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WEB FEEDING DEVICE HAVING MAGNETIC HOLD DOWN MEANS

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Fig. 1.

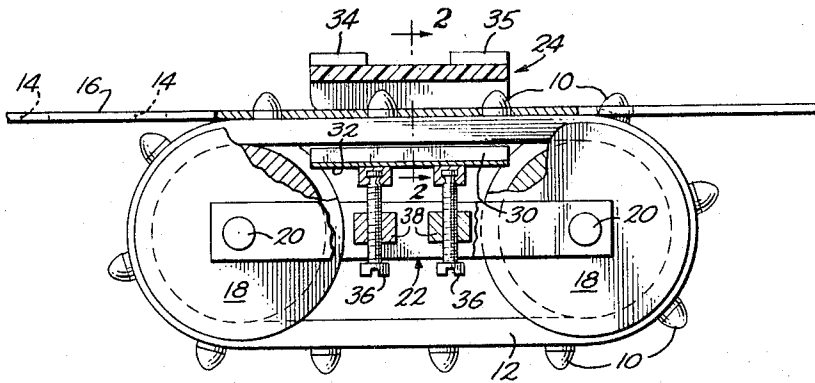


Fig. 2.

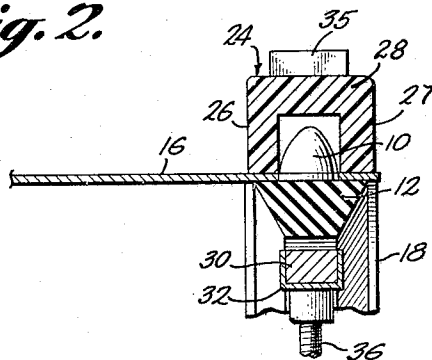
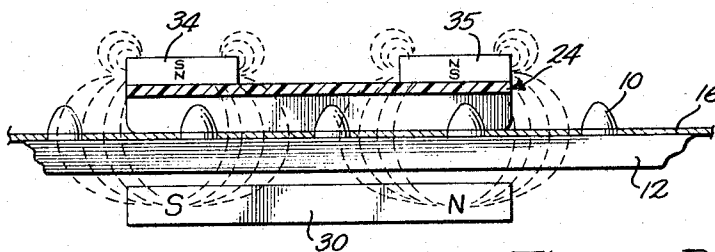


Fig. 3.



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WEB FEEDING DEVICE HAVING MAGNETIC HOLD DOWN MEANS

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This invention, generally, relates to web feeding devices for moving an elongated sheet along a predetermined path, and more particularly, it concerns a web feeding device especially suited for use with paper feeding apparatus in which a plurality of projecting pins are spaced to register with similarly spaced apertures in the paper to be fed.

Recent advances in the field of high speed electronic data processing equipment have posed many problems from the standpoint of providing various ancillary mechanical components capable of operating with sufficient accuracy and at sufficiently high rates of speed so that the extremely high performance rates of such equipment may be fully appreciated. To illustrate, the output rate of an electronic data processing system is necessarily limited by the rate at which processed intelligence can be recorded.

Various types of high speed printers have been developed to this end, but in turn, these printers have increased the performance demands on their ancillary components, such as paper feeding devices. Feeding devices found to be very effective for advancing paper on which processed intelligence is recorded by high speed printers have employed pins mounted on an endless belt or wheel and spaced corresponding to apertures or feed holes in the paper to be fed.

Thus, as the pins come into register with the feed holes, the paper is engaged and advanced positively. Also, these feeding devices conventionally employ some means to hold down the web to assure complete or positive engagement between the paper and the pins.

Hold-down devices heretofore available generally have taken the form of a flat, relatively stiff member preferably held in a position to define a space over the pin carrier slightly greater than the thickness of paper. Confining the paper to a thin space in this fashion generally has been considered preferable to the use of pressure directly against the paper adjacent to the feed pins because of the additional drag and resulting load on the paper particularly in the vicinity of the feed holes in the paper.

Also, though it is recognized as being desirable that the hold-down device be positioned as close to the feed pins as possible to prevent the paper in the vicinity of the spaced holes from riding up on the pins during feeding, considerable difficulty has been experienced in keeping the hold-down device adjusted properly to maintain the necessary close tolerances principally because of the number of parts that have been involved, and because of the requirement that the hold-down device be moveable or retractable so that paper may be loaded onto the feed pins. Moreover, and because of the difficulty of adjustment for the most part, the needed tolerances are not maintained so that much difficulty is encountered with untracking, tearing, and otherwise damaging the paper which must be fed with accuracy at the extremely high speeds that are involved.

In accordance with the present invention, paper being fed by projecting traction pins is retained on the pins against the carrier or belt by a channel member formed of low friction material, such as nylon, Teflon, or the like.

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The channel member is arranged so that two of the walls straddle the traction pins and is retained in this position by magnetic means, preferably in the form of a permanent magnet underlying the pin carrier belt and cooperable with armature means associated with the channel member.

It is contemplated further that the pressure exerted by the channel member on the paper may be made variable, such as for example, by adjusting the distance between the permanent magnet and the armature means associated with the channel-shaped member. As a result, not only are the required close tolerances easily maintained, but also, the channel-shaped member is removed very simply and is replaced as required during paper loading and unloading.

Therefore, it is a principal object of this invention to provide a hold-down device for use in conjunction with sheet material feeding apparatus wherein the problems heretofore experienced are overcome effectively and substantially.

Another object of this invention is to provide a hold-down device of the type referred to which requires no direct physical support structure to retain it in its proper operating position.

A further object of this invention is the provision of a hold-down device for use with pin-type paper feeders which is extremely simple in construction and, thus, economical both from a manufacturing and from a maintenance standpoint.

Still another object of this invention is the provision of a paper hold-down device of the type referred to which is easily placed in or removed from an operating position without danger of disturbing the working tolerances required.

Other objects and further scope of applicability of the present invention will become apparent from the description to follow below taken in conjunction with the attached drawings, in which:

FIG. 1 is a side view in elevation, partially in cross-section, of the hold-down device of this invention associated with an endless belt-type pin feed apparatus;

FIG. 2 is an enlarged fragmentary cross-section taken along the line 2-2 of FIG. 1; and

FIG. 3 is a schematic view of the hold-down device of this invention similar to FIG. 1 but showing the flux paths of permanent magnets employed to retain the channel-shaped member in position.

As shown in the drawings, and particularly in FIGS. 1 and 2, the hold-down device of this invention is associated with a conventional pin-type paper feeder in which a plurality of uniformly spaced pins 10 are carried on an endless belt 12 to register with a plurality of correspondingly spaced holes 14 formed, in accordance with conventional practice, in a paper web 16 to be fed. The belt 12 is trained about a pair of pulleys 18 having shafts 20 journaled in a suitable carrying frame 22. It will be appreciated that at least one of the pulleys 18 is adapted to be rotatably driven by connection of its shaft 20 to an appropriate source of power (not shown).

The paper hold-down device in accordance with this invention includes an elongated channel-shaped member 24 presenting a cross-section that is of inverted U-shaped configuration to define a pair of spaced vertical walls 26 and 27 connected at their upper edges by a top 28, as shown most clearly in FIG. 2 of the drawings. The channel-shaped member 24 preferably is formed of light material having low friction characteristics; for example, nylon, Teflon or the like. Also, it is preferred, though not necessarily required, that the ends of the walls 26 and 27 be curved to facilitate the passage of the paper past the corners presented at the bottoms of these walls.

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The spacing of the walls 26 and 27 from each other, as shown in FIG. 2, is slightly greater than the diameter, or maximum lateral dimension, of the pins 10. In this manner, the paper 16 is held down against the belt 12 to assure full projection of the pins 10 through the apertures 14 in the paper.

To retain the channel-shaped member 24 in the position shown in the drawings relative to the pins 10 and the belt 12, a bar-type permanent magnet 30 is positioned on the opposite side of the belt 12 from the member 24 in a supporting bracket 32 and is cooperable with armature means in the form of a pair of permanent magnets 34 and 35 carried on the top wall 28 of the channel-shaped member 24. The supporting bracket 32, in the form shown in FIG. 1, is supported on the upper end of a pair of set screws 36 threadably received in transverse portions 38 of the frame 22.

While many forms of magnetic means may be employed to retain the channel-shaped member 24 in its operative position, as shown in the drawings, the arrangement shown in FIG. 3 has been found in practice to provide excellent results. As shown, each of the permanent magnets 34 and 35 carried on the channel-shaped member 24 are disposed vertically, that is, the north and south poles thereof are oriented vertically.

Hence, by arranging the north pole of the magnet 34 above the south pole of the bar magnet 30 and the south pole of the magnet 35 above the north pole of the bar magnet 30, the flux paths shown in FIG. 3 are established to draw the channel-shaped member 24 downwardly against the paper 16 and the belt 12 toward the bar magnet 30. This arrangement has been found particularly effective from the standpoint of holding the channel-shaped member 24 against longitudinal movement in the direction of paper feed. Also, it is preferred that the magnet 34 be formed of barium ferrite, whereas the bar magnet 30 is preferably formed of an alnico alloy.

In use, the channel-shaped member 24 is removed manually by exerting a pull to overcome the magnetic attraction between the magnets 34 and 35 and the paper 16 positioned over the pins 10 as shown. Thereafter, the channel-shaped member 24 is replaced to its position as shown in the drawings and will be retained in this position by the magnetic flux paths shown in FIG. 3.

Then, as the pulleys 18 are driven rotatably, the belt 12 and the pins 10 travel about the pulleys and advance the paper in the direction of pulley rotation. Because of the magnetic retention of the channel-shaped member 24, the paper about the pins 10 which project through the openings 14 will be held under a slight but firm pressure against the belt so that complete projection of the pins through the paper is effected.

Because of the low coefficient of friction exhibited by the material from which the channel-shaped member 24 is formed, the paper will slide under the channel-shaped member 24 with very little resistance. Also, because of the slightly greater spacing between the walls 26 and 27 and the lateral edges of the pins 10, the channel-shaped member 24 will at all times be aligned with the path of pin travel.

To adjust the pressure exerted by the channel-shaped member 24 on the paper 16, the bar magnet 30 may be moved toward or away from the belt 12 and, thus, toward or away from the magnets 34 and 35 carried on the channel-shaped member 24 by adjustment of the set screws 36. It will be appreciated, however, that other means may be provided to effect this adjustment.

For example, the amount of pressure, as may be required in order to feed forms of various thicknesses, or multipart forms, may be varied by adjustment of the spacing between the magnets 34 and 35 and, thus, relative to the poles of the magnet 30, or by providing channel-shaped members in coded sets for different uses. In this latter respect, the various channel-shaped members forming a set would be provided with different strength mag-

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nets or with different thicknesses of armatures to vary the force by which they would be attracted to the magnet 30.

It will be appreciated, therefore, that by this invention an extremely simple and yet highly effective hold-down device for paper feeders is provided and by which the aforementioned objects are fulfilled completely. Moreover, it will be appreciated that the hold-down device of this invention may take different forms and be adapted to different applications than those described above.

For example, various arrangements of permanent or electromagnetic means may be employed to retain the channel-shaped member in its operative position. Moreover, the shape of the channel member could be altered to adapt itself to different pin driving means. To illustrate, a wheel-carried pin drive device could be accommodated by this invention by forming the channel member in an arcuate configuration and locating magnetic attraction means in the wheel.

Therefore, since the hold-down device of this invention may take many different forms or be adapted to other environments than those shown and described herein, it is to be distinctively understood that the foregoing description is illustrative only, not limiting, and that the true spirit and scope of this invention is to be determined by reference to the appended claims.

The invention claimed is:

1. In a web feeding device for feeding sheet material, said device being of the type having a plurality of pins spaced to register with similarly spaced apertures in sheet material to be fed and projecting from a pin carrier member, a hold-down device comprising:

a channel member of low friction material having a pair of walls spaced apart by a distance slightly greater than the lateral dimension of the pins; and magnetic means for retaining said channel member in a position wherein the walls straddle the pins and hold the sheet material against the pin carrier member.

2. In an apparatus for feeding sheet material having a series of uniformly spaced apertures therein and arranged along a path extending in the direction of feed:

endless support means for carrying the sheet material during feeding,

a plurality of pins projecting from said support means and registrable with the apertures in the sheet material,

hold-down means positionable over said pins and the sheet material to hold the sheet material against said support means while said pins project through the apertures therein, and

magnetic means to retain said hold-down means in said position.

3. Apparatus for feeding a web having longitudinally spaced apertures, comprising:

an endless carrier member for carrying the web during feeding,

a plurality of pins projecting from said carrier member and registrable with the apertures in the web,

a channel member of low friction material positionable over said pins and engageable with the web on opposite sides of said pins to hold the web against said carrier member,

armature means on said channel member, and magnetic means for retaining said channel member in position.

4. The apparatus recited in claim 3 in which said endless support member is a belt trained about at least two pulleys to establish a flat run to engage the web.

5. The apparatus recited in claim 4 in which said magnetic means comprises an elongated bar magnet positioned beneath the upper run of said endless belt.

6. The apparatus recited in claim 5 in which said armature means comprises a pair of spaced permanent magnets supported on said channel member.

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7. The apparatus recited in claim 6 in which said spaced permanent magnets have their magnetic axes disposed vertically and arranged such that the polarity of each of said magnets is attracted by the respective poles of the bar magnet underlying the upper run of the belt.

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8. The apparatus recited in claim 7 including adjustable means for supporting said bar magnet relative to said belt.

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References Cited by the Examiner**UNITED STATES PATENTS**

3,114,490	12/1963	Zenner	-----	226—74
3,219,245	11/1965	Manor et al.	-----	226—74

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