

April 30, 1963

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3,087,521

APPARATUS FOR MAKING EXCELSIOR

Filed March 2, 1960

2 Sheets-Sheet 1

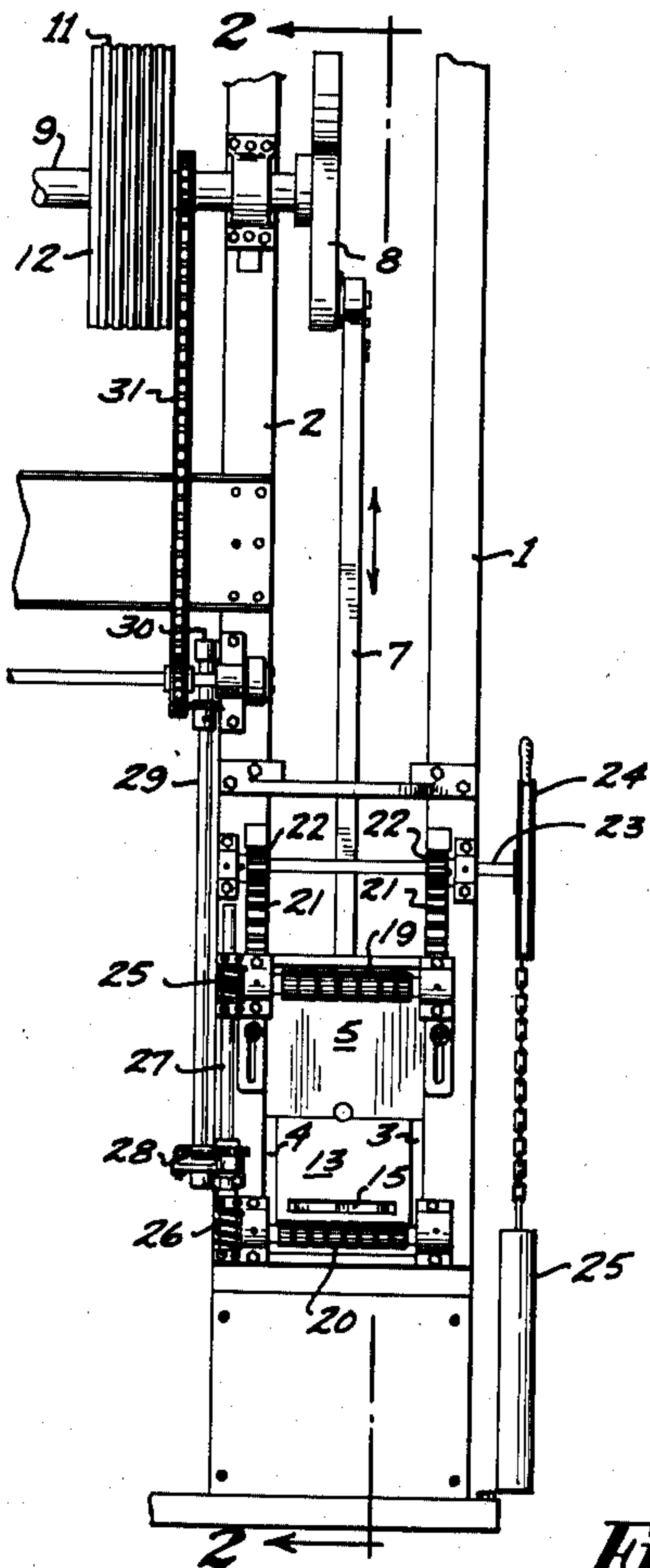


FIG. 1.

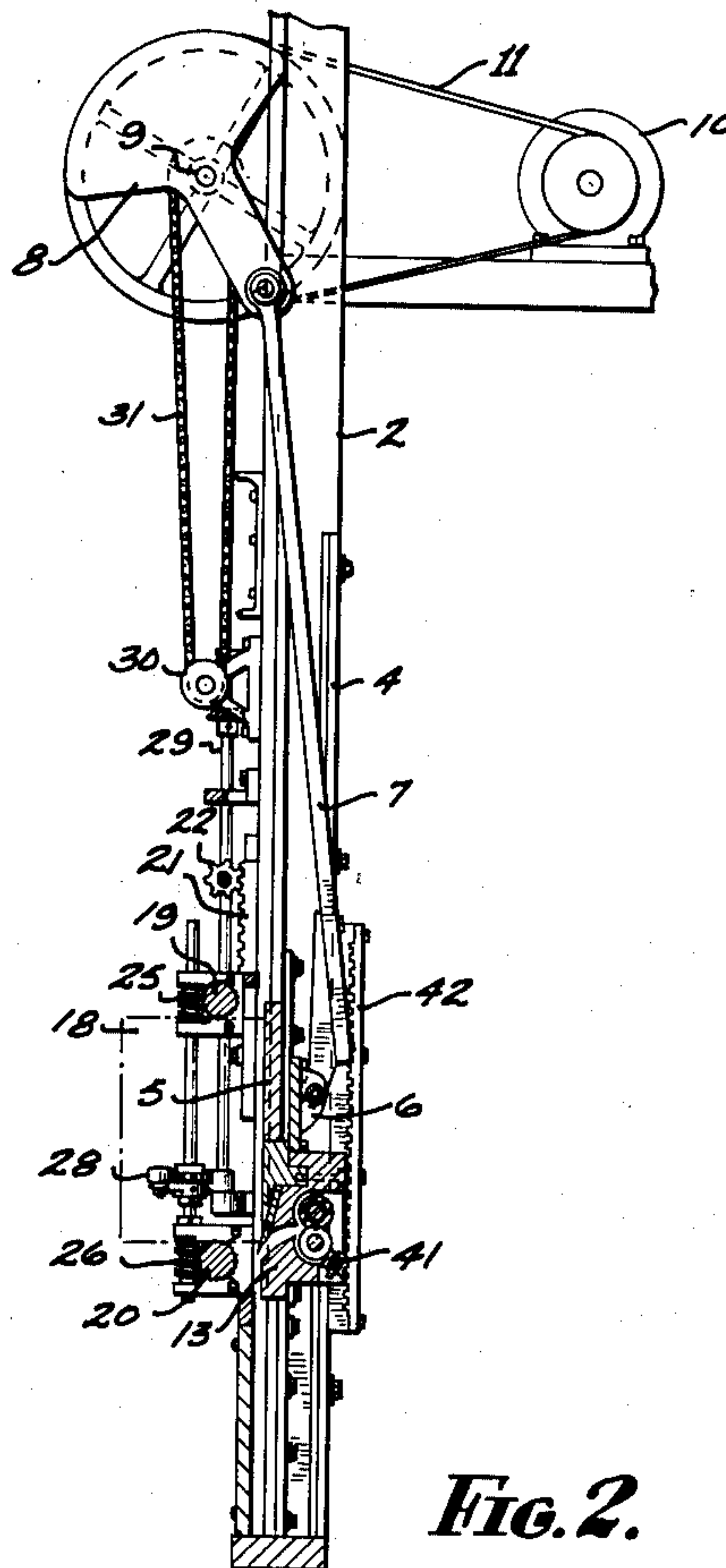


FIG. 2.

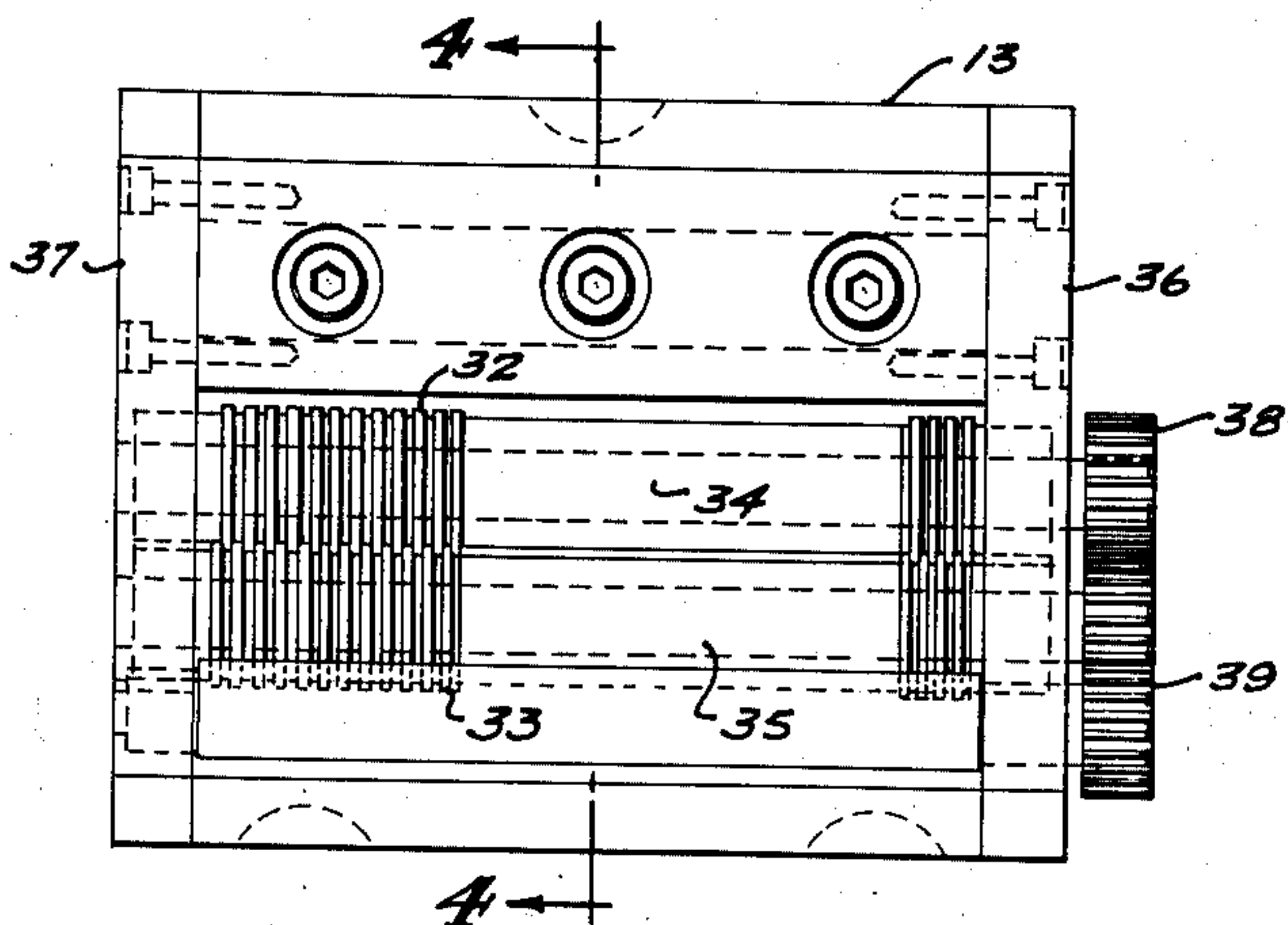


FIG. 3.

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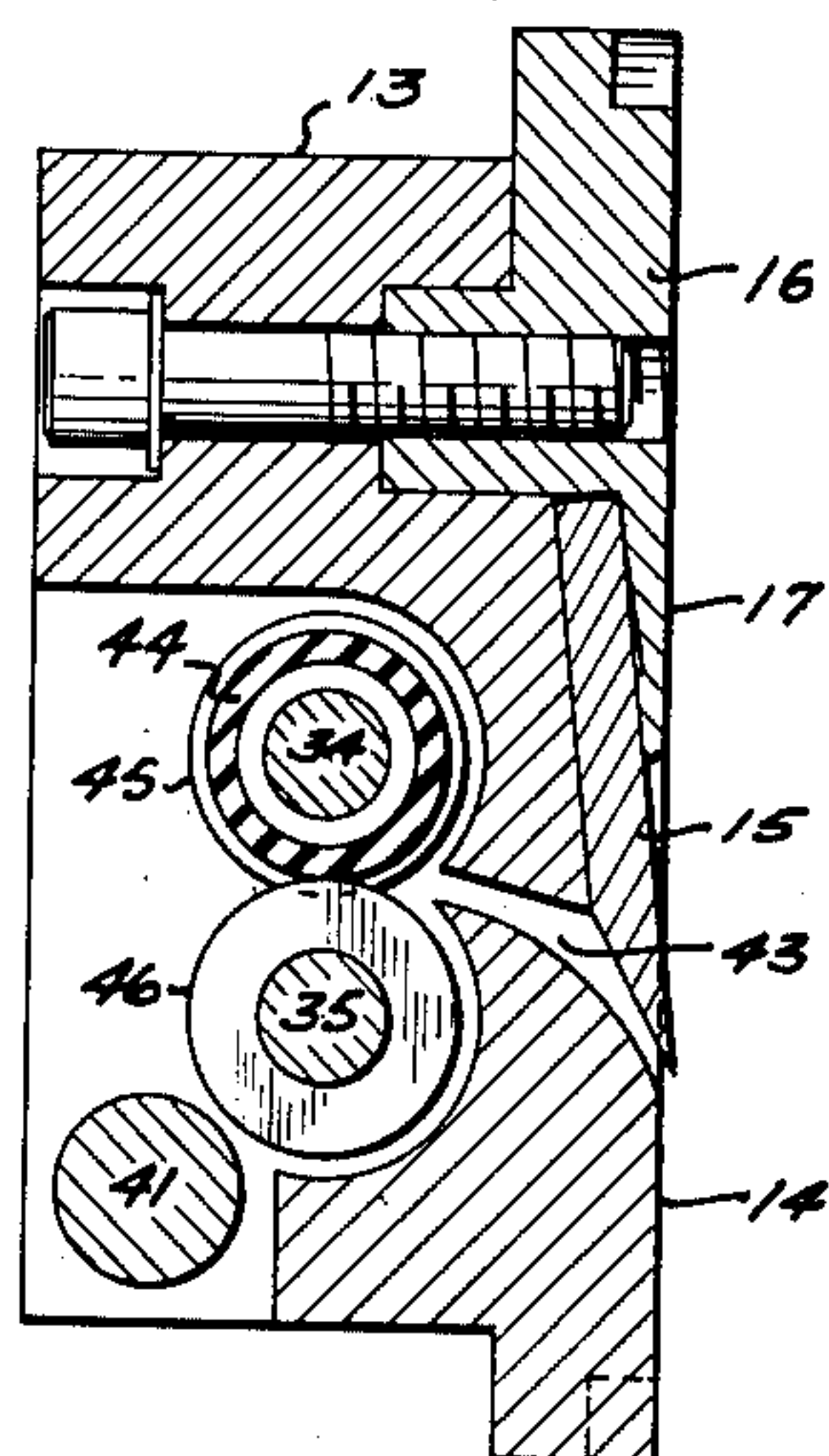


FIG. 4.

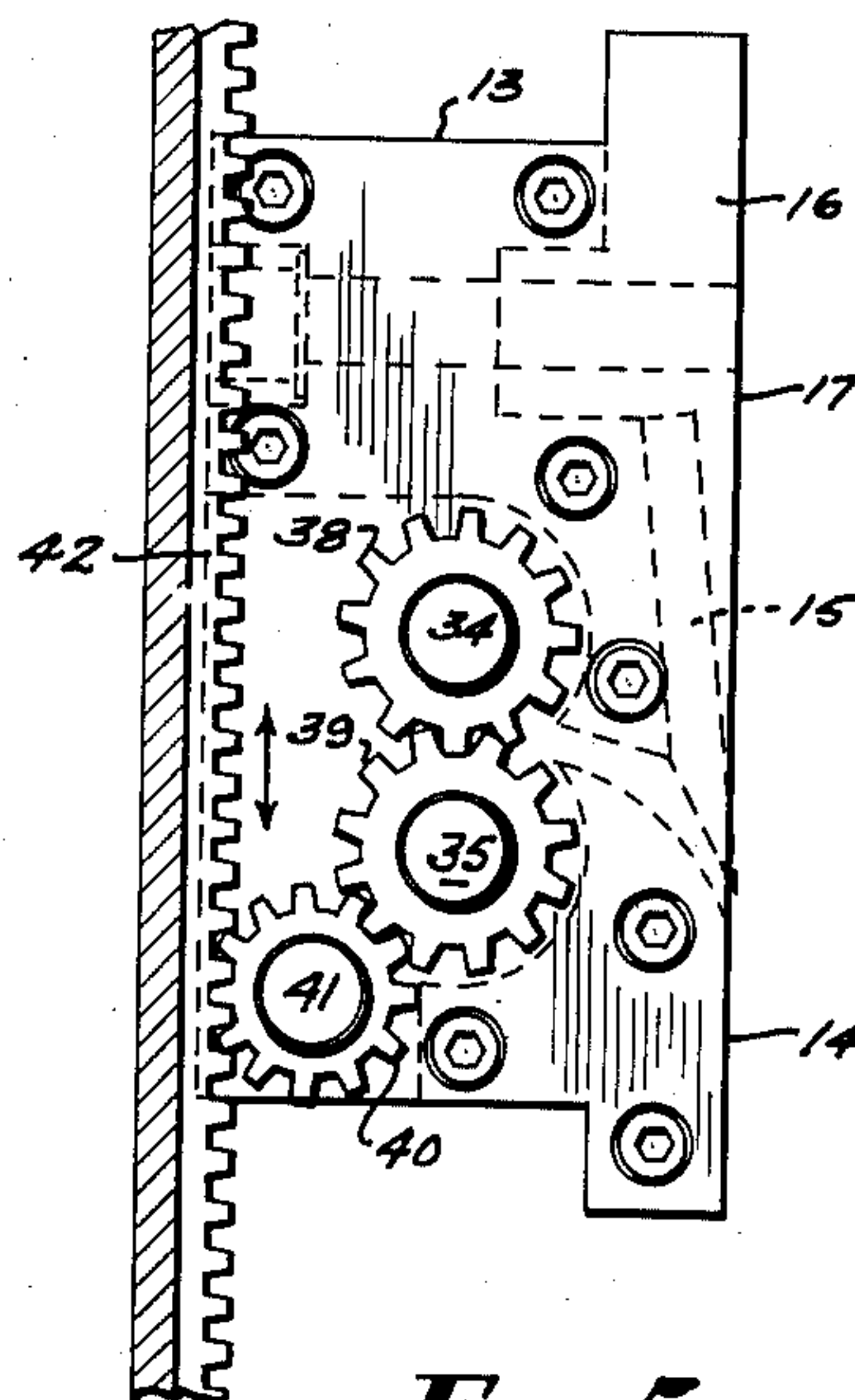


FIG. 5.

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APPARATUS FOR MAKING EXCELSIOR

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3 Claims. (Cl. 144—185)

This invention relates to the manufacture of wood wool or excelsior and relates more particularly to an improved process and apparatus for forming such material from bolts or billets of wood.

The art of cutting wood into excelsior and other similar wood products has taken many forms and many methods and devices have hitherto been employed. Essentially, in such prior art procedures the basic sequence of operation required that a bolt of wood be slit with sharpened metal fingers or knives to the desired width and depth, whereupon the face of the bolt was shaved to the approximate depth of the slits. This resulted in the production of strands of wood fibers.

In accordance with the foregoing prior art technique it was necessary to dry or season the bolts of wood prior to slitting and shaving. When it was attempted to slit the wood in the unseasoned or green condition, the slitting knives would depress and break down the wood fibers rather than slit them cleanly; and the result was very unsatisfactory wood strands. Even the use of dry and seasoned wood had its disadvantages. First, the shaving operation due to the rake of the shaving tool and the dryness of the wood frequently caused the wood to fracture as it was shaved. Second, the wood often split from the bolt, which produced large chips; and third, the slitting and shaving tools had to be kept sharpened at all times which resulted in substantial machine "downtime." In addition, even with seasoned wood there was a considerable variation in the moisture content in each bolt since the center of the bolt would contain more moisture than the outer portion, and consequently the resultant cuttings were nonuniform both in quality and moisture content.

The foregoing difficulties were of no particular consequence where the excelsior was used for packaging purposes or for stuffing mattresses, furniture and the like, wherein the quality of the strand's fiber as related to size, tensile strength, moisture content and other characteristics was unimportant. However, today there is a thriving business in the use of excelsior in the manufacture of structural fiberboard. When used for this purpose the quality of the wood fibers becomes most important since the overall quality and strength characteristics of the fiberboard are noticeably impaired when poor quality fibers are used.

Accordingly, it is a principal object of the instant invention to provide improved apparatus and procedures for forming excelsiors which will produce uniformly high quality fibers.

Another object of the instant invention is the provision of a procedure for forming wood fibers in which a green or unseasoned bolt of wood is first shaved into thin sheets after which the sheets are slit by a shearing action to produce the fiber strands.

Still a further object of the instant invention is the provision of apparatus and procedures by means of which a bolt of wood can be shaved into thin sheets without fracturing the sheets, whereupon the sheets are slit into strands by a shearing action which materially eliminates "burrs" on the fibers and increases their tensile strength.

Still a further object of the invention is the provision of techniques by means of which woods which previously were difficult to cut into excelsior can now be cut easily,

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thereby materially increasing the available wood supply and also permitting the use of green or unseasoned wood.

Still a further object of the invention is the provision of uniformly high quality wood fibers which are formed in the essentially green or unseasoned condition, whereupon the cut fibers may be subjected to a conditioning operation whereby to bring them to the desired moisture content.

The foregoing together with other objects of the invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading these specifications, are accomplished by that construction and arrangement of parts and by those procedures of which an exemplary embodiment shall now be described.

Reference is made to the accompanying drawings wherein:

FIGURE 1 is a rear elevational view of an excelsior making device in accordance with the invention.

FIGURE 2 is a vertical sectional view taken along the lines 2—2 to FIGURE 1.

FIGURE 3 is an enlarged rear elevational view of the cutting head illustrating the position of the slitting discs.

FIGURE 4 is a vertical sectional view taken along the line 4—4 of FIGURE 3.

FIGURE 5 is an elevational view similar to FIGURE 4 but illustrating the driving mechanism for the rotary cutters.

Referring now to FIGURE 1, the device comprises a vertically disposed frame having side rails 1 and 2 provided with guideways 3 and 4 which slidably mount a carriage 5 which is vertically reciprocable along the guideways. A bracket 6 (FIGURE 2) secured to one face of the carriage pivotally receives the lower end of a crank arm 7 the upper end of which is attached to a crank 8 fixed to a crank shaft 9 adapted to be driven by a prime mover 10, such as an electric motor, by means of belts 11 and multiple sheave 12. As the crank 8 is rotated, it will serve to reciprocate the carriage 5.

The carriage mounts a cutting head 13 adapted to be bolted or otherwise fixedly secured to the carriage for reciprocating movement therewith. As possibly best seen in FIGURE 4, the cutting head comprises a body block 14 to which a shaving knife 15 is secured by means of a clamp 16, the knife being arranged to project outwardly from the planar face 17 of the cutting head.

Referring again to FIGURES 1 and 2, a wood bolt or billet to be shaved, which is indicated in dotted lines at 18, is engaged between a pair of serrated rollers 19 and 20, the uppermost roller 19 being fixedly secured to a pair of slidable racks 21 movable lengthwise along the side rails 1 and 2, the racks being engaged by gears 22 mounted on a shaft 23 provided at one end with a handwheel 24. Thus by rotating the handwheel in one direction, the roller 19 is moved upwardly so that the bolt 18 may be juxtaposed to the planar face of the cutting head with its lower end supported on the roller 20, whereupon the handwheel is rotated in the opposite direction so as to move the roller 19 downwardly for engagement with the upper end of the bolt. The counterweight 25 will serve to bias the roller 19 into tight engagement with the bolt of wood.

The stroke of the carriage 5 will be such that in its uppermost position the shaving knife 15 will lie above the uppermost end of the wood bolt 18 so that, as the carriage moves downwardly, the shaving knife will contact the juxtaposed side of the bolt and shave a thin sheet of wood therefrom, preferably about 0.020 inch in thickness, although it will be understood that the blade may be adjusted to shave thinner or thicker sheets, as desired. The stroke of the carriage will be such that its

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lowermost position will carry the shaving knife below the lowermost of the bolt 18 thereby assuring that a full length sheet will be shaved with each stroke of the carriage. The upstroke of the carriage simply serves to return the shaving knife to the starting position so that it may shave another thin sheet from the bolt on its next downward stroke.

As the carriage approaches its uppermost position on the return stroke, the bolt of wood is indexed toward the cutting head by an amount equal to the thickness of the sheet being cut which, in the example given, is 0.020 inch. The indexing is accomplished by means of the serrated rollers 19 and 20 which are adapted to be rotated at the end of each operating cycle by an amount sufficient to index the bolt in accordance with the thickness of the sheet being cut. To this end, the corresponding ends of the rollers 19 and 20 are operatively connected to the spiral gears 25 and 26 secured to a vertically disposed shaft 27. The gear 25 is preferably keyed to the shaft 27 although it will be slidable there along to permit adjusting movement of the upper roller 19 as its supporting racks 21 are raised and lowered. The lowermost spiral gear 26 may be fixedly secured to the shaft 27 since the mounting brackets for the roller 20 are fixedly secured to the side rails. It may be observed at this point that the mechanism for indexing the bolt 18 is of known character and will be readily known to and understood by the skilled worker in the art. Essentially, the shaft 27 is adapted to be rotated the desired amount by means of the ratchet mechanism 28 which is actuated by shaft 29 which, through suitable gearing 30 is adapted to be driven in timed relation to the rotation of crank 8 by means of the chain 31. With this arrangement, the wood bolt will be indexed each time the carriage reaches its uppermost position and the shaving knife 15 clears the upper end of the bolt. It will be understood that other forms of indexing means may be employed. For example, the indexing means could be cam actuated from the crank shaft 9 or it could be in the form of a single revolution clutch. Similarly, a separately powered drive for the indexing rollers may be employed.

The slitting of the sheets shaved from the bolt of wood is accomplished by means of cutters forming a part of the cutting head. Preferably the slitting of the sheets into individual fibers or strands will be accomplished by means of upper and lower sets of cutting discs, indicated at 32 and 33 (FIGURE 3) the sets of discs being arranged in interdigitating relation and mounted on shafts 34 and 35 journaled at their ends in the end walls 36 and 37 of the head. The discs are arranged to slit the sheets by means of a shearing action and to this end they preferably have a thickness equal to the desired thickness of the strands being formed which, in an exemplary embodiment, may be about 0.040 inch, although here again the thickness of the strands being formed does not constitute a limitation on the invention. The shafts 34 and 35 are adapted to be driven by means of gears 38 and 39 which are in meshing engagement with each other, one of the gears—in this instant the gear 39—being additionally in engagement with a drive gear 40 secured to a shaft 41 also journaled in the cutting head.

As seen in FIGURES 2 and 5, the gear 40 engages a rack 42 fixedly secured to the machine frame, such as the side rail 2, the arrangement being such that reciprocating movement of the carriage 5 will cause the gear 40 to travel the length of the rack 42, thereby effectively rotating the rotary cutters.

The sheets being shaved are fed into engagement with the rotary cutters by means of the passageway 43 best seen in FIGURE 4, the passageway being positioned to receive the leading edge of a sheet as it is shaved from the bolt and, as the carriage and cutting head move downwardly, feed the sheet between the rotary cutters

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for severance into strand lengths. Preferably, the rotary cutters will be provided with a stripping means which, in the embodiment illustrated, comprises resilient discs 44 interspaced between the adjacent cutting discs in each set, an adjacent pair of upper and lower cutting discs being indicated at 45 and 46. The form of the stripping means employed does not constitute a limitation on the invention and other types of stripping means may be employed, inclusive of combs or fingers which project between the discs and eccentric floating rings which are free to rotate between the discs and effect a stripping action. In addition, it has been found that the reverse rotary motion of the discs during the upstroke of the carriage also assists in the stripping operation and consequently a direct connection between the gears 38, 39 and 40 is preferred, although it is readily possible to free the cutting disc from reverse rotary movement during upward movement of the carriage if so desired. While the rack and pinion drive for the cutters is preferred, it would also be possible to independently drive the cutters, as by means of a flexible drive cable.

As should now be apparent, the instant invention provides an arrangement by means of which bolts of wood may be readily shaved into thin sheets which, as the sheets are formed, are acted upon by the rotary cutters and formed into elongated strands or fibers. The invention is particularly suited to the use of green or unseasoned wood having a high moisture content. It has been found that such green wood readily lends itself to being shaved into sheets without the breaks which tend to occur where the wood is predried. Yet no difficulty is experienced in slitting the sheets so formed into thin strips, the shearing action of the disc cutters being particularly effective for this purpose. Even though the green strands have a relatively high moisture content—too high for the commercial manufacturer of fiberboard—it is a relatively simple procedure to collect the slit strands and subject them to a moisture condition operation. In fact, the slit strands may be readily collected on the continuously moving conveyor and passed through a drying oven in which their moisture content may be reduced to the desired level for the production of fiberboard, whereupon the strand may be fed directly to a collection station from which they may be formed into a mat for subsequent admixture with a cementitious binder and compacting in a press. It will be understood also that a plurality of the devices may be conveniently arranged side by side, a single prime mover and crank shaft being employed to power a series of the machines the output of which can be collected and conditioned in a substantially continuous operation.

Having thus described the invention in an exemplary embodiment and with the understanding that modifications may be made without departing from the spirit and purpose of it, what it is desired to be secured and protected by Letters Patent is:

1. In a device for forming excelsior and similar wood strands from a bolt of wood, a frame, a carriage mounted for reciprocating movement along said frame, means for reciprocating said carriage, a shaving tool mounted on said carriage for movement therewith, means adjacent the path of travel of said carriage for mounting a bolt of wood for contact with said shaving tool, means for feeding the bolt of wood towards said carriage in measured increments upon each stroke of said carriage, whereby as said carriage moves in one direction, said shaving tool will shave a thin sheet of wood from said bolt, slitting means mounted on said carriage for slitting the sheets so formed into a plurality of strand lengths, said slitting means comprising sets of coacting cutters arranged in interdigitating relation, stripping means in association with said cutters for removing the slit strands therefrom, and guide means on said carriage for receiving and guiding the sheets to said slitting means as the sheets are shaved from said bolt.

2. The device claimed in claim 1 including means for rotating said cutters in one direction as said carriage moves in one direction and for rotating said cutters in the opposite direction as said carriage moves in the other direction.

3. The device claimed in claim 2 wherein the means for rotating said rotary cutters in one direction as said carriage moves in one direction and for rotating said cutters in the opposite direction as said carriage moves in the other direction comprises a drive gear operatively connected to said cutters, said drive gear being in engagement with a rack fixedly mounted on said frame.

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