

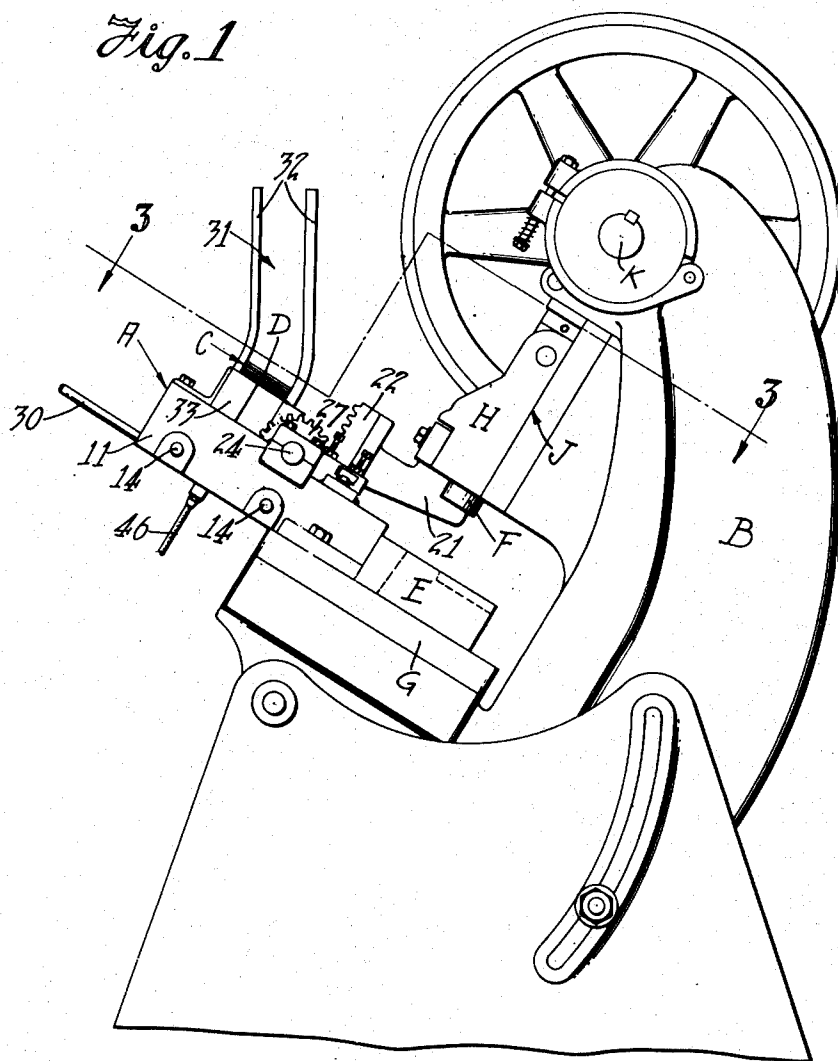
Oct. 27, 1953

H. BAKER
ARTICLE FEEDING MECHANISM WITH SEPARATOR
MEANS ACTUATED BY FEEDING MEANS

2,657,049

Filed June 20, 1949

7 Sheets-Sheet 1



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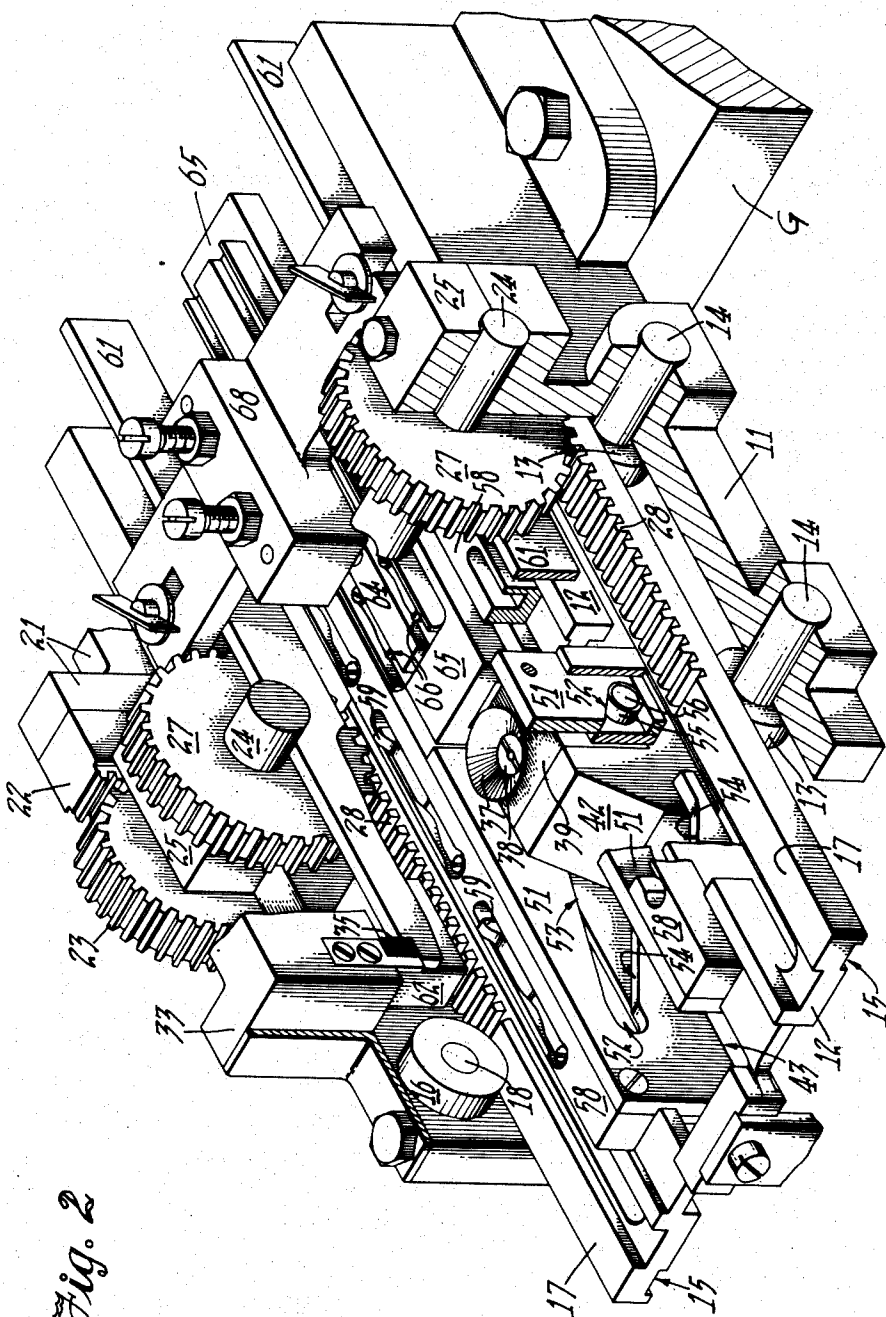
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7 Sheets-Sheet 2



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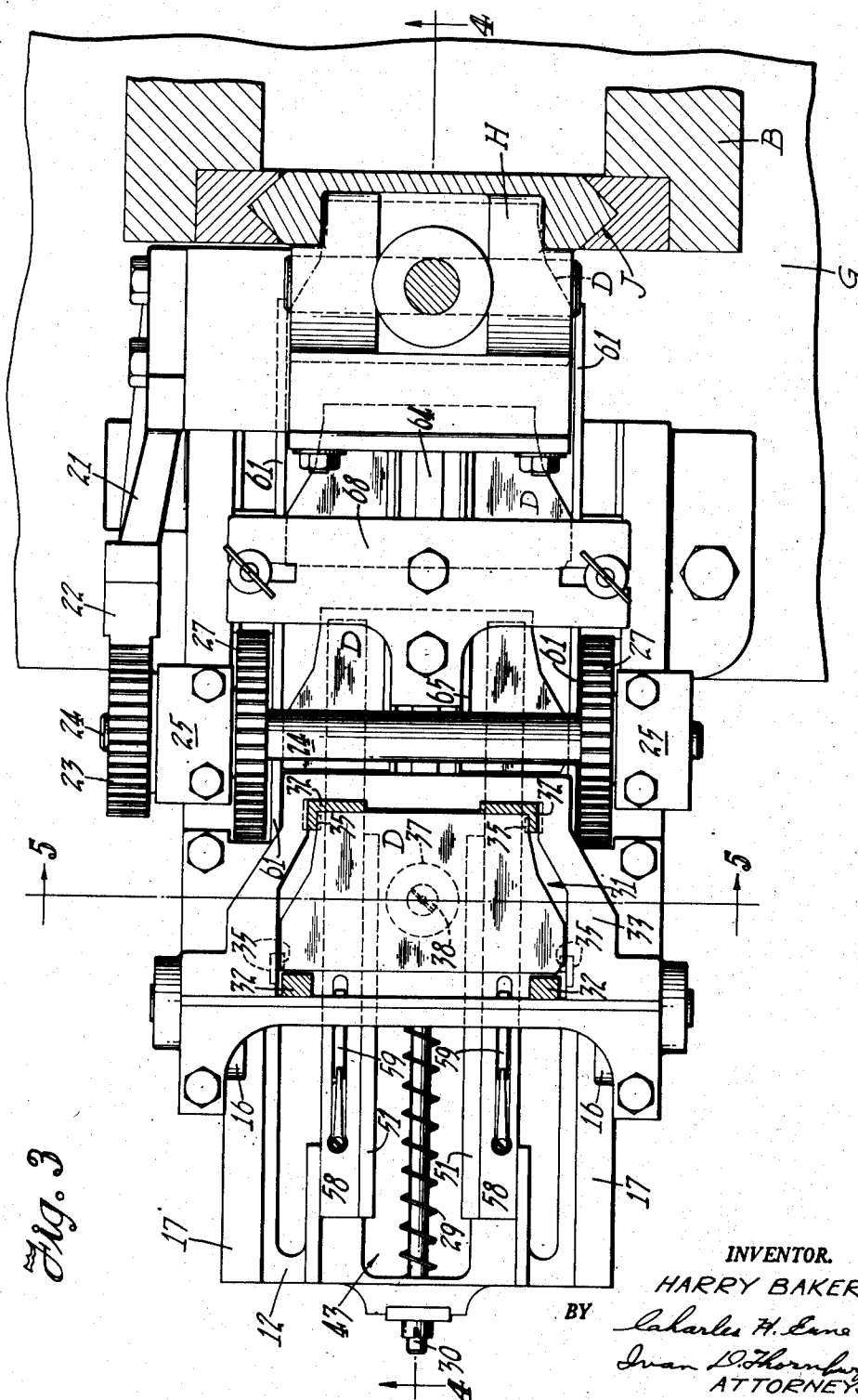
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7 Sheets-Sheet 3



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7 Sheets-Sheet 4

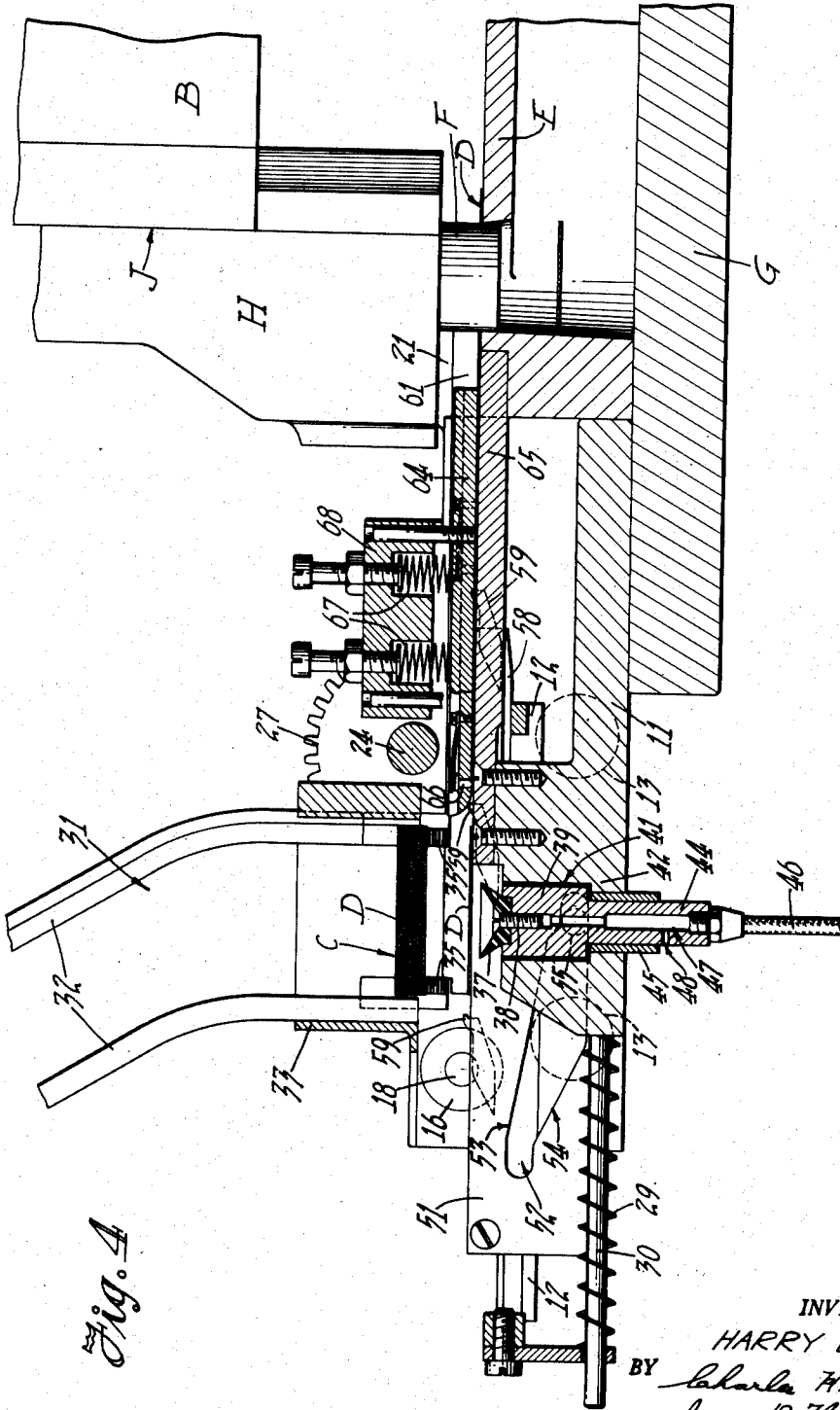


Fig. 4

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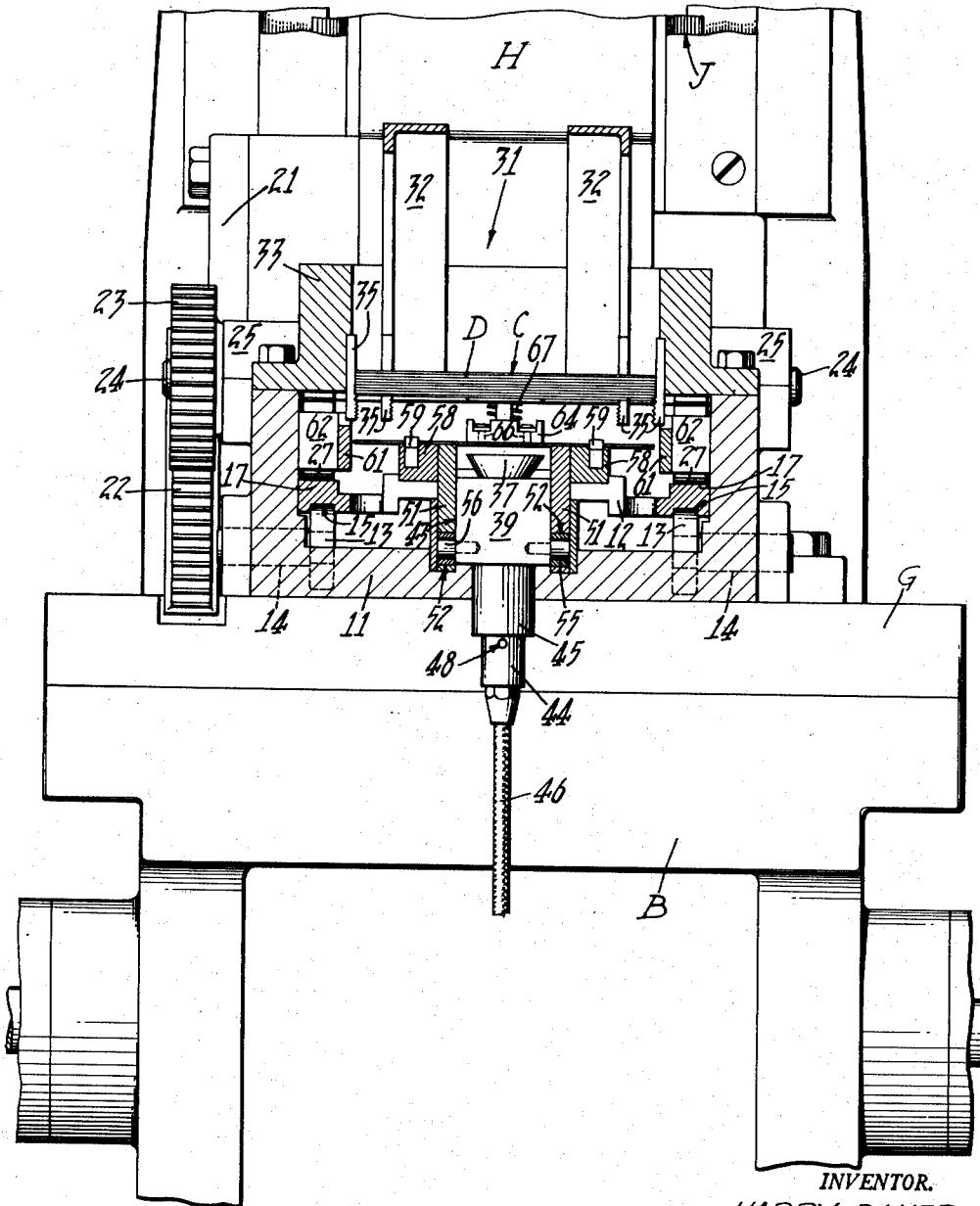
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7 Sheets-Sheet 5

Fig. 5



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7 Sheets-Sheet 6

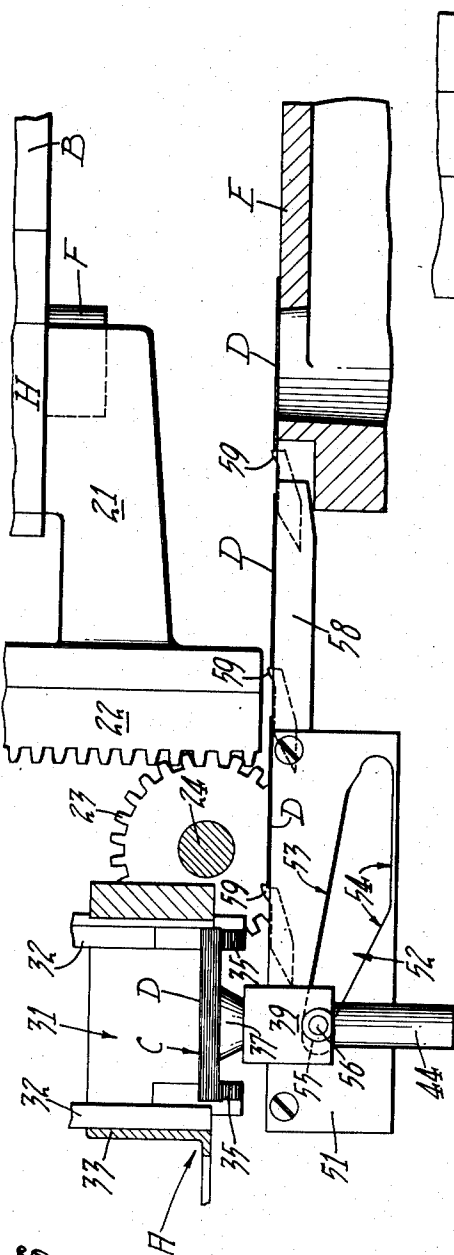


Fig. 6

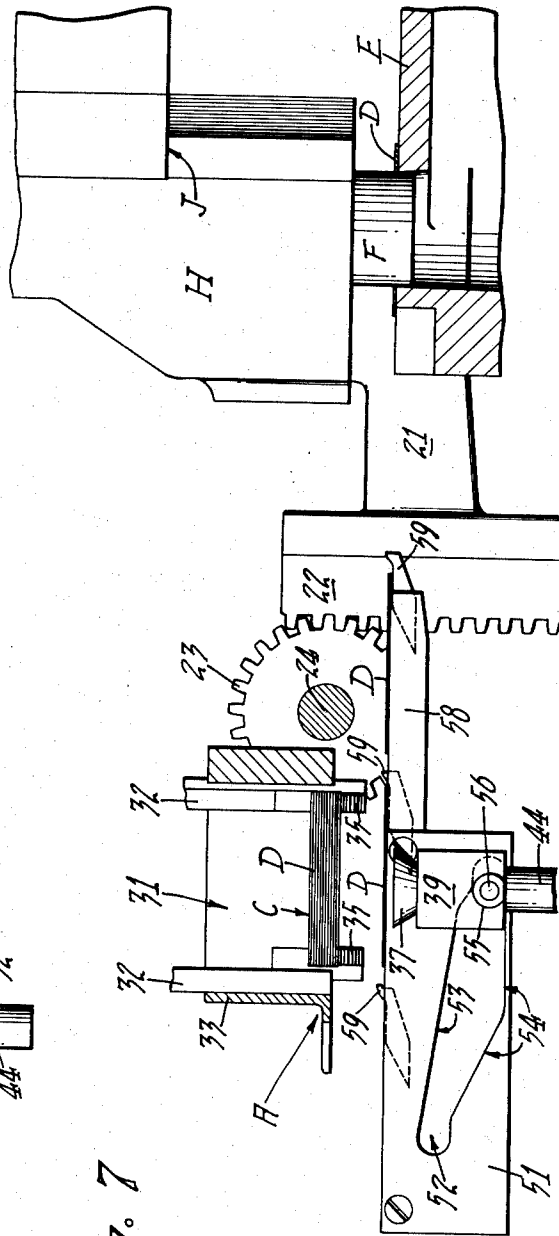


Fig. 7

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7 Sheets-Sheet 7

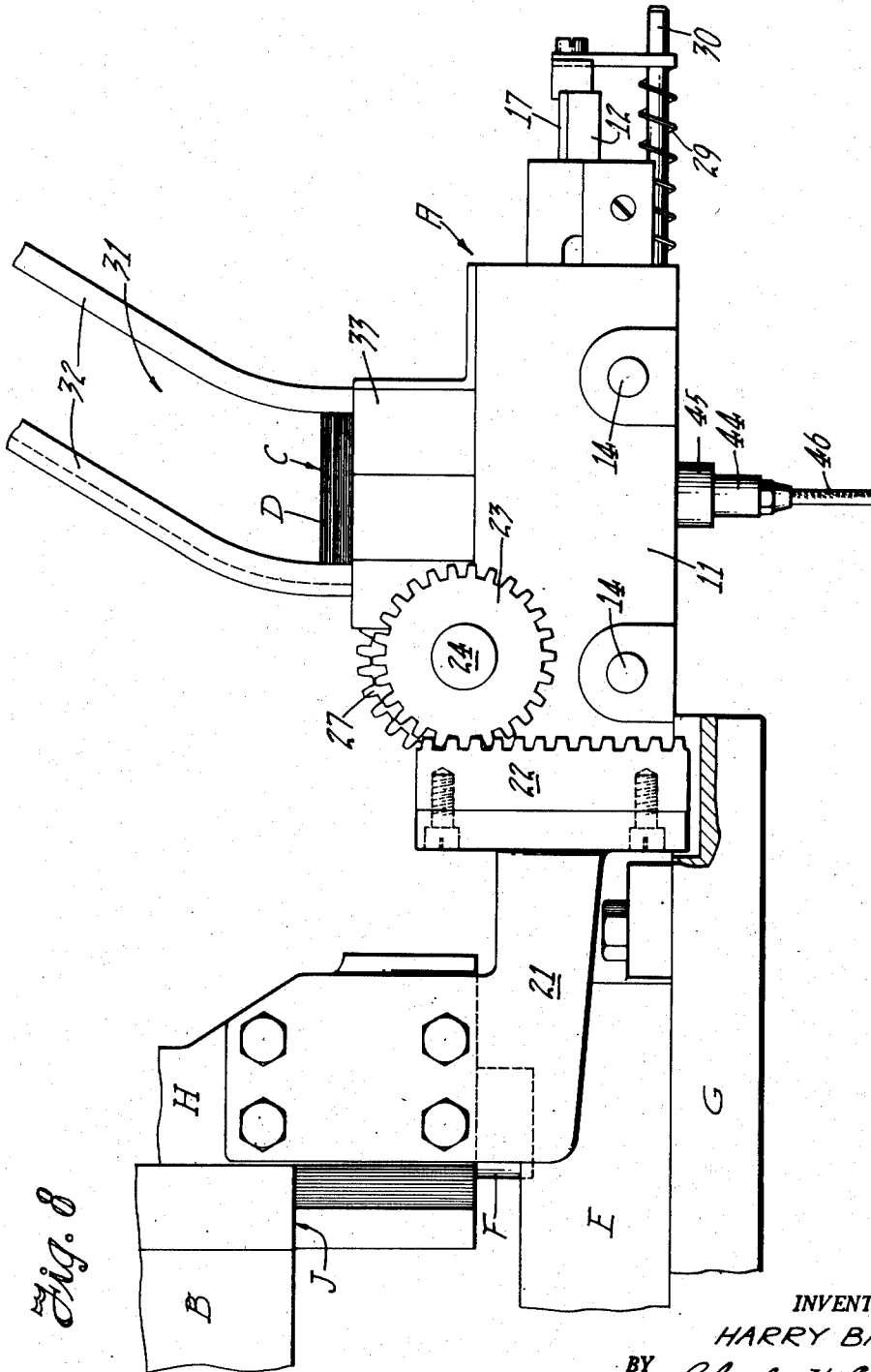


Fig. 8

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UNITED STATES PATENT OFFICE

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ARTICLE FEEDING MECHANISM WITH SEPARATOR MEANS ACTUATED BY FEEDING MEANS

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Application June 20, 1949, Serial No. 100,281

4 Claims. (Cl. 271-14)

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The present invention relates to a mechanism for feeding articles such as flat sheets individually from a stack of such sheets and has particular reference to a portable mechanism which may be readily attached to and operated by a machine for performing an operation upon the sheets advanced by the mechanism.

An object of the invention is the provision of an article feeding mechanism which is compact and self-contained as a portable unit so that it may be readily attached to a more elaborate machine for performing operations upon a fed article and may be just as readily detached to permit the use of the machine for other purposes which do not require the use of the feeding mechanism.

Another object is the provision in such a feeding mechanism of simple reciprocable devices which control the separation of the articles by gripper means and advance the separated articles into the subsequent operation machine in time with the operation of the machine.

Still another object of the invention is the provision of a feeding mechanism wherein gripper means separate individual articles from a stack of articles and bring them into the control of a reciprocating feed for advancement, the latter feed having means for actuating said gripper means in timed relation.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a side view of a machine having attached to it a portable and removable sheet feeding mechanism embodying the instant invention; with parts broken away;

Fig. 2 is an enlarged perspective view of the feeding mechanism shown in Fig. 1, with parts broken away and parts shown in section;

Fig. 3 is an enlarged combination top plan view of the feeding device and section through a portion of the machine as taken substantially along the broken line 3-3 in Fig. 1, with parts broken away;

Fig. 4 is a longitudinal section taken substantially along the line 4-4 in Fig. 3, with parts broken away;

Fig. 5 is a transverse section taken substantially along the line 5-5 in Fig. 3, with parts broken away;

Figs. 6 and 7 are schematic views illustrating principal parts of the mechanism as disclosed in

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Fig. 4 and showing these parts in different positions as an incident to separating a sheet from a stack and feeding it into the machine, with parts broken away; and

Fig. 8 is an enlarged side elevation of the feeding mechanism as viewed from the side opposite to that shown in Fig. 1, with parts broken away.

As a preferred or exemplary embodiment of the instant invention the drawings illustrate a sheet feeding mechanism A (Fig. 1) detachably mounted on a conventional punch press B for the purpose of feeding from a stack C, flat metallic sheets D, such as scroll shear blanks or other irregular or regular shaped blanks. The sheets D fed from the stack C are advanced individually into the punch press B and positioned between a lower stationary die E and a movable upper punch F for stamping a can part or other article from the sheets.

The lower stationary die E is bolted to a bolster plate G secured to the bed of the press. The upper movable punch F is carried in a vertically reciprocable punch head H which operates in a slideway J formed in the press frame. The head is reciprocated in the usual manner through a rotatable crankshaft K.

The feeding mechanism A comprises a hollow rectangular shaped frame 11 (Figs. 1 and 5) which is disposed adjacent the lower stationary die E and which is detachably bolted to the bolster plate G. The major portion of the frame 11 extends outwardly beyond and overhangs the bolster plate. The frame 11 surrounds and supports a slide plate or carriage 12 (Figs. 2, 3 and 5) which is disposed in a position parallel with the bolster plate G of the press B and which is reciprocable toward and away from the lower stationary die E.

The slide plate 12 rests on two pairs of support rollers 13, located one pair on each side of the frame and mounted on short pins 14 secured in the frame. The rollers operate in guide grooves 15 formed in the bottom of the plate and extending longitudinally thereof. The grooves are substantially the same width as the rollers so as to guide the plate in a straight line path of travel during its reciprocation.

Two top rollers 16, disposed one on each side of the frame 11, roll on raised runways 17 formed on the slide plate 12 above and opposite the grooves 15 and thus retain the plate in contact with the lower rollers 13 against vertical displacement. These top rollers 16 are mounted on short pins 18 secured in the frame 11 (Fig. 2).

Reciprocation of the slide plate 12 is effected

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in time with the punch head H of the press B, the slide being moved through a forward or sheet feeding stroke during the up or return travel of the punch head H, and through a back or return stroke during the down or working travel of the punch head. For this purpose the punch head H carries a bracket 21 (all figures) having an upright rack 22 which meshes with a gear 23 mounted on the outer end of a gear shaft 24 which extends across the frame 11 above the slide plate 12 and which is rotatably supported in bearing blocks 25 bolted to the frame.

Hence as the punch head H moves up and down, it raises and lowers the rack 22 and this rotates the gear 23, first in one direction and then in the opposite direction. This rotation of the gear is utilized to reciprocate the slide plate 12 and is transmitted to the plate by a pair of spaced actuating gears 27 which are mounted on the gear shaft 24. The actuating gears 27 mesh with a pair of racks 28 formed in the forward or inner portions of the runways 17 of the slide plate not engaged by the top rollers 16. It is through this gear connection with the punch head H that the slide plate is reciprocated in timed relation. The gears 27 are located directly above the forward plate supporting rollers 13 as best shown in Fig. 2, and thus retain the slide plate against vertical displacement, these rollers 13 at the same time serving as backing-up rollers for the gears.

Backlash between the gears 27 and the racks 28 is absorbed by a compression spring 29 interposed between the frame 11 and a depending lug on the slide plate 12. The spring is wrapped around a rod 30 one end of which is fixed in the frame 11 and the other end slidably carried in the depending lug. This provides for smooth operation of the slide plate 12.

The stack C from which the sheets D are to be fed individually is located in a substantially upright position above the slide plate 12 as best shown in Figs. 1, 4 and 8. The stack is retained in a magazine 31 comprising a plurality of spaced and parallel upright guides 32 (see also Fig. 3) which extend down into and are anchored in a hollow magazine 33 disposed across the top of the frame 11 and bolted thereto. The stack C is vertically supported in the magazine 31 by a plurality of serrated members 35 (Figs. 2, 3, 4 and 5) which are secured to the inner faces of the magazine base 33 and are located adjacent the terminal ends of the guides 32. These serrated members 35 frictionally engage against and grip the edges of the lowermost individual sheets D in the stack C and thus support the entire stack.

Preparatory to feeding the sheets D from the stack C to the press B, the sheets are individually separated from the bottom of the stack. This separation is brought about by a vertically movable suction cup or gripper member 37 (Figs. 2, 3, 4, 5, 6 and 7) which is located directly under the stack. This suction cup is secured by a hollow screw 38 to a square vacuum or gripper head 39 which is located in a vertical slideway 41 formed in a stationary block 42 of the frame 11. The block 42 is formed integrally with the frame and extends up through an opening 43 (see Fig. 3) in the middle of the slide plate 12.

The vacuum head 39 is formed on a depending stem 44 (Fig. 4) which extends down through and projects beyond a bearing sleeve 45 secured in the block 42. The lower end of

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the stem 44 is secured to a flexible tube 46 which leads to any suitable source of vacuum. The tube communicates with a channel 47 formed in the stem 44 and the vacuum head 39 and this channel communicates with the cup 37 through its hollow screw 38. A vacuum is continuously drawn on the channel 47. A vent port 48 in the stem 44 just below the lower end of the bearing sleeve 45 is provided to break the vacuum in the cup 37 when required.

The vacuum head 39 and its cup 37 are raised and lowered toward and away from the stack C in time with the movement of the slide plate 12 to separate the sheets D individually from the stack. This is brought about by a pair of spaced and parallel plate cams 51 which are disposed in the opening 43 in the slide plate 12 and located one on each side of the vacuum head 39. These cams are secured to the slide plate 12 and move with the plate. The plate cams 51 are formed with identical irregular openings 52 defined by inclined upper cam edges or surfaces 53 and inclined lower cam edges or surfaces 54. These cam edges are engaged by cam rollers 55 disposed on opposite sides of the vacuum head 39 and mounted on the outer ends of pins 56 carried in the head.

Hence when the slide plate 12 moves through a forward or feeding stroke (toward the right as viewed in Fig. 4), the cam plates 51 move forward with the slide plate and the cam rollers 55 on the vacuum head ride along the lower cam edges 54. These lower cam edges 54 for about one half of their length, extend parallel with the line of travel of the slide plate 12 and during the latter half of their length are sharply inclined toward the upper cam edges 53.

Thus during the forward travel of the slide plate 12, the vacuum head 39 remains stationary for about one half the travel of the plate. During the second half of the plate travel, the vacuum head 39 is lifted toward the stack C and the vacuum cup 37 is brought into engagement with the lowermost sheet D in the stack as shown in Fig. 6. During this lifting of the vacuum head 39 the portion of its stem 44 which has the vent port 48 moves up into the bearing sleeve 45 and thus covers or closes the vent port and this creates a vacuum in the cup 37 thereby causing the cup to adhere to the lowermost sheet D.

As soon as the slide plate 12 reaches the end of its forward stroke, it starts back through its return stroke. During this return stroke the cam rollers 55 on the vacuum head 39 ride along the upper cam edges 53 of the cam plates 51. These edges gradually slope downwardly toward the lower edges 54 and near the lower edges, abruptly change into a steep slope which terminates the movement of the cam rollers. Thus as the cam rollers 55 follow these sloping edges 53, the suction cup 37 and the lowermost sheet D clinging thereto by virtue of the vacuum within the cup, move down gradually away from the stack C, thus separating the sheet from the remainder of the stack. The serrated members 35 insure that only one sheet is separated from the stack and thereby prevent the feeding of doubles.

The suction cup 37 carries the separated sheet D down into engagement with a pair of spaced and parallel stroke or feed bars 58 having a plurality of spaced depressible feed fingers or dogs 59. These feed bars 58 extend longitudinally of the slide plate 12 and are secured to the plate adjacent the plate cams 51 so that they move with

the slide plate 12. The suction cup 37 deposits the sheet D onto the feed bars 58 in front of the first pair of feed dogs 59 just as the slide plate 12 nears the end of its return stroke and as the cam rollers 55 reach the steep slope in the cam edges 53 in the plate cams 51. At this same time in the cycle of operation, the vent port 48 in the vacuum head stem 44 becomes uncovered or open by virtue of the stem 44 moving down sufficiently to expose the port. Thus the vacuum in the cup 37 is broken and the cup moves rapidly away from the sheet D, leaving the sheet in place on the feed bars 58 as shown in Figs. 4 and 7. This completes one cycle of operation of the slide plate 12.

During the next reciprocation of the slide plate 12, the sheet D which has been deposited on the feed bars 58 is engaged by the first set of feed fingers 59 and is advanced one step, which is the distance or stroke of travel of the slide plate. During this advancement the vacuum head 39 remains stationary as hereinbefore explained until the sheet D is clear of the path of travel of the cup 37 and then the head and its cup moves up to engage and separate the next sheet in the stack as just explained. The sheet D during its advancement is guided along a straight line path of travel toward the lower stationary die E by a pair of spaced and parallel guide rails 61 fastened to spacer blocks 62 (Figs. 2 and 5) secured to the frame 11.

The sheet D is advanced between a hold down bar 64 (Fig. 4) and a table 65. One end of the table is secured to the frame block 42. Its opposite end is supported in a notch in the lower die E. The hold down bar 64 is provided with spring pressed pins 66 (Fig. 4) which engage in back of an advanced sheet D and hold it against return with the feed bars 58 during their return stroke. The hold down bar 64 is frictionally held against the advanced sheet D by adjustable compression springs 67 interposed between the bar and a retaining member 68 located above the bar and extending transversely of the frame 11. The outer ends of the member are secured to the frame.

Thus as each sheet D is separated from the stack C by the suction cup 37 and is pulled down into position on the feed bars 58, the feed dogs 59 engage behind the separated sheet and advance it through a plurality of idle stations and thence feed it into the lower stationary die E where it is operated upon by the upper movable punch F for cutting a can part or other article therefrom as hereinbefore mentioned. The cut out portion of the sheet D falls through the lower die E to any suitable place of deposit while the scrap portion left in the die is ejected in the usual manner, this later operation forming no part of the instant invention.

In such a feeding mechanism, the timing of the separation and advancement of the sheets D in respect to the movement of the upper punch F of the press B is precisely effected through the medium of the slide plate 12, the plate being actuated by connection with the punch head H and being the common carrier of the feed bars 58 and the suction cup actuating cam plates 51 provides a simple, self-contained and compact unit which may be readily attached or removed from the press B with a minimum of effort.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the

invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a sheet feeding mechanism, the combination of a magazine for holding a stack of sheets, a reciprocable slide plate disposed adjacent said magazine, a suction cup movable at substantially right angles to said slide plate toward and away from said stack for separating sheets individually from said stack, a feed bar carried on said slide plate for receiving a separated sheet from said suction cup and for advancing it along a predetermined path of travel, cam means operable by said slide plate and operatively connecting with said suction cup for moving said suction cup toward and away from said stack, said cam means having a cam surface for moving said cup toward said stack during the latter portion only of the feeding stroke of said feed bar and a second cam surface for moving said suction cup away from the stack on the return stroke of the feed bar.

2. In a sheet feeding mechanism, the combination of a frame, a reciprocable slide plate carried in said frame, said slide plate having an actuating rack connected therewith, a driving gear rotatably mounted in said frame and meshing with said rack for reciprocating said slide plate, a magazine mounted on said frame adjacent said slide plate for holding a stack of sheets, gripper means mounted in said frame adjacent said magazine and movable toward and away from said stack for separating sheets individually from said stack, cam means carried on said slide plate and movable therewith, follower means mounted on said gripper means and operable by said cam means for moving said gripper means relative to said stack in timed relation with the reciprocation of said slide plate, said cam means having a surface engageable with said follower means to move said gripper means toward said stack during the forward stroke of said reciprocable slide plate and a second surface engageable with said follower means to move said gripper means away from said stack for separating a sheet therefrom, and feeding means carried on said slide plate for receiving a separated sheet from said gripper means and for advancing it along a predetermined path of travel.

3. A portable sheet feeding mechanism, comprising in combination a portable frame attachable to a machine for effecting an operation upon sheet material, a reciprocable slide plate carried in said frame, slide plate reciprocating means mounted in said frame and connectible with a moving part of said machine for reciprocating said slide plate in timed relation with said machine, a magazine mounted on said frame adjacent said slide plate for holding a stack of sheets, gripper means mounted in said frame adjacent said magazine and movable toward and away from said stack for separating sheets individually from said stack, cam means carried on said slide plate and movable therewith, follower means mounted on said gripper means and operable by cam surfaces on said cam means for moving said gripper means relative to said stack in timed relation with the reciprocation of said slide plate, one of said cam surfaces moving said gripper means toward the stack during a portion of one stroke of said slide plate, and another of said surfaces moving the gripper means away from the stack on the other stroke of each complete reciprocation of said plate, and feeding means carried on said slide plate for receiving a sepa-

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rated sheet from said gripper means and for advancing it along a predetermined path of travel.

4. In a sheet feeding mechanism, the combination of a magazine for holding a stack of sheets in a substantially vertical position, gripper means located beneath said magazine and vertically movable toward said stack for engaging the lowermost sheet in the stack and for separating it from the stack, a reciprocating feed bar movable in a horizontal plane beneath said magazine, said feed bar having feed dogs for feeding the sheet separated by said gripper means, cam and follower means mounted on and operatively interconnecting said feed bar and said gripper means for controlling the relative movements of said bar and gripper means, and means for reciprocating said feed bar through a forward feeding stroke and thence through a return stroke, said cam and follower means having a cam surface in operative engagement with the follower during a portion only of said forward feeding stroke of the feed bar to raise said gripper means

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into engagement with the lowermost sheet in the stack and a second cam surface in operative engagement with the follower during said return stroke of the feed bar for drawing down the lowermost sheet from the stack and depositing it in front of a said feed dog, said feed dog on the forward stroke of said feed bar engaging and advancing said separated sheet along a predetermined path of travel.

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