April 27, 1965 P. F. STANLEY ETAL 3,180,183

DRILLING MACHINE WITH LATERALLY INDEXABLE HEAD

Filed Oct. 12, 1962 3 Sheets-Sheet 1

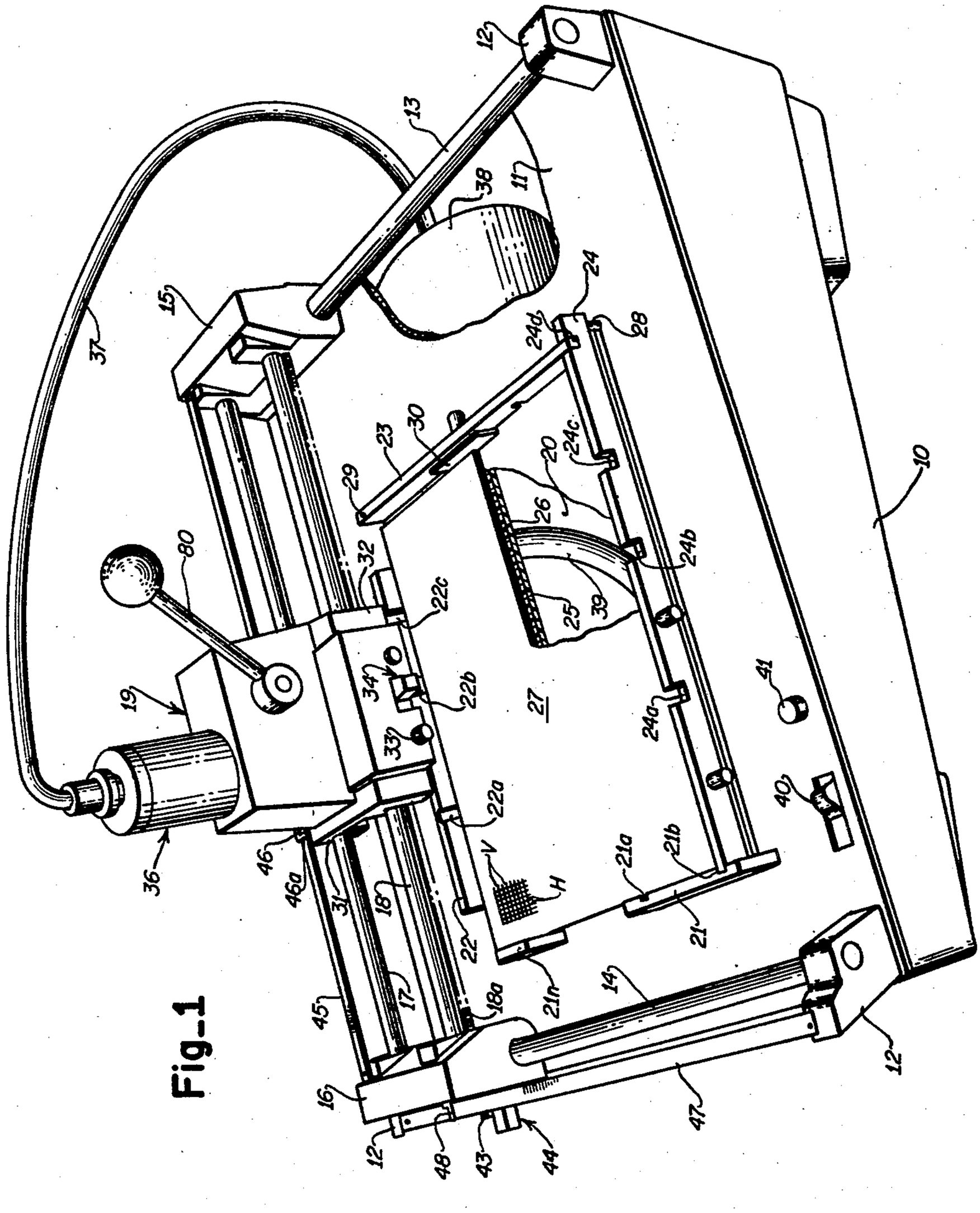

Fig_1

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Fig_2

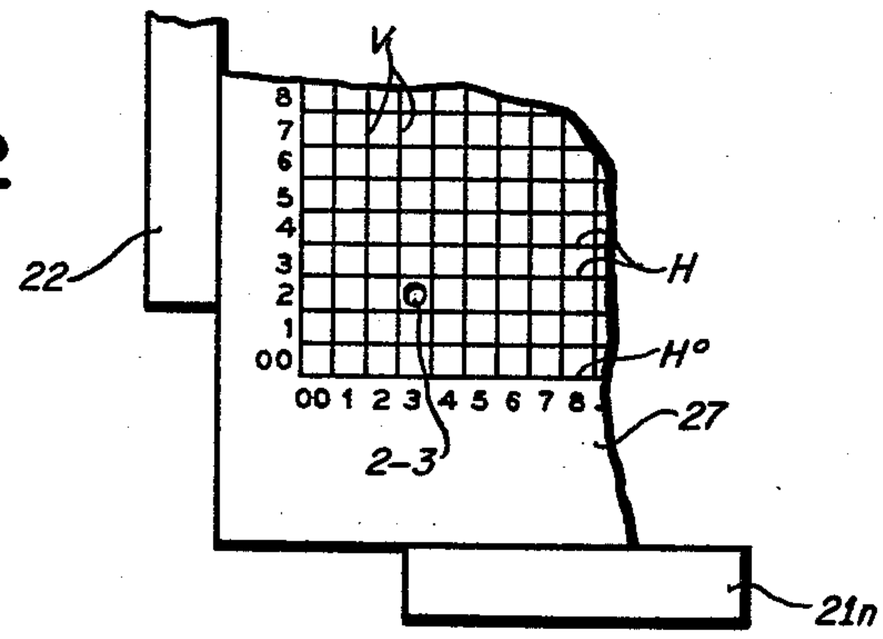
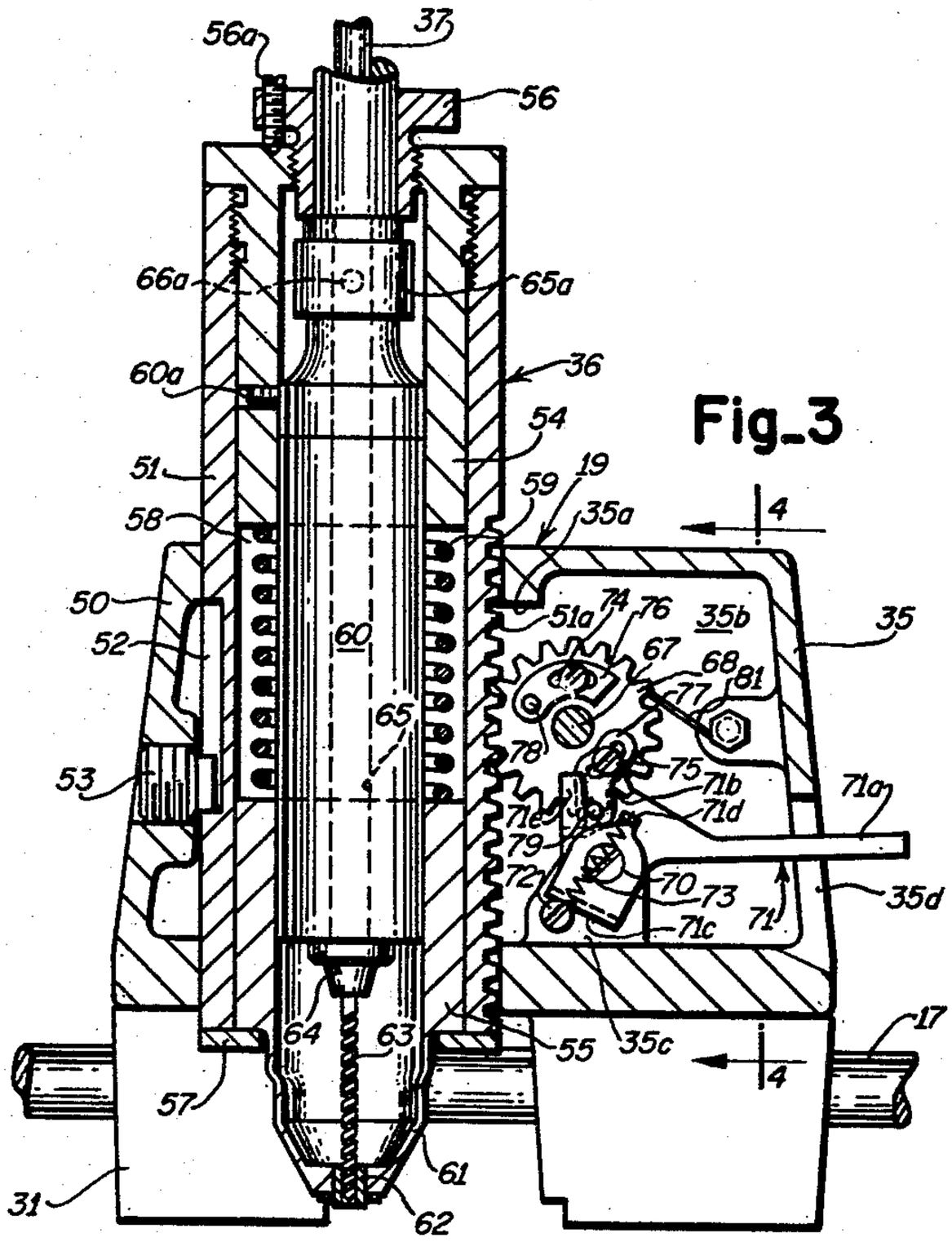


Fig_3



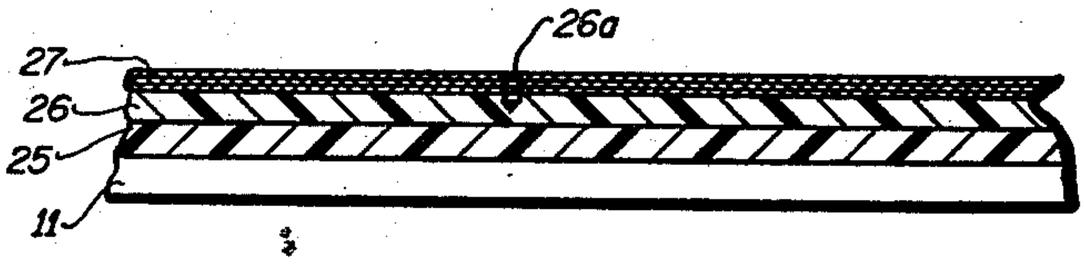


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Fig-4

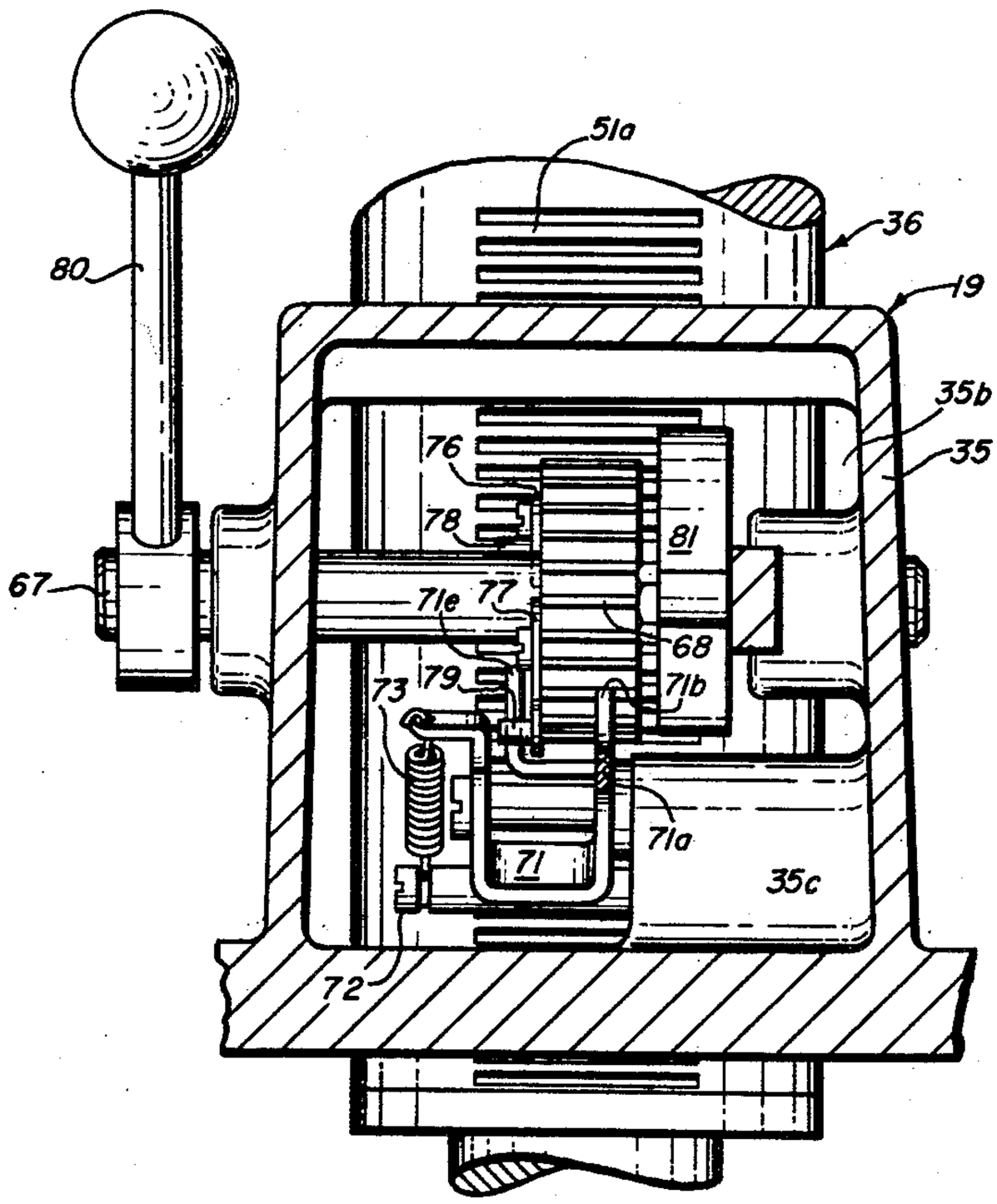
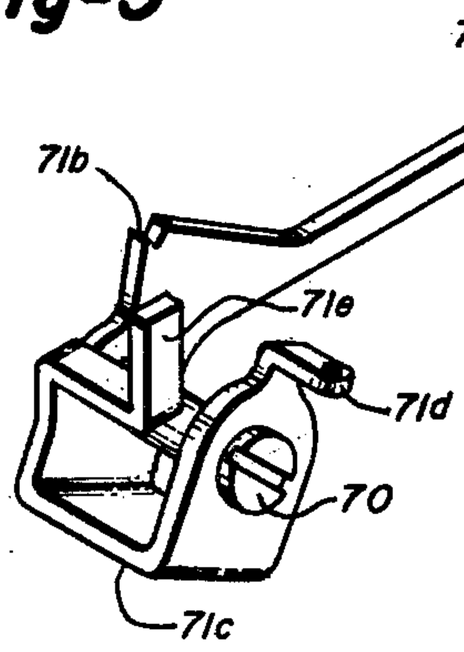


Fig-5



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3,180,183
DRILLING MACHINE WITH LATERALLY INDEXABLE HEAD

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1 Claim. (Cl. 77—34.6)

This invention relates to data processing equipment and more particularly to a machine for forming holes in a record medium such as a card and for reading holes formed in such a card for the purpose of information retrieval and is an improvement over the machine disclosed in the co-pending application of Paul F. Stanley, Serial No. 217,380, filed August 16, 1962.

Presently available data processing equipment of the above type is characterized by certain structural features that cause an amount of inconvenience in the normal use of the equipment. For example, one such device employs interchangeable drill and viewing heads (see U.S. Patent to Jonker 3,052,150). Thus in order to operate the machine for information retrieval it is necessary to remove the drill head from its carriage and install in its place an optical viewing device and vice versa. This arrangement is not only inconvenient in use but subjects both the drill and the viewer to possible damage during interchange. Other disadvantages include difficulty in making certain that the bottom card of a stack is drilled.

It is accordingly an object of the invention to provide a data processing machine of the above nature that overcomes the above-mentioned disadvantages as well as others in a thoroughly practical and efficient manner. Another object is to provide such equipment that is inexpensive, easy to operate and durable over an extended period of use.

Other objects will be in part apparent and in part pointed out hereinafter.

In the drawing wherein there is shown one embodiment of the invention and wherein similar reference characters refer to similar parts throughout the several views:

FIGURE 1 is a perspective view of the machine;

FIGURE 2 is a fragmentary top plan view of a data card;

FIGURE 3 is a sectional elevation of the drill head and a portion of the card support;

FIGURE 4 is an enlarged sectional elevation taken along the line 4—4 of FIGURE 3; and

FIGURE 5 is a perspective view of the control lever for the quill in the drill head.

Referring to FIGURE 1 the machine includes a base 10 that is deeper at the rear than at the front so that a table 11 mounted thereon lies in an inclined plane sloping upwardly from front to rear. By so inclining the table, use of the machine is facilitated and the comfort of the operator is promoted. A post 12 is secured to table 11 at each corner thereof and these four posts provide supports for upper and lower carriage guide rods 13 and 14 that are adjustably secured to the posts in any convenient manner.

A pair of blocks 15 and 16 are slidably mounted on rods 13 and 14, these blocks having secured thereto a pair of laterally spaced parallel carriage guide and supporting rods 17 and 18 that are perpendicular to rods 13 and 14. Rods 17 and 18 slidably mount a carriage generally indicated at 19. It will now appear that as rods 17 and 18 are movable horizontally over table 11 and that as carriage 19 is vertically movable therover, the carriage is capable of universal planar movement in a plane parallel to and spaced above the plane of table 11.

Table 11 has a large centrally located aperture 20 formed therein which is marginally edged by a pair of

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locating rails 21, 21*n* and 22 which are preferably permanently fixed to table 11 and another pair of rails 23 and 24 which are removably and adjustably mounted on the table. Rails 21 and 22 serve the double purpose of removably locating a translucent light diffusing plate 25 (see FIGURE 3) which rests on table 11 over aperture 20, this plate removably supporting a translucent plastic drill plate 26 which is also held in proper operative position by rails 21 and 22 (FIGURE 1), and of locating one or more data cards 27 mounted on plate 26. Rail 21 has illustratively two vertical grooves 21*a* and 21*b* formed therein, rail 22 having illustratively three similar grooves 22*a*, 22*b* and 22*c*, these grooves being provided for a purpose to be described.

Rail 24 has illustratively four horizontal notches 24*a*, 24*b*, 24*c* and 24*d* formed therein, the first three of which are in horizontal registry with rail grooves 22*a*, 22*b* and 22*c*, the four notches adapted to selectively receive the right hand end of rail 23. The right hand end of rail 24 carries a depending locating pin 28 selectively receivable in one or the other of two holes (not shown) in table 11 that are in respective vertical registry with rail grooves 21*a* and 21*b*. The left hand end of rail 23 has a hole adapted to receive a locating pin 29 which extends upwardly from table 11 to which it is secured. It may now be seen that rails 23 and 24 are adjustable relative to rails 21 and 22 in order to accommodate data cards of different size. For example, to adapt the machine for processing large cards 27, rail 24 is located in the FIGURE 1 position wherein its lower end is received in rail groove 21*b* and its pin 28 enters the table hole that registers with this groove. The right hand end of rail 23 is received in rail notch 24*d* while table pin 29 enters the hole in the left hand end of the rail, the two rails thus being securely positioned over drill plate 26 on which they rest to receive and properly locate one or more cards 27 of the selected size. To accommodate a smaller card size rail 24 may be located in groove 21*a* with its pin 28 inserted in the table hole that registers with that groove. Rail 23 may then be located in related groove and notch 22*c* and 24*c*, for example, the four rails thus being set to the selected card size. Preferably rails 23 and 24 are provided with adjustable card margin stops 30 for final nice adjustment to the card size to be accommodated.

Carriage 19 includes depending legs 31 and 32 which slidably receive rods 17 and 18, the latter of which has locating teeth 18*a* formed therein which selectively coact with a conventional locating pawl (not shown) housed in leg 32 and manually releasable by a finger piece 33 to permit movement of the carriage along rods 17 and 18. A carriage advancing device generally indicated at 34 and colloquially known as an "incher" is housed in carriage leg 32 and is manually operable to effect movement of the carriage in increments of one tooth in upward direction of carriage travel. The "incher" is provided for final vertical coordinate setting of the carriage after it has been approximately positioned at the desired coordinate location.

Block 16 is similarly provided with a finger piece 43 and an "incher" 44 similar in structure and operation to fingerpiece 33 and "incher" 34 that coact with teeth (not shown) on rod 14 similar to teeth 18*a* to control horizontal coordinate movement of carriage 19. The ends of a suitably graduated vertical scale 45 are secured to blocks 15 and 16 respectively, the scale underlying a pointer 46 mounted on carriage 19 which accordingly indicates the vertical coordinate setting of the carriage. A similar scale 47 has its ends respectively secured to lower posts 12 and underlies a pointer 48 on block 16 which indicates the horizontal coordinate setting of the carriage. Thus the coordinates of any location on a card 27 under carriage 19 can be determined from the two

scales and their associated pointers when the device is used for drilling.

Carriage legs 31 and 32 are bridged by an integral upwardly extending trunk or housing 35 in which a drill quill, generally indicated at 36, is reciprocally mounted for operation by a handle 80. Quill 36 is drivingly connected as by a flexible drive cable 37 to an electric motor 38 mounted in base 10. An annular fluorescent light 39 is also mounted in base 10 centrally beneath aperture 20 and plates 25 and 26, a switch 40 for the light being conveniently mounted on base 10. The base also provides adequate housing for the circuitry associated with the motor and light. A motor switch 41 may be provided and is suitably connected across the motor.

As shown in FIGURE 3 carriage housing 35 includes a vertical socket portion 50 in which a sleeve 51 is reciprocably mounted, the sleeve having a limit slot 52 to receive the end of a screw 53 threaded through the housing wall which prevents relative rotation between the sleeve and housing and limits vertical movement of the sleeve. Disposed within sleeve 51 are a pair of collars 54 and 55, the upper collar 54 being threaded into the upper end of the sleeve. A hollow plug 56 and set screw 56*a* are provided for adjusting the vertical position of quill 36. Lower collar 55 is slidably mounted in the lower end of the sleeve wherein it is retained by a suitable capping washer 57 which also limits downward movement of this collar in the sleeve. The inner opposed ends of collars 54 and 55 are spaced to provide an annular space 58 within which is disposed a spring 59 coiled around a post 60 to constantly bias collar 55 downwardly toward or against washer 57. Secured to or integral with collar 55 is a preferably cup-shaped drill guide 61 which carries a bushing 62 through which a drill 63 extends, this drill being removably mounted in a chuck 64 attached to a drive shaft 65 rotatably mounted in post 60. As collar 55 is axially movable relative to post 60 it will be apparent that drill 63 may be moved axially relative to guide 61 as will be described below. Upper collar 54 and post 60 are separably attached as by a set screw 60*a* so that the collar, post and drill 63 move as a unit. The upper end of drive shaft 65 is provided with a conventional connector 65*a* by which the output end 66*a* of drive cable 37 may be detachably secured to the drive shaft. The other end of cable 37 is connected to motor 38 which accordingly, upon energization, drives shaft 65 to rotate drill 63.

Quill sleeve 51 has a rack 51*a* formed on one side thereof, the teeth of which are accessible through an opening 35*a* in one side of a chamber 35*b* comprising part of housing 35. A shaft 67 is rotatably mounted in opposed walls of this chamber and carries a pinion 68 adapted to mesh with rack 51*a*. One end of shaft 67 extends through its associated housing wall and has an operating handle 80 (FIGURE 1) secured thereto. A stud shaft 70 (FIGURE 3) is mounted on a bracket 35*c* that may be integral with housing 35 and which is disposed in chamber 35*b* adjacent pinion 68. A lever 71 is rockably mounted on shaft 70 and includes an arm 71*a* which extends exteriorly of chamber 35*b* through a slot 35*d* in a wall thereof, a pawl 71*b* adapted to ratchet over the teeth of pinion 68 and a stop 71*c* adapted to coact with a stop pin 72 mounted on bracket 35*c* to limit clockwise and counterclockwise movement of lever 71.

A lug 71*d* is preferably integral with lever 71 and serves to anchor one end of an overcentering spring 73 the other end of which is fastened to stop 72. Spring 73 operates in conventional manner to hold lever 71 and accordingly pawl 71*b* in either of the extremities of their travel as determined by stop 71*c* and stop pin 72. Pinion 68 has adjustably mounted thereon as by screws 74 and 75 respectively a pair of arcuate plates 76 and 77 which respectively carry abutment pigs 78 and 79 which are adapted to coact with a finger 71*e* which is connected to or integral with lever 71 to overcenter spring 73 in a manner and for a purpose to be described.

As shown in FIGURE 2 card 27 is ruled with vertical and horizontal coordinate lines V and H which, in the illustrative card define 10,000 individual locations that can be selectively drilled thus to emplace desired information on or rather in the card. The zero horizontal coordinate H^0 is spaced from the zero graduation on scale 45 an amount exactly equal to the distance between the reading edge 46*a* of pointer 46 and the axis of quill 36 which is, of course, the same as the axis of drill 63. Thus while any given graduation on scale 45 is not in horizontal registry with its corresponding horizontal coordinate on card 27, the drill will be properly located when pointer edge 46*a* is set at the selected horizontal coordinate graduation on the scale. On the other hand the graduations on scale 47 are in precise vertical registry with the vertical coordinates on the card. Thus assuming it is desired to drill a hole in the card (in practice a plurality of cards are usually drilled simultaneously) at coordinates H^2–V^3 carriage 19 is adjusted so that pointer 46 is set at graduation 2 on scale 45 and pointer 48 is set at graduation 3 on scale 47. Operation of the drill in the manner described below will drill the hole 2–3.

When the cards are to be drilled they are first properly positioned on the table and carriage 19 is manipulated using the "inchers" 34 and 44 if necessary so that pointers 46 and 48 are set to the selected coordinates. Handle 80 is then depressed counterclockwise (FIGURE 1) to drive quill 36 (FIGURE 3) down. During this downward movement, drill guide 61 first engages the top card 27 of the stack of cards (fifty or so may be drilled at the same time) which stops further downward movement of collar 55. Continued depression of handle 80 forces drill 63 through the cards until lower extremity of drill movement is reached, this limit being determined by screw 53 and the top of slot 52 in sleeve 51. When the drill reaches this limit it will have drilled into plate 26 a small amount 26*a* to assure that the bottom card in the stack has been drilled.

The ratchet and pinion mechanism described above is provided to make certain that the drill reaches its lower limit. Thus as handle 80 is rotated counterclockwise pinion 68 rotates and, through rack teeth 51*a* forces quill 36 downwardly and pawl 71*b* ratchets over the pinion teeth preventing reverse rotation of the pinion. Just before the downward limit of drill movement is reached, pin 78 on pinion 68 engages finger 71*e* and rocks lever 71 clockwise causing spring 73 to overcenter and withdraw pawl 71*b* from pinion 68. Reverse rotation of pinion 68 by a return torsion spring 81 connected to the housing and to shaft 67 drives quill 36 upwardly to its upper limit as determined by slot 52 and limit screw 53 and just before this upper limit is reached pinion pin 79 engages lever finger 71*e* causing spring 73 to overcenter in the opposite direction and re-engage pawl 71*b* with pinion 68. Should it be desired to withdraw drill 63 before a full stroke has been effected, pawl 71*b* may be disengaged from pinion 68 by manually depressing lever arm 71*a*. It may accordingly be seen that all the cards in the stack will be drilled as the drill cannot be withdrawn, except by manipulation of lever arms 71*a*, until it has reached the lower limit of its movement.

When it is desired to retrieve information from a card, carriage 19 is moved to the side of plates 25 and 26 and the card is placed over the plates. Light switch 40 is turned on and light may be observed through the hole in the card, the coordinates of the hole being readily determined from the rulings on the card.

It will now be seen that I have provided data processing equipment that attains the objects set forth above in a thoroughly practical and efficient manner.

As other embodiments of the invention are possible and as modifications of the one disclosed may be made, all without departing from the scope of the invention it is to be understood that the foregoing should be interpreted as illustrative and not in a limiting sense.

I claim:

In a machine for forming one or more holes in one or more cards each ruled with horizontal and vertical coordinates and for reading the coordinate position or positions of said hole or holes, the combination of,

a base having an inclined top with an aperture formed therein,

a light mounted in said base below said aperture,

a motor mounted in said base,

a plurality of rails mounted on said base, some of said rails being fixed and the others adjustable, said rails comprising locating elements for cards of different dimensions,

a translucent plastic plate mounted on said base top over said aperture,

a carriage,

means mounting said carriage on said base top for universal planar movement over said plate in a plane parallel to that of said base top,

hole forming means including a drill mounted on said carriage for limited reciprocal movement relative to said plate,

means to preclude complete withdrawal of said hole forming means from said carriage,

flexible drive means interconnecting said motor and said hole forming means for actuating said hole forming means, said carriage being movable to a position remote from said plate whereby light transmitted through a hole in a card may be observed and the

coordinates of such hole determined from the ruling on the card,

manually operable means mounted on said carriage for driving said hole forming means,

means for precluding upward withdrawal movement of said hole forming means before said hole forming means has reached a predetermined downward limit of travel whereby drilling of the bottommost card of a stack is assured,

means for disabling said precluding means to permit withdrawal of said drill before its downward limit of travel is reached, and

manually operable means for effecting incremental movement of said carriage in coordinate directions.

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