March 6, 1951 B. DUNN 2,543,836

SHEET FEEDING MACHINE

Filed Jan. 9, 1947 4 Sheets-Sheet 1

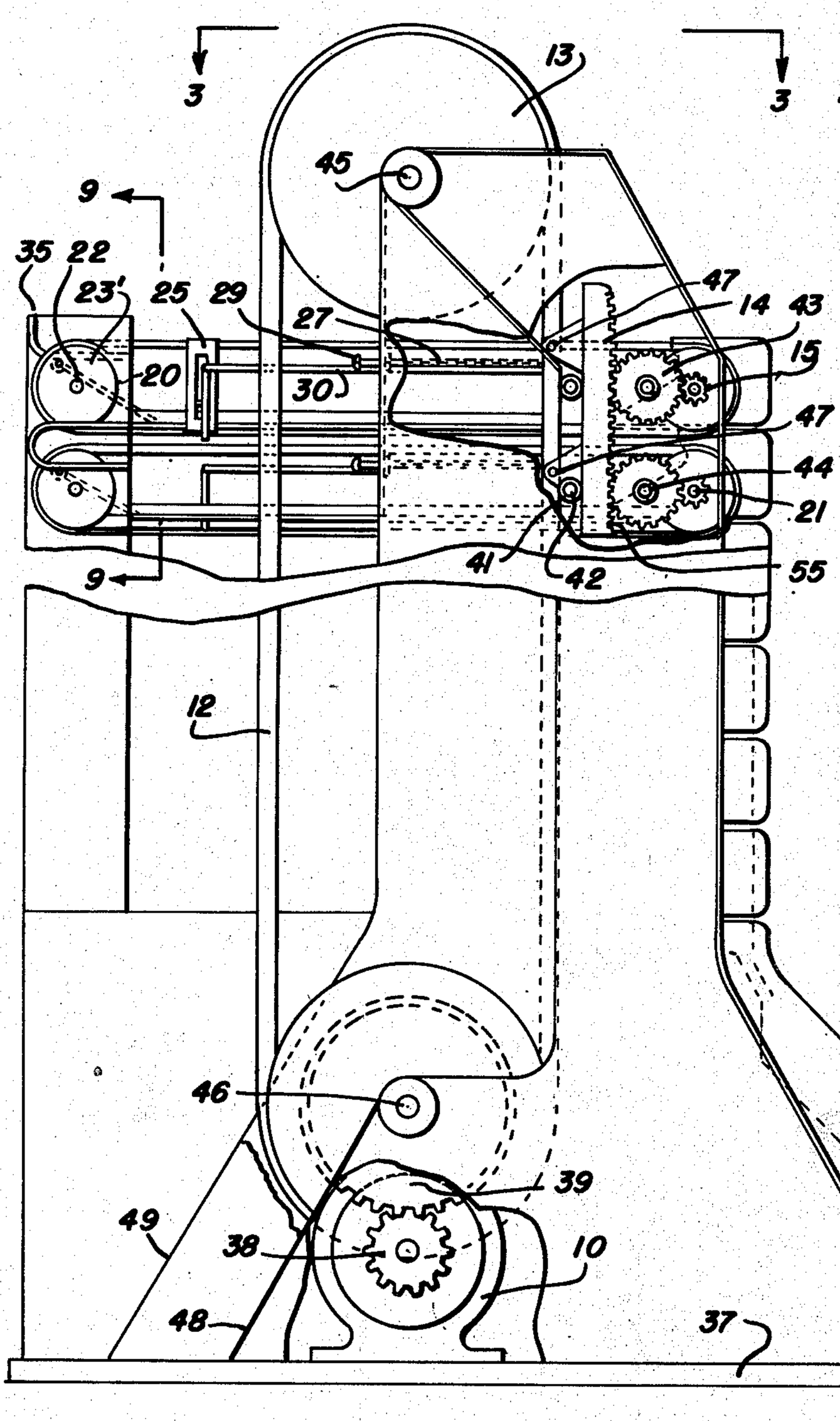

FIG. 1.

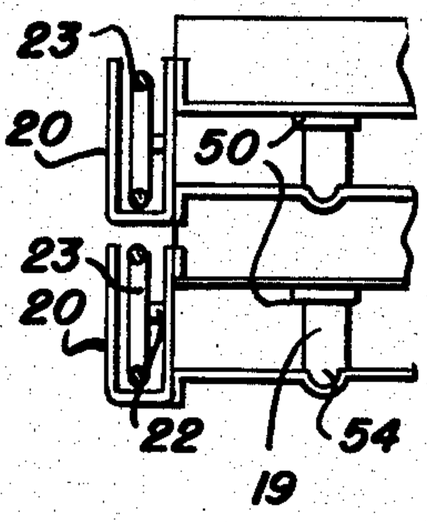

FIG. 9.

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SHEET FEEDING MACHINE

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4 Sheets-Sheet 2

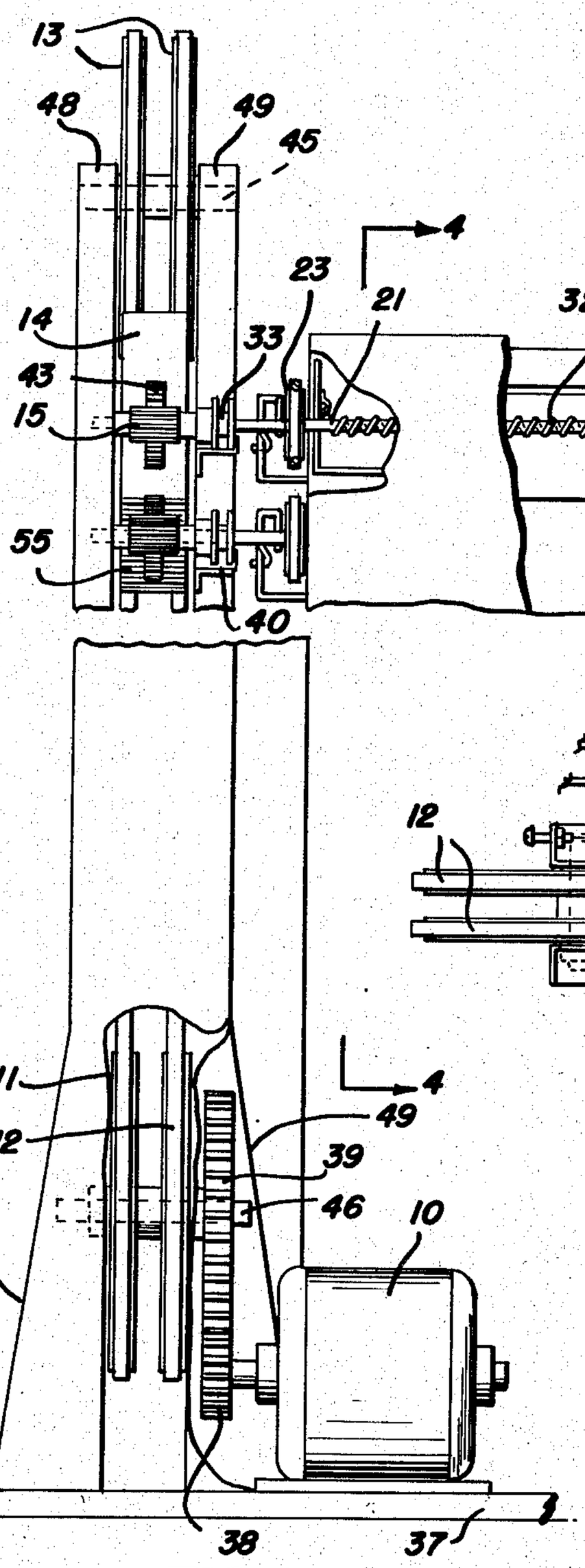

FIG. 2.

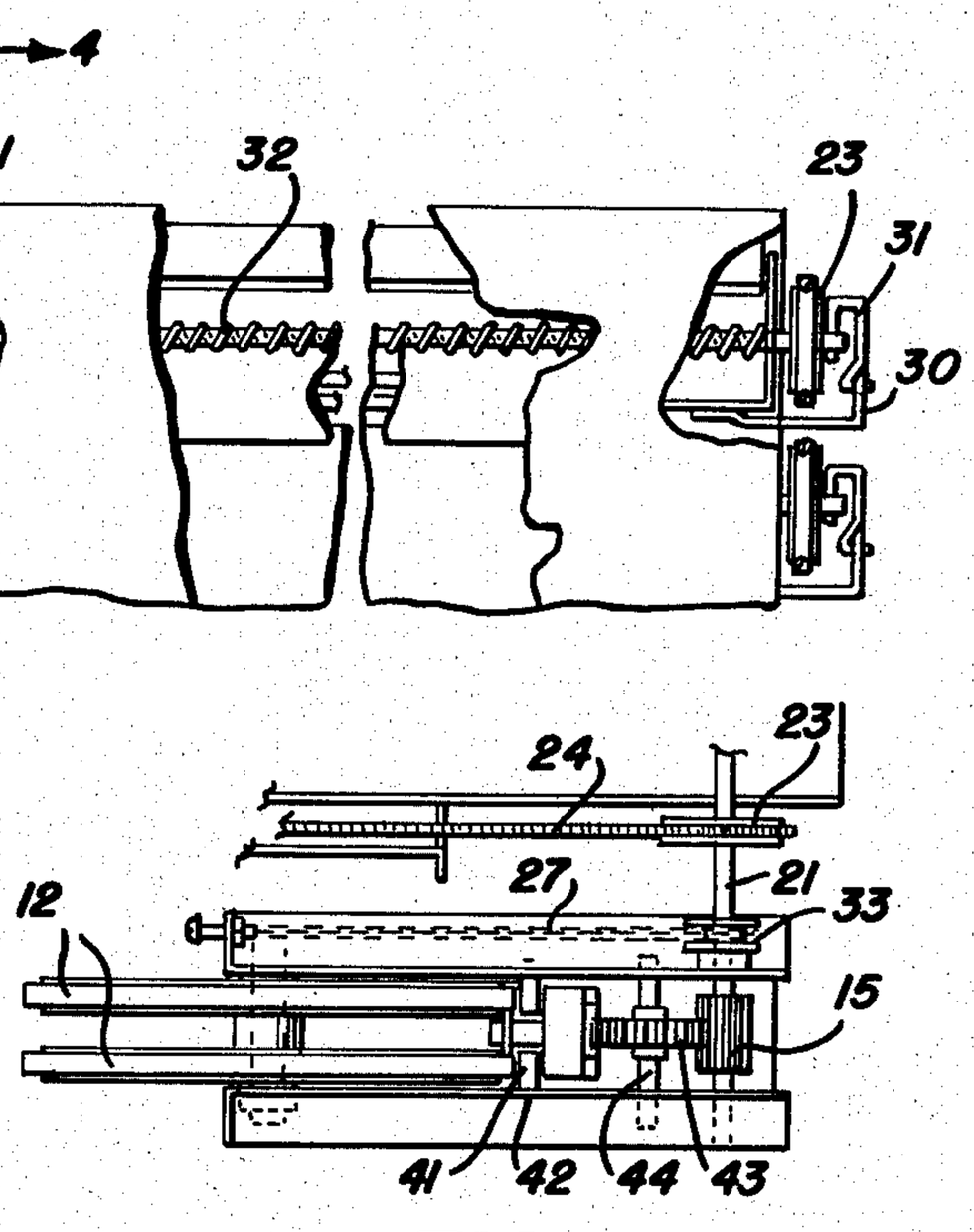

FIG. 3.

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SHEET FEEDING MACHINE

Filed Jan. 9, 1947 4 Sheets-Sheet 3

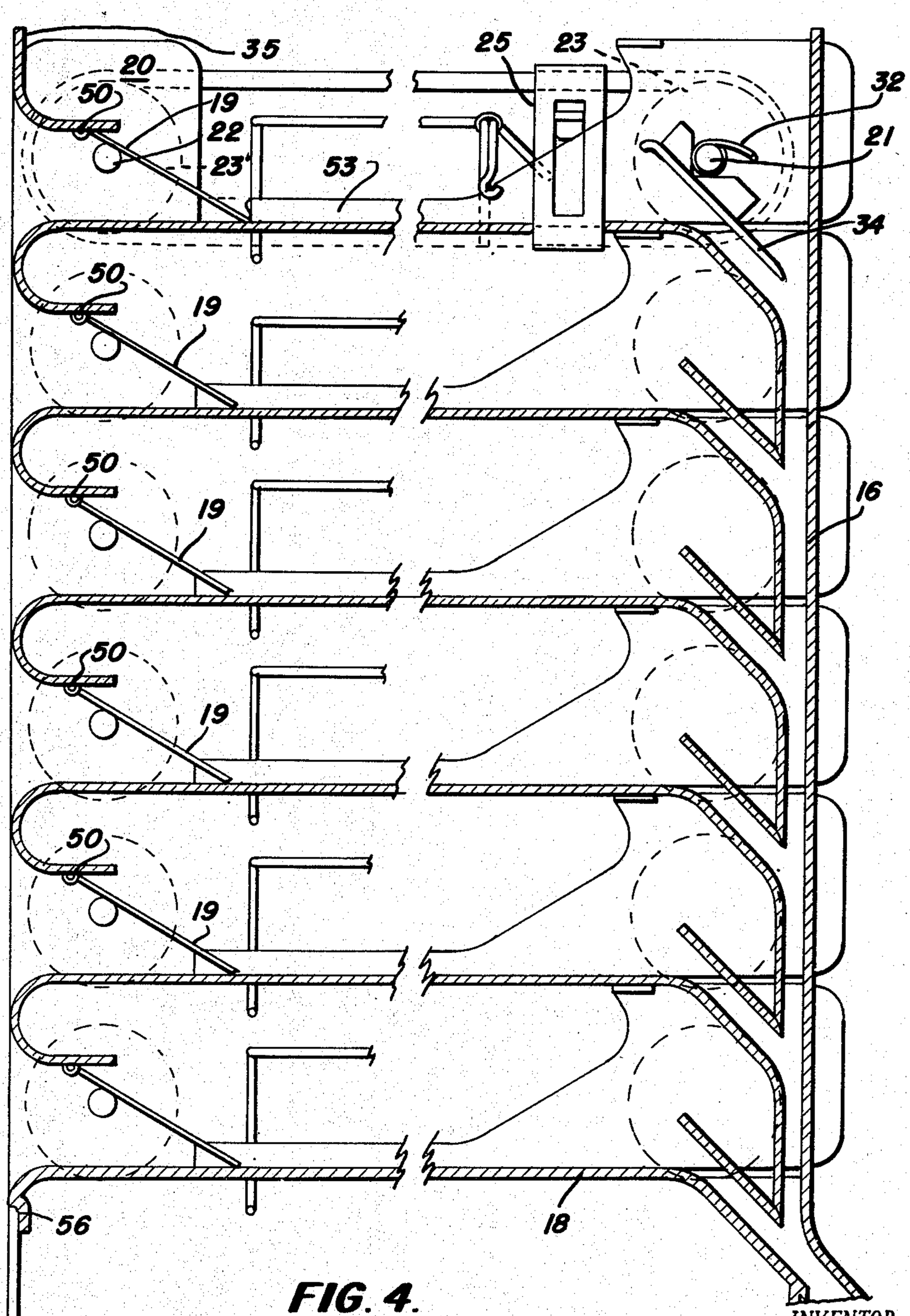

FIG. 4.

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SHEET FEEDING MACHINE

Filed Jan. 9, 1947 4 Sheets-Sheet 4

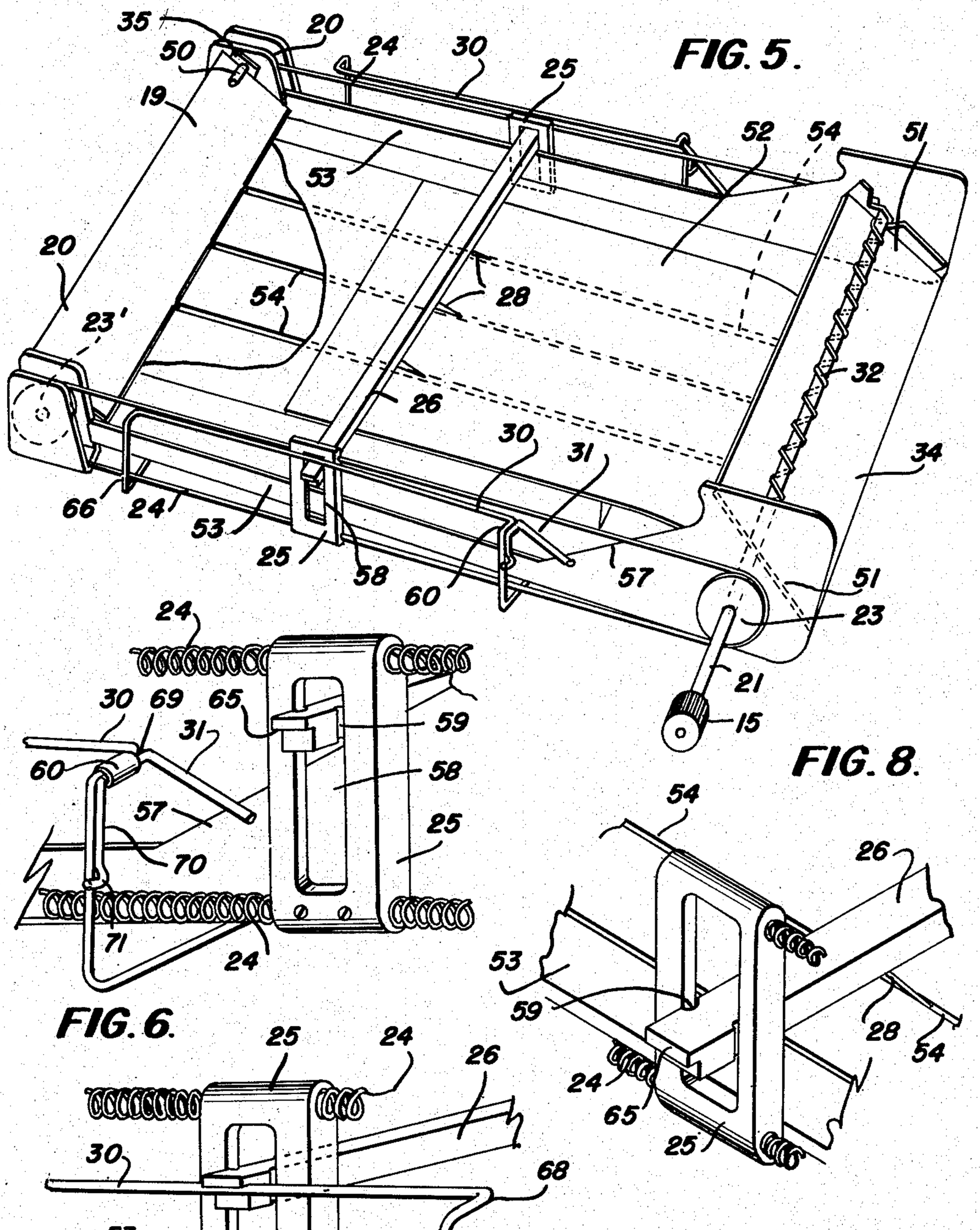

FIG. 5.

FIG. 6.

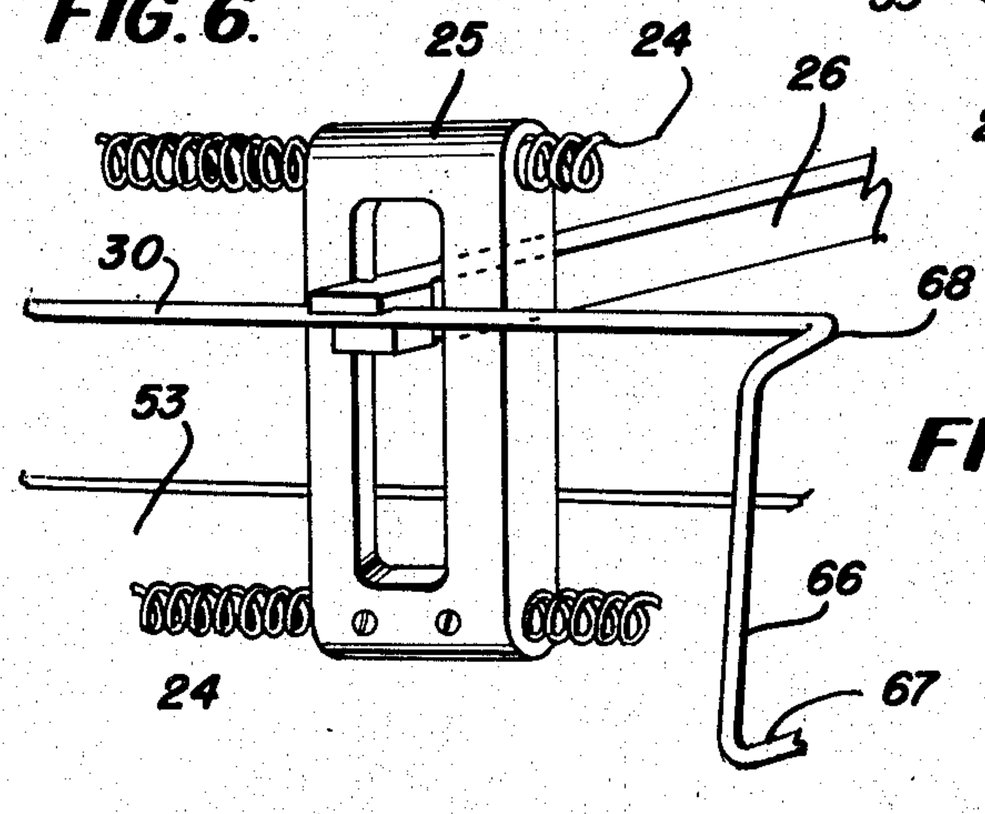

FIG. 7.

FIG. 8.

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Patented Mar. 6, 1951 2,543,836

UNITED STATES PATENT OFFICE

2,543,836

SHEET FEEDING MACHINE

Benjamin Dunn, West Hartford, Conn.

Application January 9, 1947, Serial No. 721,084

4 Claims. (Cl. 271—42)

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The present invention relates to improvements in a Sheet Feeding Mechanism and has for an object to provide a machine simple in construction, positive in operation, and economical in manufacture.

Another object of the invention is to provide a machine whose simplicity in construction requires a minimum of costly machined parts and requires little maintenance.

A further object of this invention is to provide a positive mechanical means for ejecting the paper, or material to be collated, from the stock piles to a common assembly point, thus dispensing with the conventional vacuum apparatus more common in the art.

A still further object of the invention is to provide a machine that occupies a minimum of floor space, that is compact in structure, subject to very little maintenance, and due to its simple mechanical ejecting mechanism over the conventional vacuum arms and costly auxiliary machinery is particularly adapted for economic mass production.

With the foregoing and other objects in view, the invention will be more fully described hereinafter and more particularly pointed out in the appended claims.

In the drawings, in which like parts are denoted by the same reference characters throughout the several views,

Figure 1 is a fragmentary side elevation of an improved collating machine constructed in accordance with the present invention with parts broken away.

Figure 2 is a fragmentary end elevation of Figure 1 with parts broken away.

Figure 3 is a top plan view of the driving mechanism taken on the line 3—3 in Figure 1.

Figure 4 is a vertical section taken on the line 4—4 in Figure 2.

Figure 5 is a perspective view of one of the stock pile units with the ejecting beam at the medial portion of the ejecting movement.

Figure 6 is an enlarged fragmentary perspective view of the ejecting beam at the completion of the ejecting movement.

Figure 7 is an enlarged fragmentary perspective view of the ejecting beam on its return trip to the starting point of the ejecting movement.

Figure 8 is also a perspective view showing the magazine empty of paper and the ejector and ejecting pins dropped down to the lowermost position.

Figure 9 is a vertical section taken on the line 9—9 in Figure 1.

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Referring more particularly to the drawings, the machine is composed of units. Each unit contains a quantity of a page and all the pages in the same unit bear indicia. There are as many units as there are differently numbered sheets to be collated. That is, all the sheets bearing the number of page 1 are in one unit, all the sheets bearing the number of page 2 are in one unit, and so on, the lowest numbered page being in the lowest unit, and each successively numbered page being in the unit next higher. Each unit is identical and the units are placed one above the other in step ladder fashion. They are connected to a common chute 16 that guides each sheet as it is ejected into a common basket or container 17.

The operating power comes from a small electric motor 10 mounted on base-board 37. The motor 10 drives a gear 38 which is in mesh with gear 39 to obtain less speed and more power for the operation of the machine. Gear 39 and two V'd pulleys 11 are keyed to shaft 46. This unit is supported in bearings that are fastened to pulley and gear supports 48 and 49 respectively. Pulley and gear supports 48 and 49 are in turn fastened to base 37. On pulleys 11 there are two V belts 12 which run from the bottom of the machine, V'd pulleys 11, to the top of the machine, V'd pulleys 13. V'd pulleys 13 are keyed to a shaft 45 which also is supported by supports 48 and 49. Carried on belts 12 by two pins 47 is a freely attached rack 14 which is of a predetermined length and having teeth 55 thereon. Also supported between supports 48 and 49 are back-up rubber rolls 41 carried by shafts 42, an idler gear 43 carried by shaft 44, and the end of shaft 21 which extends from each of the aforesaid units. For each of these shafts 21 there is an idler gear 43 and shaft 44 and two rubber rolls 41 and shafts 42. On shaft 21 between supports 48 and 49 is a gear 15 which meshes with gear 43. Also on the shaft 21 outside of the support 49 is a timing spool 33. Wound on the timing spool 33 is a predetermined length of flat chain 27. The chain 27 extends from the spool 33 to the rear of the support 49 where it is freely attached to an adjustment screw 29. To confine the chain 27 when it is unwound a chain retaining bracket 40 is provided just beneath the timing spool 33. This bracket 40 extends from the front of support 49 to the back of same and is retained by being spot welded.

When the machine starts, the belts 12 cause the rack 14 to pass between the rolls 41 and gear

43 such that the teeth 55 on the rack 14 cause gear 15 of each unit to operate in the proper sequence. Each unit thereupon deposits its paper into chute 16 and through the chute 16 into basket 17. The page 1 of paper 52 in the lowest unit will be ejected first, then the rack 14 will pass between the next rolls 41 and gear 43 causing the next gear 15 to operate. This will cause page 2 to be ejected and so on to each higher unit in proper sequence. When the last unit has been engaged, the belts 12 carry the rack 14 back to the starting position thus causing a complete cycle of operation. The return spring 32 causes idler gear 43 to be returned to its initial position after the rack 14 passes on to the next higher gear train. The chain 27 checks the return movement.

In each unit is a sheet holder 18 which is slightly larger than the size of paper 52 to be used. At the front corners of the sheet holder 18 are bearing supports 51. The front sheet holder bearing supports 51 are bent upwardly from the body of the sheet holder 18 to an angle of 90° and run along the long dimensioned sides of the holder 18. Inclined planes 57 are cut into these sheet holder bearing supports 51 which cause the traverse arm 26 to disengage the paper 52. The front sheet holder bearing supports 51 carry shaft 21 and return spring 32. Mounted between the front sheet holder bearing supports 51 is a deflector 34. The deflector 34 is spot welded to the front sheet holder bearing supports 51.

Return spring 32 is fixed to one of the front sheet holder bearing supports 51 on one end and shaft 21 on the other end. The rear bearing supports 20 are spot welded to sheet holders 18. Inasmuch as the rear bearing supports 20 carry stub shafts 22, space is provided between such stub shafts for loading the stacks of paper into the sheet holders 18 of all the units in the machine. On these shafts 21 and 22 are four V'd pulleys 23 and 23^1. The function of the pulleys 23 is to drive two spring belts 24 along the sides of the sheet holder 18. Fixed to the bottom run of the spring belts 24 and allowed to run freely of the top run of the spring belts are traverse arm carriers 25 having vertically elongated slots 58 therethrough, one provided for each side of the holder 18.

The ends of the traverse arm 26 are vertically slidable in the slots 58. The traverse arm 26 carries two or more very sharp pins 28. The pins 28 project down so as to engage the top sheet 52. The angle of projection varies from 0° to 90° depending upon the kind, quality, weight, and thickness of the paper used and may be controlled by mechanical adjustment. Guide slots 59 are cut in the sides of the traverse arm 26 to confine same between the side bars of the carriers 25. Arm 26 is constructed of hollow square pipe with removable plug 65, and the weight can be varied by inserting shot or other weighted material.

Side return rails 30 are mounted outwardly of the slotted guides 58 at an elevation higher than that of the original sheet stack 52 in position to receive and slidably support the extreme outer end of the bar 26 on the return movement of the bar from front to rear of the sheet holder 18. The extreme ends of the bar 26 may be shouldered or provided with lips as indicated at 65 to better support the bar 26 from the rails 30.

The rails 30 may be carried by legs 66 which are substantially vertical and arms 67 substantially horizontal and extending beneath the lower runs of the traverse arm carriers 25 for attachment to a portion of the machine or sheet holder 18. Other arms 68 extending horizontally from the upper ends of the leg 66 carry the rails 30 in suchwise that the rails 30 lie just outwardly of the traverse arm carriers 25 while the supporting frames 66, 67, and 68 are offset outwardly to avoid interference with the belts 24 or other moving parts. For convenience the return rails 30 and their respective offset frames 66, 67, and 68 may be of one piece resilient metal wire construction.

The forward portion of these rail-supporting frames may be utilized to pivotally support the lift arms 31. Such arms 31 are carried by trunnions 69 rotatably mounted in collars 60 carried by the forward arm 68. The trunnions 69 also carry stop arms 70 having laterally turned offset terminal free ends 71 extending across the legs 66. The arms 31 and 70 extend off the trunnions 69 at differential angles as shown in Figure 6 and the unit as a whole gravitationally is biased to the position shown in Figure 6 in which both arms 31 tend to descend until the stop 71 abuts leg 66; in which position the arm 70 may be vertical, and the arm 31 diagonal and intersecting the inclined edges 57.

Each unit operates in the following manner:

As the rack 14 passes between rolls 41, the teeth 55 on said rack mesh with gear 43 imparting rotation thereto and thus to gear 15. Gear 15 rotates the shaft 21 and unwinds timing chain 27; simultaneously, pulleys 23 move spring belts 24 forward and tighten or compress spring 32. The traverse arm carriers 25 being attached to the lower run of the belts 24 are thus carried forward causing the traverse arm 26 to advance and dig its pins 28 lightly into the sheet of paper and rest thereupon, the pins being pointed in the direction of ejection. As the rack 14 completes its run on the gear train, the traverse arm 26 is carried forwardly almost to the end of its path. The pins 28 meanwhile have caused the paper to be partly ejected from the sheet holder 18. When the center of gravity of the paper passes the edge of the sheet holder 18, the paper falls due to gravitational attraction through chute 16 into the basket 17. Approximately at this point the traverse arm 26 has begun to ascend the inclined planes 57, thus causing the paper 52 to completely detach itself from the pins 28. As the ends of the arm 26 ride up the inclined planes 57 they will encounter the lift arms 31 from the under sides, thus freely lifting such arms 31. After the ends of the bar 26 move past the arms 31, such arms 31 will automatically drop back to origin position indicated in Figures 5 and 6. At this point the rack 14 disengages the gear train and the return spring 32, which has heretofore been compressed, causes the front shaft 21 to rotate in the opposite direction. The belts 24 also reverse direction and move the traverse arm carriers 25 backwardly toward the rear of the sheet holder 18. In so doing the ends of the arm 26 descend the inclined planes 57, ride up the lift arms 31, slide along the elevated rails 30, and eventually fall off the rear ends of the rails onto the next sheet of paper to be ejected from that particular unit. The timing spool 33, chain 27, and adjustment screw 29 stop the shaft 21 from further rotation when the arm 26 falls off the elevated rails 30. This completes the cycle of action and the unit is ready to operate again

when the rack 14 returns to reengage the gear train.

As stated hereinbefore, the rack 14 engages the gear train of each unit successively so that each unit higher up deposits its sheet of paper on top of the sheet of paper of the unit next lower so that the proper numerical or chronological sequence is maintained.

Loading each unit is accomplished by placing the stack of paper 52, the printed side down, slightly into the entrance of each sheet holder 18. When the stack is lined up with the guides of the sheet holder 18, the operator slowly pushes the pile of paper into the machine. A line will be stenciled on the case of the machine to indicate how far the stack should be pushed. When the stack enters the sheet holder 18, the corner of the pile of paper forces the paper loaders 19 upwardly. The paper loaders 19 are hinged by pins 50 to the sheet holder 18, except in the top unit where they are hinged by pins 50 to spacer 35. When the paper loaders 19 are forced upwardly they carry the traverse arm 26 and thereby clear the sheet holder 18 for the new stack of paper.

When and if a unit has no paper, the traverse arm 26 rests on runners 53 which are part of the sheet holder 18. These runners 53 are bent upwardly from the body of sheet holder 18 and extend from the rear bearing supports 20 to merge into inclined planes 57 of the front sheet bearing supports 51. Also approximately under the pins 28 of the traverse arm 26 are as many troughs 54 as there are pins. These troughs 54 are in the body of the sheet holder 18 and extend from the rear bearing supports 20 to the vicinity of the shaft 21. When the paper runs out, the traverse arm 26 falls off the rails 30 upon the runners 53 of the sheet holder 18. The pins 28 clear the sheet holder 18 because the troughs 54 are pressed into its body and extend in length beyond the path of the pins 28 as they come in proximity with the sheet holder 18. When the rack 14 causes the arm 26 to advance, it does so but does not eject paper; in other words, all units work in sequence regardless of whether or not the units contain paper.

While I have disclosed herein the best form of the invention known to me at the present time, I desire it to be understood that I reserve the right to make changes and modifications in the herein described embodiment of the invention provided such changes fall within the scope of the following claims.

What I claim is:

1. For use with a plurality collator wherein the sheets to be collated are adapted to be vertically disposed to one another, a collator comprising, a sheet holder, an ejector having a reciprocating ejecting and return movement, a vertically slotted yoke slidably receiving and guiding said ejector, cam means carried by said sheet holder at the sides thereof cooperating with said ejector at the end of its ejecting movement for lifting said ejector within said yoke from the sheets when said ejector contacts said cam, a track carried by said sheet holder for returning said ejector to its initial starting position, and drive means to move said yoke and said ejector carried therein for ejecting and return movements.

2. A collator according to claim 1 wherein said drive means comprises endless belts alongside the sheet holder, means to drive said belts forwards and backwards, and vertically slotted yokes affixed to one of the runs of the belts and slidably receiving end portions of said ejector for vertical reciprocation during horizontal movement.

3. In a collator, a sheet holder, a movable ejector member, vertically slotted yokes for receiving end portions of the ejector member, endless coil spring belts having runs thereof slidable through upper portions of the yokes and other runs fixed to the lower portions of the yokes, spring means carried by said sheet holder and connected to said endless coil spring belts for holding said yokes in an initial position, means for moving said yokes on an ejecting movement, and means for returning said ejector member at a higher elevation from the stack than on its ejecting motion.

4. For use in a collator having a plurality of vertically disposed sheet holders for sequentially ejecting a numerical series of papers or the like, a sheet holder, side walls carried by said sheet holder having inclined planes at the ejecting ends thereof, endless belts alongside said sheet holder, means carried by said side walls of said sheet holder for supporting said endless belts on each side of said sheet holder, a vertically slotted yoke carried by said endless belt at each side of said sheet holder, a return track carried by said sheet holder along the sides thereof, an ejector bar carried within the confines of said vertically slotted yoke extending beyond said side walls and having pins carried thereon adapted to contactually engage and forwardly urge papers stacked on said sheet holder, and spring means one end of which is secured to a side wall of said sheet holder and the other end of which is secured to said carrying means for said endless belts whereby when said endless belt carrying means is rotated in one direction the yoke is driven forwardly to eject paper from said sheet holder and said ejector ascends the inclined walls and the rotary motion is removed thereby permitting the then contracted spring member to expand and impart rotation to said carrying member driving said ejector along said trackway and returning the same to its initial starting position.

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