as in FIGURE 3) which, in turn, is affixed on a bearing sleeve PB_g rotatably mounted on shaft F. Thus, as before, it will be apparent that a magnetic field will be generated by coil *dcl* in response to a current pulse therethrough and will emanate from drive roll *dcb* so as to draw magnetic cylinder *ms* toward itself for driving engagement with sheet T, compressing resilient hub *rh* in somewhat-elliptical fashion.

As another feature of this embodiment, a magnetic idler unit IC is provided to idle-rotate pinch roll *ms* preferably in the manner that magnetic drive roll (capstan) *dcb* does. Thus, unit IC comprises a magnetic cylinder or idle capstan *icb* affixed on one end of an idler shaft *Is* journaled rotatably in panel P (on bearings IB_g), a driving pulley LP being affixed at the other end thereof so as to be also driven by belt BT. A selectively energizable magnetic coil *icl* is also provided, like coil *dcl*, being rotatably mounted on shaft *Is* for selectively projecting a magnetic field from body *icb* (such as indicated by schematic flux path *fp*) to attract pinch roll *ms* into driven engagement against its surface at selectable (idling mode) times, according to the energization of coil *icl*. Roll *icb* may be frictionally surfaced, as with roll *dcb* (rings *fr*), for this purpose. Of course, in certain cases, pinch unit PR may simply be mounted on shaft F to be normally spring-biased into this idling engagement with unit IC, which in such a case need not be magnetic. Certain other changes are contemplated. For instance, rubber hub *rh* might be dispensed with, shaft F being instead affixed to rotate with cylinder *ms*, being instead rotatably journaled on a flexible pivot member, such as with roll 3 on pivot flexure 6 of FIGURES 1 and 2. In the latter case unit PR might be mounted to be normally flexure-biased into idling engagement with unit IC.

In FIGURE 5 there is shown a special, simplified version 1-5 of the arrangement 1 in FIGURES 1 and 2, constructed and functioning relatively the same except as noted. Pinch roll arrangement 1-5 comprises a magnetic pinch roll 4-3 and a magnetic drive roll 4-13, pinch roll 4-3 being rotatably mounted on a flexure bar 4-7 to be projected from a fixed point so as to be maintained normally out of engagement with drive roll 4-13. As with the foregoing embodiments, drive roll 4-13 is arranged

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to be constantly rotated and selectively magnetized (such as with a magnet coil) to project a magnetic field which attracts pinch roll 4-3 theretowards to squeeze an intermediate sheet (T) therebetween for selective advancement thereof. This magnetic force will be sufficient to pull roll 4-3 into this sheet engagement against the return (spring) force of bar 4-7 (indicated as thus flexed part way toward advance-engagement). Flexure bar 4-7 will automatically and quickly disengage roll 4-3 upon termination of this magnetic field pulse, returning 4-3 to the idle-position. As another feature of this embodiment, rolls 4-13 and 4-3 may both be driven continually at the same speed, such as by flat belt segments 4-B, 4-B' coupled thereto on conventional pulley means, etc. (not shown) to cooperate in thrusting web T equally. Thus, it will be apparent that in order to keep the tension on belt segment 4-B' constant despite pivoting of roll 4-3, bar 4-7 must be disposed so as to pivot roll 4-3 through an arc which keeps the belt arc relatively constant and thus maintains constant belt tension. It will be readily appreciated by those skilled in the art that this can readily be done and further that segments 4-B, 4-B' can form sections of a common drive belt, these being provided with suitable associated redirecting idler means (not shown) as known in the art to keep the indicated belt/roll engagement relation. The convenience thus afforded by pinch roll arrangements according to the invention will be evident.

In FIGURE 6 there is shown a pair of pinch roll arrangements 6-31, 6-32 adapted for driving a web member, such as a paper tape, in Forward and Reverse directions, respectively, upon command as part of an overall bi-directional transport assembly 6-30. In this embodiment, it will be apparent that pluralities of resilient-mounted magnetic pinch roll arrangements like those aforescribed may be employed together, and that when idler rolls are used therein, they may be driven in common with associated drive rolls. Thus, in the Forward drive arrangement 6-31, for instance, a magnetic pinch roll 6-P-1 is pivoted from a point PV-1 on a flexure bar *f-1* and adapted to be normally biased into idling engagement with a magnetic idler roll 6-I-1, kept constantly rotating, such as by a belt 6-BL'. Pinch roll 6-P-1 may be selectively disengaged from idler 6-I-1 and attracted magnetically toward a prescribed constantly rotating magnetic drive roll 6-D-1 for advancing engagement with intermediate tape web T in the "Forward" direction. As a feature of the invention schematically indicated by the path of belt 6-BL', it will be apparent that both drive roll (6-D-1) and idler roll (6-I-1) may be conveniently driven by the same belt (6-BL') at the same speed, etc. A similar arrangement is indicated for the Reverse drive assembly, 6-33 including a magnetic pinch roll 6-P-2 flexure-mounted for normal engagement against magnetic idler roll 6-I-2 and adapted to be selectively attracted toward magnetic drive roll 6-D-2, common drive belt 6-BL being provided to rotate both the drive and the idler rolls as before. The drawing is not to scale and rolls D, P, I will be assumed of like diameter, so that rolls 6-P-1, 6-D-1 have relatively the same surface speeds etc. A magnetic, flexure-suspended brake means 6-B is also indicated with both directional drive assemblies. Thus, a magnetic brake member 6-B-1 is cantilevered from PV-1 on the other end of flexure bar *f-1* to be in magnetic attracting relation with a magnetic, frictionally-surfaced shoe member 6-M-1, so that selective energization of 6-M-1 will pull brake 6-B-1 theretowards for deceleration engagement with tape T. A like magnetic brake 6-B-2 and associated magnetic shoe 6-M-2 assembly is also provided adjacent reverse drive assembly 6-33 with tape read head HD being provided between the two drive assemblies, as is conventional.

According to another feature of the invention indicated very schematically in FIGURE 7, a common magnetic drive roll may be used to selectively rotate a plurality of

magnetic friction rolls, each being resiliently attractable thereagainst. Thus, in FIGURE 7 a pair of print ribbon spools 7-B', 7-C' is shown and understood as having a conventional print ribbon "reverse-wound" (along 7-R) between them, so that clockwise rotation of one spool will wind the ribbon thereon, whereas counterclockwise rotation of the other spool will likewise wind the ribbon on that spool. Spools 7-B', 7-C' are affixed on respective shafts 7-S', 7-S, these shafts being rotatably journaled in a fixed support (not shown) and each including a pulley member 7-B, 7-C, respectively, affixed thereon resiliently displaceable toward 7-C (arrows 7-a, 7-a'). Pulleys 7-P, 7-P' are made to include magnetizing means, such as the aforementioned drive roll coils and are disposed on their respective shafts to be normally spaced from, but in magnetic attracting relation with a magnetic resiliently displaceable drive capstan 7-A, kept constantly rotating one (driveable) shaft 7-SS (by means not shown) as known in the art. Thus, capstan 7-A may comprise a permanent magnet and pulleys 7-B, 7-C made selectively magnetizable such as with coil windings (not shown) to selectively, magnetically attract the capstan (in directions c, b, respectively) into frictional driving engagement when a current pulse is applied to its respective coil. Thus, ribbon (7-R) may be wound in either one direction or the other (on either one spool or the other) according to which pulley is magnetically energized (current-pulsed) since that pulley will be rotated by engagement with capstan 7-A. Pulleys 7-B, 7-C and capstan 7-A are arranged to be resiliently translatable relative one another into this driving engagement. For instance, capstan 7-A may have its driving shaft 7-SS mounted on a resilient hub or the like, as with the embodiments of FIGURE 3 and may be provided with frictional engaging surfaces.

FIGURE 8 shows a further embodiment of the invention incorporating a wait station WS comprising part of a known type unit record handling machine. Station WS is adapted to receive punched card type webs from known injection means (not shown) to transport them across an intermediate path to known ejection means (not shown) selectively or alternatively to arrest their advance along this path to subsequently eject them. This intermediate path is defined by a pair of outer and inner curved card guiding track means GD-1, GD-2, respectively, along which cards may travel in prescribed alignment. A continually rotating injection roll R-1 is arranged to accept injected cards and constantly thrust them, engaged against outer guide GD-1, to be "skidded" around the curve described by the guides and into translatable relation with a pinch roll unit. The pinch roll unit comprises a magnetic pinch roll (pulley) PP mounted on a spring steel flexure PP-F in operative relation with a magnetic drive roll DP, kept constantly rotating (by means not shown). An electromagnet PM is also provided, being arranged to attract pinch roll PP magnetically into advancing engagement with an intermediate card as indicated before. Pulley PP is thus mounted on flexure PP-F from a fixed pivot point to be cantilevered normally out of engagement with said cards but disposed an operative gap distance from magnet PM. An eject drum TD is arranged at the eject end of the guide path (defined by guides GD) for accepting cards advanced by pinch roll unit P-8 to be transported out of wait station WS in a prescribed manner, engaging them resiliently against a constantly moving transport belt TB at engagement zone T-P.

According to another feature of the invention a magnetic flexure brake BF is also provided along the card path, upstream of this pinch roll assembly, being arranged in magnetic attractable relation with an associated brake electromagnetic BM. Brake BF is shown attracted to magnet BM so as to press an incoming card stoppingly against outer guide GD-1, doing so at prescribed selectively braking times. When released from BM, flexure BF can be self-biased to be unloaded from guide

GD-1, though it need not be completely disengaged therefrom but, in some operative modes, may be biased to easily "admit" a passing card when magnet BM is "OFF." A novel control of these elements is also provided by a pair of card tracking (presence-detecting) devices SC-1, SC-2, each including a light source and a detecting cell arranged along detect axes AX-1, AX-2 respectively, so as to indicate the presence of a card thereat. Thus, according to one advantageous mode of controlling this transport braking arrangement, an injected card may be thrust by roller R-1 around the curved guides until its forward edge interrupts the light to detect unit SC-2 (along axis AX-2) and the output thereof applied to magnet BM to attract flexure BF for automatically braking the card at a constant "wait-location." This assures that a card is stopped before reaching eject-engagement zone T-P and with its leading edge in a prescribed constant location (for predictable eject times despite varying card lengths). This area may also include a flexure guide (not shown) for biasing cards lightly against the inner surface of outer guide G-1 and thus preventing curled card edges from impacting drive roll DP. Controls may also be provided to apply a "brake-disabling" signal to BM responsive to an indication that the card is not intended to "wait," but is to be advanced out of station WS. Brake magnet BM may further be arranged to automatically release after a brief prescribed delay, sufficient to assure that a card will have been stopped (e.g. as controlled by a known single shot multivibrator, a 6 ms. delay being found suitable here).

Similarly, when a card (leading edge) crosses detect axis AX-1, an output signal from detect unit SC-1 may be applied to PM to initiate the engagement of pinch roll PP against the incoming card and drive roll DP. Unit SC-1 should thus be (adjustably) located so that axis AX-1 in upstream (ahead) of the "pinching locus" sufficient to give PP adequate "purchase" on the card just as it is released by roll R-1. Thus, the location of SC-1 (and assembly P-8) relative to R-1 depends upon (minimum) card length so that the leading card edge interrupts axis AX-1 to give this prescribed purchase to P-8. Similarly, unit SC-2 may be disposed so as to control the disengagement of pinch unit P-8 as well as the engagement of brake BF. That is, axis AX-2 may be located so that when the leading card edge interrupts it, not only is BM energized, but also the pinch roll driver PM is de-energized, then disengaging roll PP from the card. A pinch energizing arrangement found suitable for these purposes will include a coil of about 750 turns #27 magnet wire wrapped inside drive roll DP, this coil being driven by conventional circuitry including a pulse shaping circuit. The driving and driven rolls DP, PP, respectively, are comprised of high permeability magnet iron and arranged to operate across a normal, cardpassing air gap of about 15 mils. It was found possible with such an arrangement to start "pinching" a card within about 2 ms. of a command pulse.

It will be apparent to those skilled in the art that the principles of the present invention may be applied to different embodiments form that shown using analogous elements, etc. For instance, although the driving roll (capstan) has been indicated as preferably magnetic, mounted on a fixed shaft, wrapped with the magnet coil, etc. and the driven (pinch) roll has been indicated as magnetic and alone resiliently displaceable (e.g. in FIGS. 1, 2), workers in the art will understand that, in some cases these features may be modified. For instance, the magnet coil might be mounted external to the capstan which might in some cases be non-magnetic, only the pinch roll being magnetically translated. Conversely, both rolls might include associated magnet coils and both made resiliently translatable though this is not preferable in the above embodiments.

What is claimed is:

1. A device of the type described comprising:

first, second and third like magnetic parallel spaced roll means, said first and third roll means being fixedly journaled at prescribed locations and also being arranged to include respective selectively-energizable electromagnet means adapted to project attracting magnet flux from the respective roll means to said second roll means and so magnetize it as to be urged theretoward for driven rotational coupling thereto; said second roll means being arranged to be movable predetermined excursion distances toward and away from each of said first and third roll means; said first and second roll means being oppositely disposed about a prescribed transport plane; drive means coupled to said first and said third roll means for prescribed rotation thereof at a prescribed speed; mounting means arranged to support said second roll means to be disposed between said first and third roll means a prescribed magnetic gap distance from each and from their associated electromagnet means, and also to accommodate the selective translation of said second roll means into engaged driven relation with said first and said third roll means.

2. The combination as recited in claim 1 wherein said magnetizable roll means is supported rotatably from said frame on prescribed shaft means; and wherein said mounting means includes at least one resilient hub member flexibly coupling at least one of said magnetizable roll means to said rotatable shaft means.

3. The combination as recited in claim 1 wherein said first roll means comprises a constantly rotated drive capstan and wherein said second roll means comprises a plurality of pinch rolls, each pinch roll being rotatably journaled from said frame to be spaced a prescribed magnetic gap distance from a different peripheral portion of said capstan and including associated magnetic field means to selectively project a prescribed attracting flux to said capstan; said drive capstan being magnetic and also rotatably mounted from said frame to be magnetically attracted selectively across said magnetic gap responsive to projection of said flux, to thereby rotate said associated selected pinch roll.

4. In a device of the class described, a continuously-moving record thrust means adapted to be engaged with prescribed records for selective advance thereof at a prescribed speed along a prescribed advance path; electromagnet means adapted to generate a prescribed magnetic field at prescribed advance times upon receipt of a prescribed "advance signal"; magnetic pinch means, said pinch means including magnetic pinch roll conveyor means and unitary, resilient, self-returning support means, said roll conveyor means being rotatably mounted on said support means so as to be resiliently translatable toward, and away from, said thrust means and being sufficiently magnetic to be so displaced at said advance times to squeeze an intermediate one of said records advancing-

ly against said thrust means when so attracted by said electromagnet means; and idling means including a magnetizable idle-capstan arranged to be engageable with said pinch roll conveyor means for thrusting thereof at other than said "advance times" and arranged to be, itself, constantly driven at approximately said prescribed speed.

5. The combination as recited in claim 4 wherein said idling means comprises a resilient elastomeric O-ring coupled to be rotated with said thrust means and frictionally engaged with said conveyor means for said idling thrusting thereof.

6. The combination as recited in claim 4 wherein said idling means comprises a magnetic drive means coupled to be driven synchronous with said thrust means and a magnetic driven means coupled to idle thrust said conveyor means, being disposed and adapted to be driven responsive to advancement of said magnetic drive means.

7. The combination as recited in claim 4 wherein said conveyor means includes pulley means coupled in synchronous driving relation therewith; wherein said idling means comprises a driven timing belt means coupled drivingly about said pulley means and adapted to so idle said conveyor means thereby; and wherein said conveyor pulley means is so related to said resilient support means as to maintain relatively constant tension in said belt means during squeezing translations of said conveyor means.

8. The combination as recited in claim 4 wherein said thrust means comprises a constantly driven magnetic drive roll, wherein said conveyor means comprises a rotatable spring mounted pinch roll; and wherein is also included a constantly rotating idler roll, disposed and adapted to engage said pinch roll during said other than advance times.

9. The combination as recited in claim 8 wherein said idler drive rolls are driven in common at a common driving speed; and wherein said pinch roll is spring mounted to be resiliently biased against one of said drive roll and idler roll, the other of said rolls being adapted to magnetically pull said pinch roll into engagement therewith.

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EDWARD A. SROKA, *Primary Examiner.*

U.S. Cl. X.R.

271—74; 226—169, 188

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,428,308

February 18, 1969

David W. Bernard

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 10, line 9, "comprses a reslent elastromerc" should read -- comprises a resilient elastomeric --.

Signed and sealed this 14th day of April 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents