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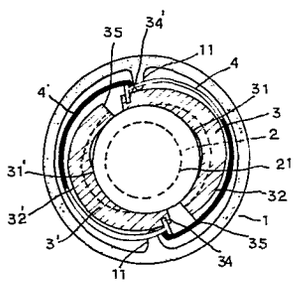
(71) Applicant: **Hu, Anny, 102, Sec. 1, Nei Hu Road, Taipei (TW)**

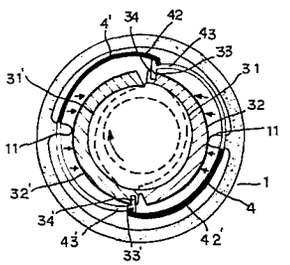
(72) Inventor: **Hu, Anny, 102, Sec. 1, Nei Hu Road, Taipei (TW)**

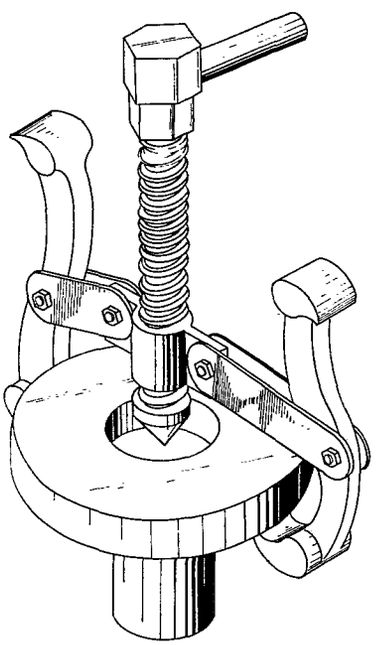
(74) Representative: **Casalonga, Axel et al, BUREAU D.A. CASALONGA OFFICE JOSSE & PETIT**
Baaderstrasse 12-14, D-8000 München 5 (DE)

(54) **Rapid advancing and retracting mechanism for clamping device.**

(57) Advancing and retracting mechanism for clamping means comprising a pair of split nuts (3, 3′) resiliently retained in place inside a hollow cylindrical body (1) by spring means, which mechanism can either slidably hold a screw spindle (2) to rapidly push it to working position or retract it to dismount the workpiece when the threads (31, 31′) of split nuts (3, 3′) are not in mesh with the screw spindle (2) or offer a snug. Complete engagement between the split nuts (3, 3′) and screw spindle (2) in which the load is equally distributed, thereby largely reducing the wear thereof, and allowing the device to be fabricated in relatively small size.







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Rapid advancing and retracting mechanism for clamping device

The present invention relates to a rapid operating mechanism for advancing or retracting the screw spindle of clamping means, for example clamps, vises, and such-like.

Yet known clamping devices fall into two categories : manual type, and hydraulic type. Despite its relatively high cost of production, the application of the former is much limited due to the structure thereof, and adapted only to special C-clamps. Moreover, such device entails a preparatory step to set the screw in operating position and is therefore inconvenient. For this reason, it is not preferably accepted by the public. While the cost of production of the latter is also high, it is not adapted to ordinary use. Provided with a hydraulic chamber, the layout of such device is inconveniently bulky, thus limiting its application to some specialized works.

A yet known means to obtain the rapid advance or retraction of clamping means to fasten or release the workpiece is accomplished by an eccentric nut provided with thread means on half of its internal surface, which nut, normally does not in engagement with the screw spindle, yet when turned inside a hollow cylindrical body in the frame, will produce a radial displacement such that its half-threads engage with the screw spindle penetrating through it. Rapidly as it can fasten or release the workpiece, such device suffers several disadvantages as follows :

1. Since only half of the inner wall is provided with thread, the load is mostly exerted on the threaded portion in operation, therefore largely increasing the wear of the thread and screw spindle. Moreover, such device cannot convert the torsion of the operator completely and efficiently into the pressure against the workpiece, particularly when the load is heavy.

2. The provision of a cylindrical body and the eccentric nut renders the inconveniently large size of the resulting

assembly, which largely limits the use of such device. Also, the nut must provide enough number of threads to convert the angular torque into axial thrust, thus the required length is also inappropriately long.

3. In operation, only three effort points are bearing the propulsion of the screw spindle, thus causing the wear of the entrance and the exit of the cylindrical body, and enlarging the size of the opening thereof after long use, so that the screw spindle is liable to slacken during operation and fails to hold the workpiece snugly and securely in place.

Accordingly, it is the chief object of this invention to provide a rapid advancing and retracting mechanism to supercede the yet known means, thereby curing the deficiencies of the latter.

This invention concerns an improved rapid mechanism for advancing and retracting the screw spindle by means of a pair of split nuts which constrict to knuckle the screw spindle when the latter is turned in obverse direction (i.e. the direction which results in advance) and expand to release the screw spindle when the latter is turned in reverse direction (i.e. the direction which results in retract). Unlike the aforementioned prior art, the load is equally distributed to the two split nuts as well as the periphery of the screw spindle, thus largely reducing the wear thereof.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same taken in conjunction with the accompanying drawings, in which :

Figure 1A is a partial sectional view of this invention in released condition ;

Figure 1B is a partial sectional view as A, in engaged condition ;

Figure 2 is a graphical representation of one of the two same springs used in this invention, respectively showing the plane view, and edge view of the spring in straightened

and bent states ;

Figure 3A and Figure 3B are respectively the transverse sectional views showing the screw spindle and the split nuts in disengaged and engaged state ;

Figure 4 is an embodiment of this invention.

Referring now to Figures 1A and 1B, this invention comprises substantially a hollow cylindrical body 1 for receiving a pair of split nuts 3, 3', resiliently retained in place by a pair of springs 4, 4'. The inner wall cylindrical body 1 is provided with two opposite pins 11 which form an integral part of cylindrical body 1. Referring to Figures 3A and 3B, the broken lines with reference numerals 31 and 31' designate the female thread of the split nuts 3, 3'. The arrow X in Figures 1A and 1B indicates the direction of the advance of the screw spindle 2. In Figure 3A, the threads 31 and 31' of nuts 3, 3' are not in mesh with the male thread 21 of screw spindle 2, thus allowing the screw spindle to be pushed axially to the working position or retracted directly without turning. Under such conditions, the two split nuts 3, 3' are spaced apart by a gap. However, in order to retain the two split nuts 3, 3' in position, they are interconnected by two like springs 4, 4' which are connected in a head-to-tail manner to define a loop wrapping around the nuts. The outer surface of each of split nuts 3, 3' is provided with a groove 33, 33' to receive the heads 43, 43' of springs 4, 4'. Each of the tails 42, 42' of springs 4, 4' is structured to engage with the heads 43', 43 of another spring. In Figure 2, there is shown a plane view of one of the aformentioned springs, which is formed integrally by a highly tough, flexible and machineable steel plate with two slots including a close slot 44 and an open slot (not numeralled) extending along the length of the spring to allow a pin to pass through. A stop piece 41 divides the slot into two. Both sides of ends of the heads 43, 43' are flanged, to define an inserter 431 to insert into groove 33 and to abut the tail 42 of another spring, whereas only one side of the

end of the tail 42 is flanged. Empirically, a tapering 34, 34' of the thickness of the nut wall at the two margins is found to give better results.

As shown in Figures 3A and 3B, when the screw spindle 2 is turned in obverse direction, the split nuts 3, 3' together with springs 4, 4' are also turned in this direction until the stop pieces 41, 41' touch pins 11 and effect so that the split nuts 3, 3' and the springs 4, 4' can no more be turned. Now the gaps between the two split nuts 3, 3' diminish. And a resulting nut fully in mesh with screw spindle 2 is formed. Inasmuch as the nut can no more be turned, the screw spindle 2 can now be turned in obverse direction relative to the nut to produce an axial thrust.

To bring the state in Figure 3B back to that of Figure 3A, one only needs to make about half a turn of the screw spindle 2 in reverse direction. The operation of this invention is similar to the prior art, but the result is much better. Figure 4 is an embodiment of this invention. In operation, one only needs to push the screw spindle 2 forward to touch the workpiece, and then fasten it with a few obverse turns. Likewise, while dismounting the workpiece, one only needs to make a turn in reverse direction, then pull the screw spindle 2 back.

It will be apparent from the foregoing description of my invention, that the same is subject to alteration and modifications without departing from the underlying principles involved, and I accordingly do not desire to be limited to the specific details illustrated and described except as may be necessitated by the appended claims.

C L A I M S

1. A rapid advancing or retracting mechanism for clamping means having a screw spindle or the like, comprising :

a screw spindle (2) ;

a pair of split nuts (3, 3') provided with female threads (31 , 31') that can mesh with the male threads (21) of said screw spindle (2) ;

a hollow cylindrical body (1) to receive said split nuts (3, 3') therein ;

spring means to resiliently retain said split nuts (3, 3') in position in said cylindrical body (1) ;

said cylindrical body (1) being secured to said nuts (3, 3') so that they can corotate ;

said cylindrical body (1) being internally structured so that when said screw spindle (2) is turned in obverse direction, i.e. the turning direction to advance the screw spindle (2), said split nuts (3, 3') and spring means can be driven to corotate therewith and the threads (31, 31') of said nuts begin to mesh with said screw spindle (2) and when the threads (31, 31') of said split nuts (3, 3') are completely in mesh with said screw spindle (2), said split nuts (3, 3') and said spring means are structurally no longer rotatable in the obverse direction, and when said screw spindle (2) is turned in reverse direction, i.e. the direction to retract the screw spindle (2), said split nuts (3, 3') and said spring means will resume their original state in which said split nuts (3, 3') are not in mesh with said screw spindle (2), yet still keep in contact therewith so that said screw spindle (2) is slidably held therein.

2. The mechanism according to claim 1, wherein said split nuts (3, 3') are separated apart by two gaps when not completely in mesh with said screw spindle (2), and combine to form an entire nut without gap existing therebetween when completely in mesh with said screw spindle (2).

3. The mechanism according to claim 1, wherein said spring means comprises two springs (4, 4') interconnected in an end-to-end manner to define a loop wrapping around said split nuts (3, 3').

4. The mechanism according to claim 3, wherein one end of each of the two springs (4, 4') is provided with means to be secured to the outer surface of one of said two split nuts (3, 3').

5. The mechanism according to any of the above claims, wherein the inner wall of said cylindrical body (1) is provided with two opposite pins (11) symmetrical to the central axis thereof which are structured and positioned so that said split nuts (3, 3') and spring means are prevented from further turning when the threads (31, 31') of said split nuts (3, 3') are completely in mesh with the thread (21) of said screw spindle (2).

6. The mechanism according to any of the above claims, wherein each of the two springs (4, 4') is provided with elongate slots extending along the length of the spring (4, 4') along the path that said pins (11) make relative motion to the springs (4, 4') when each spring is turned in said cylindrical body (1), including an open slot and a close slot (44), separated by a stop piece (41) which is so positioned that when the threads (31, 31') of said split nuts (3, 3') are completely in mesh with said screw spindle (2), the springs (4, 4') are stopped by said pins (11) with their stop piece (41) lying in the pins' path of relative motion.

7. The mechanism according to any of the above claims, wherein each spring (4, 4') is formed integrally by a piece of highly tough, resilient metal.

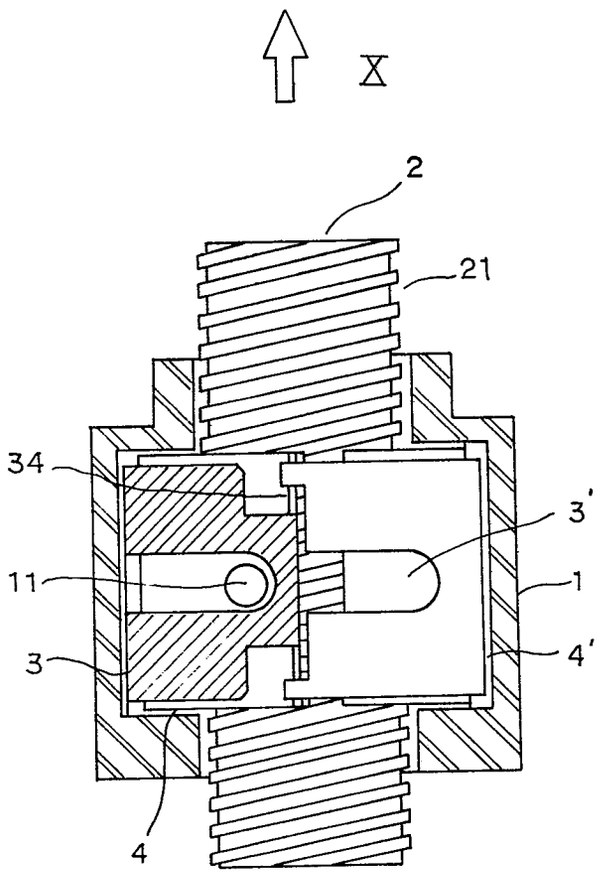

FIG. 1-A

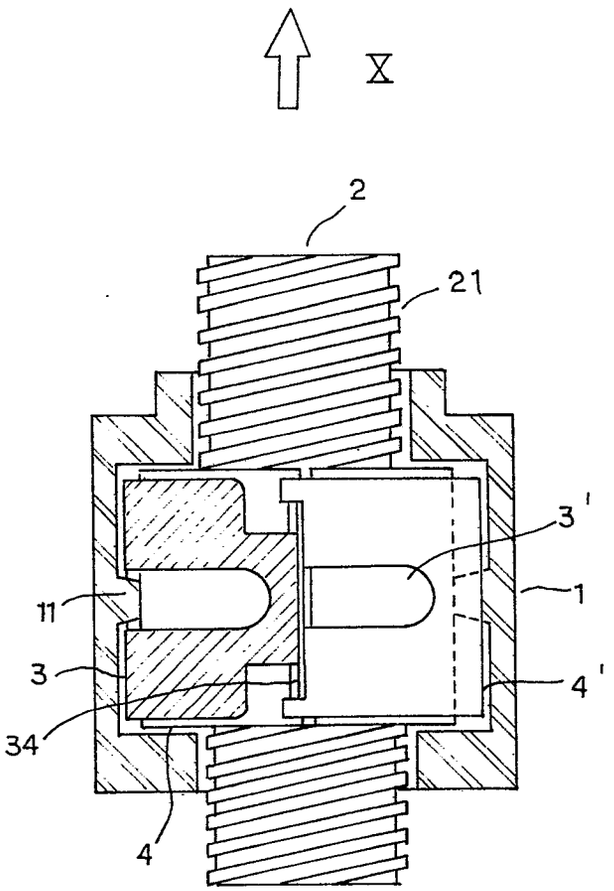

FIG. 1-B

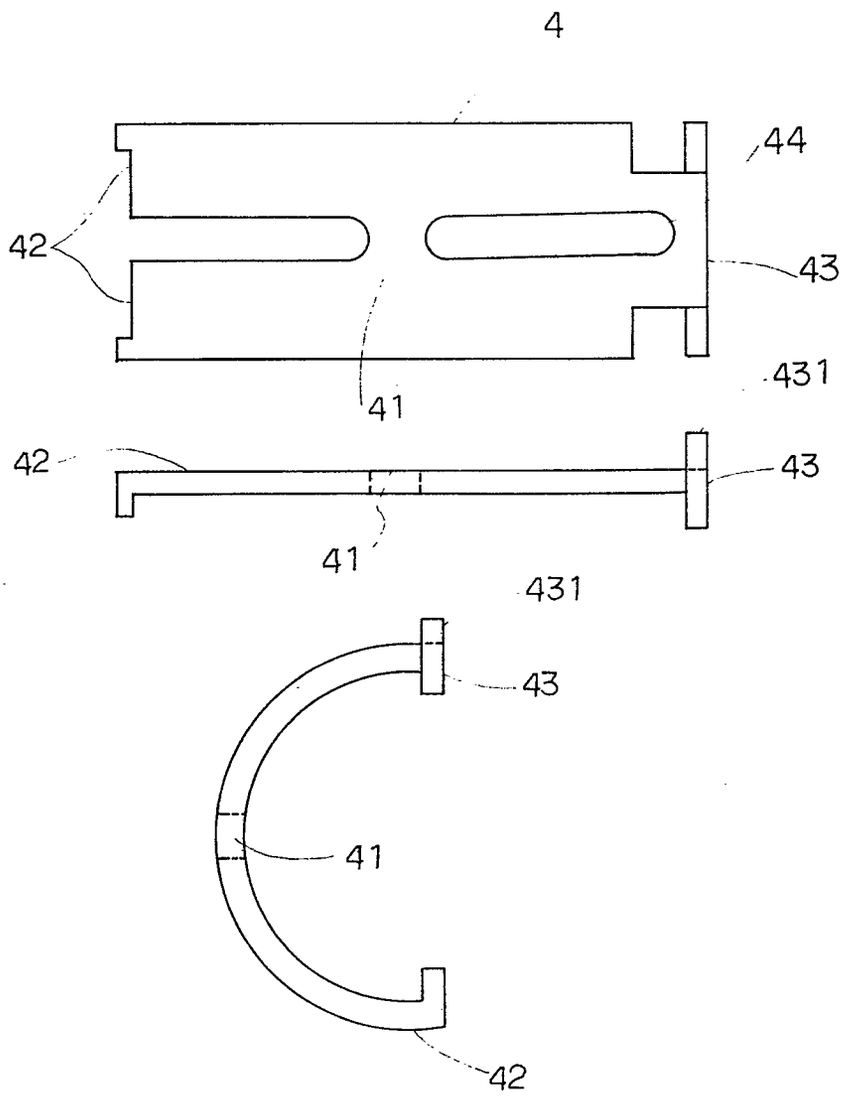

FIG .2

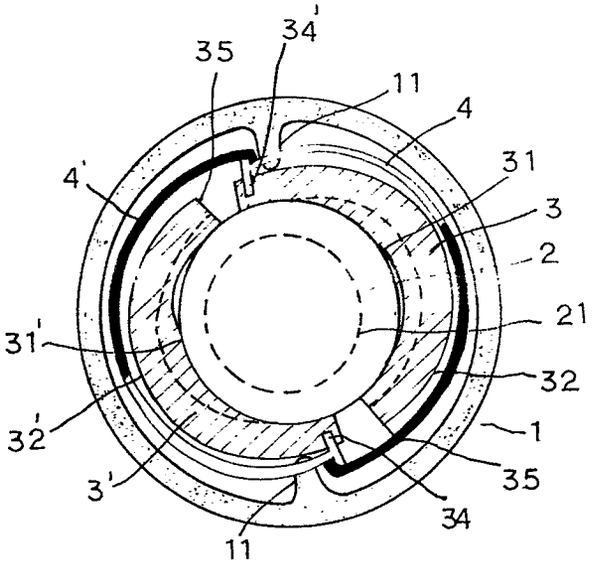
34'
35
11
4
4'
31
3
2
21
31'
32
32'
1
3'
35
34
11

FIG. 3-A

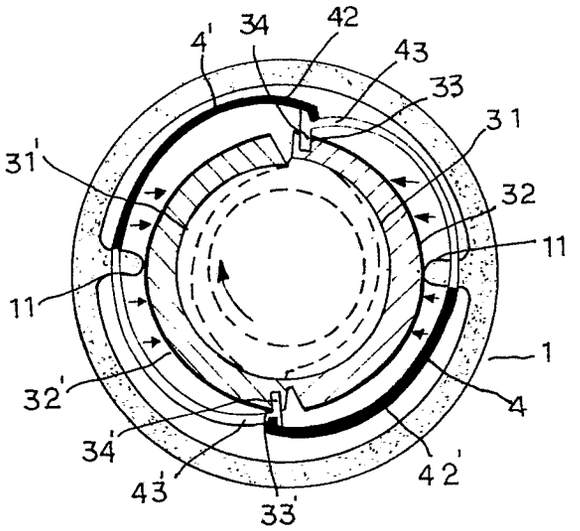
4'
34
42
43
33
31
31'
32
11
11
1
32'
4
34'
42'
43'
33'

FIG. 3-B

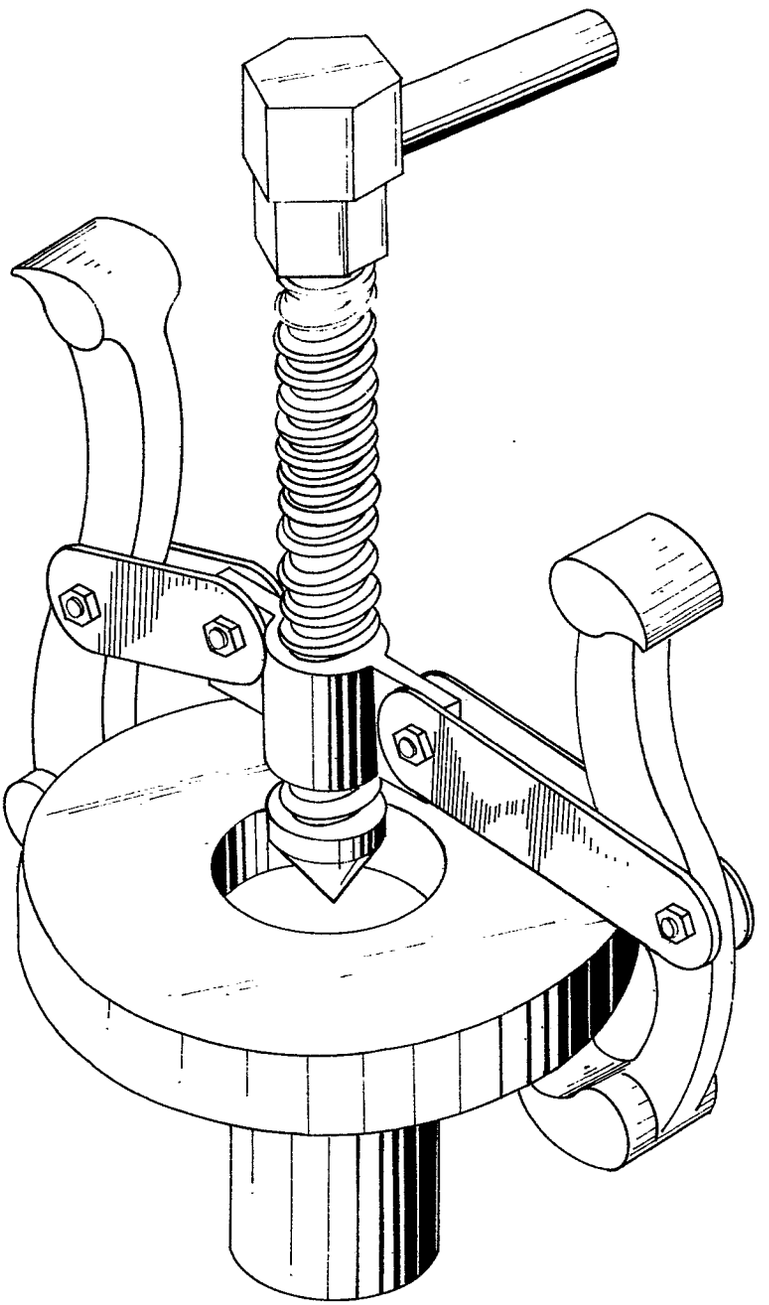

FIG. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 81 10 4412.2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 3 669 440 (R. KARTASUK) * claims 1 to 19; fig. 3 to 10 * -- DE - C - 705 306 (K. BEYER) * claims 1, 2; fig. 2 * ----	1 1,2

CLASSIFICATION OF THE APPLICATION (Int. Cl 3)

B 25 B 27/073

TECHNICAL FIELDS SEARCHED (Int. Cl.3)

B 25 B 1/12
B 25 B 27/00
B 25 B 33/00
F 16 B 37/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	16-12-1981	HOFFMANN

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