Feb. 2, 1960 A. W. METZNER ET AL 2,923,543

STRIP FEEDING DEVICE

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Fig. 2

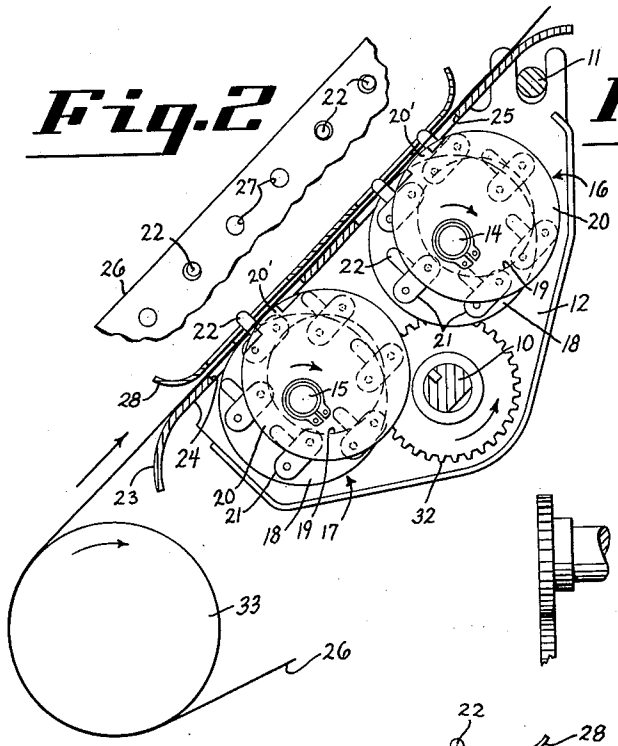


Fig. 1

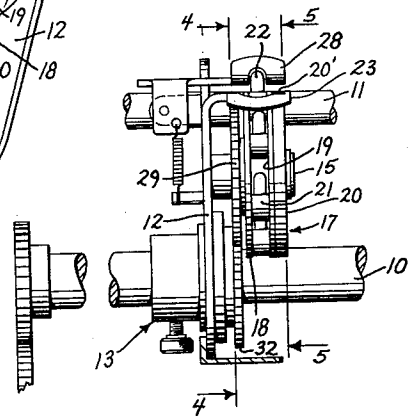


Fig. 3

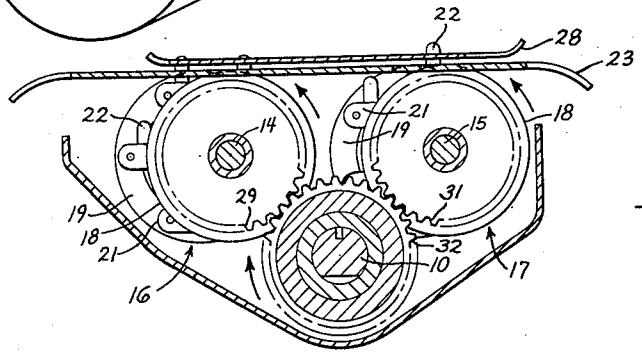


Fig. 4

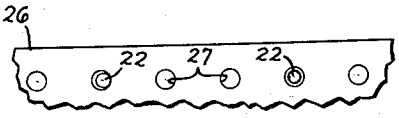


Fig. 6

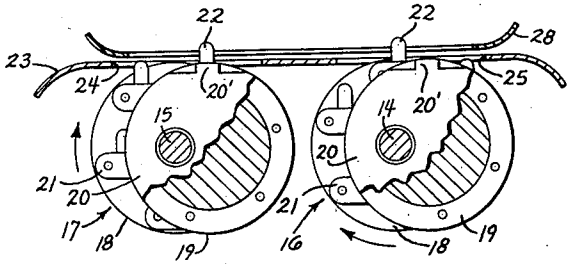


Fig. 5

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STRIP FEEDING DEVICE

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5 Claims. (Cl. 271—2.3)

This invention relates to strip feeding apparatus, and particularly to a rapid acting strip feeding device especially adapted for use in modern high speed printers and electronic business machine equipment.

Printers and business machines of the kind described operate at about 600 lines per minute, that is, a record receiving manifold strip is advanced through successive line spacing operations at a rate of about 10 per second. In most such machines, the paper comprising the strip is actually stopped, information printed thereon, and restarted ten times in each second's operation. This, of course, presents a problem in proper control and feeding of the record strip material which conventionally is accomplished by pin feeding devices engageable with marginal perforations in the strip. It is important to avoid any lag in the pick up of the strip at the start of an increment of movement, as well as over-running of the strip at the end of each increment of movement, and it is also important to maintain the several superposed copies which comprise the record strip assembly in proper alignment to facilitate entrance and withdrawal of the feeding pins relatively to the strip perforations.

The object of the invention is to simplify the construction as well as the means and mode of operation of strip feeding apparatus, whereby such apparatus may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable to a wide variety of applications, and be unlikely to get out of repair.

It is a further object of the invention to present a strip feeding apparatus better adapted than any heretofore known for efficient and reliable high speed operation.

Another object of the invention is substantially to obviate slipping of the strip in the high frequency starting and stopping of a record strip or the like.

A further object of the invention is to obtain close control of the feeding and aligning of manifold record strip material through the use of plural pin feeding devices operating in a complementary out of phase relationship to one another.

A still further object of the invention is to present an improved form of escalator type feeding device for use in high speed strip feeding apparatus.

A further object of the invention is to provide a strip feeding apparatus possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

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 as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein is shown one but obviously not necessarily the only form of embodiment of the invention,

Fig. 1 is a detail view in side elevation of a strip feeding device in accordance with the illustrated form of the invention;

Fig. 2 is a fragmentary view in plan of a record strip, showing the relationship of the feeding pins to the perforations of the strip which prevails in the position of the parts shown in Fig. 1;

Fig. 3 is a detail view in front elevation of the strip feeding device of Fig. 1;

Fig. 4 is a view in cross section, taken substantially along the line 4—4 of Fig. 3, with some parts omitted;

Fig. 5 is a detail view of the strip feeding device of Fig. 1, showing the parts in another position of adjustment or operation; and

Fig. 6 is a detail view like Fig. 2, showing the relationship of the strip and feeding devices in the position of the parts shown in Fig. 5.

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

Referring to the drawings, in its illustrated form, the invention has in view a generally new type of strip feeding device in which plural (in the present instance two) rotary pin wheels are mounted in series relation and for unison synchronized operation, with the respective devices being set for feeding and aligning of the strip in such alternating relation that the strip is substantially continuously controlled by the feeding pins.

As shown in the drawings, a rotary drive shaft **10** and a parallel tie rod **11** mount a plate **12** which through an adjustable mounting sleeve assembly **13** may be set in selected positions along the lengths of the shafts **10** and **11**. The plate **12** has laterally spaced apart stub shafts **14** and **15** set therein which provide rotary bearing mounts for respective pin wheel assemblies **16** and **17**. The latter, which are thus freely rotatable on their respective mounts **14** and **15** are of an escalator pin type heretofore known. Thus, each comprises a pair of parallel spaced apart discs **18** and **19**, the former being concentric on its stub shaft mounting and the latter being eccentric thereto. Disc **19** is mounted for rotation on anchor plate **20**, which plate is held against rotation by engagement of lug **20'** with table **23**. Disposed between the discs **18** and **19**, in rotary series formation, are links **21** pivotally connected at their one ends to the disc **18** and similarly connected at their opposite ends to the disc **19**, the separate end connections with respect to each link being in a common horizontal plane. Integrally formed with or otherwise secured to each link **21** is an upright pin **22**. The construction and arrangement of parts is such that rotation of the pin feed or pin wheel assembly about the stub shaft mounting causes the links **21** with their pins **22** to revolve about the stub shaft mounting and during a part of such motion the pins **22** project above the peripheries of the carrying discs **18** and **19**. The respective devices **16** and **17** are so arranged that the circumferential area of projection of the pins **22** is the same for both feeding devices. The supporting plate **12** at its upper end is formed with a turned over table **23** in which are longitudinally spaced apart respective openings **24** and **25** through which the pins of the respective devices project. As indicated in Fig. 1, a strip **26** extends in overlying contacting relation to the table **23** and marginal perforations **27** therein are engaged by the pins **22** with the result that the strip **26** is carried forward or advanced over the table **23** in response to rotation of the pin feeding devices **16** and **17**. A hold down member **28** is pivotally mounted on the plate **12** and serves to hold the strip upon the table **23** in position to be engaged by the feeding pins, it being understood that the strip is positioned with the perforations **27** therein in line with or in the path of the revolving feeding pins.

A gear 29 is suitably secured to the outer face of disc 18 of feeding device 16. A like gear 31 is secured to the outer face of the disc 18 of the device 17. A third gear 32 is secured to the shaft 10 and is in common meshing engagement with the gears 29 and 31. As a result, rotation of the shaft 10 effects a corresponding and synchronous rotation of the gears 29 and 31 and their respective pin feed devices.

The feeding devices 16 and 17 are, as before noted, identical in their construction. Each, in the illustrated instance, comprises six equally spaced apart feeding pins 22. In accordance with the instant invention, however, the respective feeding devices are rotatably offset with respect to one another. Thus, corresponding pins on the respective devices may be said to be in leading or following relation with respect to one another. In Fig. 1, for example, the device 17 is positioned with a single pin in uppermost position, and this pin is at this time fully extended. In the case of the device 16, however, two of the feeding pins are approximately equally extended. The left hand one thereof, which may be considered to correspond to the fully extended pin of the device 17, is just starting to enter a perforation in the strip while the right hand extended pin is retracting therefrom. Corresponding pins of the two devices may therefore be said to engage the strip in alternating relation to one another. A slight additional rotation of the feeding devices will serve to place the device 16 in the position shown occupied by device 17 in Fig. 1, and vice versa.

In relation to the perforations 27 in the strip, as shown in Fig. 2, the single extended pin in the device 17 in Fig. 1 is seen to be in full driving engagement with the fore edge of the perforation 27 receiving such pin. In the case of device 16, at this same time, the right hand one of the pair of extended pins continues to be in engagement with the fore edge of its perforation and in effect remains in driving engagement with the strip although it is at this time retracting therefrom. The left hand one of the pair of extended pins is just rising into its perforation and engages or substantially engages the rear edge thereof. The feeding device 16 is thus in a sense in locking engagement with the strip in that the strip substantially is precluded from forward and rearward relative movement. Should the motion of the strip stop at this moment, therefore, no appreciable slipping or sliding of the strip will result and when the feeding devices re-start the strip will be picked up and moved smoothly without lost motion.

The parts are shown in Figs. 5 and 6 moved slightly beyond the positions shown in Figs. 1 and 2 where it may be seen that the right hand one of the pair of extended pins in the device 16 has dropped out of engagement with the strip while the left hand one of such pair has risen further and is about to engage the fore edge of its perforation to effect positive feeding of the strip. In the device 17, the single extended pin, previously responsible for the feeding impulse, is beginning to retract from the strip and a succeeding pin is rising to take its place. This pin, as may be seen, is rising centrally and concentrically in its perforation. Due to the fact that the strip is constantly aligned a rising feeding pin always finds clean or sharp edges perforation opening to receive it and there is little or no likelihood of misalignment and consequent misoperation.

In conventional strip feeds of the kind with which this invention is principally concerned, the perforations 27 in the strip are spaced apart a distance of about one-half inch. The result of using a feeding mechanism in accordance with the present invention is that each feeding pin is responsible for imparting to the strip an increment of movement less than one-half inch and is assisted in its feeding and aligning functions by another pin or pins in complementary relation thereto. A close control over the movements of the strip thereby is obtained comparable to what might be achieved were the number of perforations in a given area doubled and the number of feeding pins in a feeding device correspondingly doubled, both of which concepts are impractical as rotary pin feeding practices are now understood. The illustrated feed apparatus may be said to control the strip to within .0062 of an inch. Thus, from their fore and back edges the pins measure .650 of an inch. The fore and rear edges of the perforations in the strip measure .6562, all of these being measurements of a conventional feeding mechanism, as may be used in a business machine of the like to advance a strip 26 over a platen 33 for the imprinting of data thereon.

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 but one 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 our invention, we claim:

1. Strip feed mechanism for feeding and aligning strip material having a series of perforations, the mechanism being of the type having support structure, a pair of spaced-apart shafts carried by the support structure, a plurality of disc members, there being a pair of spaced-apart disc members rotatably mounted upon each of the shafts, one of each pair of disc members being a concentric disc member as the disc member is concentric with the shaft, one of each pair of disc members being an eccentric disc member as the disc member is eccentric with the shaft, a plurality of link members connected between each pair of disc members, each link member having one end thereof pivotally connected to an eccentric disc member and the other end thereof pivotally connected to a cencentric disc member, the link members which connect between a pair of disc members being substantially parallel, a plurality of pin members, there being one pin member rigidly connected to each link member intermediate the ends thereof, all of the pin members extending in substantially the same direction from the link members, gear means connected to each concentric disc member and joining the concentric disc members one to the other so that there is simultaneous rotation of the two pairs of disc members in the same direction of rotation, a strip support member adjacent the disc members, the strip support member having a pair of openings therein over which the strip lies, there being one opening adjacent each pair of disc members so that pin members of each of the pairs of disc members are movable through the opening and movable into perforations of the strip and thus are in driving position with respect to the strip, the link members and pin members being so disposed with respect to disc members that at least one pin member of each pair of disc members is always disposed in driving position with respect to the strip.

2. Apparatus for feeding strip material which is provided with spaced perforations comprising a plurality of tandemly spaced-apart feed devices, each of the feed devices being of the type having a shaft, a pair of disc members rotatably carried upon the shaft, one of the disc members being eccentric with respect to the shaft, the other disc member being concentric with respect to the shaft, a plurality of link members extending between the

disc members, one end of each link member being pivotally attached to one of the disc members, all of the link members being substantially parallel, a plurality of pin members, there being a pin member firmly attached to each of the link members, all of the pin members being substantially parallel and extending in the same direction from the link members, the combination also including strip support structure, the pin members of the feed devices being extendible into perforations of the strip, means connecting the feed devices together so that there is simultaneous rotation thereof for moving the strip with respect to the strip support structure, so that there is always at least one of the pin members of each feed device within a perforation of the strip.

3. A device for movement of a strip of material provided with a series of apertures therethrough, comprising support structure, the support structure having a surface over which the strip of material is movable, a plurality of tandemly spaced-apart feed devices, each of the feed devices being of the type having a pair of rotatable disc members carried by the support structure, one of the disc members being a concentric disc member as it is rotatable about its center, the other disc member being an eccentric disc member as it is rotatable about an axis nonconcentric with the center thereof, a plurality of links connecting one disc member to the other disc member with the links extending between the disc members and being pivotally attached to both of the disc members, a plurality of pin members, there being one pin member attached to each of the links and extending therefrom, the support structure having a pair of openings, there being one opening adjacent each of the feed devices through which the pin members thereof are movable during rotation of the feed devices, the pin members being movable into apertures of the strip of material, and means connecting the concentric disc members of the feed devices one to the other so that the feed devices rotate one with the other to move the paper along the support structure as the pin members engage the strip of material within the apertures thereof, and so that there is always at least one of the pin members of each feed device within an aperture of the strip.

4. Apparatus for feeding and aligning strip material having a series of perforations therein comprising a pair of tandemly spaced-apart rotary feeding devices, each of the feeding devices being of the type having a pair of spaced-apart substantially parallel discs, the discs being similar in size, the discs being offset one with respect to the other, one disc having an axis of rotation concentric therewith and the other disc has an axis of rotation eccentric therewith, a plurality of links extending between each pair of discs, each link being pivotally attached to each disc, a plurality of pins, there being a pin carried by each link and extending therefrom, all of the pins being parallel, the combination also including support structure provided with a surface having openings therethrough adjacent the feeding devices, the strip of material resting upon the support surface and having portions disposed over said openings, the pins of the feeding devices being movable through the openings and through the perforations, means connecting the feeding devices one to the other rotating the feeding devices in synchronism so that there is always at least one pin of each feeding device extending through a perforation of the strip, the feeding devices being rotatable so that two pins of one feeding device extend through perforations of the strip while one pin of the other feeding device extends through a perforation of the strip.

5. Apparatus for feeding and aligning strip material having a series of perforations therein comprising a pair of tandemly spaced-apart rotary feeding devices, each of the feeding devices being of the type having a pair of spaced-apart substantially parallel discs, the discs being similar in size, the discs being offset one with respect to the other, one disc having an axis of rotation concentric therewith and the other disc having an axis of rotation eccentric therewith, a plurality of links extending between each pair of discs, each link being pivotally attached to each disc, a plurality of pins, there being a pin carried by each link and extending therefrom, all of the pins being parallel, the combination also including support structure provided with a surface having openings therethrough adjacent the feeding devices, the strip of material resting upon the support surface and having portions disposed over said openings, the pins of the feeding devices being movable through the openings and through the perforations, gear means engaging both of the feeding devices rotating the feeding devices in synchronism so that there is always at least one pin of each feeding device extending through a perforation of the strip, the feeding devices being rotatable so that two pins of one feeding device extend through perforations of the strip while one pin of the other feeding device extends through a perforation of the strip.

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