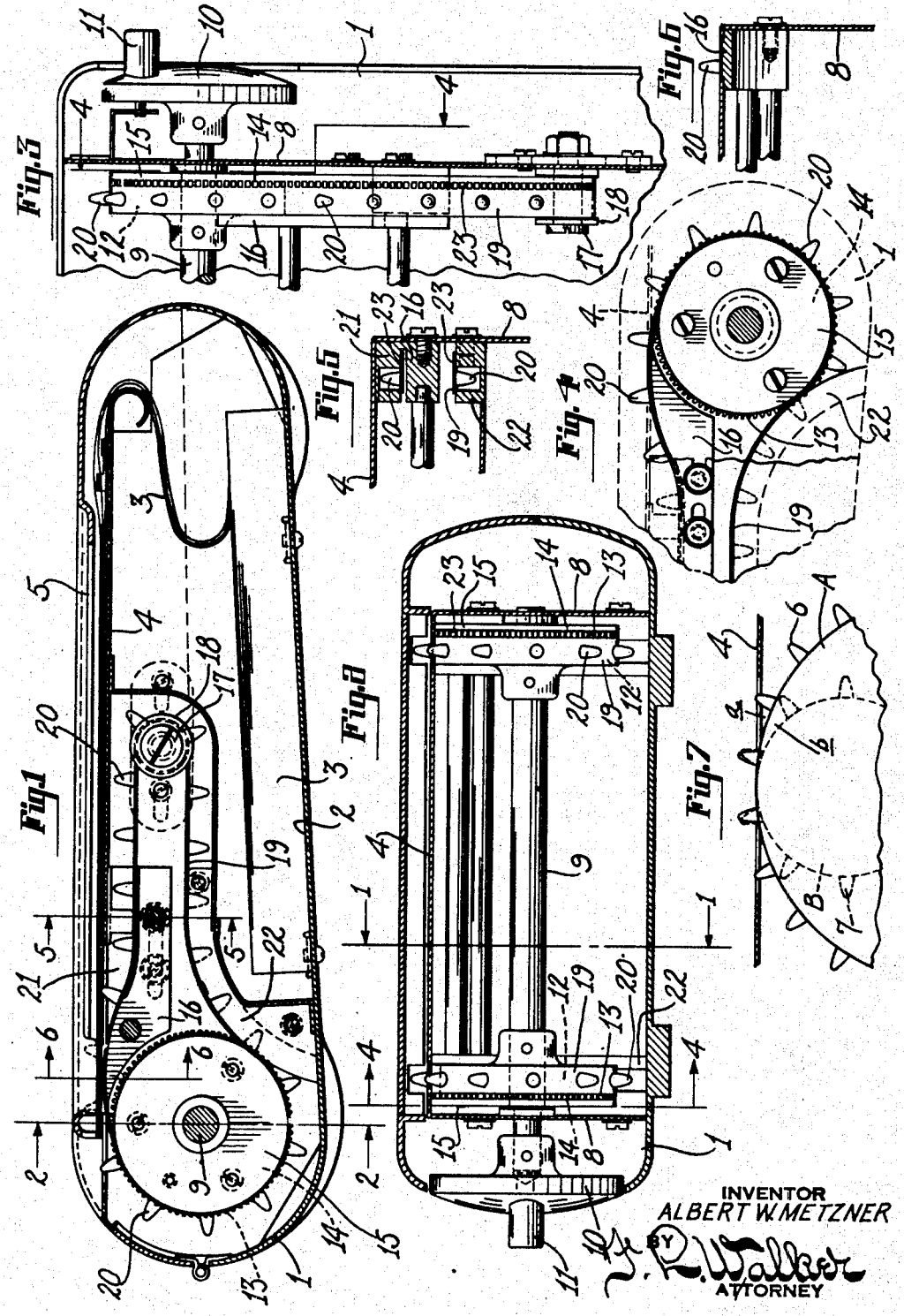
Jan. 21, 1947. A. W. METZNER 2,414,478

PIN TYPE FEEDING DEVICE

Filed July 24, 1942 2 Sheets-Sheet 1



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Fig. 9

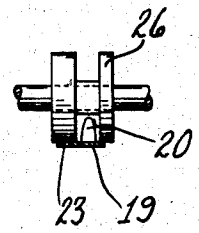
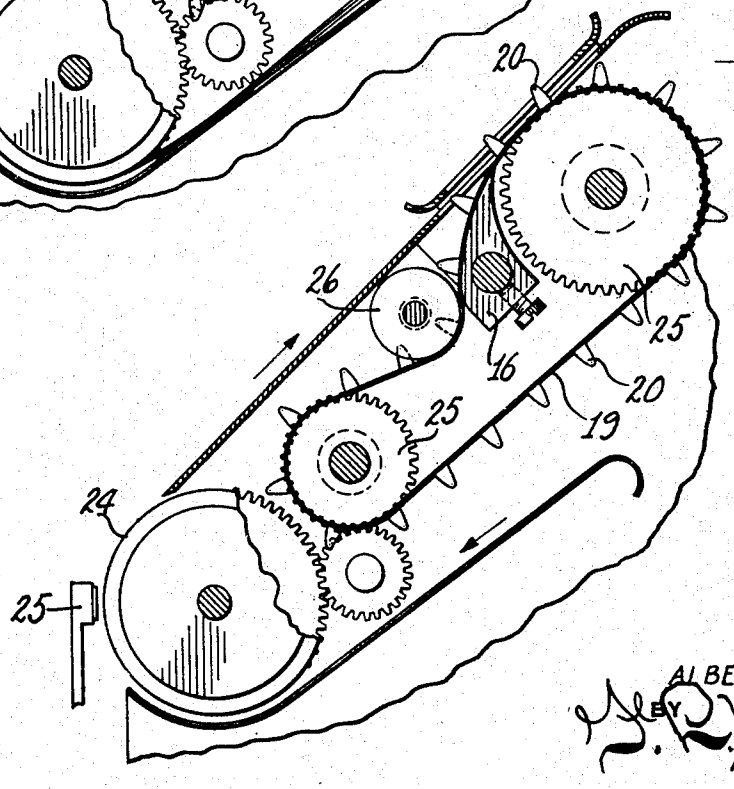


Fig. 8

Fig. 10



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PIN TYPE FEEDING DEVICE

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8 Claims. (Cl. 271—2.4)

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This invention pertains to motion transmitting apparatus of the chain and sprocket type, and more particularly to a construction and mode of operation wherein the advantageous operating conditions of a sprocket of relatively large diameter may be achieved within a limited working space too restricted to accommodate a conventional sprocket wheel of commensurate size.

The invention is herein illustrated and described as comprising a pin type feeding device for progressively advancing continuous strips of record material past a recording position of a writing or imprinting apparatus, for which purpose the present apparatus is well adapted, but it is to be understood that in suitable size and design the invention is applicable to other sprocket drive operations for various purposes, and is not necessarily limited to feeding manifolding stationery.

Continuous form stationery engageable by pin type feeding devices is ordinarily provided with longitudinally spaced holes or other configurations, usually, but not necessarily, in the margin thereof. When such punched material is tangentially advanced over a sprocket or pin wheel of relatively small size, the feeding pins or sprocket teeth abruptly enter and leave the holes in the material along curved paths which intersect the path of the record material at relatively wide angles, whereas when the record material tangentially passes over a sprocket of larger size, the pins or sprocket teeth enter and leave the holes in the strip along a longer arc of greater radius in more acute relation with the path of travel of the strip.

The strip maintains its feeding engagement with the smaller sprocket during a less period of time. To maintain a given rate of feeding speed, the small sprocket must be rapidly rotated causing the feeding pins or sprocket teeth to enter and leave the holes in the strip more quickly, effecting a more or less "jerky" or disturbed motion. To the contrary, the feeding pins or teeth of a pin wheel of greater diameter not only enter and leave the holes less abruptly, but maintain their engagement through a greater range, or arc, and the peripheral speed of the larger sprocket or pin wheel being greater, less rapid rotation is required, and a more even, smooth feeding action is effected.

However, in many instances the available space for location of the sprocket or pin wheel is quite limited, as for example, in an autographic register of the portable type, the housing or cabinet of which is comparatively shallow, or in applying

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pin type feeding apparatus to typewriters, billing, tabulating and addressing machines, the disposition of contiguous parts of the machine effectually prevent use of a relatively large pin wheel, the effect of which is achieved within limited bounds by the present disclosure.

In registering and aligning superposed record strips by means of pin type feeding devices, to compensate for differential stretch and shrinkage of individual record strips and mechanical imperfections of printing and punching the feed holes are punched in definite relation with succeeding printed record impressions, and minute relative shifting motion or jogging effect of the superposed record strips one relative to another is effected as the pins progressively enter the succeeding feed holes to adjust the corresponding forms into exact registry regardless of the expansion or contraction thereof, or slight errors of spacing of succeeding imprinted forms thereon. It is highly desirable, however, that the number of feeding pins having full and partial engagement with the record material be commensurate with the size of the feed holes in the record material and the relative spacing thereof and the clearance of the pins therein. If too few pins engage the holes in the record material at a given time, the freedom for relative shifting movement may be excessive, thereby losing complete control of the material, and the record material may not be held sufficiently accurately positioned during the recording operation. To the contrary, if too many feeding pins simultaneously engage in the holes of the superposed record material, the capability for relative adjustment necessary for accurate registry and alignment may be so restricted as to defeat such purpose, or indeed to entirely prevent the desirable jogging or shifting motion.

The most efficient and desirable range of pin engagement with the record material and number thereof lies between the mentioned extremes, and is determined by the size of the feed holes, the relative spacing thereof and the clearance of the feeding pins therein. The present disclosure enables the arc through which the pin carrying conveyor belt is guided to be changed at will for another of different radius to better accommodate the particular character of the record material being fed and the conditions of use of the feeding unit. The construction further enables the benefit and advantages of large or small radius travel of the feeding pins to be achieved on various types of recording, writing and imprint-

ing apparatus, wherein substitution of full size pin wheels would be quite impossible.

To enable the advantageous action of a large sprocket to be achieved within the limited space, a succession of relatively spaced feeding pins are repetitiously directed in endless succession about a stationary arcuate segmental guide of comparatively large radius by a driver of much less radius.

The object of the invention is to improve the construction as well as the means and mode of operation of driving sprockets, and particularly pin type feeding devices for strip material, whereby they may not only be economically manufactured, but will be more efficient in use, automatic in operation, uniform in action, having few operating parts, and be unlikely to get out of repair.

A further object of the invention is to enable the achievement of the advantageous operations of a sprocket or pin wheel of comparatively large size within a space too limited to accommodate a conventional sprocket or pin wheel of commensurate size.

A further object of the invention is to provide a construction wherein feeding teeth or pins will gradually enter into engagement with a driven member and will maintain their engagement therewith throughout a greater range of travel.

A further object of the invention is to enable relatively shallow strip feeding devices to be constructed and used without sacrificing the strip feeding advantages of deeper and more capacious constructions.

A further and important object of the invention is to provide strip feeding mechanism affording a large feeding radius for short length record forms.

A further object of the invention is to effect a gradual entry of the feeding pins into feeding engagement with the strip of material being advanced, and to maintain the feeding engagement through increased range, but effect a quick disengagement of the pins therefrom at the end of the active feeding interval of such pins.

A further object of the invention is to provide a sprocket or pin type feeding construction, wherein the feeding radius may be optionally varied to accommodate different record materials, and meet different operating conditions.

A further and primary object of the invention is to provide a sprocket or pin type feeding device having the advantageous structural features and embodying the inherent meritorious characteristics and mode of operation herein described.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described or illustrated in the accompanying drawings.

In the drawings, wherein is shown the preferred but obviously not necessarily the only forms of embodiment of the invention,

Fig. 1 is a longitudinal sectional view of a portable type autographic register in which the present invention is embodied.

Fig. 2 is a transverse sectional view of the assembled autographic register shown in Fig. 1.

Fig. 3 is a detail top plan view.

Fig. 4 is a detail side elevation viewed from the side opposite Fig. 1.

Fig. 5 is a detail sectional view on line 5—5 of Fig. 1.

Fig. 6 is a similar view on line 6—6 of Fig. 1.

Fig. 7 is a diagrammatic view showing comparatively the relation to the engaged strip of conventional sprockets of different radii, and their direction of travel of their teeth into and out of feeding engagement.

Fig. 8 is a side elevation of a tractor feed for a typewriter, tabulator, billing machine or the like, embodying the present invention.

Fig. 9 is a detail view of a guide roller therefor.

Fig. 10 is a modified embodiment of the structure shown in Fig. 8.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawings, there is shown in Fig. 1 a typical autographic register to which the present invention is applied, which includes a housing or cabinet 1 having therein a compartment 2 to receive a supply packet of stationery 3, which is progressivley advanced past a recording position upon a writing tablet 4 beneath an access opening 5 in the cabinet top.

The stationery 3 advanced over the writing tablet by the pin type feeding devices herein disclosed comprises superposed continuous marginally punched strips of series connected detachable printed forms divisible on longitudinally spaced transverse weakened lines into independent sheets or slips. Experience has shown that best strip feeding conditions prevail when a relatively large pin wheel is employed, for example, one of eleven inches circumference, having twenty-two radial teeth spaced at half inch intervals. Such pin wheel is capable of feeding a full eleven inch record form upon a single rotation.

However, a typical portable autographic register, such as that herein illustrated, will accommodate only a small size pin wheel of not more than five inches circumference (1.5915" diameter) having but ten feeding pins. As is illustrated in Fig. 7, the feeding pins 6 of a pin wheel A of larger size, approach the plane of the advancing strip 3 at an acute angle *a*, and enter and leave the holes in the record strip more slowly and gradually, and maintain their engagement therewith through greater range of movement than do the pins 7 of the smaller wheel B.

The pins 7 of the smaller pin wheel traverse a path at a much wider angle *b*, with the engaged strip, and enter and leave the holes therein abruptly. With such small diameter pin wheel the pin 7 which is leaving the strip is entirely disengaged before the incoming pin 7 is properly engaged, and at an intermediate position only one pin is in operative engagement with the strips. To feed a given length form at a specified speed requires twice the rotation of the smaller pin wheel. The larger wheel radius A enables the strip to be advanced at a greater speed without danger of mutilating the feed holes, and the pins entering and leaving the strip more slowly and through greater range, tend to effect more smooth operation.

In the present instance, the large size of the sprocket or pin wheel is eliminated, but the increased effective feeding arc of the pin travel is retained.

Near the front of the cabinet journaled in suitable bearings in spaced partitions 8 thereof, is a transverse revoluble shaft 9. At its end is a rotary disc 10 on which is eccentrically posi-

tioned a crank handle 11 for manual rotation of the shaft. Mounted on the rotary shaft 9 is a pair of spaced circular heads or pulleys 12, the peripheral faces of which are smooth throughout the greater portion of their widths, but which have a narrow series of sprocket teeth 13 projecting beyond the smooth peripheral surfaces thereof. The gear or sprocket teeth 13 are preferably, but not necessarily, formed upon separate discs 14 secured to a lateral face of each head or pulley 12. Additional discs 15 having smooth peripheries agreeing with those of the main heads 12 are secured outside the toothed discs 14 to form complete units which are revoluble with the shaft 9. Secured to the cabinet partitions 8 adjacent to the rotary heads or pulleys 12 are segmental guides 16, the upper surfaces of which are arcuate upon radii greater than those of the heads or pulleys 12, but disposed tangentially thereto. The relation is such that the arcuate surfaces of the guides 16 merge smoothly into the peripheral surface of the rotary heads or pulleys 12. The guides 16 are preferably detachably secured to the register structure and are interchangeable with other guides having arcuate guide surfaces of different radii.

Journaled upon studs 17 projecting from the cabinet partitions 8 in spaced relation with the shaft 9 and the pulleys 12 are flanged idler rollers 18. Disposed about the pulleys 12 and the idler rollers 18 and over the arcuate surface of the guide 16 therebetween are endless flexible belts or tapes 19 equipped with spaced feeding pins 20 fixed thereto. In their approach to the arcuate guides 16, the endless tapes or belts 19 pass beneath inverted channeled guides 21 which maintain the belts or tapes 19 and the feeding pins 20 thereon in a substantially straight path of travel below the level of the writing tablet 4 and the plane of travel of the record material 3 thereover.

The feeding pins 20 of the endless belts project within the inverted channels of the guides 21, while the margins of the tapes or belts have traveling engagement upon the under faces of the guides at opposite sides of the channels.

Beyond the channeled guides 21, of which there is one at each side of the register, the belts or tapes are directed upwardly over the arcuate surfaces of the guides 16 and thence onto the peripheries of the corresponding rotary heads or pulleys 12.

In their advance over the arcuate guides the conveyor belts or tapes are elevated into tangential relation with the record strips 3 and the feeding pins 20 are progressively projected into the feed holes in the strips 3. The feed pins gradually enter the holes as the belts 19 and record strips 3 advance in unison, until at the tops of the guides 16 the pins are fully entered. Due to the large radii of the guides 16 the pins 20 enter into the feed holes of the strips relatively slowly and gradually and maintain full feeding engagement during an appreciable interval. As the pins pass beyond the crests of the arcuate guides 16, they begin to withdraw from the feed holes in the record material. As the feed pins pass from the large radii arcuate guides 16 onto the pulleys 12 of lesser radii, the withdrawal of the pins from the holes is accelerated, although the speed of lineal advancement remains the same.

One of the differences between the action of pin wheels or sprockets of larger and smaller

diameter is that the pins enter into and withdraw from the holes in the strips within a much less lineal travel in the instance of the smaller radius than when advanced over an arc of greater radius at exactly the same lineal speed. By the combination of the arcuate guide of larger radius and the pulley of smaller radius, over which the pin carrying belt is advanced successively, an effect of slow and gradual entry and longer maintained feeding engagement of the feeding pins, followed by a quick withdrawal, is accomplished.

After passing about the rotary heads or pulleys 12, the peripheries of which are tangential to the arcuate guide surfaces of the guides 16, the belts or tapes 19 are directed along curved channeled guides 22, within the channels of which the feed pins 20 project while the tapes or belts ride upon the guides at opposite sides of the channels. The curvilinear portions of the guides 22 are disposed tangentially to the periphery of the rotary pulleys 12 while the elevated straight rearward portions of such guides 22 extend in tangential relation with the idler pulleys 18. To transmit motion uniformly from the rotary pulleys 12 to the pin carrying belts or tapes 19, the latter are each provided with a continuous series of holes or perforations 23 in which the teeth 13 of the discs 14, comprising portions of the corresponding pulleys 12, have progressive engagement. The coaction of the sprocket teeth 13 with the corresponding belt or tape 19 is but a conventional sprocket and chain drive.

The pins 20 traveling up the curved surface of the guide 16 they are gradually and uniformly elevated into feeding engagement in corresponding holes in the stationary strips 3. Because of the larger radius of the guide 16, the feed pins approach the plane of the record strips along a more acutely disposed path of travel, enter the holes more slowly through a greater range of travel, and maintain their engagement therewith through a further greater range than if the feeding pins were carried directly on the rotary heads or pulleys 12. However, having completed their strip feeding operation, the feeding pins in passing about the periphery of the rotary heads or pulleys act in a manner as though mounted on such pulleys. As a result, the disengagement of the pins from the strips is effected more quickly and abruptly and within a lesser range of movement of the strips.

While a greater number of turns of the crank handle and pulleys is necessary to advance the record strips a given distance than would be required if a large sprocket or pin wheels were employed, nevertheless the feeding effect of the pins 20 as they advance over the curved guide 16 is quite analogous to the advantageous feeding action of such larger size sprocket or pin wheel. Thus, the action of a feeding device of large size is attained within the limited space of a portable register cabinet, or other strip feeding or recording apparatus too small to contain such large size feeding unit.

It is recognized that sprocket chains upon which relatively spaced feeding pins are carried have been heretofore used for feeding marginally punched record strips and for other conveyor purposes, but such series connected feeding pins have not been directed through arcuate paths of travel in tangential relation with the driven member in such relation as to afford the advantage of a larger size feeding sprocket or pin wheel within a limited space.

While the invention is herein described in its relation to an autographic register, it is to be understood that it is equally applicable to other writing and imprinting apparatus for advancing continuous record material, as in typewriters, tabulating and billing machines, addressing machines, and for other conveyor purposes.

The use of pin belt conveyors for feeding record material has heretofore been known. However, in such instances the effective feeding reach of the pin belt has been straight and the engagement or disengagement of the pins and record material have been effected about arcs of relatively short radii.

The present means of affording the advantages of a large pin wheel within restricted spaces available upon typewriters, tabulators, billing and addressing machines, and the like, is illustrated in Figs. 8, 9 and 10. In such embodiment, the record material **3** is advanced about a rotary platen roll **24** past a writing position, wherein the record material is engaged by an imprinting type member **25**, and beyond which the inscribed record material is directed in an upwardly and rearwardly inclined direction.

The pin carrying belt **19** is conducted about a pair of spaced sprockets **25**, one of which is either directly connected or is connected through a gear train for unison rotation with the platen roll. Located intermediate the sprockets **25**, in the path of travel of the conveyor belt **19**, is an arcuate guide **16** of the desired radius disposed in substantially tangential relation with the path of travel of the record material. The feeding pins **20** upon the conveyor belt are maintained out of engagement wtih the record material during their upward travel by grooved guide rollers **26**, except as they pass over the arcuate guide **16**. During such passage the pins **20** are progressively and gradually projected into the holes in the record material and are temporarily maintained in feeding engagement therein, and subsequently withdrawn. The timing of the changing relations of the feeding pins **20** and the record material is determined by the radius of the arcuate guide **16**. Obviously, such type of feeding device may be disposed to effect feeding engagement with the record material either during its departure from the platen roll as illustrated, or during its approach thereto, as is more or less common with other types of feeding mechanisms of the prior art.

In Figs. 1 and 4 the guide member **16** has been shown to be adjustable relative to the pulley **12** to enable the extent of the arcuate deflection of the pin carrying band or tape to be varied.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A strip feeding device for a recording apparatus, including a traveling conveyor belt, a series of spaced feeding pins carried thereby and engageable with a strip of record material to advance the latter past a recording position, communicating arcuate guide portions for the belt of different radii in substantially tangential relation with each other over which the belt travels directly from one to the other, at least one of which is tangentially disposed to the path of travel of the record strip relative to which the belt is advanced, the construction and arrangement being such that the feeding pins carried by the belt will be advanced into engagement with the strip more slowly and less abruptly than they are withdrawn therefrom at the end of their period of engagement with the strip.

2. A record strip feeding device for a recording apparatus, including a traveling conveyor belt, a series of relatively spaced feeding pins carried thereby and progressively engageable in correspondingly spaced holes in the record strip, a rotary driver for the belt, and contiguous thereto, a segmental arcuate guide of greater radius than the driver, the contour of which merges uniformly into that of the driver, and disposed in substantially tangential relation with the path of travel of the strip over which the pin carrying belt is progressively advanced from one to the other, the construction and arrangement being such that the advancement of the pins into engaging relation with the strip and the range of engagement maintained therewith will be substantially equivalent to those of a pin wheel having a radius equal to that of the arcuate guide.

3. A strip feeding means for an autographic register, having a writing tablet over which superposed strips of record material are advanced past a writing position, including an endless belt conveyor engageable with the record material, a rotary driver for advancing the conveyor, and an arcuate guide for the conveyor being of greater radius than the rotary driver the guiding face of which is disposed in tangential relation with the periphery of the rotary driver over which the belt is directed, and by which the belt is deflected from its course determined by the driver into operative engagement with the record material.

4. A pin type feeding device progressively engageable in longitudinally spaced configurations in a strip of material to be fed, including an endless traveling belt, a plurality of relatively spaced feeding pins carried thereby and engageable in the configurations of the strip to be fed, a pulley about which the belt is directed, and an arcuate guide element of greater radius than the pulley disposed with its arcuate face in substantially tangential relation with the periphery of the pulley, the construction and arrangement being such that the belt traverses the arcuate guide and pulley successively in tangential relation with the path through which the strip to be fed is advanced thereby.

5. A belt conveyor apparatus, including a traveling belt, a plurality of relatively spaced pins carried thereby and guide means for directing the belt through a path of travel, including a bight of changing radii in tangential relation with a member to be conveyed with which the pins progressively engage, the construction and arrangement being such that the engagement

and disengagement of the pins therewith will be effected differentially.

6. A strip feeding device whereby a continuous strip of record material is progressively advanced past a recording position, comprising a traveling pin carrying belt, the pins of which are progressively engageable in longitudinally spaced holes in the record strip, and an arcuate guide for the belt of progressively changing radius disposed in tangential relation with the path of travel of the record strip by which the pins are given a different rate of engaging and disengaging movement relative to the strip.

7. A pin type strip feeding device for progressively advancing a record strip past a recording position, including a series of traveling pins progressively engageable in longitudinally spaced holes in the strip, and guide means for directing the pins through an arcuate path of travel of progressive changing radius tangential with the path of travel of the strip, wherein the pins progressively engage and disengage the record strip through travel ranges of different lineal extent.

8. A pin type strip feeding device for progressively advancing a record strip past a recording position, including a series of traveling pins progressively engageable in longitudinally spaced holes in the strip, and adjustable guide means for directing the traveling pins through an arcuate path of variable extent in tangential relation with the record strip.

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