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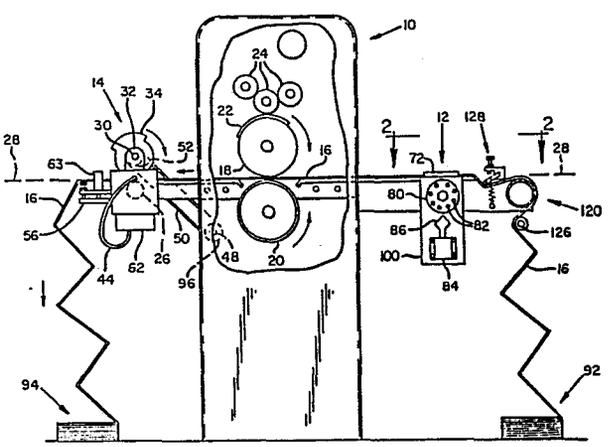
(54) Processing continuous form paper.

(57) An attachment to enable an offset press 10, of a type adapted to process individual sheets of paper, to feed and print continuous forms stationery in proper registery includes, in addition to an intermittently operable paper feeding station 14 downstream of the press, a separate registration station 12 upstream of the press. The registration station 12 maintains continuous engagement with the paper 16 by means of a freely rotatable, endless pin belt 66 which engages the pin holes 70 of the paper and individually registers each increment of paper to the press 10 while the paper is disengaged by the paper feeder 14. A rotating disc 80, operatively connected to the pin belt 66, includes a plurality of windows defined by adjacent posts 82 for receiving a solenoid activated, wedge-shaped finger 86 which arrests and positions the disc 80, and hence the paper, in one of a plurality of predetermined positions. A sensor 44 associated with the paper feeder station 14 detects when the paper is engaged or disengaged with the paper feeder and generates a signal to the solenoid 84, but there is no mechanical interconnection between the paper feeder and the registration device. In another embodiment the intermittent paper feeding function may be accomplished solely by the printing blanket of the offset press.



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PROCESSING CONTINUOUS FORM PAPER

BACKGROUND OF THE INVENTION

This invention relates to the feeding and registering of continuous form paper to a processing unit such as for example an offset press and to adapting a processing unit such as an offset press, originally adapted to process single sheets of paper, to process continuous form paper.

The arrival of the word processors and high speed, computer controlled printers in modern offices and businesses has created a need for a variety of business documents, such as invoices, purchaser orders, letterhead, envelopes, checks, and the like to be available on continuous form paper so they may be rapidly processed by the high speed office printer. One method of providing such a capability is to mount the business documents such as letterheads or invoices onto continuous carrier paper. This involves several processes, first the business document must be printed and second it must be mounted on the carrier paper precisely aligned and registered so that the high speed office printer, which is referenced to the carrier paper through the pin holes on the margins of the carrier paper, will know where to print and where to not print. Expensive, relatively slow machines are needed to mount the documents on the carrier paper in precise registry.

Another method is to print the business documents such as letterhead or invoices directly onto the continuous form paper and then, through the use of perforations in the continuous form paper, separate the printed documents from the marginal strips having the pin holes therein and from the adjacent printed documents. This process is preferable to the carrier mounted method since it eliminates a step and an expensive machine, but it has the same requirement for precise registry. The printing on the continuous form must be precisely placed with respect to the perforations which define the separate

documents within the continuous form paper. Lack of proper registration can cause printing to run over the perforations extending across the continuous form paper which define the separate documents.

Printing on continuous form paper raises another problem, especially in the case of letterhead which should have an "clean edge" appearance and not display detectable serrations on the edges. While perforation methods and apparatus are available which can achieve such a clean edge appearance when the individual sheets of letterhead are broken out of the continuous form, such clean edge perforations are very delicate and prone to breaking during processing.

There is therefore a problem in arranging to feed and precisely register continuous form paper to a press or other processing unit without breaking the perforations, even clean edge perforations.

Most of the existing machines for processing continuous form paper use a "tractor feed" device, a system of multiple driven pin wheels or pin belts which engage the pin holes on the margins of the continuous form paper and pull the paper through the processor. Similarly, most of these machines also use the tractor feed mechanism to index or register the continuous form paper to the press or processor. In many processors, such as offset presses and perforators, it is necessary to stop, retard, or advance the passage of paper through the processor to keep the paper in proper registry with the printing or perforating cylinder.

Disadvantages associated with this type of system include the fact that each of the tractor feed drives on a particular unit must be synchronized and timed with respect to each other and to the processing unit, and that any imprecision in the feeding system is carried over into the registration system. Thus small errors can, with sufficient iterations, accumulate into large errors. Furthermore, the stopping, starting, retarding and advancing of the multiple tractor feed devices, all of which engage the paper, has a tendency to distort or rip the pin holes, or break the perforations,

especially clean edge types of perforations.

To some extent, these disadvantages can be avoided by providing an intermittently operable paper feeder arrangement and a separate registration device which can operate to index the continuous forms documents between each feed operation while the paper feeder is disengaged from the paper. Such a system is disclosed in U.S. Patent No. 3373684 of Fisher, but the Fisher arrangement is designed for use with a standard multigraph type printing press having a driven drum carrying a printing plate and the registration device is linked mechanically with a separate paper feeder and with the drive for the printing plate drum. As disclosed, it would not be suitable for use with an offset press of the kind having a printing blanket mounted on a blanket cylinder that is disengageable with an impression cylinder and would not be suitable for use as a readily fitted removable attachment to convert or modify an existing printing press or like processing unit. Moreover, in that the operation of the Fisher registration device is directly dependent upon and is related to the speed of the press drive through the mechanical linkage which in any event is relatively slow acting, it tends to allow the paper to float freely for a significant period during the transitions between successive paper feed and registration indexing operations and the device is not suitable for high speed operation. For indexing Fisher also proposes the use of a rotating star wheel type detent but this also has disadvantages especially for operation at high speed.

Summary of the Invention

The present invention accordingly seeks to provide an improved apparatus for use in registering continuous form paper fed to or through a processing unit which apparatus, at least in preferred embodiments, can be applied to processing units such as high speed offset printing presses and may be designed as an attachment capable of being readily fitted and removed without substantial effort or modification.

More specifically, the present invention provides registration apparatus for successively registering continuous paper that is fed discontinuously at a selected speed by a paper feeder to a processing unit such as a printer, perforator or the like, said apparatus comprising: paper engaging means arranged to maintain continuous engagement with said paper while permitting the discontinuous feeding of said paper by said paper feeder; detent means arranged to move and interact selectively with said paper engaging means so as to arrest and align said paper with respect to said processing unit; and means for activating said detent means, characterised in that said activation means is operable selectively to cause said detent means to move to interact as aforesaid with said paper engaging means at a speed which is independent of and unrelated to the operating speed of said paper feeder and said processing unit.

Where the paper feeder is such that it alternately engages and releases the paper, the activation means preferably operates to enable the detent means to move and interact with the paper engagement means so as to arrest the paper substantially instantaneously after the paper feeder releases the paper.

In preferred embodiments, said activation means is not mechanically linked, either directly or indirectly, to the paper feeder and includes electrical means, preferably a solenoid, for moving the detent means. Also, the detent means when moving to interact with the paper engaging means is preferably arranged to move along a straight line or linear path.

The foregoing and other objectives, features, and advantages of the invention will be more readily understood upon consideration of the following detailed description of preferred embodiments, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a partially schematic elevational view of a first embodiment of the present invention ir conjunction with an offset printing press.

FIGURE 2 is a plan view of the registration portion of the embodiment of FIGURE 1 taken along lines 2-2.

FIGURE 3 is an elevational view of the registration portion of said embodiment.

FIGURE 4 is an elevational view of the registration portion of the embodiment of FIGURE 1 taken along lines 4-4 of FIGURE 2.

FIGURE 5 is a partial plan view of the paper feeding portion associated with the first embodiment of the invention taken along lines 5-5 of FIGURE 1 with the draw roller solenoid cut away.

FIGURE 6 is a partially cut away elevational view of the paper feeding portion associated with the first embodiment shown in FIGURE 1.

FIGURE 7 is an end elevational view of the paper feeding portion associated with the first embodiment of the invention taken along lines 7-7 of FIGURE 5.

FIGURE 8 is a partially schematic view illustrating a second embodiment of the present invention.

FIGURE 9 is a schematic, partial elevational view of the arrangement shown in FIGURE 8 showing the cam and cam follower associated with the paper feeding portion.

FIGURE 10 is a partial view of the infeed portion of the apparatus illustrated in the preceding Figures, showing a vacuum brake

and dancer.

FIGURE 11 is an elevational view of the dancer taken along lines 11-11 of FIGURE 10.

DETAILED DESCRIPTION

The apparatus of the present invention is shown in the drawings and is described herein in conjunction with an offset printing press of the type adapted to process individual sheets of paper. One embodiment employs a modified printing blanket assembly as a paper feeder while another embodiment adds a separate paper feeder to the offset press. However, it should be understood that the features and principles described herein apply equally to other processing units whether adapted to process single sheets or continuous form paper.

Turning to FIGURE 1, a first embodiment of the apparatus of the present invention is shown in conjunction with an offset printing press 10 adapted to print individual sheets of paper, and includes a registration station 12, upstream of the press, and a paper feeding station 14 downstream of the press so that the continuous form paper 16 is pulled past the registration station and through the press by the paper feeder.

The press includes a blanket cylinder 18 and a parallel opposed impression cylinder 20 which rotate at the same speed. The blanket cylinder and impression cylinder are arranged so that there is a small space (approximately .033 inch i.e. 0.84 mm) between them. The blanket cylinder mounts a printing blanket 22 whose thickness (.035 inch i.e. 0.89 mm) exceeds the space between the cylinders.

The printing blanket contains the image to be printed on to the paper. An assembly of ink rollers 24 spread ink and water onto the printing blanket. It should be noted that the blanket cylinder and impression cylinder are arranged and rotated so that when the blanket becomes opposed to the impression cylinder the combined rotation of the two cylinders will pull paper through the press, but when the blanket is not opposed to the impression cylinder, the paper, being thinner (.004 inch) than the space between the cylinders, will not be acted upon by the press.

Referring to FIGS. 1, 5, 6 and 7, the paper feeding station 14 according to a first embodiment of the present invention includes a draw roller 26 arranged perpendicular to the paper flow and directly below the paper plane 28, as defined by the path of the paper as it passes through the offset press. The draw roller is mounted on a shaft journaled in bearings 54 at either end for free rotation. A feeder shaft 30 is journaled directly above and parallel to the draw roller by a pair of feeder shaft bearings 32. Mounted on the feeder shaft for rotation therewith is an adjustable segment 34 comprising two adjacent, concentric, circumferential segments 34a and 34b. One of the segments 34a is fixed to the shaft by a collar 36 while the other segment 34b may be free to rotate about the feeder shaft with respect to the fixed segment. As may be seen in FIG. 6, each of the segments includes a plurality of adjustment holes 38 which may be employed to fix the segments together with a bolt 40 or other suitable fastening device in a desired rotational relationship to each other. It should be apparent that by selective use of the bolt and adjustment holes the circumferential length of the segment may be adjusted as desired. The holes 38 shown in FIG. 6 allow configuration of the segments in any one of a plurality of predetermined circumferential lengths. Employing slots

instead of holes would permit any circumferential length within the range of the two segments.

A retro-reflective photoelectric scanner 42 such as manufactured by Banner Engineering Corporation of Minneapolis, Minnesota is mounted to the apparatus near the feeder portion. A fiberoptics device having a bifurcated fiber 44 adapted to be used with a retro-reflective scanner leads from the scanner to a position near one of the feeder shaft bearings and is aligned so that the beam path 46 of the fiber 44 is within a plane defined by the axis by the feeder shaft and the draw roller. As may be seen in FIGS. 6 and 7, the fiber is positioned so that the beam will only strike the segment 34a or 34b when the segment is in contact with the draw roller.

As previously mentioned, the draw roller is freely rotatable. However, the feeder shaft is operatively connected to a drive shaft 48 on the press by a belt 50 and pulley 52 mounted on the feeder shaft in a manner shown in FIGS. 1, 6 and 7. The drive shaft is operatively connected to the shaft that turns the blanket cylinder and the impression cylinder so that the blanket cylinder, impression cylinder and feeder shaft all turn at the same rate.

Turning to FIG. 6 it can be seen that the draw roller bearings 54 which journal the draw roller are mounted to an arm 56 which is pivotally hinged to the main structure of the apparatus. The arm is supported by a biasing spring 58 mounted to a side plate 60 which is integrally attached to the main structure of the press. The height of the draw roller assembly with respect to the main structure may be predetermined and maintained by a set screw 62 so as to set and maintain the pressure between the segment and the draw roller. A draw roller solenoid 63, attached to the main structure with its piston 64 bearing against the arm 56, may be used to selectively disengage the draw

roller from the paper plane and the segment by causing the arm carrying the draw roller bearings to pivot down and away from the paper plane.

Turning now to the registration station of the apparatus shown in FIGS. 1 through 4, with initial reference to FIGS. 2 and 4, an endless pin belt 66 having a plurality of pins 68 thereon is arranged so that a portion of the endless pin belt is co-planar with the paper plane 28 and aligned so as to cooperate with the pin holes 70 along one margin of the continuous form paper 16. A paper guide 72 straddles the pins as they protrude from the paper to ensure that the pins are, and stay, securely seated in the pin holes of the paper.

A pair of upper pulleys 74 position the endless pin belt in the paper plane. The pin belt is also trained over a lower pully 76 which is fixed to an indexing shaft 78. Turning to FIGS. 2 and 3, it may be seen that the indexing shaft has a disc 80 attached thereto for rotation therewith. The disc 80 has a plurality of posts 82 mounted at regular intervals around the circumference thereof. The endless pin belt 68, pulleys 74, 76, indexing shaft 78, disc 80 and posts 82 are all preferably made from strong, durable, yet light material so that the mass and therefore the inertia of the registration assembly is minimized. To this end, the disc, preferably nylon, has a plurality of holes formed therein.

A registration solenoid 84 having a wedge-shaped finger 86 attached to its piston is mounted proximate the disc so that activation of the solenoid causes the wedge-shaped finger to extend within the circumference of the disc contacting the posts and stopping the rotation of the disc. As shown in dashed lines in FIG. 3, the wedge-shaped finger wedges in between two posts, causing the disc to rotate to a position so that the adjacent posts are equidistant

from the axis of the wedge-shaped finger, represented by the arrow 88. A return spring 90, fastened to mounting plate 100 and to the finger, serves to retract the finger from engagement with the disc and the posts when the solenoid is energized.

In operation, the segment 34 is adjusted so that the circumferential length of the segments 34a and 34b added together correspond exactly to the incremental length of the document within the continuous form paper which is to be printed. This may be accomplished by rotating segment 34b on the feed shaft with respect to segment 34a and locking it into the desired position by means of the holes 38 and bolt 40. Next, the entire segment 34 is aligned to correspond with the position of the blanket 22 on the blanket cylinder as shown in FIG. 1. This may be done by unlocking the collar 36 on segment 34a and rotating the segment on the feed shaft, or by slackening the drive belt 50 and rotating the feed shaft. Continuous form paper is fed from the infeed pack 92, shown in FIG. 1, through the registration station where it is engaged with the pins of the endless pin belt, through the press, between the blanket cylinder and the impression cylinder, and through the paper feeder, over the draw roller and under the segment, to the outfeed pack 94, also shown in FIG. 1.

When the apparatus is operated, the blanket cylinder, impression cylinder and feeder shaft turn at the same rate and the segment and blanket engage the paper substantially simultaneously. Although the blanket cooperates with the impression cylinder to help draw the continuous paper through the press, in the first embodiment of the invention shown in FIG. 1 it is the segment, in cooperation with the draw roller, which is primarily responsible for the feeding function. As may be seen in FIGS. 2 and 7, the segment grips the paper between itself and the draw roller, and as the

segment rotates about the feeder shaft the draw roller is rotated and paper is drawn through the apparatus. After exactly one increment of paper corresponding to the length of the document to be printed has been drawn through the press, the segment disengages from the paper at approximately the same time that the blanket disengages from the paper. In the first embodiment the printing blanket is usually shorter than the incremental length of paper to be printed so that the blanket will usually engage the paper after, and/or disengage from the paper before, the segment.

The fiberoptics fiber 44 is arranged in a plane defined by the axis of the feeder shaft and the axis of the draw roll, so that when the segment disengages from the paper and draw roll, the reflective receiving fiber will sense the loss of a reflective signal caused by the beam 46 bouncing off the segment. In this way the scanner may immediately generate a signal when one increment of paper has been drawn through the machine. This signal is sent to the registration solenoid and causes the wedge-shaped finger to extend within the circumference of the disc. Similarly, when the segment rotates back into the beam of the reflective receiving fiber, the scanner will generate a signal to de-energize the registration solenoid and the finger will be pulled out of contact with the disc by the spring.

As may be understood with reference to FIG. 3, as the wedge-shaped finger protrudes into the rotating disc, the point of the finger will enter into a "window" defined by the adjacent posts. As the finger thrusts into complete engagement with the posts, the wedge shape of the finger will cause the disc to rotate, either forward or backward, so that the adjacent posts are equidistance from the axis 88 of the finger. In this way the disc is arrested and positioned in one of a number of predetermined positions,

each predetermined position defined as the mid-point of the window between adjacent posts. Since the disc is linked to the endless pin belt which engages the pin-holes of the paper, the paper will be positioned in one of a number of predetermined positions. Recall that when the registration solenoid is fired, the blanket and the segment have just disengaged from the paper and the paper may be freely moved forward or backward by the disc and pin belt of the registration station.

It will be readily understood that one of the advantageous features of the present invention is that reiterative indexing of the continuous form paper with respect to the processing unit after each document is printed prevents cumulative error. It should also be pointed out that the registration is very precise due to the interaction of the wedge-shaped finger and the posts, and that the "window" concept allows for a large margin of error in generating the signal to the registration solenoid. For example, the window in the exemplary embodiment represents one-half inch of paper travel, so the signal from the scanner may be in error by as much as one-quarter inch of paper travel, yet the paper will be reindexed to within .062 inches (1.57mm).

Comprehension may be assisted by the provision of an example. To print 11 inch letterhead with the present invention, the segment would be adjusted so that the circumferential length of the segment was exactly 11 inches (279 mm). The blanket needed to print the letterhead would be something less than 11 inches, (279mm) perhaps as little as two or three inches if the letterhead only bears printing at the top. The segment and blanket would be aligned so that the segment was sufficiently rotationally advanced with respect to the blanket to properly place the printing on the document, for example 1 inch (25.4mm) below the top of the document. Next the pre-perforated paper would be fed to the apparatus, engaged on the pin belt of the registration station and

aligned with the blanket so that the printing will assume the proper position on the document. When the apparatus is operated, the segment will pull exactly 11 inches of pre-perforated paper through the press, the scanner would detect when the segment disengages from the paper and send a signal to the registration solenoid, which would fire the finger into contact with the disc arresting and precisely positioning the paper with respect to the processing unit and the paper feeder in preparation for another iteration.

A second embodiment of the invention may be seen in FIGS. 8 and 9. As with the first embodiment, the second embodiment is shown in conjunction with an offset printing press 10 adapted to print individual sheets of paper. However, in the second embodiment the paper feeding function is accomplished by the printing blanket 22 and blanket cylinder 18 in cooperation with the opposed impression cylinder 20. The paper 16 is pinched between the rotating blanket and the rotating impression cylinder and drawn through the press at the same time it is being printed by the blanket.

In the second embodiment the printing blanket is sized so that its length, arranged on the blanket cylinder, is equal to the predetermined incremental length of the paper to be printed. As explained previously with respect to the first embodiment, when the printing blanket rotates out of contact with the paper the paper is disengaged from the press and may be moved with respect to the press by the registration station which operates substantially as explained above. Of course it is necessary to provide timely signals to the registration solenoid 84 when the blanket disengages from the paper, and again when it is about to reengage the paper.

With reference to FIGS. 8 and 9, the shaft (not shown) journaling the blanket cylinder is axially tapped and threaded to receive a bolt 110. The bolt is

used to fasten a pair of adjacent, concentric, circular plates 112, one plate superimposed upon the other, to the end of the blanket cylinder shaft for rotation therewith. Each plate has a cam 114 formed on the circumference thereof. The nature and function of these cams will be readily understood to be analogous to the circumferential segments 34 of the paper feeder shown in FIGS. 1, 5, 6 and 7 and described above with reference to the first embodiment. Like the circumferential segments, the plates may be rotated with respect to each other and locked in positional relationship by the bolt so that the circumferential length of their combined cams corresponds angularly with the circumferential length of the printing blanket on the blanket cylinder. As may be seen in FIGS. 8 and 9, the angular displacement of the cams on the circumference of the plates corresponds to the angular displacement of the printing blanket on the circumference of the blanket cylinder.

A cam follower 116 operatively connected to a microswitch 118 generates a signal to the registration solenoid 84 causing it to de-energize and allow the spring 90 to pull the finger from engagement with the disc 80 when the blanket is about to engage the paper. Similarly, the cam, cam follower, and microswitch provide a signal to the registration solenoid to energize the solenoid and thrust the finger into engagement with the disc, stopping and registering the paper when the blanket disengages from the paper. In operation it is preferable to size the cam so that it has a slightly larger angular displacement than the blanket to ensure that the paper has been released by the registration station prior to engagement by the blanket, and also to ensure that the blanket has disengaged from the paper prior to it being reregistered and immobilized by the registration station.

In FIGS. 8 and 9, the angular displacement of the cam is aligned with the angular displacement of the printing blanket, and the cam follower and microswitch have been positioned at the bottom of the plates 112 to correspond with the position that the blanket will engage the paper. A moments reflection will reveal that the microswitch may be positioned anywhere about the periphery of the plates and that the cam may be rotated out of alignment with the blanket so long as the cam and microswitch are respectively positioned so as to cause the microswitch to generate a signal when the blanket is about to engage the paper and again when it has disengaged from the paper.

In order to discourage the paper from unwanted movement with respect to the processing unit, yet allow the paper to be freely moved by the paper feeder and the registration station, applicant has found that it is preferable to provide a degree of resistance, analogous to the drag of a fishing reel, to movement of the paper. For this purpose a vacuum brake 120 as shown in FIGS. 2, 3, and 10 is positioned at the infeed end of the press. The vacuum brake merely consists of a sealed tube 122 having a plurality of holes 124 formed therein. Vacuum is applied to the inside of the tube and creates a suction force at the holes to provide some resistance to paper movement past the holes. A keeper arm 126 tucks the paper around the tube to maintain the paper in contact with the holes.

Applicant has also determined that it is preferable to provide a shock absorber to cushion the paper from sudden stops and starts which could tear the paper. The buffering device shown most clearly in FIGS. 2, 3, 10 and 11 is commonly called a dancer 128 in the printing trade, taking its name from its characteristic up-and-down motion while in operation. The dancer includes an elongate bar 130 extending across the paper path and resting upon the paper. Each end of

the bar is bent so as to have an ear 132 extending parallel to the axis of the bar. The bar is pivotally supported at each end by blocks 134 which have bores formed therein to receive and retain the ears of the dancer. As may be seen in FIG. 11, a spring 136 urges the bar down upon the paper and a set screw 138 limits the upward pivoting of the bar.

The purpose and operation of the dancer is most readily explained with reference to FIG. 3. Movement of the paper through the press causes the disc 80 to rotate counterclockwise. Because the registration station cannot stop and register the paper until after it has been released by the paper feeder, the disc will typically advance to a position illustrated by line a'. When the finger 86 thrusts into engagement with the disc 80, it will counter rotate the disc to a position illustrated by line b'. This counter rotation of the disc backs up the paper 16, creating slack or surplus. The spring-biased dancer 128 takes up the slack as shown in FIG. 3. When the paper is reengaged by the paper feeder and released by the registration station the dancer absorbs the shock caused by the sudden movement of the paper. Without the dancer, or some other form of buffering device, this sudden movement, coupled with the slack in the paper would be likely to tear the paper.

The present invention is particularly useful to convert a pre-existing processing unit, of the type adapted to process individual sheets of paper, to process continuous form paper. As may be seen in FIGS. 1 through 4, the registration station does not need to be operatively connected to the examplary press, nor does it need to be precisely positioned with respect to the press. The registration station merely ensures that exactly one predetermined increment has been pulled through the registration station each cycle. If slightly more or slightly less than a predetermined

increment has passed the registration station, the window concept described above will move the paper forward or backward accordingly, re-registering the paper to the printer each cycle. Since the paper is engaged on the pin belt, the paper cannot slip with respect to the registration station. Because the registration station is neither operatively connected nor precisely positioned with respect to the press, it may be easily and quickly bolted on and off the press. Alternatively, only that portion of the registration station which interferes with the printing of single sheets needs to be removed.

In the case of a wet offset press of the type shown in the drawings, it may not be necessary to provide a separate paper feeding station 14 as shown and explained with respect to the first embodiment of the invention since the operation of the printing blanket, blanket cylinder and impression cylinder will serve as a paper feeder to feed continuous paper in discontinuous pulses. However, it is necessary to provide timely signals to the registration station to register and hold the paper in registration, and to release the paper when the next increment of paper is fed to the press.

With other types of existing presses or processing units it may be necessary to add a separate feeding station 14 as shown in FIG. 1, 5, 6 and 7 to feed predetermined increments of the continuous paper to the processing unit in discontinuous pulses.

The paper feeding station of the first embodiment may be installed on and removed from the exemplary printing press with little difficulty. Although the feeder shaft does need to be operatively driven off a shaft of the press, it is a relatively simple matter to modify the press by fastening an output pulley 96 on an available drive shaft as shown in FIG. 1. As with the registration station, precise

placement of the paper feeding station with respect to the press is not required since it is only critical that it draw exactly one predetermined increment of paper through the press, not any particular predetermined length of paper. A paper feeding station, substantially as shown in FIGS. 5 and 6 may be fitted on to the outfeed end of the press by any suitable method such as the fasteners 98 shown in FIG. 6.

It may also be desirable to provide additional electrical control signals between the press, the registration station and the paper feeder, as well as the aforementioned control signals between the paper feeder and the registration solenoid. When beginning printing operations with an offset press, it is customary to disengage the blanket cylinder from the impression cylinder so that the blanket cylinder and the ink cylinders may be rotated to "ink up." In the case of the first embodiment, to avoid feeding paper through the press during this process when no printing is being accomplished, the press may be electrically linked to the draw roller solenoid 63 and the registration solenoid 84 to activate both solenoids during "ink up," thereby preventing the segment from drawing paper through the press and maintaining the paper in proper registry to the press.

In the case of the second embodiment as shown in FIG. 9, a press solenoid 139 is connected to a pivotable arm 140 which supports the shaft 142 of the impression cylinder 20. When this solenoid is activated it drops the impression cylinder away from the blanket cylinder so that the press will not feed or print paper. The press solenoid is controlled through a relay by a second microswitch (not shown) co-located with the first microswitch 118, to ensure that the press solenoid does not disengage the impression cylinder when the press is feeding and printing paper nor engage the impression cylinder when the registration station has the paper immobilized.

Those familiar with this art will realize that there are readily available alternatives for many of the features described and shown herein. For example, an optical scanner of the type adapted to count pin holes, a tachometer generator, or a variety of state-of-the-art motion detectors employed in conjunction with computers, may be used instead of the scanner or cams shown herein to determine when a predetermined increment has been fed to the press and so provide a signal to the registration station.

The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

CLAIMS

1. An apparatus for successively registering continuous paper to a processing unit, such as a printer, perforator or the like, having a paper feeder for discontinuously feeding said paper at a selected speed to said processing unit, said apparatus comprising:

(a) paper engaging means for maintaining continuous engagement with said paper while permitting the discontinuous feeding of said paper by said paper feeder; and

(b) detent means for selectively interacting with said paper engaging means to arrest and align said paper with respect to said processing unit, characterised by

(c) activation means for selectively causing said detent means to move to interact with said paper engaging means at a speed which is independent of and unrelated to the operating speed of said paper feeder or said processing unit.

2. The apparatus of Claim 1 wherein said activation means includes electrical means for moving said detent means.

3. The apparatus of Claim 1 wherein said activation means includes a solenoid.

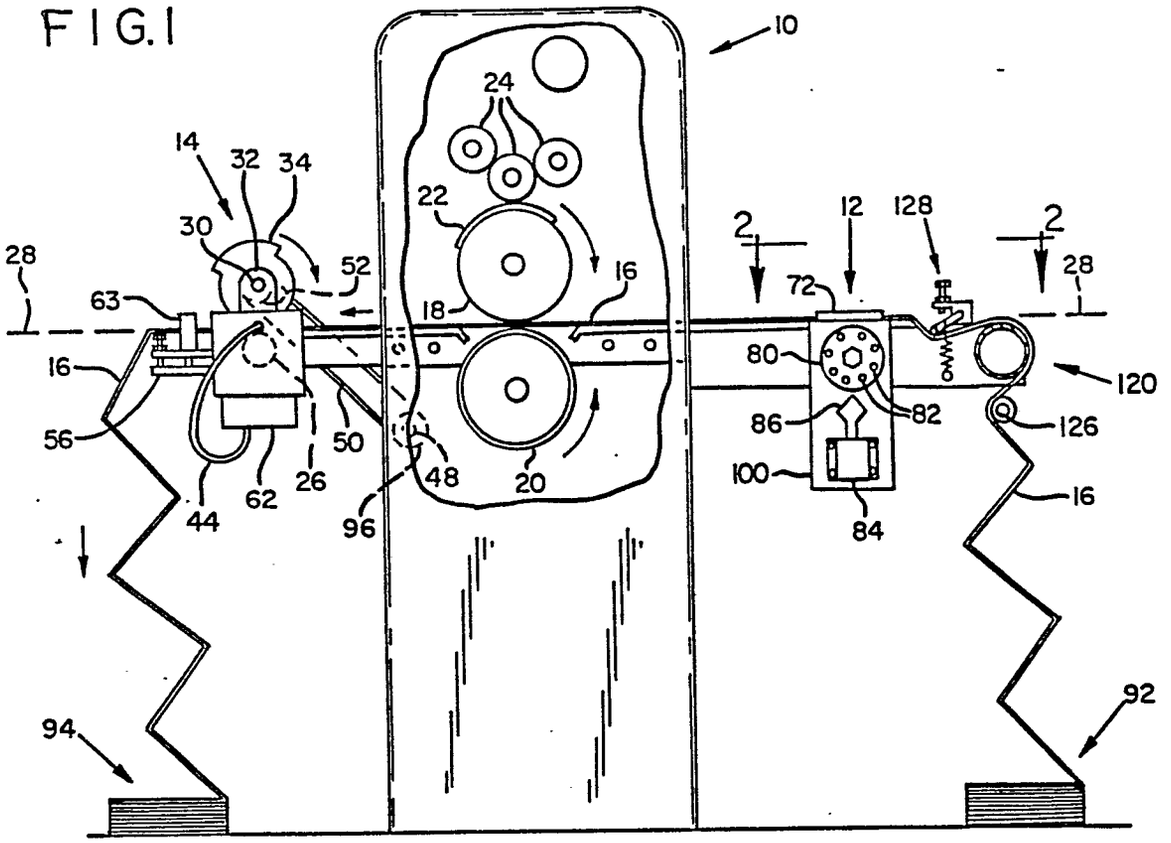
4. The apparatus of Claim 1 wherein said paper feeder alternately engages and releases said paper, said activation means including means for enabling said detent to interact with said paper engagement means and arrest said paper substantially instantaneously after said paper feeder releases said paper.

5. The apparatus as claimed in any of the preceding claims wherein said activation means is not mechanically linked, either directly or indirectly, to said paper feeder.

6. The apparatus as claimed in any of the preceding claims wherein said movement of said detent means to interact with said paper engaging means defines a straight line.

7. A processing unit such as a printer, perforator or the like, for processing continuous forms paper, in combination with apparatus as claimed in any of the preceding claims for successively registering the continuous paper to said processing unit.

FIG.1


10
24
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32
34
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22
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80
120
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126
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100
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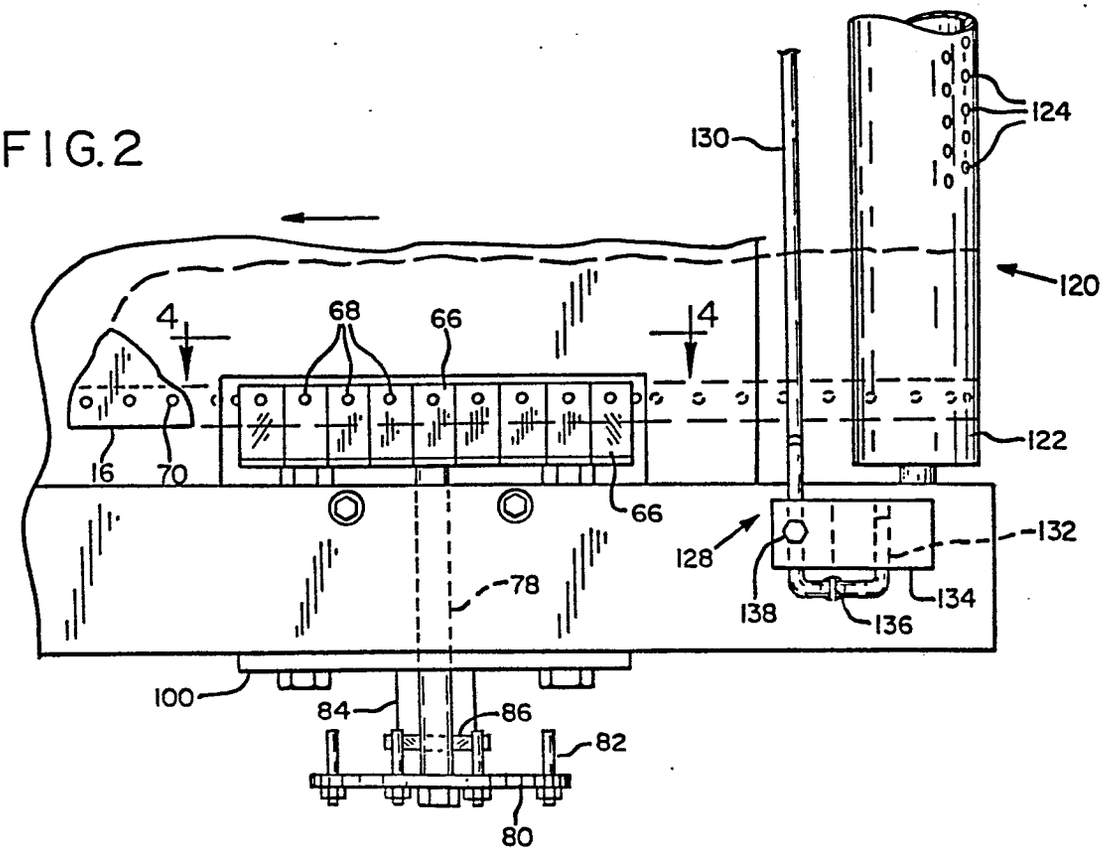
94

FIG.2


130
124
120
4
68
66
14
122
16
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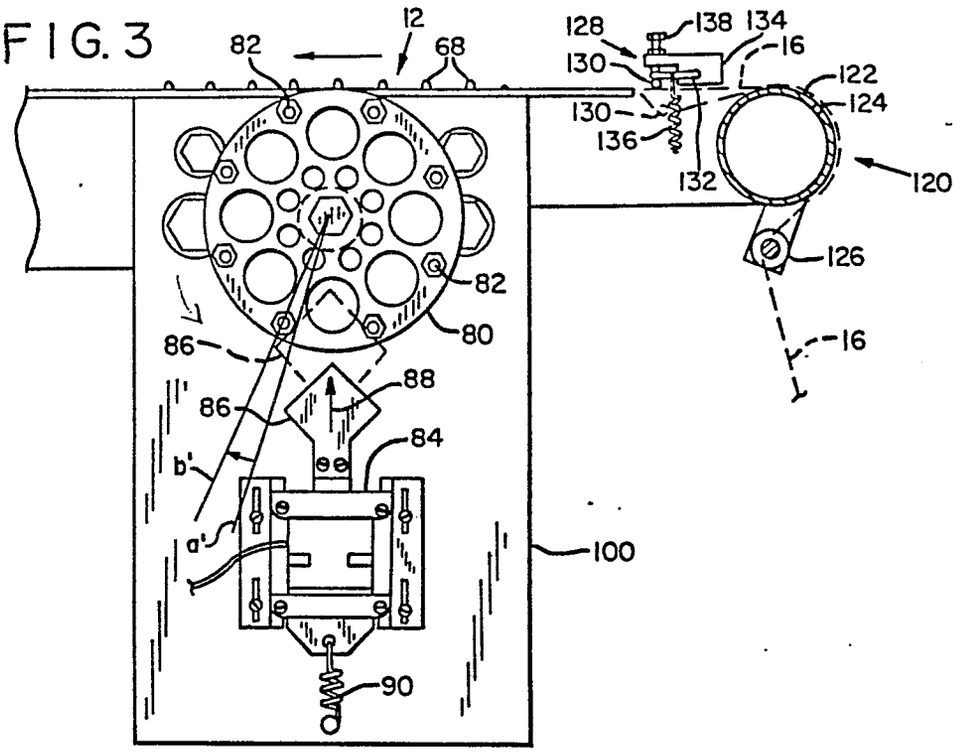
66
128
132
78
138
136
134
100
84
86
82
80

FIG. 3



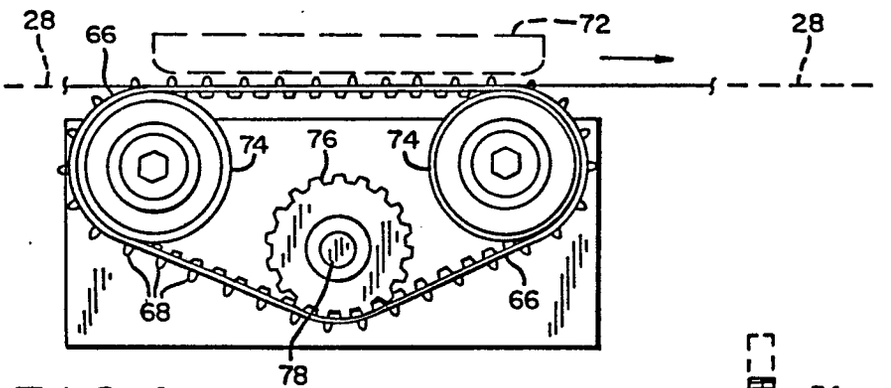


FIG. 4

FIG. 7

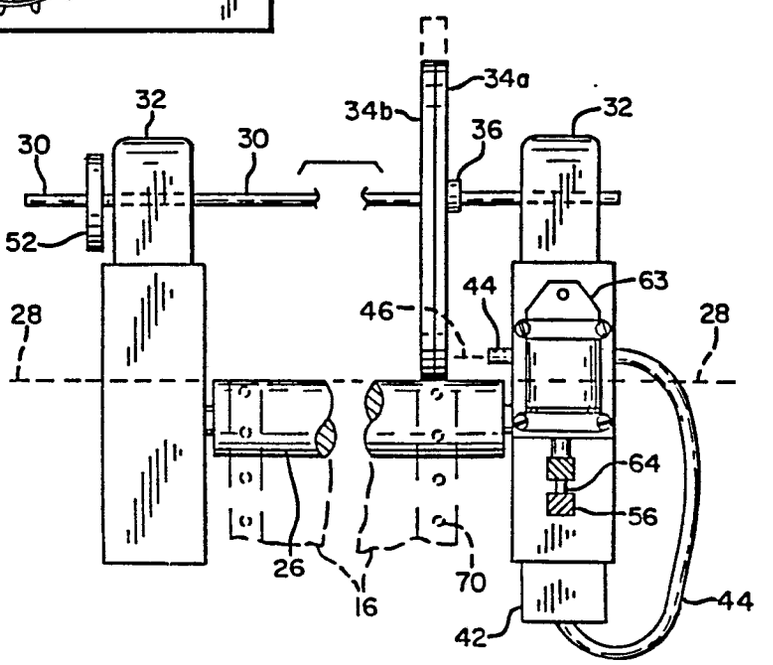
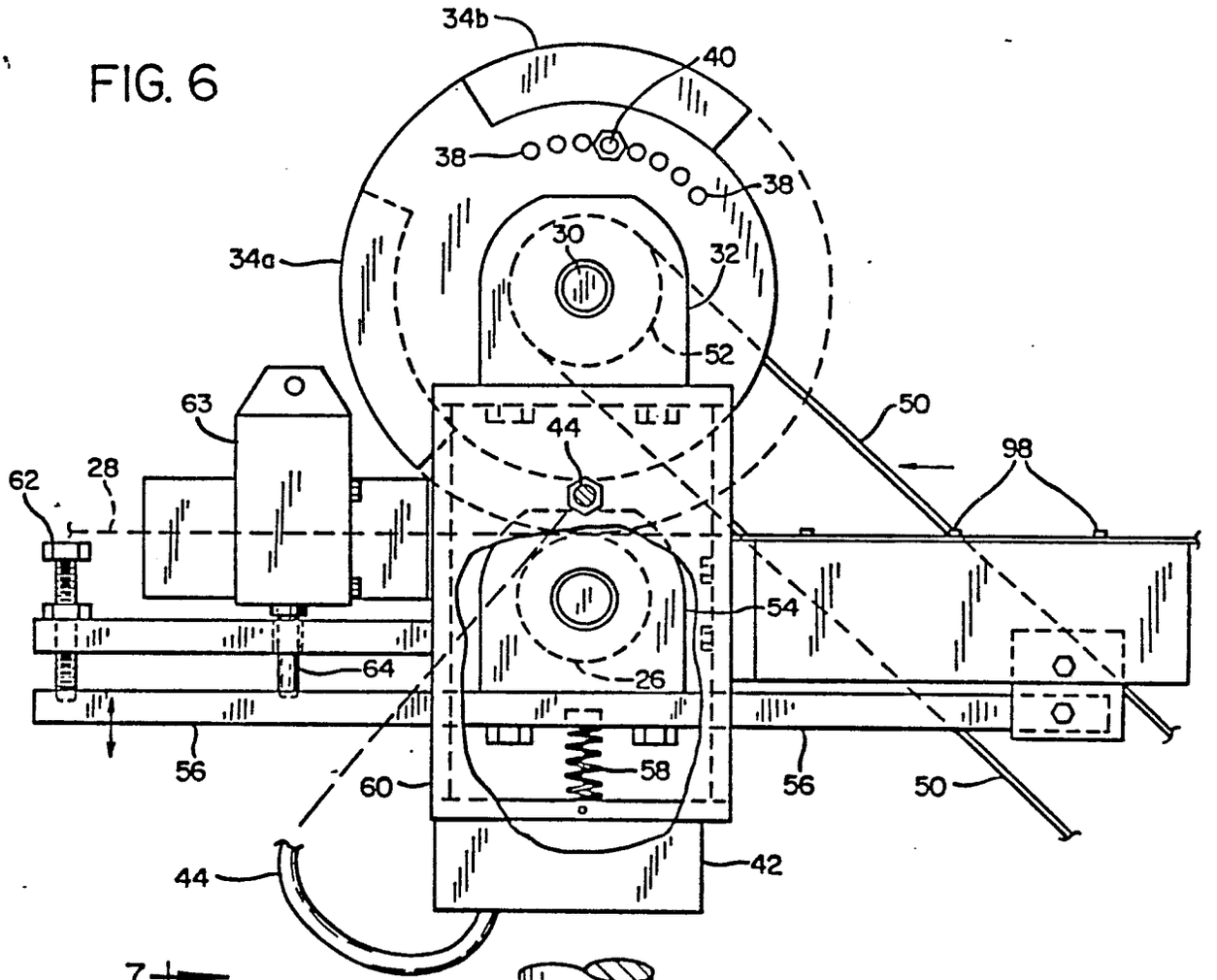


FIG. 6


34b
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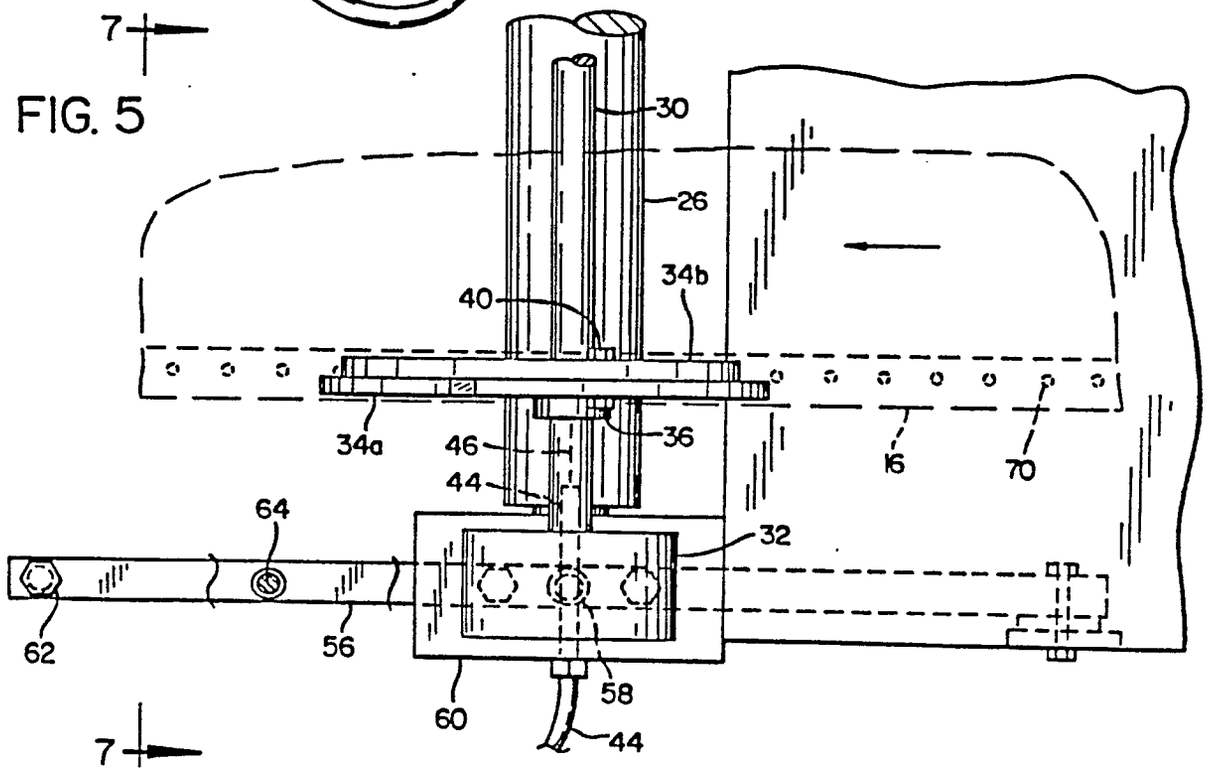
38
38
34a
30
32
52
63
44
50
98
62
28
54
64
26
56
58
60
56
50
44
42
7

FIG. 5


30
26
34b
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34a
46
36
16
70
44
64
32
62
56
60
58
44
7

FIG.8

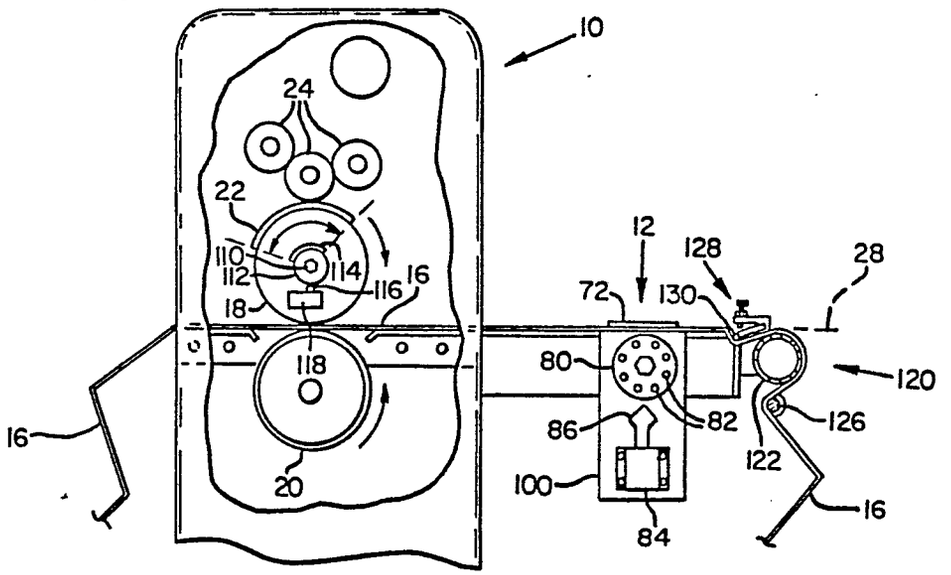

FIG.9

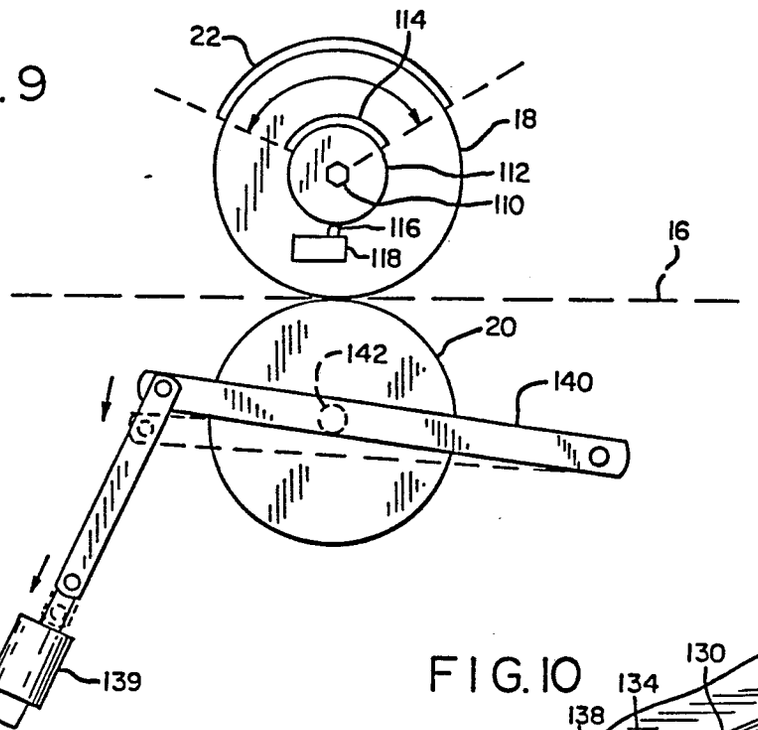

FIG.10

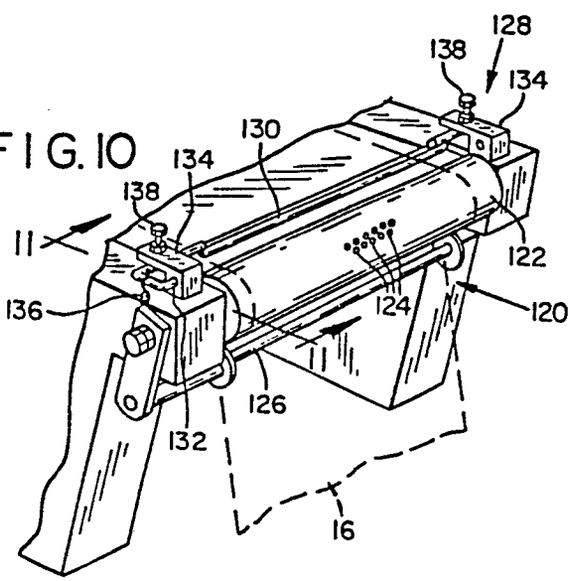

FIG.11