Aug. 23, 1932. W. K. ECKHARD 1,872,916

PRINTING MACHINE HAVING AUTOMATIC FEEDERS

Filed Dec. 29, 1928 5 Sheets-Sheet 1

FIG. 1

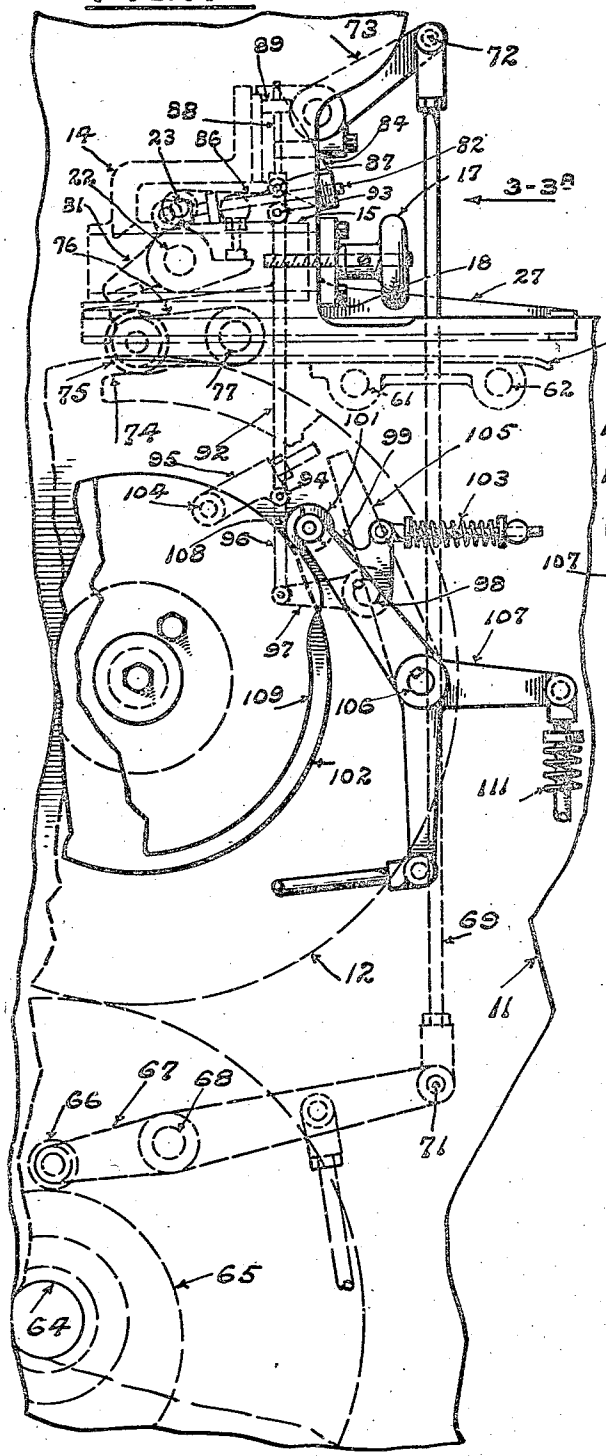
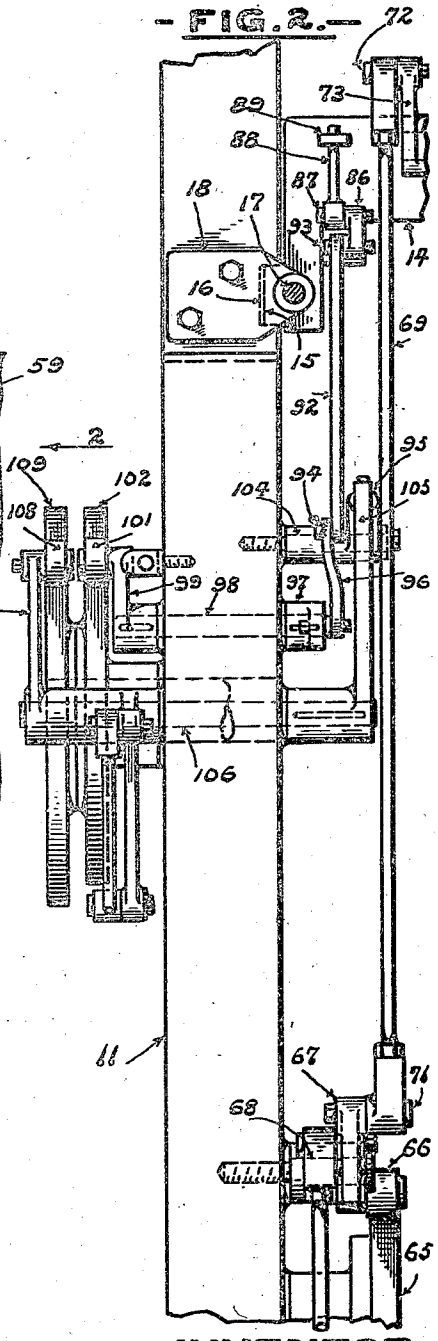


FIG. 2.



INVENTOR

William K Eckhard

By John R Townsend

ATT'Y.

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PRINTING MACHINE HAVING AUTOMATIC FEEDERS

Filed Dec. 29, 1928 5 Sheets-Sheet 2

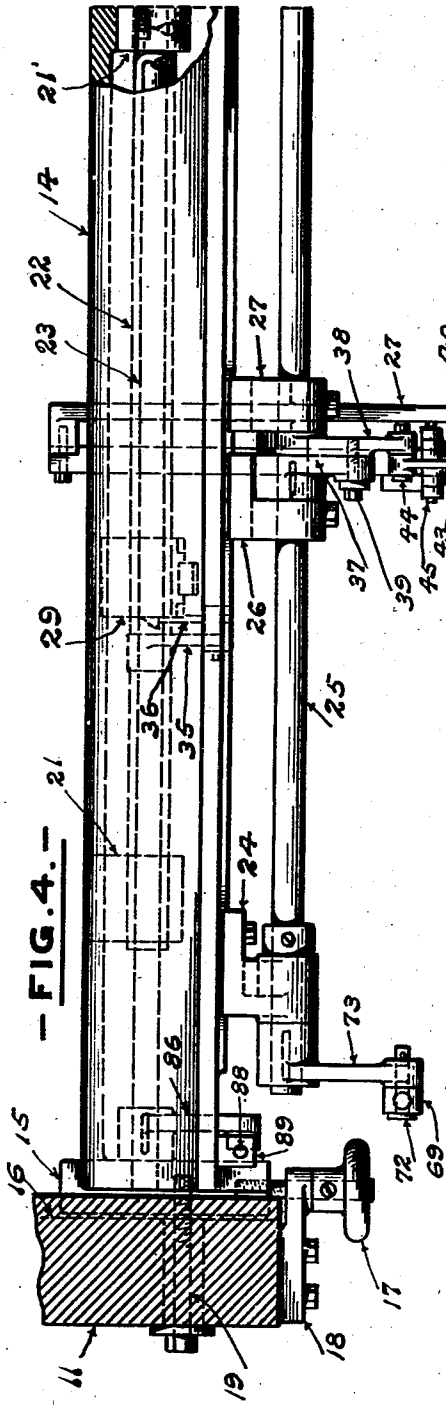


FIG. 4.

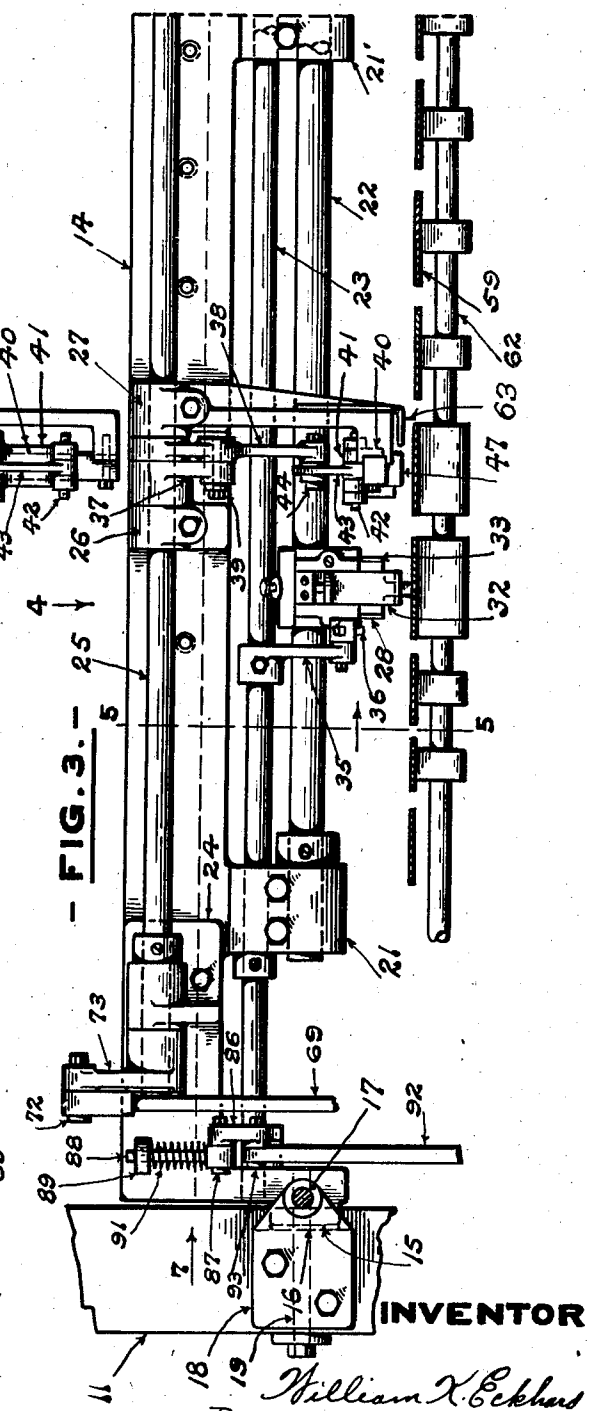


FIG. 3.

INVENTOR

William K. Eckhard

By John P. Bowley

ATT'Y

Aug. 23, 1932. W. K. ECKHARD 1,872,916

PRINTING MACHINE HAVING AUTOMATIC FEEDERS

Filed Dec. 29, 1928 5 Sheets-Sheet 3

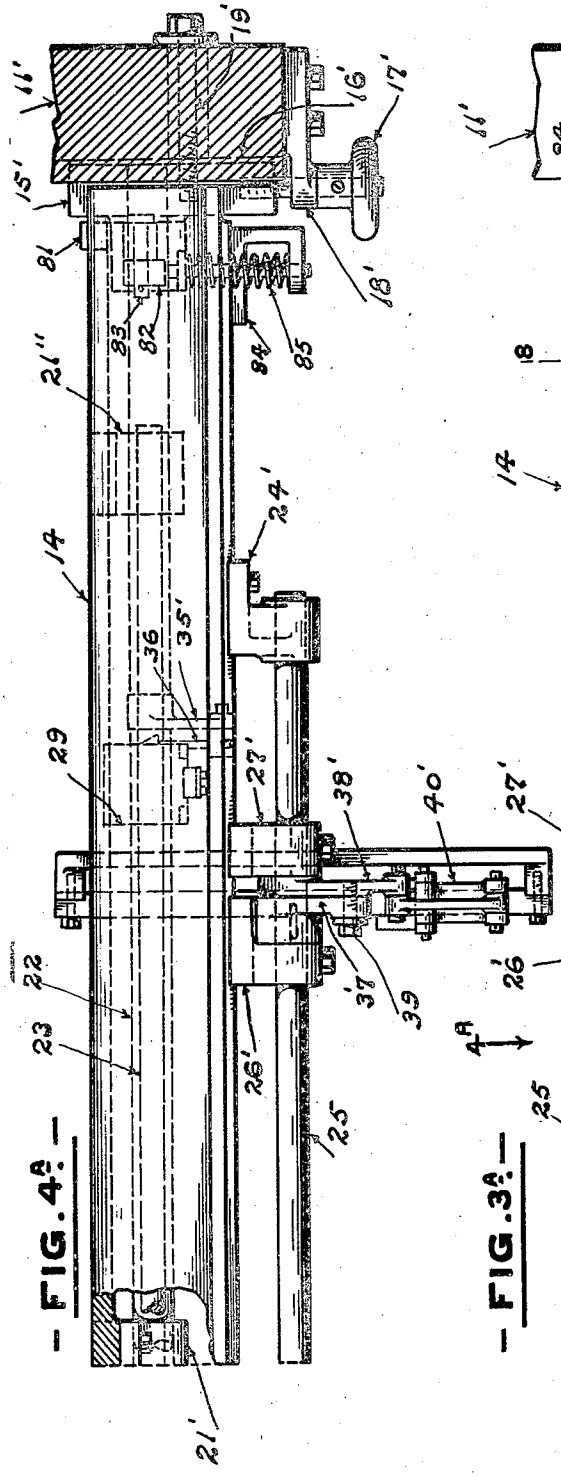


FIG. 4A.

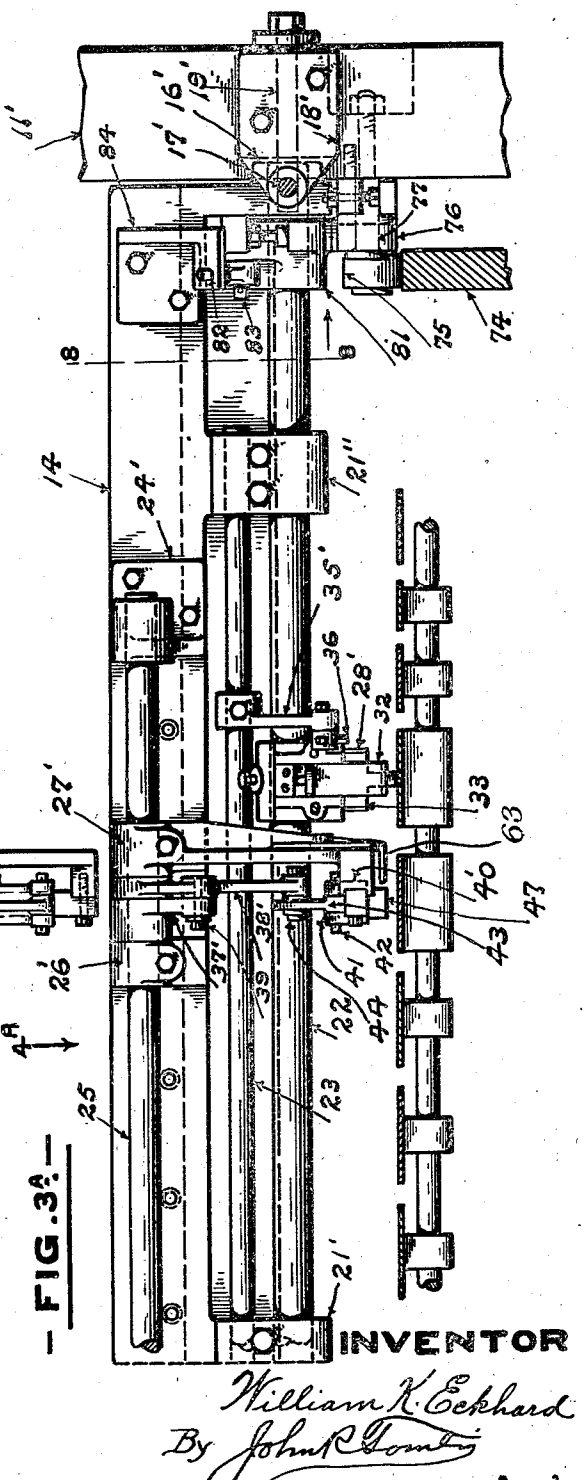


FIG. 3A.

INVENTOR

William K. Eckhard

By John R. Toomey

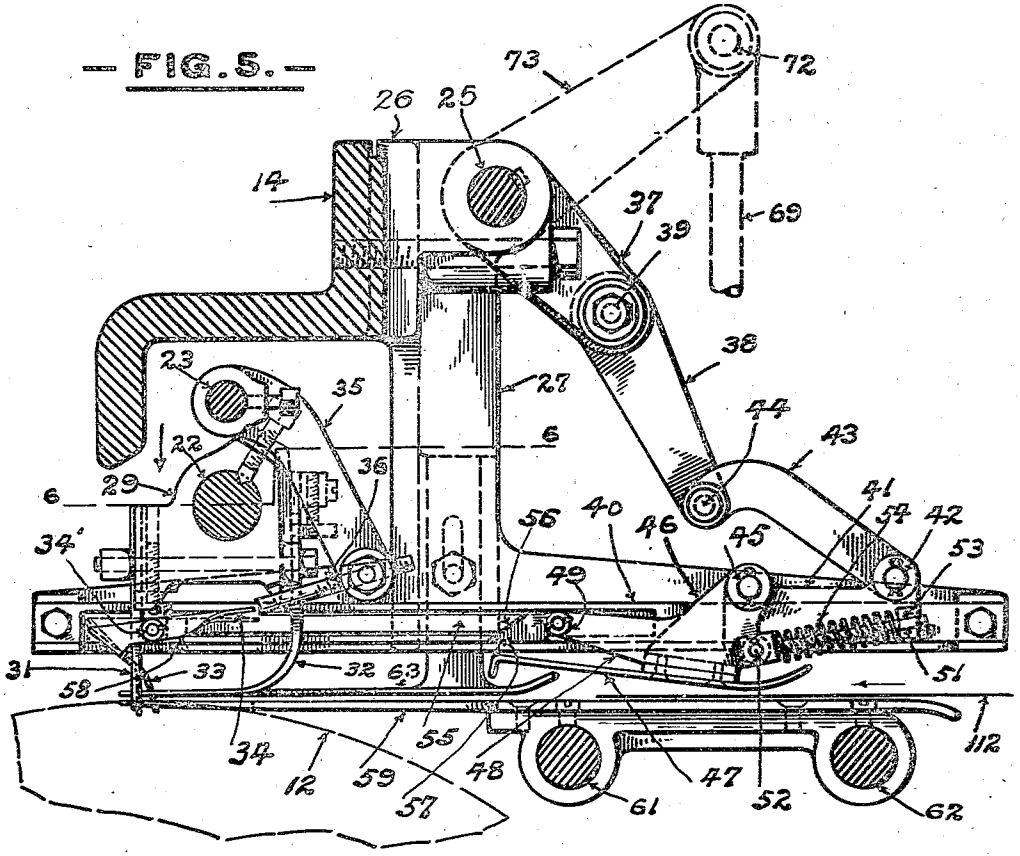
ATT'Y

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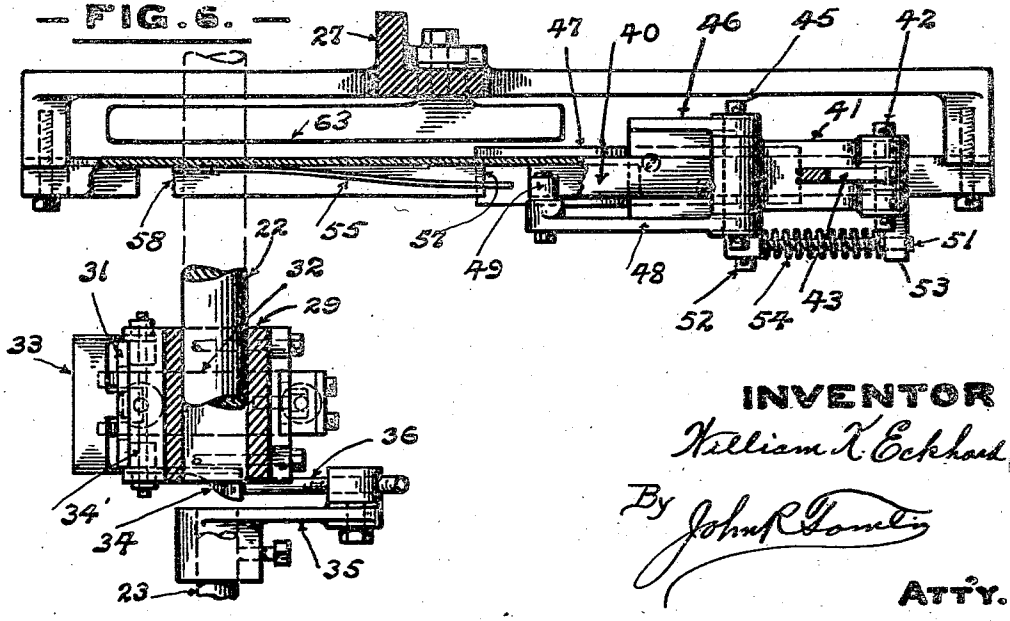
PRINTING MACHINE HAVING AUTOMATIC FEEDERS

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— FIG. 5. —



— FIG. 6. —



INVENTOR

William K. Eckhard

By John R. Gowling

ATT'Y.

Aug. 23, 1932. W. K. ECKHARD 1,872,916

PRINTING MACHINE HAVING AUTOMATIC FEEDERS

Filed Dec. 29, 1928 5 Sheets-Sheet 5

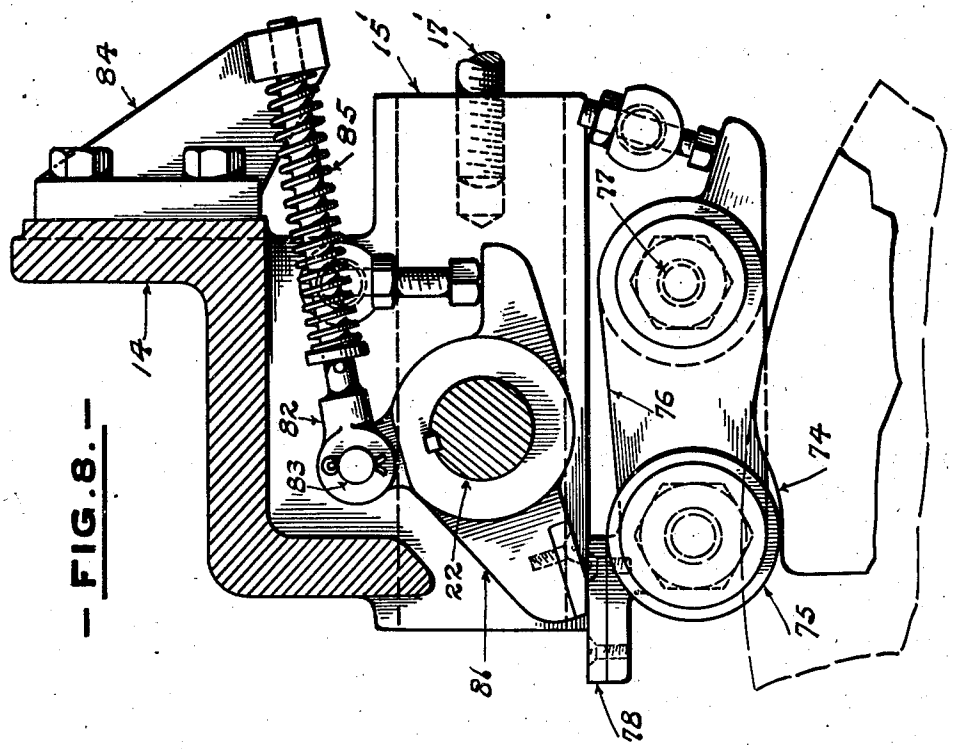


FIG. 8.

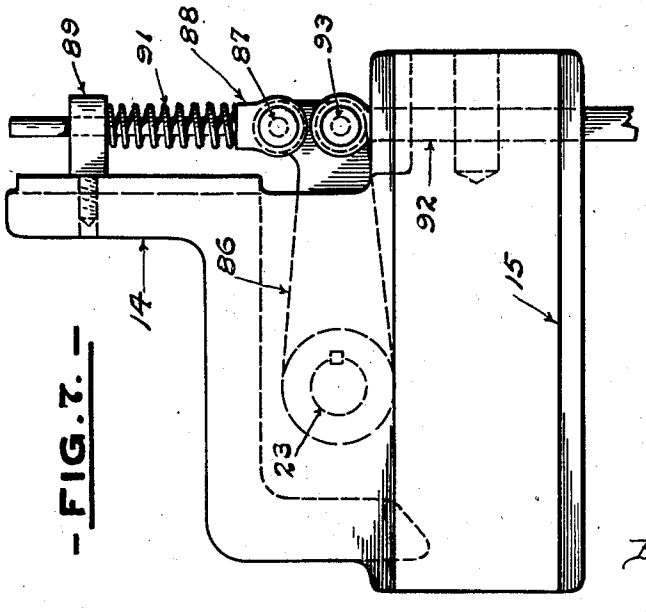


FIG. 7.

INVENTOR
William K. Eckhard
By John C. Fowler
ATT'Y

Patented Aug. 23, 1932 1,872,916

UNITED STATES PATENT OFFICE

WILLIAM K. ECKHARD, OF DUNELLEN, NEW JERSEY, ASSIGNOR TO R. HOE & CO., INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

PRINTING MACHINE HAVING AUTOMATIC FEEDER

Application filed December 29, 1928. Serial No. 329,139.

This invention relates to printing machines that are equipped with an automatic feeder, by which the sheets are fed to grippers carried on the impression cylinder of the machine.

It is well known that feeders of this class are usually arranged to take sheets from a pile and rapidly forward them, one at a time, along a pathway, slow them down and bring them to rest against two registering stops commonly called front guides which hold the front edge of the sheet in the correct position to be grasped by the grippers.

A sheet detector is usually associated with the registering mechanism and operates to throw off the impression i. e., separate the impression cylinder from the printing surface if the sheet being fed is not properly positioned against the registering stops at both sides of the machine.

The registering stops and the detector mechanism are usually integral parts of the printing machine and operated directly from cams on the impression cylinder, or on a shaft rotating in synchronism therewith; but the mechanism which forwards the sheet and decelerates it so that it comes to rest against the front guides, is part of the feeder mechanism which is usually furnished as an attachment to the printing machine and is frequently made by a different manufacturer.

It has been the usual practice to operate the mechanism for separating the sheets from the pile, forwarding them along the pathway and decelerating them, all from one shaft which is geared to some suitable moving part of the printing machine.

Common practice in the operation of the decelerating mechanism by this means, employed two pairs of miter gears, two universal joints and two pairs of spur gears, all of which are eliminated by the arrangement herein shown, whereby the sheet decelerator is operated directly by a cam carried on one of the shafts of the printing machine.

It will be readily understood that this simplification eliminates much lost motion, and results in a more positive drive for the sheet decelerator.

The front guides are made adjustable with respect to the frame of the machine in order to effect a proper positioning of the sheet before it is taken by the grippers. This adjustment is made by the shifting of brackets secured to the cross frame which carry the bearings of the shafts that support and operate the front guides and the detector mechanism.

The forward end of the feeder which carries the sheet decelerator, in the past has been carried by separate brackets similarly supported and adjusted, and this arrangement whereby the sheet decelerator and the front guides were separately adjusted has caused difficulty to be experienced in maintaining the correct relation between them.

In the invention herein disclosed, a cross frame is provided to support the several shafts of the sheet registering mechanism, the sheet detector and the sheet decelerator. This frame supports all of these co-acting mechanisms in a fixed relation that is not disturbed when the cross frame is moved with respect to the printing machine in order to adjust the register.

This cross frame also provides intermediate bearings for the several shafts and thus obviates difficulty that has been caused by the action of the reciprocating parts springing the shafts when the machine is operated at high speed.

When the sheet decelerators heretofore used were operated at high speed it has been found impossible to prevent a slight vibration of the hooks which engage the sheet. These hooks are formed with a small opening into which the edge of the sheet enters, and any vibration tears the edge of the sheet. The arrangement described herein overcomes this difficulty.

An object of the invention is to provide a sheet feeder for a printing machine, in which the sheet registering mechanism, the sheet detectors and the sheet decelerator are all supported in fixed relation to each other in a cross frame that is in turn supported by the frame of the printing machine and adjustable with respect to it, for registering the

sheet with reference to the impression cylinder.

Another object of the invention is to provide a sheet feeder in which the sheet registering mechanism, the sheet detectors and the sheet decelerator are supported in a cross frame having intermediate bearings for the shafts of the several mechanisms.

Another object of the invention is to provide a sheet feeder in which the sheet decelerator is operated by a direct connection to the printing machine.

Another object of the invention is to provide a sheet feeder having a sheet decelerator that will not tear the sheets when the machine is operated at high speed.

It is also an object of the invention to provide a sheet feeder of generally improved construction, whereby the device will be simple and durable, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed, it being understood that various changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings which form a part of this specification:

Figure 1 is a side view in outline showing a portion of a printing machine and a portion of a sheet feeder attached thereto, the arrangement being in accordance with the invention.

Figure 2 is a view showing the parts shown in Figure 1 and as viewed in the direction of arrow 2 of Figure 1.

Figures 3 and 3A together show an enlarged view of the sheet registering mechanism, the sheet detectors and the sheet decelerators with their operating shafts and the cross frame which supports them, as viewed in the direction of arrow 3—3A of Figure 1.

Figures 4 and 4A together show a view partly broken away and partly in section of the parts shown in Figures 3 and 3A as viewed in the direction of arrow 4 of Figure 3 and arrow 4A of Figure 3A respectively.

Figure 5 is an enlarged sectional view taken on the line 5—5 of Figure 3 as viewed in the direction of the arrow and shows the registering, detecting and decelerating mechanism in detail.

Figure 6 is a sectional view taken on the line 6—6 of Figure 5 showing the mechanism as viewed in the direction of the arrow.

Figure 7 shows a position of the impression trip operating mechanism as viewed in the direction of arrow 7 of Figure 3, and

Figure 8 is an enlarged sectional view taken on the line 8–8 of Figure 3A as viewed in the direction of the arrow and shows the means employed for operating the sheet registering mechanism or front guides.

Referring to the drawings, 11 and 11′, indicate the side frames of a printing machine having an impression cylinder 12. Sheets are fed to the printing machine by an automatic feeder, the major portion of which is not shown as it may be of a well known form. The portion included by the invention, however, is fully illustrated.

Referrng particularly to Figures 3, 3A, 4, and 4A, a cross frame 14 has pads 15 and 15′, which are fitted to slide in grooves 16 and 16′, in the side frames 11 and 11′, respectively. Provision is made for adjusting the cross frame with respect to the side frame, and consists of hand screws 17 and 17′, which pass through clearance holes in brackets 18 and 18′, secured to the side frames and are screwed into the cross frame. The side frames are slotted to provide adjustment clearance for screws 19 and 19′ which serve to lock the cross frame in position when proper adjustment has been made.

Brackets 21, 21′, and 21″ are secured to the cross frame 14 and form bearings for shafts 22 and 23. Other brackets 24 and 24′ also secured to the cross frame, support the shaft 25 near its ends, and brackets 26, 26′, 27, and 27′ support it at intermediate points.

The shaft 22 supports the sheet registering mechanism or front guides generally indicated at 28 and 28′, on Figures 3 and 3A respectively; each of which comprise a body 29 which is secured to the shaft 22, a stop plate 31 secured to the body, and a top sheet guide 32. Two front guides are usually used and they are so located that when the front edge of a sheet is placed against them, the sheet will be properly aligned and in position to be taken by grippers not shown, but which it will be understood are carried by the impression cylinder 12 in accordance with the usual practice.

When the sheet is taken by the impresison cylinder the shaft 22 is caused to turn clockwise and lift the front guides out of the way, so that the sheet may pass and be carried around and brought in contact with a printing cylinder not shown, and then passed on to a delivery.

A sheet detector is associated with the sheet registering mechanism and includes the pendulum 33, the pendulum arm 34, and other parts to be hereinafter described.

The pendulum is pivoted at 34′ in a bracket secured to the body 29 and normally assumes the position in which it is shown in Figure 5. When a sheet is placed against the stop plate 31, however the pendulum 33 is pressed forward and in alignment with the stop plate as shown by the dotted lines.

The shaft 23 is a part of the sheet detector

mechanism and has secured thereto the arms 35 and 35′, which carry rods 36 which engage with the pendulum levers 34.

The shaft 24 is a part of the sheet decelerator or slow-down mechanism. Arms 37 and 37′ are keyed to the shaft 24, while arms 38 and 38′ are loose on the shaft 24 but are held in fixed relation thereto by being secured to the arms 37 and 37′ respectively, by screws 39. An elongated clearance hole of sufficient size is provided in the arms 37 and 37′, so that a certain range of adjustment of the arms 38 and 38′ is obtained.

The brackets 27 and 27′ carry slide ways 40 and 40′ for the sheet decelerators. A carriage, generally indicated at 41, is fitted to slide on each of the slide ways and has suitable lugs carrying a pivot pin 42, which connects it to a link 43, which is in turn connected to the arm 38 by pivot pin 44. Thus oscillation of the shaft 24 will result in moving the carriage 41 forward and back along the slide. Other lugs on the carriage carry pivot pin 45, on which the hook support 46 is pivoted. The hook or sheet engaging member 47, is secured to the support which also has an arm 48, carrying a roller 49.

A spring holder 51 is pivoted to the hook support 46 at 52 and passes through a clearance hole in the block 53, secured to the carriage. It carries the spring 54, which thus acts to hold the hook raised to the position shown in Figure 5.

The slide way 40 is channelled to form a guide way for the roller 49, and a spring 55 is secured in the channels. The end of the spring 55 is tapered at 56, and when the carriage is moved forward or to the left from the position shown in Figure 5, the roller 49 encounters the tapered end of the spring and is caused to move downward and through an opening 57 cut in the under side of the channel at this point. The roller then follows along the outside of the channel until it reaches another opening at 58 when the spring 51 acts to force the roller up into the channel.

When the carriage 41 is moved backward the roller follows in the channel and presses the spring 55 out of its path. When the roller has passed the end of the spring, the latter returns to the position shown in Figure 6. It will thus be understood that when the carriage moves forward, the hook 47 is lowered and held down until the carriage nears the end of the stroke; it is then raised and held up during the return stroke.

In order that the sheet decelerators may handle sheets of varying width, a row of tapped holes is provided in the frame 14 so that the brackets 26 and 27, and 26′ and 27′ may be secured thereto in suitable positions. The registering mechanism and the sheet detectors, are similarly provided with side adjustment as they can be secured to their operating shafts at any desired point.

Lower sheet guides 59 are formed with openings to clear the ends of the hooks 47 and are secured to brackets supported on rods 61 and 62, and an upper sheet guide 63 is secured to the bracket 27.

The cylinder 12 carries a gear which meshes with a duplicate gear on the shaft 64 which thus runs at cylinder speed. A cam 65 is secured to shaft 64 and engages a roller 66 on the arm 67 which is pivoted at 68. A link 69 is pivoted to the arm 68 at 71. The other end of the link is pivoted at 72 to an arm 73 secured to the shaft 24. A means is thus provided for reciprocating the carriage 41.

A cam 74 is secured to the cylinder 12 and engages the roller 75 on the arm 76, which is pivoted at 77, and carries a wear plate 78, which engages a similar plate on the arm 81, which is secured to the shaft 22. A spring holder 82 is pivoted at 83, to the arm 81, passes through a hole in the bracket 84 secured to the cross frame 14, and supports a spring 85, which tends to turn the shaft 22 counter-clockwise.

An arm 86 is keyed to the detector shaft 23 and connected by pivot pin 87 to a spring holder 88, which passes through the block 89, secured to the frame 14. The spring 91 thus presses the arm 86 downward. A link 92 is connected to the arm 86 by pivot pin 93. The other end of the link is pivoted at 94 to an arm 95, and to a second link 96, which is also connected to an arm 97, secured to the shaft 98, on the other end of which an arm 99 is secured. This arm carries a roller 101, which engages a cam 102, secured to the shaft carrying the cylinder 12, the roller being held in engagement by the spring 103.

The arm 95 is pivoted at 104, and when moved downward, engages an arm 105, secured to the shaft 106, to the other end of which, a three armed lever 107 is secured. One arm of this lever carries a roller 108 in engagement with a cam 109, also secured to the shaft carrying the cylinder 12. The roller 108 is held in engagement with the cam 109 by a spring 111, acting on a second arm of the lever 107, while the third arm is connected to a mechanism not shown, that trips the impression by separating the printing cylinder from the impression cylinder.

Means not shown are provided for forwarding the sheets to the mechanism shown and described herein and a sheet, a portion of which is indicated at 112 is shown approaching the sheet decelerator.

When the machine is in operation the impression cylinder makes one revolution for every sheet printed, and it will be understood that the sheet decelerators, the sheet registering mechanism and the sheet detectors each complete one cycle of their opera-

tion during a revolution of the impression cylinder.

When the leading edge of the approaching sheet 112 is in the position shown, the sheet decelerator is about to start forward. As it moves ahead, the hook member 47 is lowered and the sheet soon thereafter overtakes it. The sheet decelerator hook 47 operates close beside the sheet guides, and as they are set so as to leave but little clearance for the sheet, the leading edge of the sheet is prevented from buckling when it strikes the hook. The cam 65 is so shaped that thereafter the sheet is gradually decelerated so that it moves quite slowly as it comes to rest against the registering stops 31, and it is thus accurately placed in position to be taken by the grippers on the impression cylinder.

The sheet detector pendulum 33 is pressed forward in alignment with the registering stop 31, when the edge of the sheet is pressed against the stop. The pendulum arm 34 is thus moved out of alignment with the rod 36, as shown in the dotted position, and the shaft 23 is free to turn and move the arm 95 into interfering relation with arm 105, and prevent turning of the shaft 106.

If the sheet is not properly registered the pendulum 33 is not pressed forward and the arm 34 remains in alignment with the rod 36. The shaft 23 is then prevented from turning, the arm 95 is not moved to engage the arm 105, and the shaft 106 is turned and the impression is tripped.

On sheet decelerators heretofore made, the hook member 47 has the hook portion made with a return bend so that the end is folded back forming a channel in which the sheet is held. These hooks have a tendency to vibrate when the mechanism is operated at high speed and it has been found that the action of hooks so formed tears the edge of the sheet.

With the invention shown herein the upper sheet guide 63 is provided, and the hook member has but a ninety degree bend. This arrangement allows the horizontal portion of the hook member 47 to be kept well above the sheet and permits operation at high speeds without danger of tearing the sheet.

When the cylinder reaches the point where the grippers take the sheet, the registering stops 31 are moved forward and up, thus permitting the sheet to pass.

From the foregoing description it will be seen that the movements of the sheet decelerators, the sheet detectors and the sheet registering devices are closely related functions which are performed best, when the several mechanisms are rigidly held in the proper position with respect to one another and to the printing machine. Also that a sheet decelerator has been provided that will function properly at higher speeds than the mechanism heretofore used.

What I claim is:

1. In a printing machine with a sheet feeder, a sheet decelerator, a sheet registering mechanism, shafts supporting the said decelerator and registering mechanism, and a frame supporting said shafts.

2. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, shafts supporting the said decelerator, detector and registering mechanism, and a frame supporting said shafts.

3. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, independent operating shafts for the said decelerator, detector and registering mechanism, and a frame supporting the operating shafts in fixed relation to one another.

4. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, independent operating shafts for the said decelerator, detector and registering mechanism, and a frame supporting the shafts with their axes in fixed relation to one another, said frame being adjustably attached to the printing machine.

5. In a printing machine with a sheet feeder, a sheet decelerator, a sheet registering mechanism, independent operating shafts for the said decelerator and sheet registering mechanism, and a frame with end and intermediate bearings supporting the shafts with their axes in fixed relation to each other.

6. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, independently operating shafts for the said decelerator, detector and registering mechanism, and a frame with bearings supporting the shafts near their extremities and at an intermediate point, said frame being adjustably attached to the printing machine.

7. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, operating shafts for the said decelerator, detector and registering mechanism, a frame adjustably attached to the machine and having bearings supporting the shafts, and means for operating the said decelerator, detector and registering mechanism directly from a suitable moving member of the printing machine.

8. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, operating shafts for the said decelerator, detector and registering mechanism, a frame adjustably attached to the printing machine and having bearings supporting the shafts, and means for operating the said decelerator, detector and registering mechanism from a suitable moving member of the printing machine.

9. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, operating shafts for the said decelerator, detector and registering mechanism, a frame adjustably attached to the printing machine and having bearings supporting the shafts near their extremities and at an intermediate point, and means for operating the said decelerator, detector and registering mechanism from a suitable moving member of the printing machine.

10. In a printing machine with a sheet feeder, a sheet registering mechanism supported on a shaft, and an adjustable frame having three bearings for the shaft, one of which supports it near its longitudinal center.

11. In a printing machine with a sheet feeder, a sheet registering mechanism, a shaft to support the said registering mechanism, and a frame adjustably connected to a part of the machine and having end bearings and intermediate bearings for the said shaft.

12. In a printing machine with a sheet feeder, a sheet detector, a sheet registering mechanism, a shaft to support the said detector and registering mechanism, and a frame adjustably connected to a part of the machine and having end bearings and intermediate bearings for the said shafts.

13. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, shafts to support the said decelerator, detector and registering mechanism, and a frame adjustably connected to a part of the machine and having end bearings and intermediate bearings for the said shafts.

14. In a printing machine with a sheet feeder, a sheet decelerator, a sheet registering mechanism, shafts supporting the said decelerator and registering mechanism, and a frame adjustably connected to a part of the machine and adapted to support said shafts.

15. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, shafts supporting the said decelerator, detector, and registering mechanism, and a frame adjustably connected to a part of the machine and adapted to support said shafts.

16. In a printing machine with a sheet feeder, a sheet decelerator, a sheet detector, a sheet registering mechanism, independent operating shafts for the said decelerator, detector and registering mechanism and a frame adjustably connected to a part of the machine and adapted to support the operating shafts in fixed relation to one another.

17. In a printing machine with a sheet feeder, a sheet registering mechanism, a shaft to support the said registering mechanism, and a frame adjustably connected to a part of the machine; said frame having bearings for the shaft.

18. In a printing machine with a sheet feeder, a sheet detector, a sheet registering mechanism, shafts to support said detector and registering mechanism, and a frame adjustably connected to a part of the machine and having bearings for the said shafts.

19. In a printing machine with a sheet feeder, a sheet decelerator, a sheet registering mechanism, supporting shafts for the sheet decelerator and sheet registering mechanism, a frame with bearings supporting the shafts, and means for operating the said decelerator and registering mechanism shafts from a suitable moving member of the printing machine.

20. In a printing machine with a sheet feeder, a sheet detector, a sheet decelerating mechanism, shafts to support said detector and decelerating mechanism, and a frame adjustably connected to a part of the machine and having bearings for the said shafts.

In testimony whereof, I affix my signature.

WILLIAM K. ECKHARD.