

Jan. 6, 1953

J. DUNOD

2,624,368

WEFT REPLENISHING APPARATUS FOR CIRCULAR LOOMS

Filed Dec. 21, 1950

6 Sheets-Sheet 1

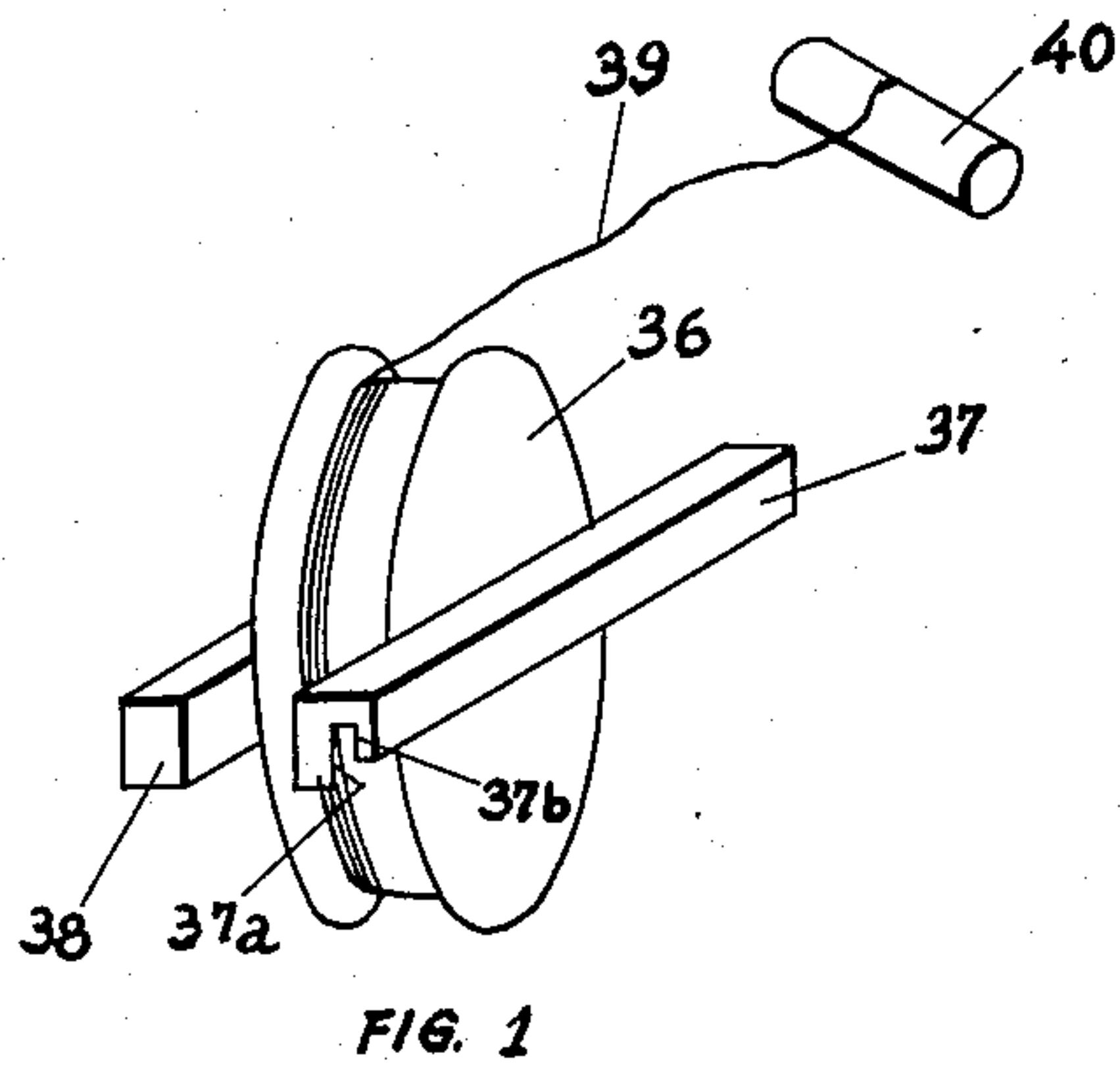


FIG. 1

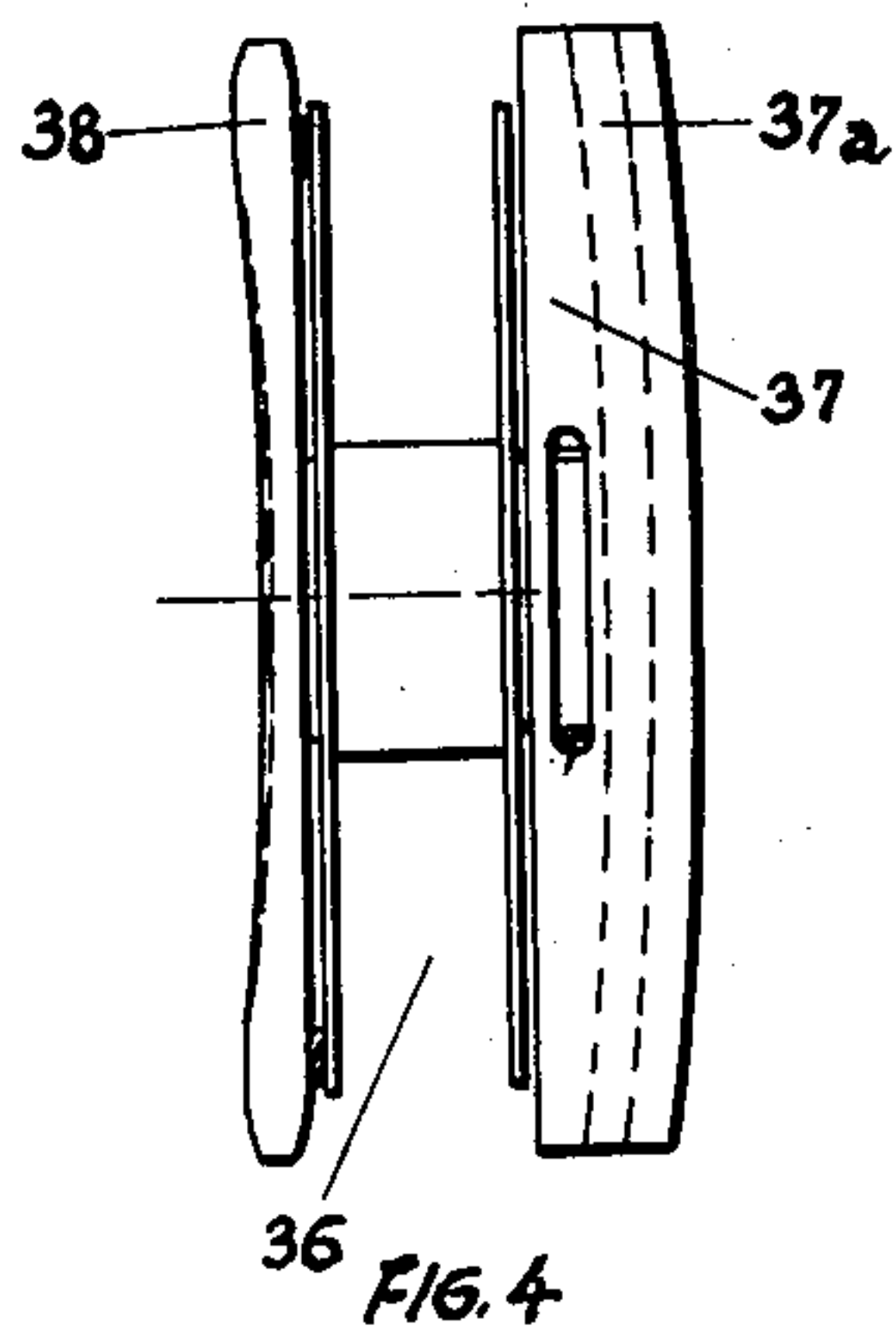


FIG. 4

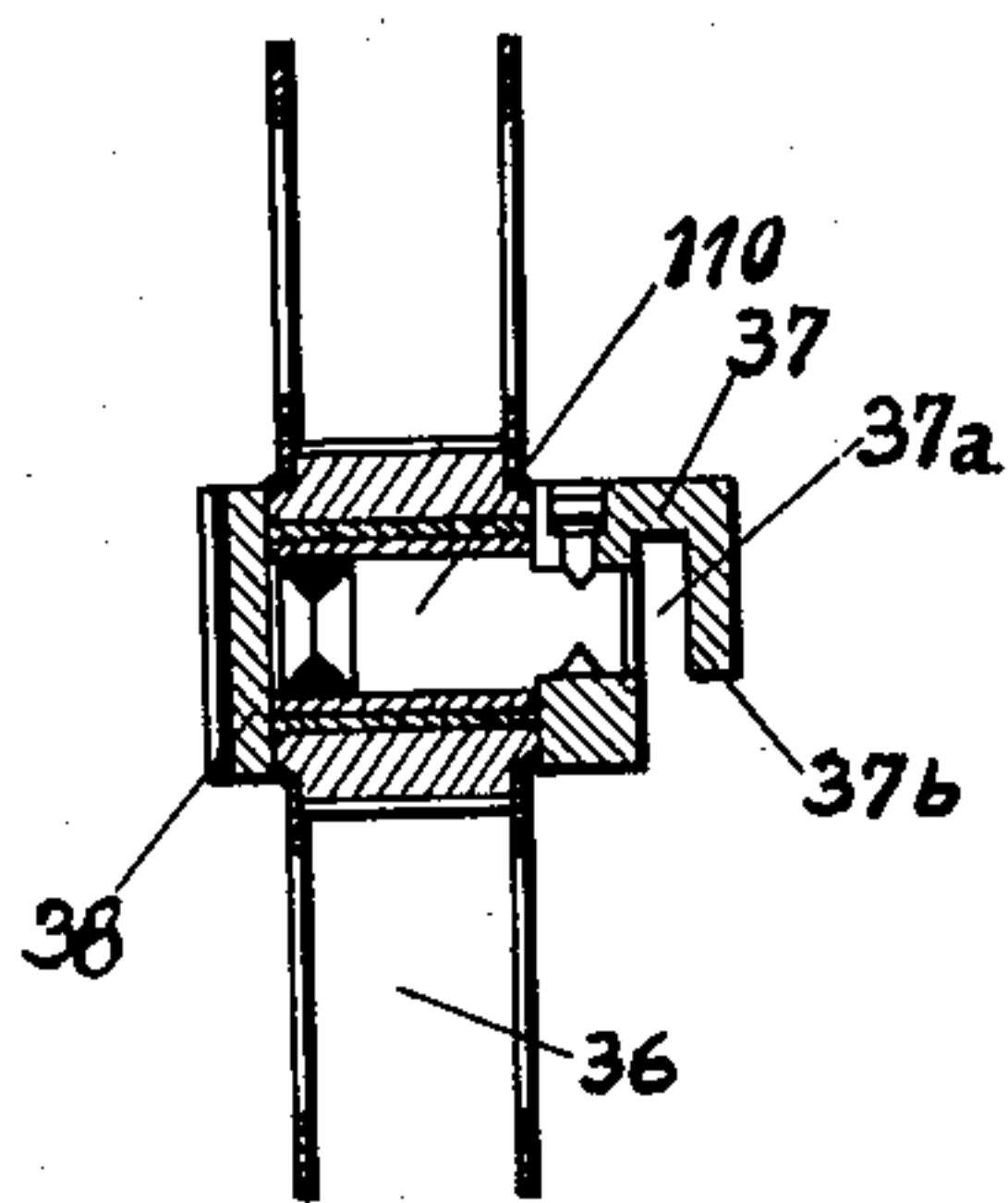


FIG. 2

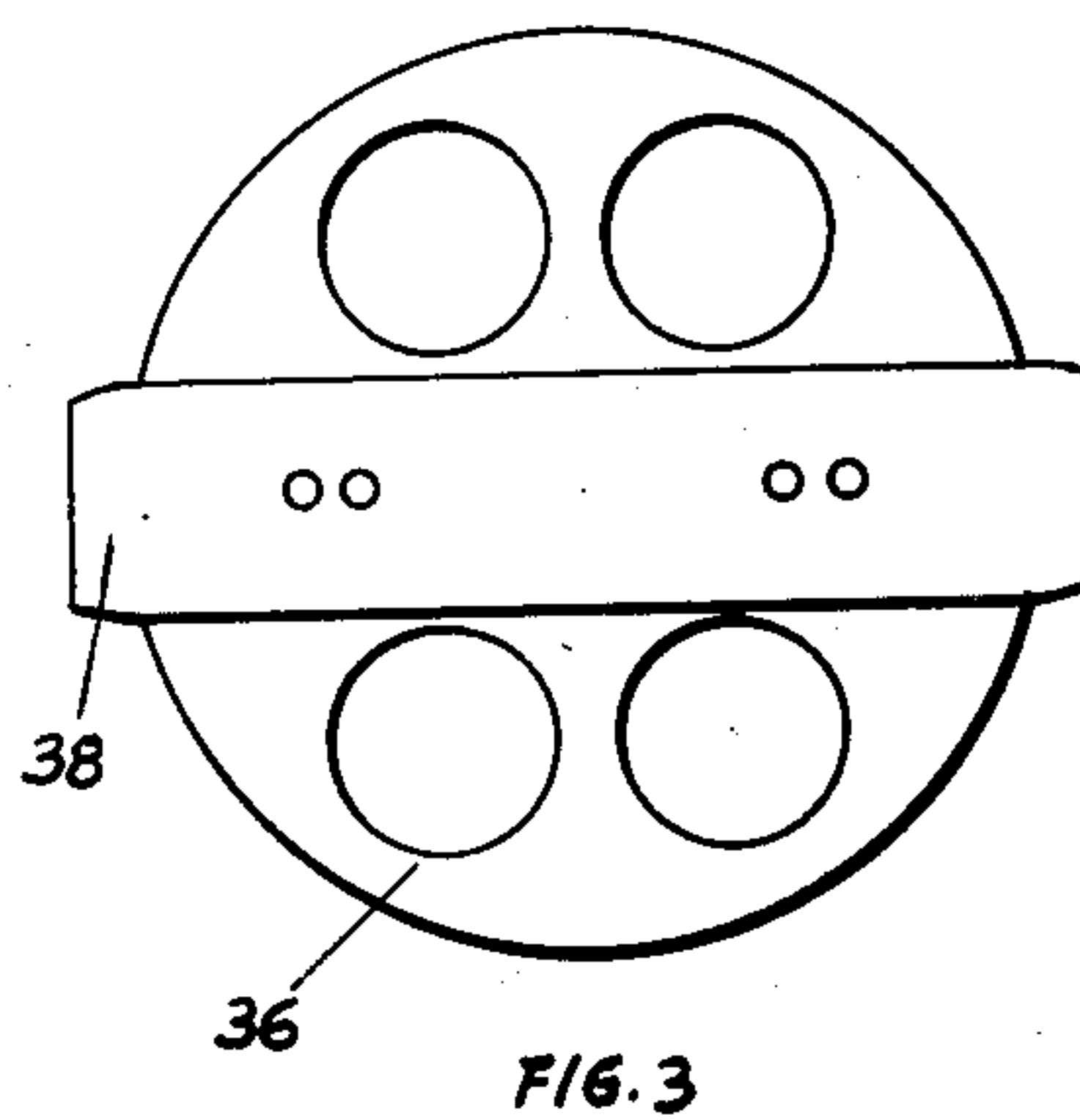


FIG. 3

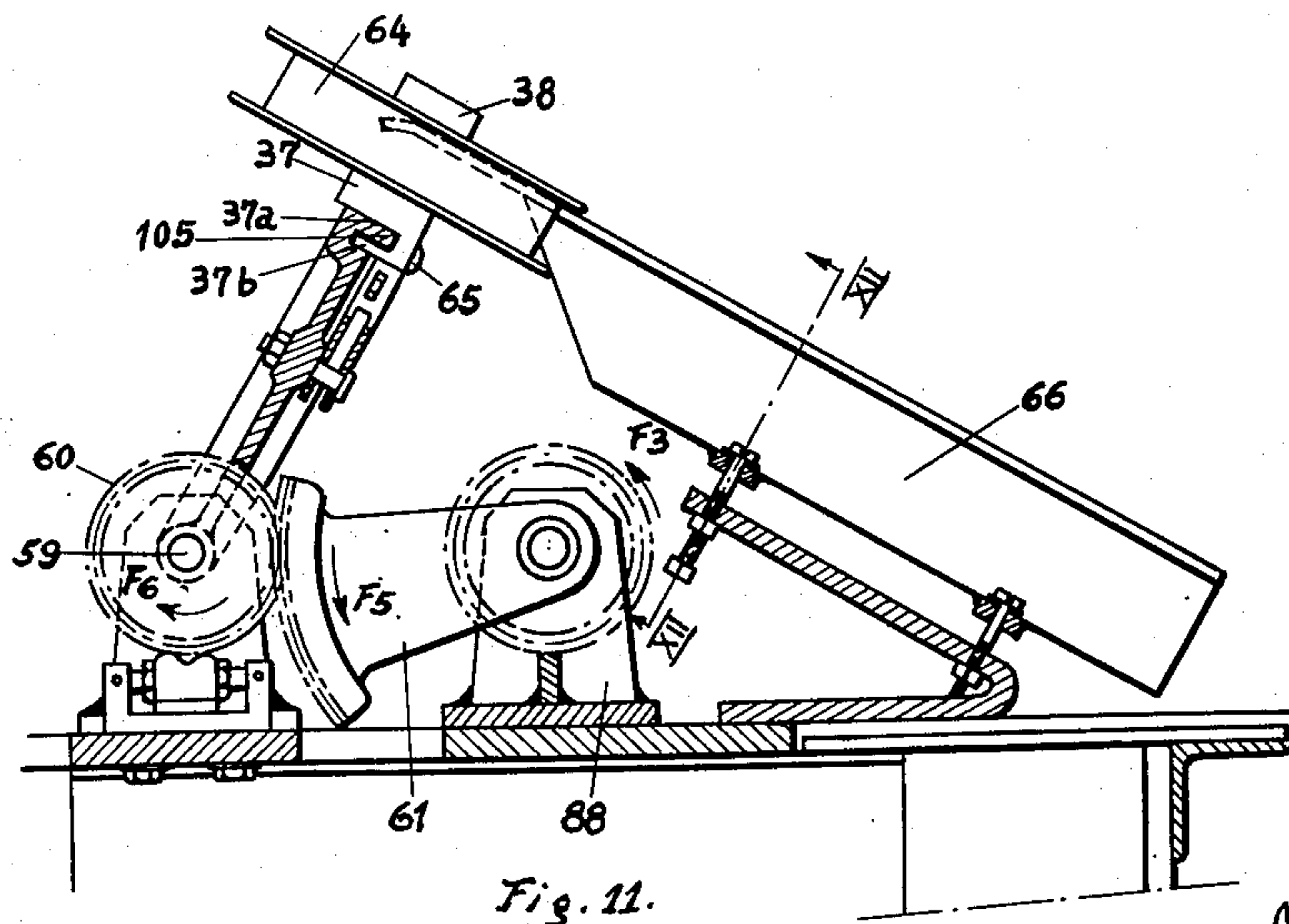


Fig. 11.

Jean Dunod
by Christy, Parnes & Thieland
his attorneys

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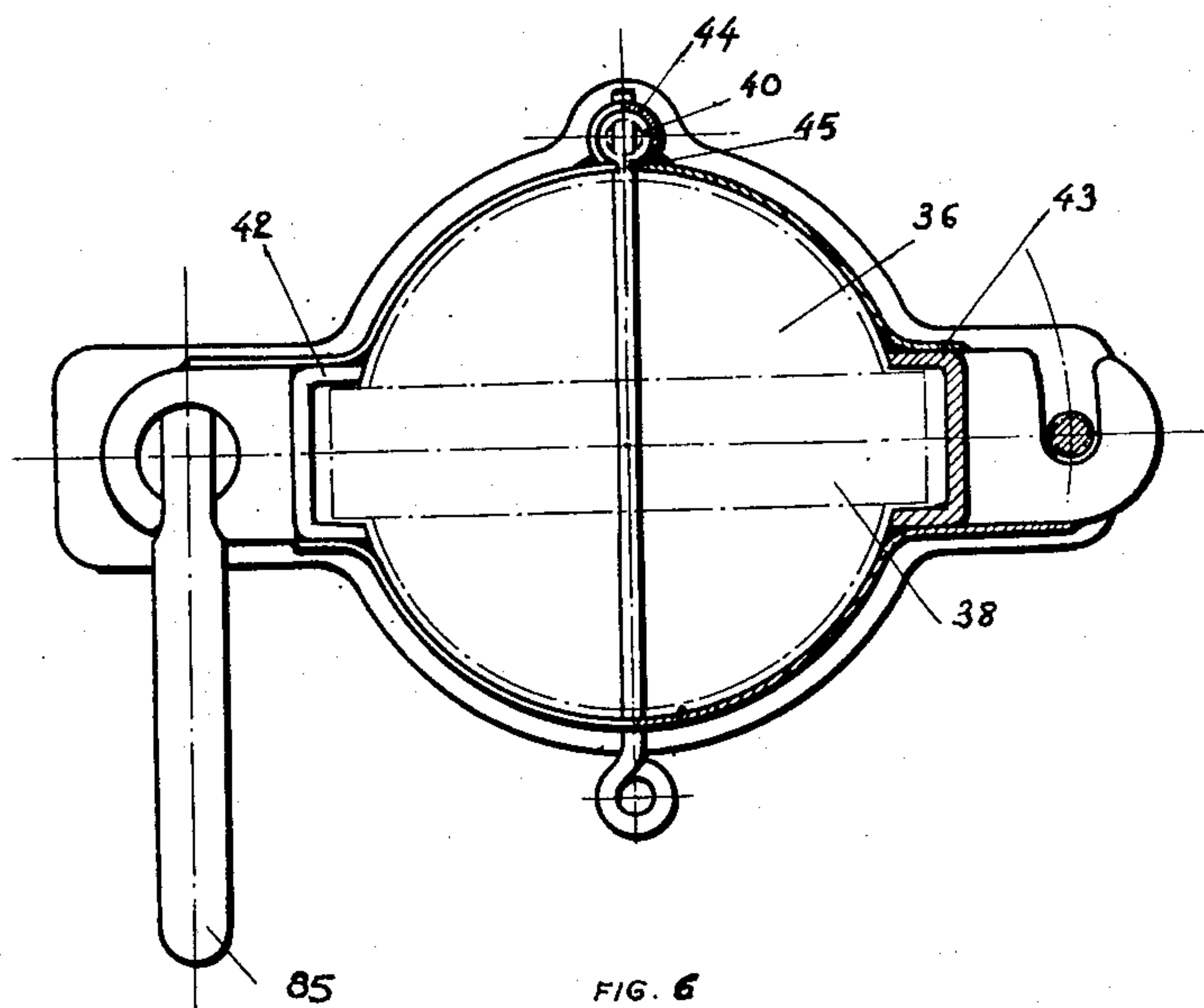
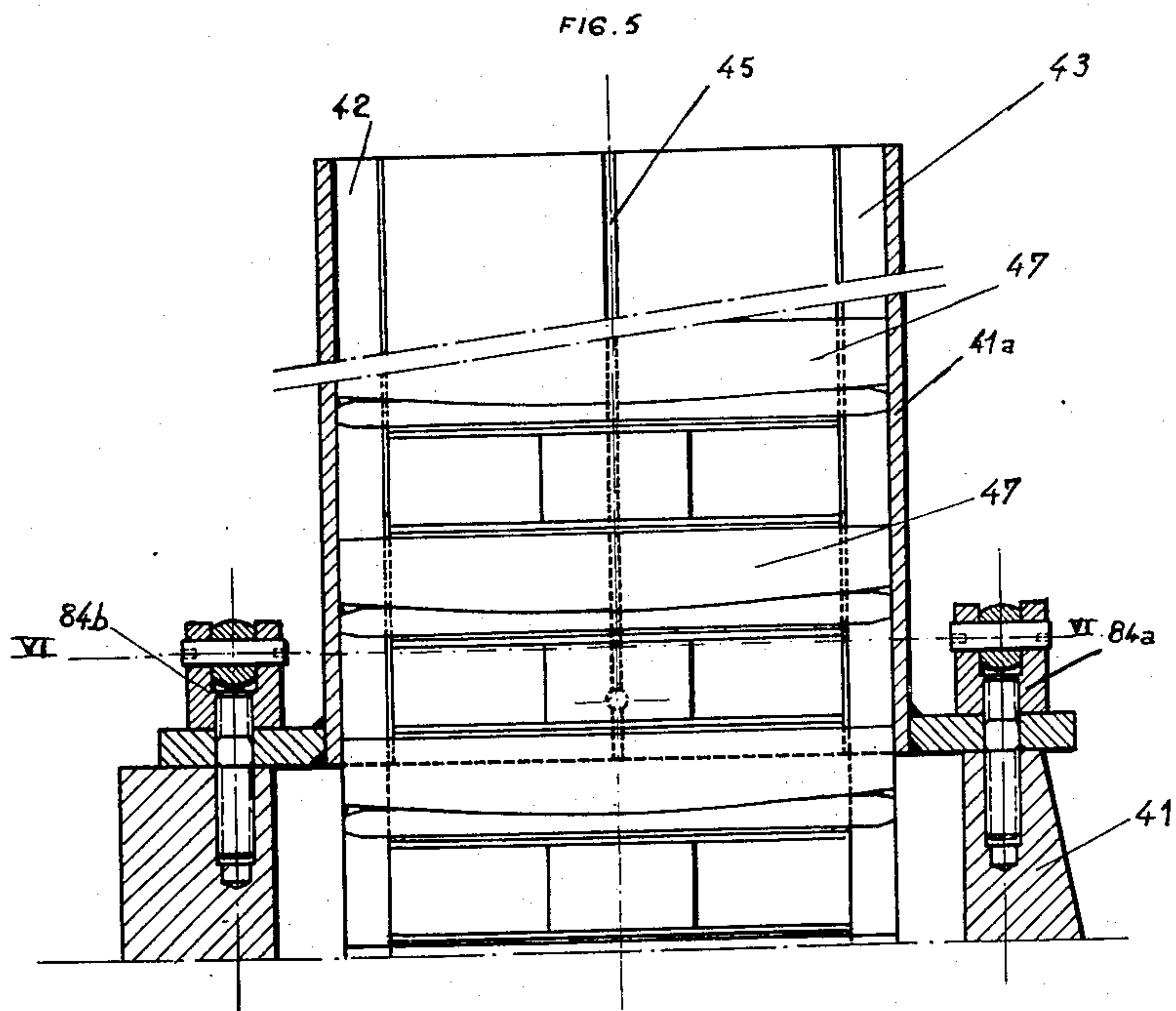
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jean Dunod
by Christy, Parnell & Strickland
his attorneys

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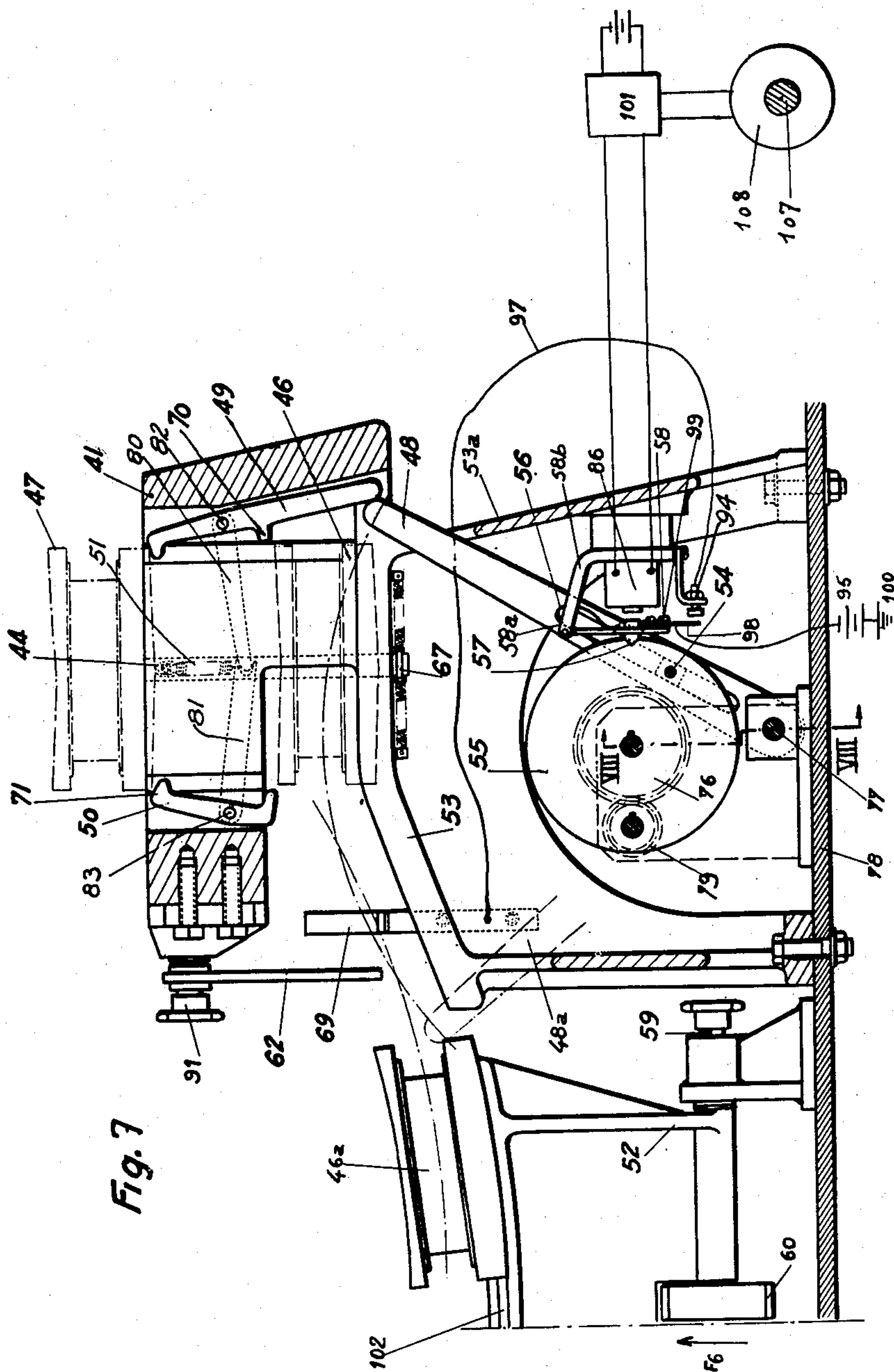
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your Duod
by Christy, Parmelee & Strickland
his attorneys

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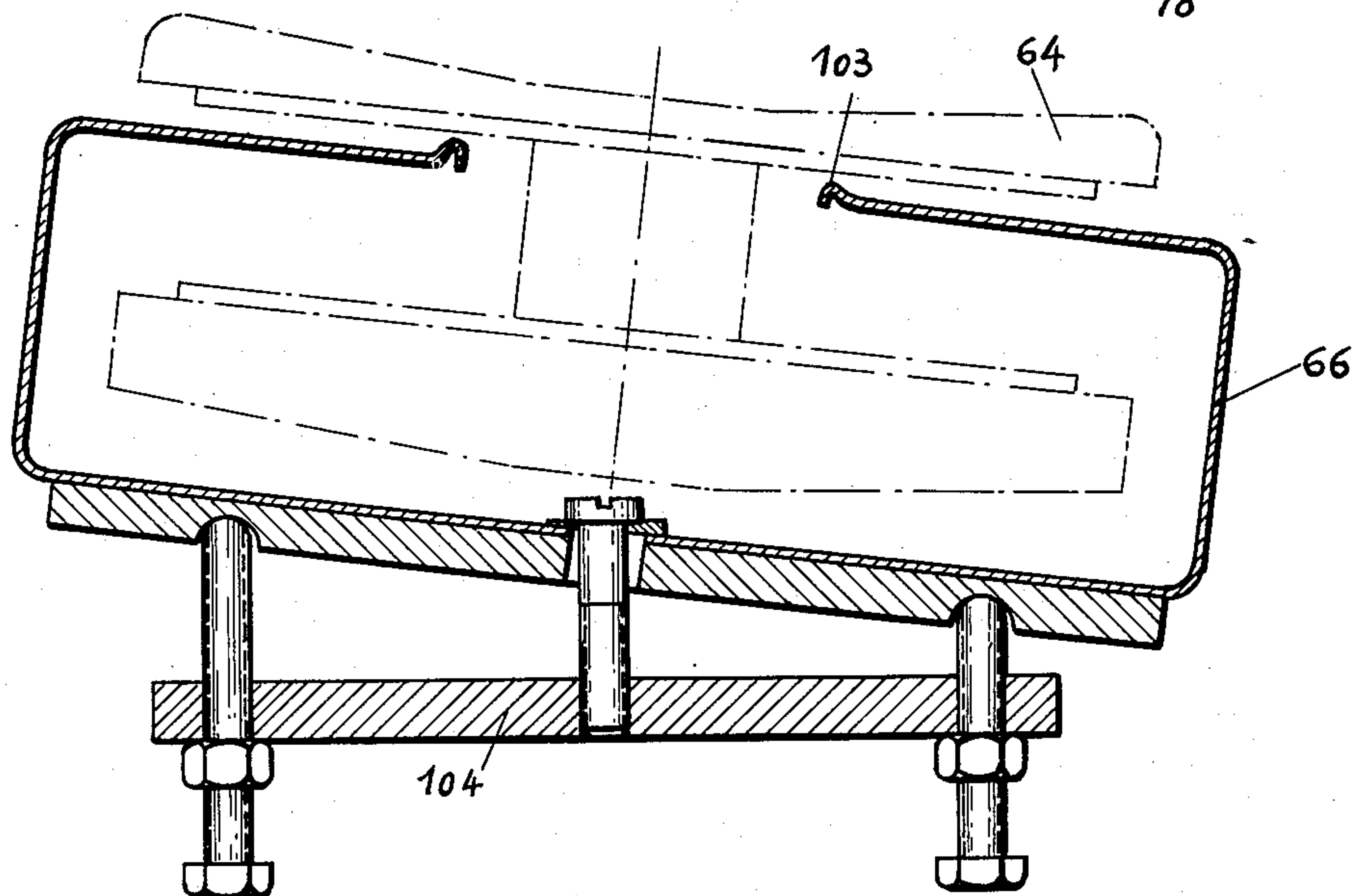
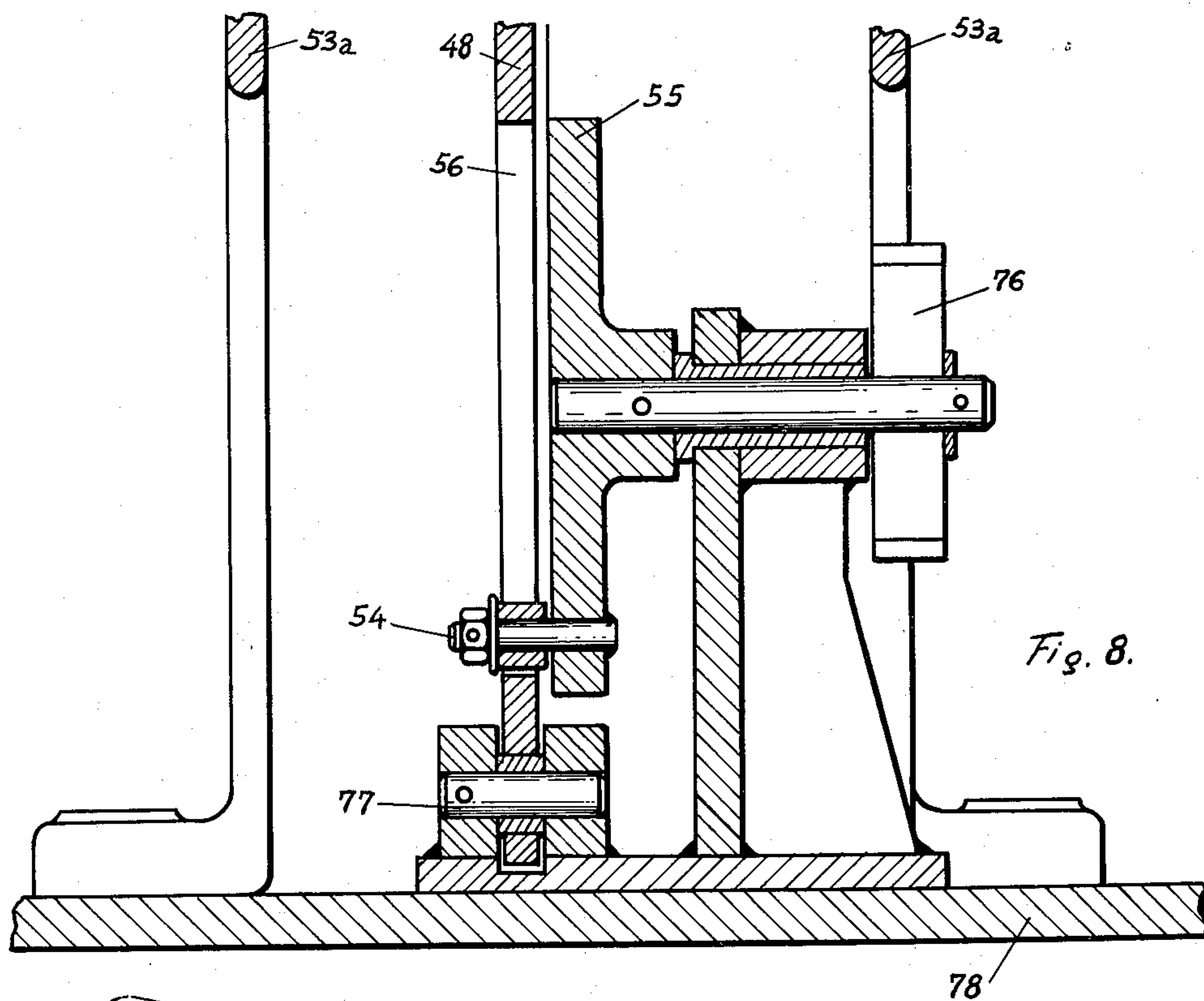


Fig. 12

*Jean Dunod
by Christy, Parneke & Strickland
his attorneys*

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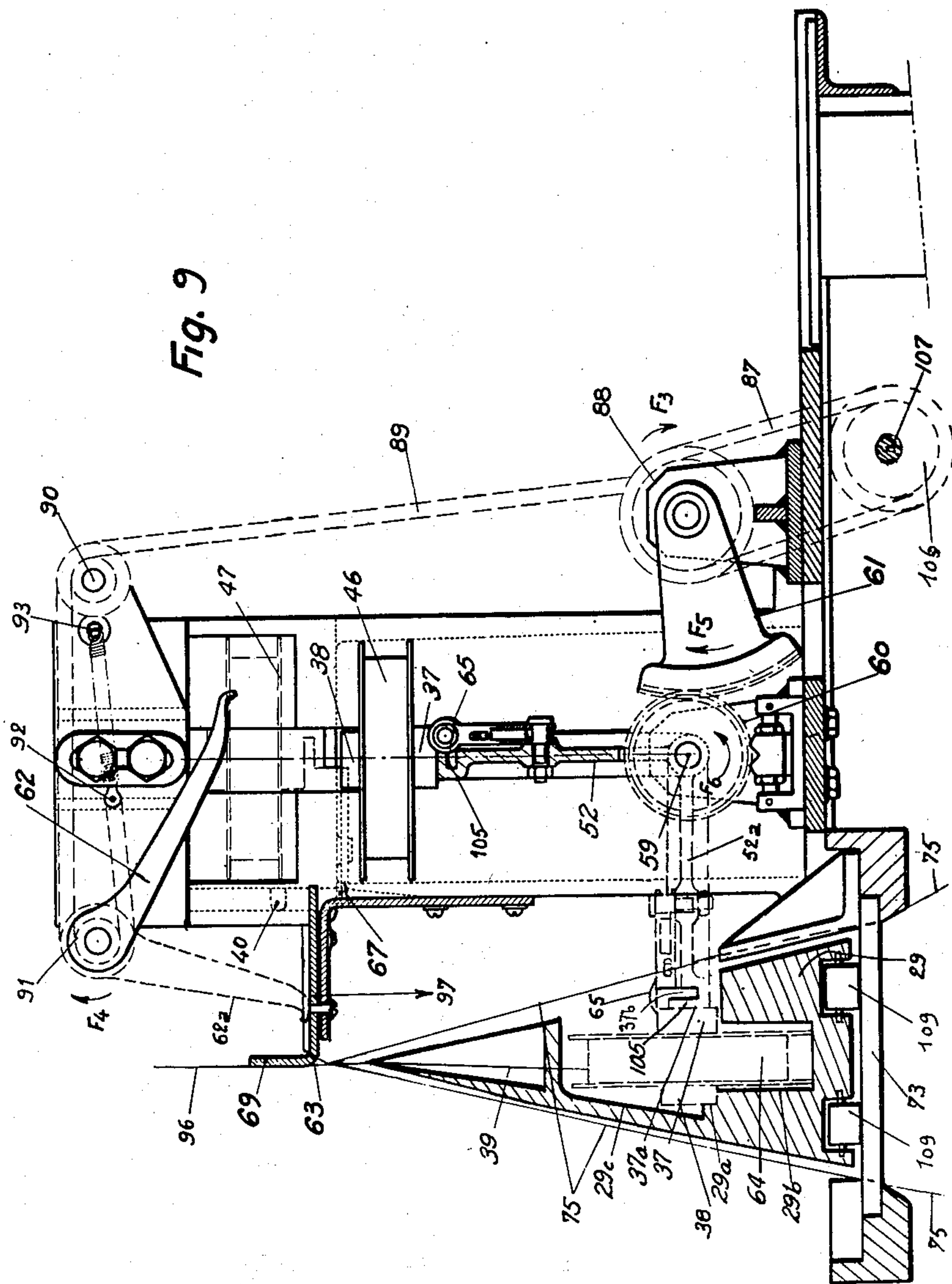
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Jean Dunod
by Christy, Perreault & Strickland
his attorneys

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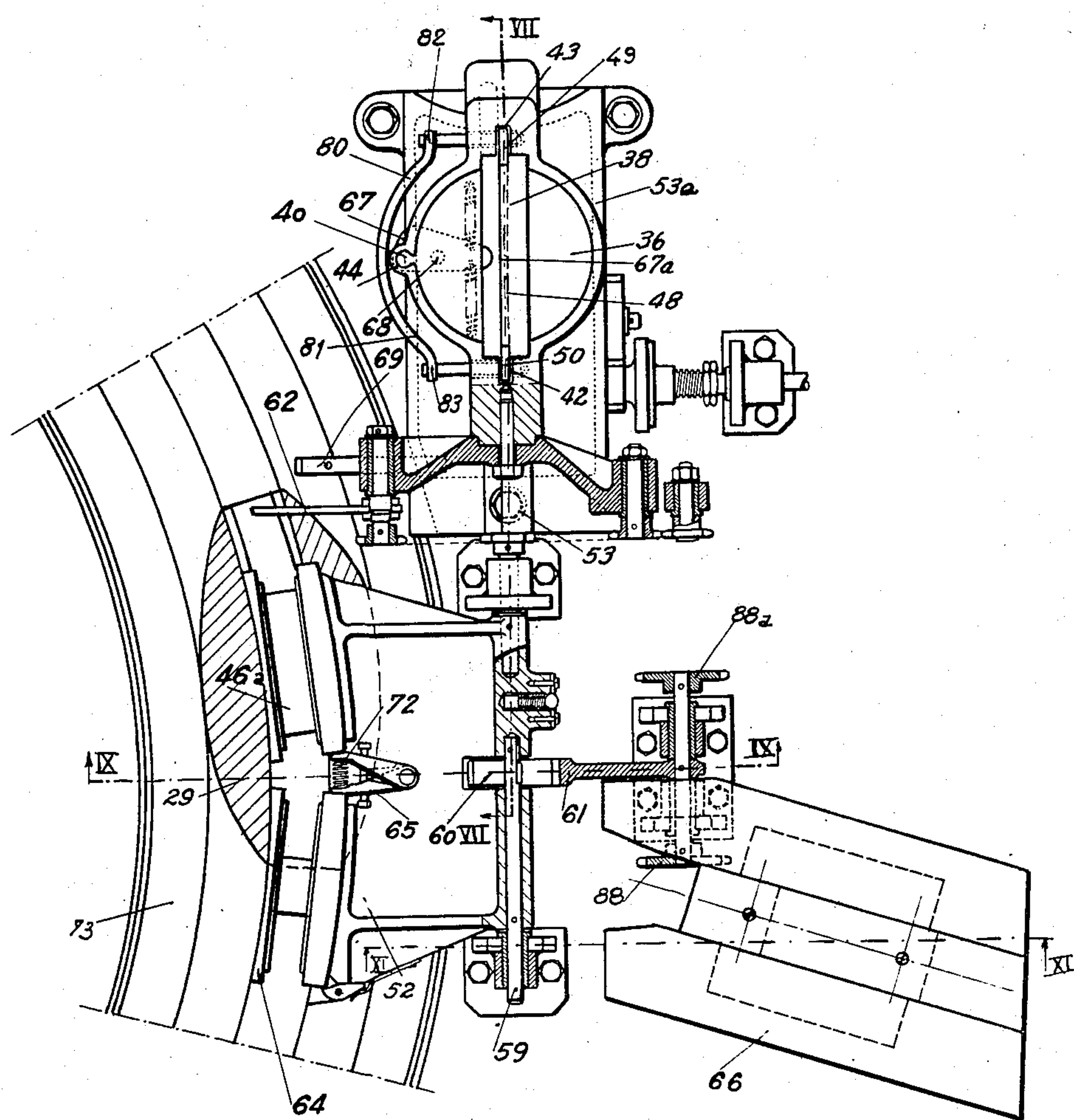
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Fig. 10



*Jean Dunod
by Christy, Pomeroy & Stidland
his attorneys*

UNITED STATES PATENT OFFICE

2,624,368

WEFT REPLENISHING APPARATUS FOR
CIRCULAR LOOMS

Jean Dunod, Paris, France

Application December 21, 1950, Serial No. 201,965
In France January 31, 1948

6 Claims. (Cl. 139—16)

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My invention relates to an automatic device for re-loading the shuttle in a circular weaving loom without stopping the operation of the loom.

This application constitutes a continuation-in-part of an earlier filed application, now abandoned, Serial No. 72,202, filed January 22, 1949.

The object of my invention is to provide, in a circular weaving loom comprising means for retracting all the warp threads clear from the shuttle and means for reestablishing the normal shedding position of the warp threads, an apparatus for automatically re-loading the shuttle including a container for the full spools, means for bringing a spool full of weft thread into the path of the shuttle, means for retaining the end of the weft thread to a fixed part of the container, means on the shuttle for picking up, as it passes, the full spool, means for removing said empty spool from the path of the shuttle, and means for cutting off the weft thread upon return of the warp threads into the normal shedding position.

In the accompanying drawings, one embodiment of the invention has been illustrated diagrammatically and by way of example.

Fig. 1 is a perspective view, Fig. 2 a vertical section, Fig. 3 a lateral view and Fig. 4 a plan view of a full weft spool.

Fig. 5 is a vertical section of a container for the weft spools.

Fig. 6 is a section through VI—VI of Fig. 5.

Fig. 7 is a vertical section, showing the feed mechanism, through VII—VII of Fig. 10.

Fig. 8 shows a detail of the control of the mechanism for releasing a full roller, in section through VIII—VIII of Fig. 7.

Fig. 9 is a vertical section through a plane at right angles to that of Fig. 7, i. e. through IX—IX of Fig. 10.

Fig. 10 is a general arrangement plan view of the mechanism.

Fig. 11 is a fragmental section through XI—XI of Fig. 10 looking in the direction of the arrows.

Fig. 12 is a section through XII—XII of Fig. 11.

My invention can be equally well applied to the case of weaving a metallic wire as to the case of weaving a textile thread. In a general manner, the term "spool" will be used herein to denote the member which carries the reserve of weft and which is adapted to be placed in the shuttle, said member being the "bobbin" in the particular case of a textile thread.

Hereinafter, it will be assumed that the loom is equipped with two shuttles set at 180° with respect to one another.

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So long as the loom is operating normally, the shed is opened as each shuttle passes by means of a suitable device which is not part of the invention but which is preferably of a type described in my copending United States Patent Serial No. 201,964, filed December 21, 1950.

On the moment of re-loading the shuttle, the full spool is subjected to a considerable acceleration since it changes almost instantly from zero speed to a speed V equal to that of the shuttle, and the empty spool undergoes a sudden braking because it has to change from the speed V to zero speed. Means are provided which will now be described for decreasing the acceleration of the full spool and the deceleration of the empty spool.

It will be assumed in this case that the loom is of the type in which the reed is continuous and the feed of the shuttle is effected through the top.

Preferably, each weft spool comprises (Figs. 1 to 4):

(a) A spool 36 carrying the supply of weft thread 39,

(b) Two guide-bars 37 and 38 located on either side of the spool and acting as a system for resting and fastening the spool in the loading device and in the shuttle.

As shown in Figs. 1 to 4, the guide-bar 37 is provided with a notch 37a and an edge 37b, whilst the guide-bar 38 is of rectangular shape. The guide-bar 38 cooperates with a groove 29a on the shuttle 29 (Fig. 9). The notch 37a is designed for cooperating with a corresponding rib 105 of the loading arm, whilst the free edge 37b of the guide-bar 37 is designed for cooperating with a groove 102 of the said loading arm. It is to be noted that the reference 36 has been used for indicating only the bobbin in itself, and that the whole of the spool is always of the same structure, the references 46, 46a or 64 being used merely for identifying different spools of the same construction.

The spool 36 can rotate with respect to the guide-bars 37 and 38 being mounted on a spindle 110, see Fig. 2, secured to both guide-bars in the manner disclosed in my copending United States Patent Serial No. 23,607 filed April 26, 1948 which is now Patent No. 2,587,982.

As shown in Fig. 9, the shuttle is of general triangular shape in vertical section, provided with rollers 109 and characterized by a housing 29c open outwardly and provided at the bottom with a recess 29b for receiving the weft spool, a groove or shoulder 29a providing a housing for the guide-

bar 38 of the spool, and the guide-bar 37 bearing on the body of the shuttle.

The free end 39 of the weft thread is attached to a small mass of steel 40 of suitable shape.

A number of spools are stored in a container 41 having an extension 41a secured as by bolts 84a, 84b to said container, wherein the spools are piled up vertically (Figs. 5 and 6). The bolts 84a, 84b can be tightened by means of a handle 85.

Said container, which is of circular cross-section, is provided over its entire height with two diametrically opposite grooves 42 and 43, in which the ends of the guide-bars 37 and 38 of the spools are adapted to engage (Fig. 6).

On the other hand, a tube 44, which also extends over the entire height of the container and is connected thereto through a slot 45, is adapted to accommodate the masses 40 to which all the free ends of the threads 39 of the spools are attached.

The masses 40 are therefore piled up vertically in the tubes 44. Each of said masses, which is of suitable length, is located opposite the corresponding spool.

I have provided a device, shown in Figs. 7 to 12, for releasing the lowermost spool located at the bottom of the container, the other spools being retained in position, and for pushing said lowermost spool up to an arm 52 that serves for loading the shuttle. Said device, after the re-loading operation, releases the mass 40 to which is attached the weft thread, this process being described hereinafter.

Assuming that all the warp threads have been retracted towards the same side of the reed, the re-loading device operates as follows:

When the change of the weft spool is to be effected, a lever 48 controlled through any known suitable device, for example through the device disclosed and claimed in my copending U. S. patent application Serial No. 23,607 filed April 27, 1948, now Patent No. 2,587,982, and actuated as described hereinafter is moved towards the right of Fig. 7 and pushes a latch 49 which symmetrically actuates a second latch 50. The levers 49 and 50 are connected together by the links 80, 81 (one of which is forked, as shown in Fig. 7, and engaged by the end of the other). The spool 46 which was retained by the two lower hooks 70 is released, while the two upper hooks 71 retain the next spool 47. The spool 46, which falls into the guideway 53 carried by the support 53a, is pushed towards the left of Fig. 7 by the lever 48 to which a reciprocating movement is imparted by a finger 54 (Figs. 7 and 8) mounted on a disc 55 and adapted to slide in a slot 56 of said lever.

On the left of Fig. 7, there is shown a spool 46a which has been pushed by the lever 48 on its preceding stroke; (the corresponding position of this lever is shown in dotted lines at 48a). The lever 48 is pivoted at 77 to the frame 78 of the loom, and as said hereabove its reciprocating motion is given by means of the finger 54, when this latter slides in the slot 56, the disc 55 being driven by any suitable mechanism from any source of power, for example through a gear 76, 79 (Figs. 7 and 11), the power for driving the driving wheel of the gear being picked up through a suitable transmission and a slipping clutch (not shown) from the loom driving shaft.

The disc 55 is provided with a notch 57 which is adapted to engage a resilient pin 58 which only allows the disc 55 to effect one revolution at each change of spool.

The pin 58 is pivotally mounted at 58a in a

support 58b suitably carried by the frame 53a of the mechanism. The pin 58 is released at the desired moments by any suitable mechanism, for example by an electro-magnet 86. This latter is energized at these suitable moments by means of a device 101, which does not form a part of the invention but is preferably of the type disclosed and claimed in my copending application Serial No. 23,607, now Patent No. 2,587,982. As long as the pin 58 engages the notch 57, the slipping clutch referred to allows for the free rotation of the driving shaft without rotating the wheel 79. But as soon as the electro-magnet 86 retracts the pin 58, the driving motion is imparted to the wheel 79 and, consequently, to the disc 55 and to the lever 48.

The spool 46 urged by the lever 48 engages by means of its guide-bar 37 in a corresponding groove 102 of an arm 52 (Figs. 7, 9 and 10).

In the practice, a spool 46a is always in the position shown Fig. 7 on the arm 52, and ready for a reloading operation.

At the suitable moment, for example a quarter revolution before the shuttles pass at the points where the reloading operation is to be effected, the arm 52 on to which the spool 46a has been conveyed in the manner hereinbefore indicated moves downwards and rotates 90° into the position 52a shown in dotted line about the shaft 59 which is set in motion for example by means of a pinion 60 and a toothed quadrant 61 (Fig. 9) as it will be explained hereinafter.

The spool 46a is therefore located in the path of the shuttle (Fig. 10).

During this movement of the arm 52, a hook 62 (Fig. 9), the operation of which is dependent on that of the arm 52, engages as it passes the beginning 39 of the weft thread (position 62a in dotted line Fig. 9), the end of which has remained attached to the container by means of the mass 40 as hereinbefore explained; the hook 62 conveys the thread to the point 63 where the end of the shuttle tail has to pass. As the same passes, the thread is therefore automatically engaged therein.

The hook 62 is actuated in synchronism with the arm 52 through the mechanism shown in Fig. 9. The quadrant 61 is rotated by a chain and toothed wheel device 87, 88. The chain 87 passes around a second toothed wheel 106 keyed on a shaft 107 (Fig. 9). The shaft 107 is driven by a motor 108 (Fig. 7) controlled by the device 101 referred to above. From a second wheel 88a keyed on the spindle of the wheel 88 (Figs. 9 and 10), a second chain 89 passes around an idle pulley 90, around the pulley 91 upon the spindle of which is keyed the hook 62, and is secured at 92 to a spring the other end of which is connected at 93 to the frame of the machine. Consequently, when the wheel 88 rotates in the direction of the arrow F3, the chain 89 is pulled and the hook 62 rotates in the direction of the arrow F4 to the position 62a; similarly, the quadrant 61 rotates in the direction of the arrow F5, the pinion 60 rotates in the direction of arrow F6, and the arm 52 comes into the horizontal position. Thus all these parts rotate only under the control of the device 101.

When the shuttle passes in front of the arm 52, it leaves the empty spool 64 thereon (Fig. 10), the guide-bar 37 of the spool 64 being at this moment engaged by a rib 105 provided on the arm 52. In order to damp the impact of the empty spool 64 against the full spool 46a, a shock-absorber 65 comprising a spring 72 has

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been provided and is mounted on the arm 52. As it abuts against the shock-absorber 65, the spool 64 initiates the movement of the full spool 46a which is then carried away by the shuttle, and it remains on the arm 52 by the engagement of the notch 37a of the guide-bar 37 with the rib 105 of the arm 52. When the shuttle has travelled beyond the point of reloading, the arm 52 is moved by the pinion 60 and the toothed quadrant 61 up to a position inclined with respect to the vertical plane passing through the axis of the shaft 59 (Fig. 11). In this position, the guide-bar 37 of the spool 64 slides along the rib 105 due to its own weight, and the spool 64 falls in a chute or guideway 66 (Figs. 11 and 12) which conveys it to a suitable store. After completion of this operation, the shaft 59 is rotated in the opposite direction and the arm 52 comes to a standstill in the vertical position (Fig. 9) and is ready for a fresh loading operation. The chute 66 has preferably the shape shown Fig. 12, that is to say is constituted by a rectangular box the top of which is provided with a longitudinal aperture 103 for allowing for the passage of the hub of the empty spool, one flange of the spool sliding along the external upper surface of the guideway. The box 66 is suitably mounted upon a frame 104 secured to the frame of the loom.

During the return movement of the arm 52, the lever 48, in its return movement (towards the right of Fig. 7), strikes the extremity 67a of a shutter 67 (Figs. 7 and 10) which rocks about a pivot 68 and opens the lower end of the tube 44, thereby allowing the mass 40, to which is fixed the beginning 39 of the weft thread wound on the spool 46, to escape. In the case of a wire, said wire is brought into contact at this instant with an insulated member 69. The member 69 is connected through an electric wire 97 to an electric contact 94. When the electro-magnet 86 is energized and causes the pin 58 to be retracted from the notch 57, a flexible tongue 98 secured as by screws 99 to the support 58b of the pin 58 comes into engagement with the contact 94 and closes a circuit from the member 69 to an earth 100 by way of wire 97, contact 94, 99, source of current 95. On the other hand, the weft wire 39 is grounded by the mass 40, since this latter is in contact with metallic parts of the loom which are grounded. It will be understood that when the weft wire 39 touches the member 69, the electric circuit from the source 95 is thus completed, and the wire is severed at 69 by Joule effect, thereby completely releasing the mass 40. In the case of a textile thread, this device is replaced by a system of scissors known in itself and automatically actuated, at the same time as the shutter 67 allows the mass 40 to fall.

What I claim is:

1. An apparatus for automatically re-loading a shuttle in a circular weaving loom which comprises means for retracting all the warp threads clear from the shuttle and means for re-establishing the normal shedding position of the warp threads, said apparatus including a container for the full weft spools, means for transferring a full weft spool from this container into the path of the shuttle, means for retaining the end of the weft thread to a fixed part of the container, means on the shuttle for picking up, as it passes, the full spool, means for damping the impact of the empty spool against the full weft spool and for imparting a starting impulse to the full weft spool, means for removing said empty spool from

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the path of the shuttle, and means for cutting off the weft thread upon return of the warp threads into the normal shedding position.

2. An apparatus for automatically re-loading a shuttle in a circular weaving loom which comprises means for retracting all the warp threads clear from the shuttle and means for restoring the normal shedding position of the warp threads, said apparatus including a container, full weft spools stored in said container, means for releasing the lowermost spool, means for retaining the end of the weft thread into the container up to after the shuttle is passed away, means for bringing said lowermost spool into the path of the shuttle, means on the shuttle for picking up the full spool, means for damping the shock at this moment and for imparting a starting impulse to the full weft spool, means for leaving the empty spool, means for removing said empty spool from the path of the shuttle, and means for cutting off the weft thread upon return of the warp threads into the normal shedding position.

3. An apparatus for automatically re-loading a shuttle in a circular weaving loom which comprises means for retracting all the warp threads clear from the shuttle and means for restoring the normal shedding position of the warp thread, said apparatus including a container, full weft spools stored in said container, latches for retaining the lowermost spool in the container, means including an oscillating lever for releasing said latches, a mass attached at the end of each weft thread, a housing in the container for containing said masses, means for bringing said lowermost spool into the path of the shuttle, means on the shuttle for picking up the full spool, means external to the shuttle for damping the shock at this moment and for imparting to the full weft spool a starting impulse, means external to the shuttle for extracting the empty spool, means for removing said empty spool from the path of the shuttle, a pivoting hook for bringing a point of the weft thread wound on the fresh spool into the path of the shuttle tail, means for actuating said hook, means for releasing the mass attached to the end of each weft thread, and means for cutting off the weft thread from said mass.

4. An apparatus for automatically re-loading a shuttle in a circular weaving loom which comprises means for retracting all the warp threads clear from the shuttle and means for restoring the normal shedding position of the warp threads, said apparatus including a container, full weft spools stored in said container, means for retaining the end of the weft thread into the container until after the shuttle is passed away, means including an oscillating lever for releasing the lowermost spool, means for actuating said oscillating lever, a pivoting arm, means including toothed wheels and belt or chain transmission for actuating said pivoting arm, means on said pivoting arm cooperating with means on the spool for temporarily retaining said spool on said arm, means on the shuttle for picking up the full weft spool, means on the pivoting arm for damping the shock at this moment and for imparting to the full weft spool a starting impulse, means on the pivoting arm for extracting the empty spool, means for removing said empty spool from the path of the shuttle, an oscillating hook for bringing a point of the weft thread into the path of the shuttle tail, a belt or chain transmission for rotating said hook, and means for cutting off the

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weft thread upon return of the warp threads into the normal shedding position.

5. An apparatus as claimed in claim 4, wherein the means for actuating the oscillating lever include a rotating disc, a notch on the edge of said disc, a resilient pin normally engaging said notch, electro-magnetical means for retracting at will the pin from the notch, a finger excentrically secured to the surface of the disc, and a corresponding slot in the oscillating lever.

6. An apparatus for automatically re-loading a shuttle in a circular weaving loom for weaving metallic wire which comprises means for retracting all the warp threads clear from the shuttle and means for restoring the normal shedding position of the warp threads, said apparatus including a container, full weft spools stored in said container, means for releasing the lowermost spool, means for retaining the end of the weft thread into the container up to after the shuttle is passed away, means for bringing said lowermost spool into the path of the shuttle, means on the shuttle for picking up the full spool, means for damping the shock at this moment and for

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imparting to the full weft spool a starting impulse, means for leaving the empty spool, means for removing said empty spool from the path of the shuttle, a conducting member secured to the frame of the loom but insulated from said frame, a connection from said member to the fixed terminal of a contact switch, a connection from the movable terminal of said contact switch to the positive pole of a source of current the other pole of which is grounded, means for closing at the desired moment the contact switch, means for bringing at this moment the metallic weft wire into contact with the conducting member, and means for grounding said weft wire.

JEAN DUNOD.

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The following references are of record in the file of this patent:

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