United States Patent [19]

Espasa

[11] **3,760,641**

[45] **Sept. 25, 1973**

[54] **DEVICE FOR IMPARTING RECIPROCATORY MOTION TO A MOVING ELEMENT**

[76] Inventor: **Arcadio Espasa,** Calle Peligro 40, Barcelona, Spain

[22] Filed: **Aug. 5, 1971**

[21] Appl. No.: **169,342**

[30] **Foreign Application Priority Data**

Aug. 28, 1970 Spain 383161

[52] **U.S. Cl.** ..... **74/57,** 242/18 R

[51] **Int. Cl.** **F16h 25/12**

[58] **Field of Search** ..... 74/57; 242/18 R

[56] **References Cited**

UNITED STATES PATENTS

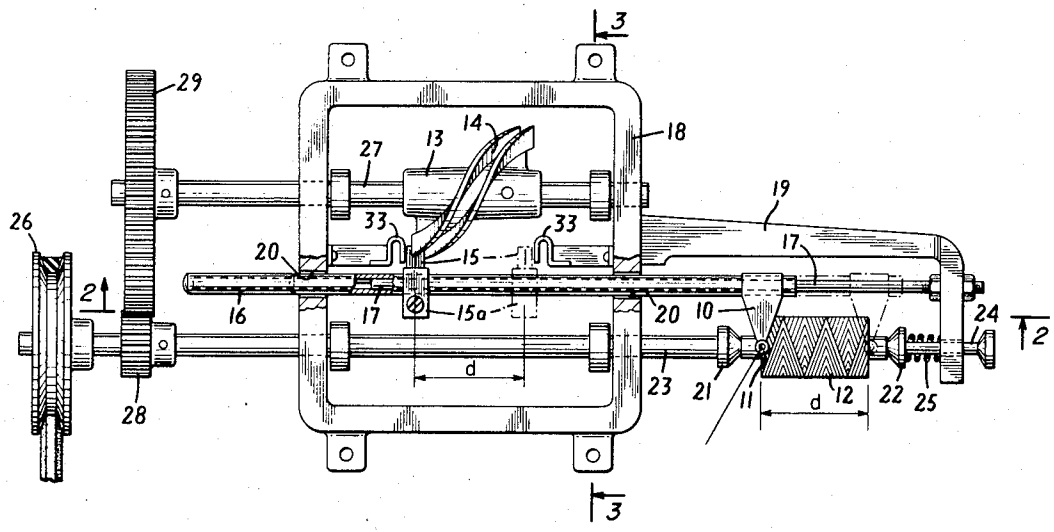
1,399,107	12/1921	Frankowski et al.	74/57
2,441,596	5/1948	Reitter	74/57
3,190,628	6/1965	Litzka	74/57
3,398,904	8/1968	Adams et al.	74/57
1,959,606	5/1934	Zindel	242/18 R
3,193,209	7/1965	Hambach	242/18 R

Primary Examiner—Charles J. Myhre
Assistant Examiner—Wesley S. Ratliff, Jr.
Attorney—Granville M. Brumbaugh et al.

[57] **ABSTRACT**

A device for imparting reciprocatory motion to a moving element by means of a driven rotor having a channel formed around the outer periphery, a channel follower driven by the rotor and an impact absorbing means acting on the channel follower to decelerate it as it completes its movement in one direction and accelerate it during its initial movement in the opposite direction.

2 Claims, 8 Drawing Figures



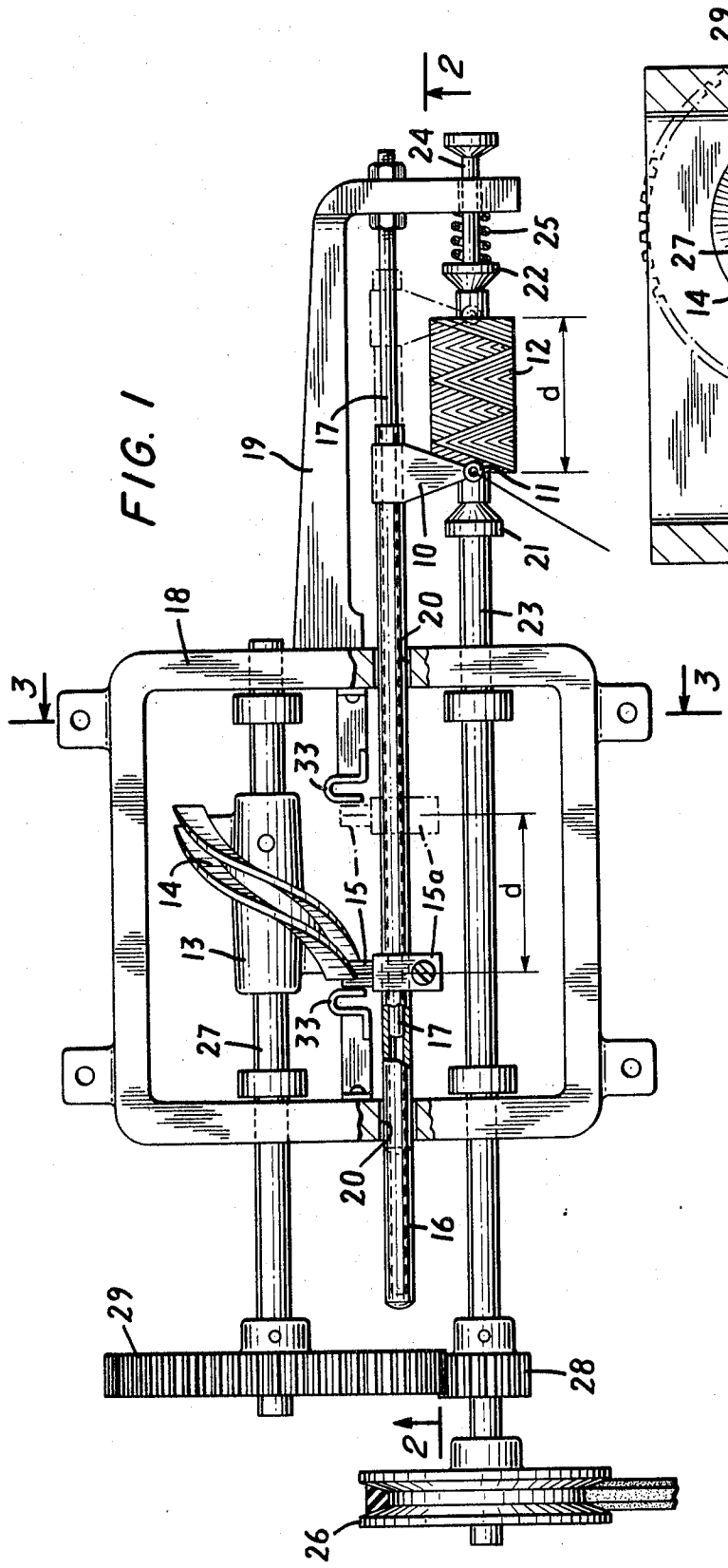


FIG. 1

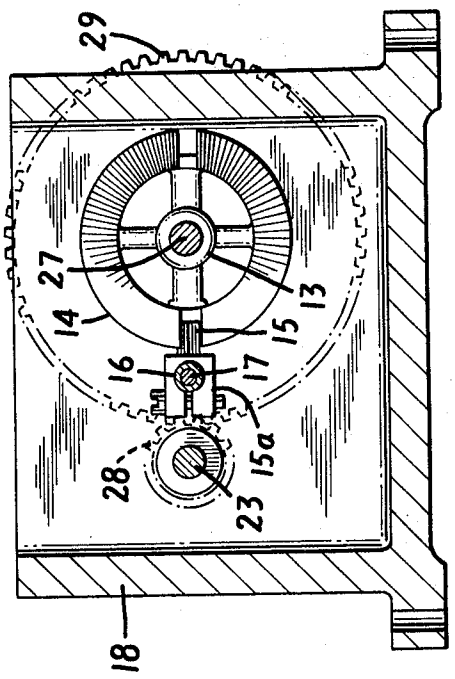


FIG. 3

INVENTOR.
ARCADIO ESPASA

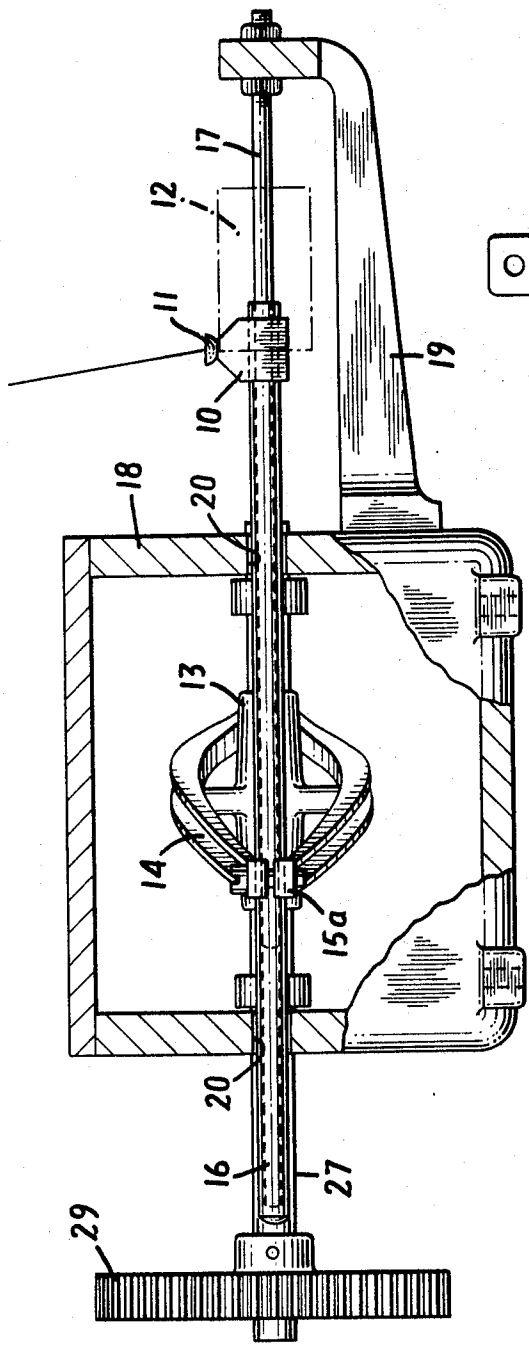


FIG. 2

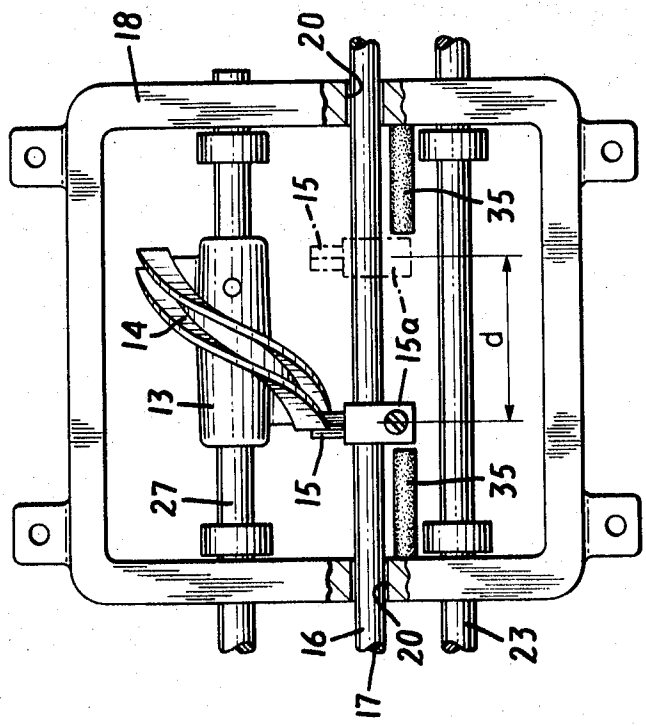


FIG. 4

INVENTOR.
ARCADIO ESPASA

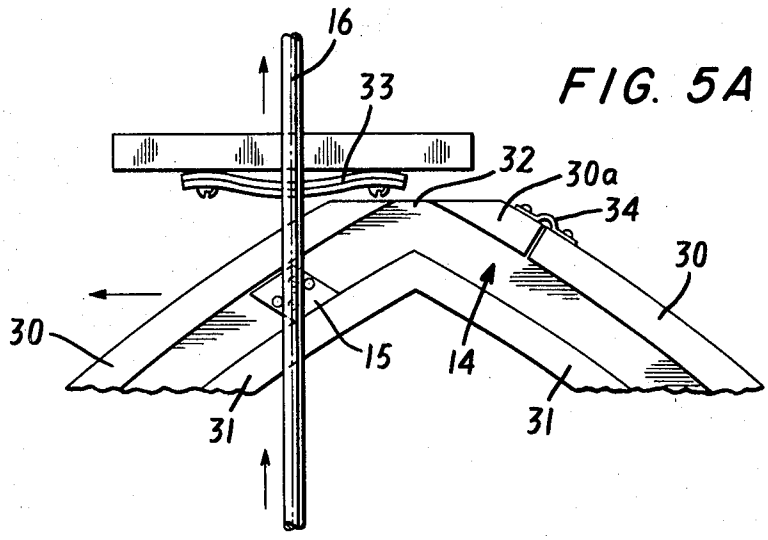


FIG. 5A

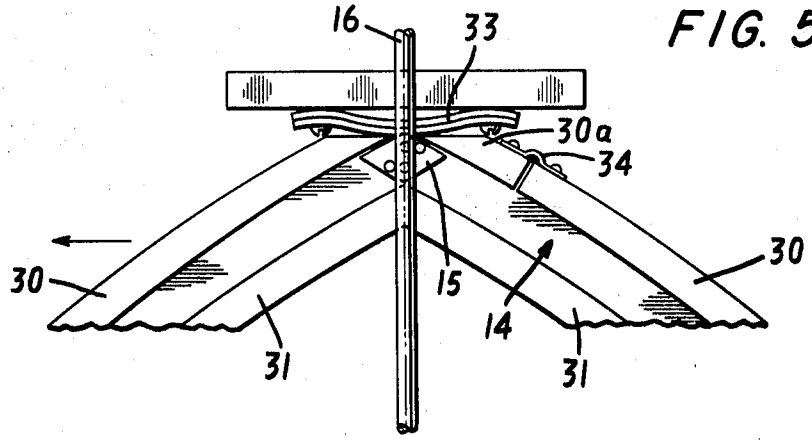


FIG. 5B

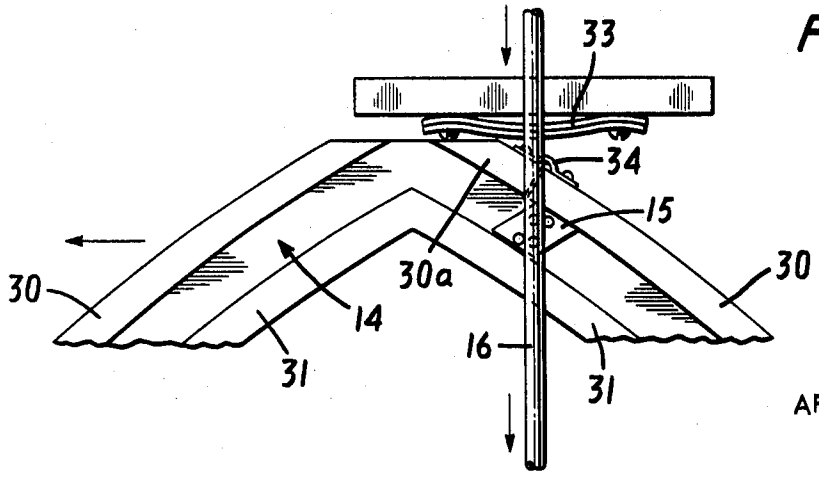


FIG. 5C

INVENTOR.
ARCADIO ESPASA

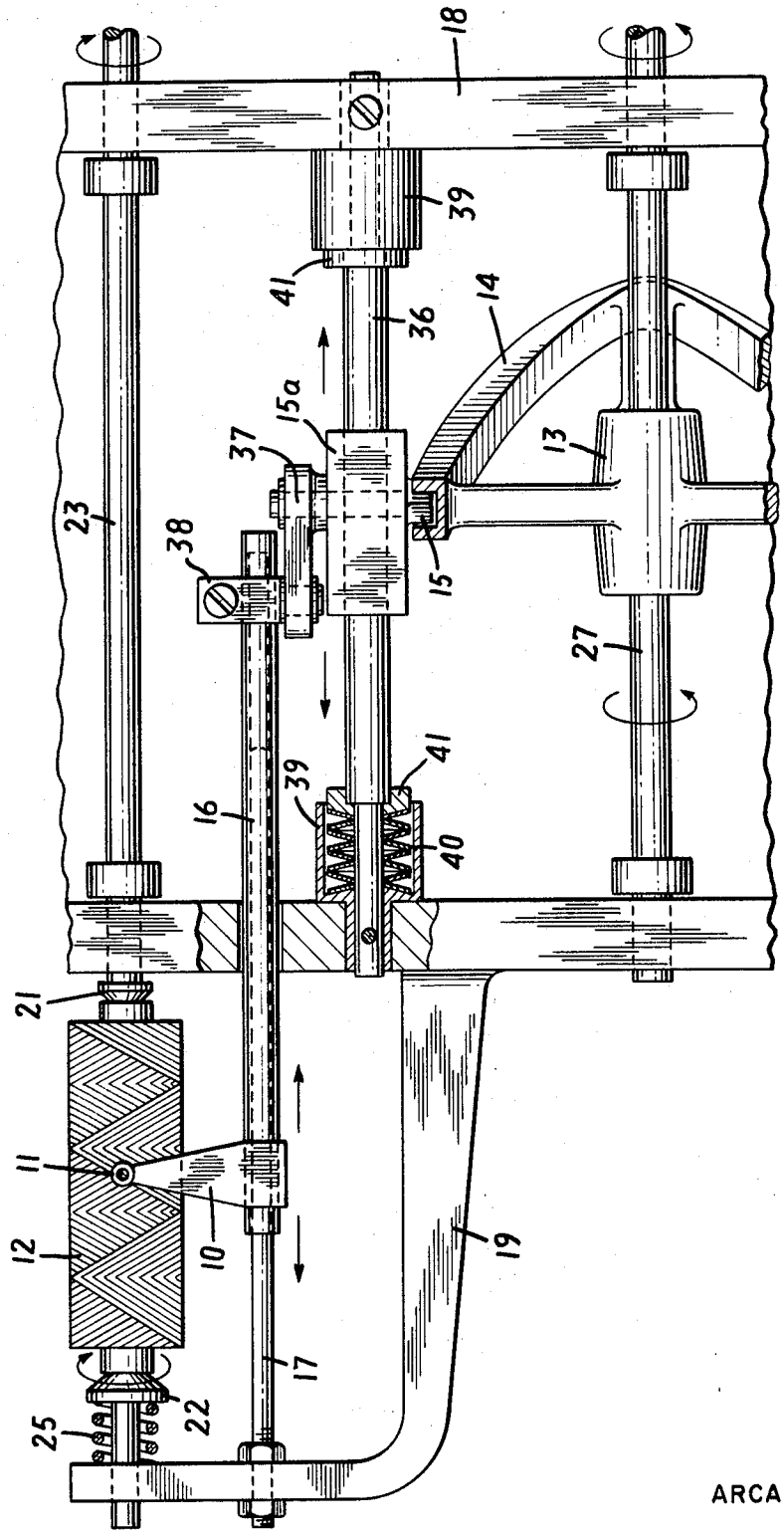


FIG. 6

INVENTOR.
ARCADIO ESPASA

DEVICE FOR IMPARTING RECIPROCATORY MOTION TO A MOVING ELEMENT

This invention relates to a device for imparting reciprocatory motion to a moving element wherein it is desired to quickly decelerate the movable element as it completes its travel in one direction and to accelerate it during the initial motion in the opposite direction with minimum impact and friction.

The present invention has particular application to certain types of mcahines in which it is desired to impart an alternating or reciprocatory motion at substantially uniform and constant velocity over as much of the travel in each direction as is possible. One such application of the present invention is for imparting reciprocatory motion to a thread guide for cross-winding thread onto a bobbin. In such machines it is desirable that the thread guide move at relatively uniform and constant velocity in each direction and to reverse direction as quickly as possible. Ideally, the change in direction should be accomplished almost instantaneously, but the devices heretofore proposed to accomplish a rapid change in direction have been characterized by excessive impact and friction, especially at high speeds of operation.

The object of the present invention is to provide a device for imparting reciprocatory motion to a moving element capable of quickly decelerating the speed at the completion of one stroke and accelerating the speed at the beginning of the stroke in the opposite direction with minimum impact and friction. Toward this end, the device of the present invention embodies a driven rotor having a channel formed around the outer periphery, a channel follower connected to the member to which the reciprocatory motion is to be imparted and impact absorbing means acting on the channel follower to decelerate it rapidly as it completes its stroke in one direction and to accelerate up to the desired velocity as it begins its stroke in the opposite direction.

For a complete understanding of the present invention reference can be made to the detailed description which follows and to the accompanying drawings, in which:

FIG. **1** is a plan view of the device of the present invention;

FIGS **2** and **3** are sectional views taken on the lines **2—2** and **3—3**, respectively, of Figure **1**, looking in the direction of the arrows;

FIG. **4** is a plan view illustrating an alternative embodiment of the invention;

FIGS. **5A**, **5B** and **5C** are schematic views showing the channel follower near the end of one stroke, at the point of reversal and at the beginning of the return stroke; and

FIG. **6** is a plan view of another alternative embodiment of the invention.

Referring to the drawings, the present invention is shown as applied to a device for imparting reciprocatory motion to a thread guide **10** having an eyelet **11** which reciprocates over a distance *d* between the ends of a bobbin **12** on which the thread is being cross-wound. The thread passes through the eyelet as it is wound onto the bobbin.

The reciprocatory motion is imparted to the thread guide **10** by a driven rotor **13** having a channel **14** formed around the outer periphery and a channel follower **15** carried by a support **15***a* which is mounted on a reciprocating tube **16** in telescoping relation with a guide rod **17**. The driven rotor **13** and the channel follower **15** are accommodated within a housing **18**, and the rod **17** is supported at one end by a bracket **19** which extends outwardly from one side of the housing. The tubular element **16** is guided in its reciprocatory motion on the rod **17** within openings **20** in the housing.

The bobbin **12** is held between a pair of tapered supports **21** and **22**, the support **21** being mounted at the end of a drive shaft **23** and the support **22** being mounted at the end of a plunger **24** and urged into operative engagement with the bobbin by a spring **25**. Rotation is imparted to the spool by a belt driven pully **26** mounted on the opposite end of the shaft **23**.

The driven rotor **13** is mounted on a shaft **27** which is also driven at the proper speed by the pulley **26** through a gear **28** mounted on the shaft **23** and a gear **29** mounted on the shaft **27**.

The channel **14** includes a section for moving the channel follower **15** at a relatively uniform and constant velocity in one direction and a section for moving the channel follower at a relatively uniform and constant velocity in the opposite direction. Intermediate these two sections the channel follower is quickly decelerated at the end of the travel in one direction and quickly accelerated at the start of its travel in the opposite direction so that the reversal will occur as quickly as possible with a minimum of impact and friction.

The means for accomplishing the reversal in direction of the channel follower is illustrated schematically in FIGS **5A**, **5B**, and **5C** of the drawings. In FIG. **5A**, the channel follower **15**, shown in its preferred form as a rhombus, is guided between the channel walls **30** and **31** approaching the end of the travel in one direction. At the section of the channel at which the reversal occurs the outer wall **30** of the channel is provided with an opening **32** to permit the channel follower to engage in impact absorbing element **33**, in this instance a spring, which absorbs the impact of the change in direction and quickly decelerates the channel follower at the terminal end of its movement in one direction and thereupon accelerates the channel follower at the beginning of its movement in the opposite direction.

When the channel follower reaches the opening **32** in the channel wall **30**, as shown in FIG. **5B**, it engages the spring **33** and begins its movement in the opposite direction, initially engaging a channel wall section **30***a* which is resiliently mounted at the leading end of the return section of the channel by means of a resilient mounting or spring **34**. The resiliently mounted channel wall section **30***a* absorbs part of the impact of the channel follower as it begins its return movement and makes it possible to replace the part of the channel wall which is subject to the greatest wear. The channel follower is quickly accelerated to the desired uniform velocity, as shown in FIG. **5C**.

The channel follower **15** can be of circular or ovaloid section, but in the preferred shape of a rhombus it adapts to the shape and change in direction of the channel. At the point of reversal the two opposite edges to be guided by the return section of the channel are presented to the return section before the other two opposite guided edges leave the previous section of the channel, as illustrated in FIG. **5B**.

Instead of providing an opening **32** in the channel wall **30**, the width of the channel can be enlarged at this point to afford the channel follower sufficient displace-

ment to enable it to impart the impact to the resilient element **33.** Also, the channel follower need not directly engage the resilient element **33.** In the embodiment illustrated in FIG. **4,** the support **15***a* for the channel follower engages blocks **35** of resilient material at each end of the stroke.

To afford a rapid reversal of the reciprocating parts, it is desirable that the inertia of the movable parts be reduced to a minimum. Although the inertia of the hollow tube **16** in the embodiment illustrated in FIG. **1** is relatively small, in the embodiment illustrated in FIG. **6** the overall length of the reciprocating tube **16,** and hence the inertia, is substantially reduced. In this embodiment the channel follower support **15***a* slides on a shaft **36** mounted at opposite ends in the housing **18.** The movable support **15***a* carries an arm **37** which is connected with a part **38** clamped to the tubular element **16.**

The means for absorbing the impact of reversal in the embodiment illustrated in FIG. **6** includes cupshaped elements **39** mounted to opposite inner walls of the housing **18,** each containing a plurality of elastic washers **40** of the Belleville or Schnorr type and having a plastic end collar **41** which receives the impact of the channel follower support **15***a* at the end of the stroke.

The present invention has been shown in its preferred forms and by way of example only, and many modifications and variations may be made within the spirit of the invention. The invention, therefore, is not to be limited to any particular form or embodiment except insofar as such particular forms or embodiments are expressly set forth in the claims.

I claim:

1. A device for imparting reciprocatory motion to a moving element comprising a driven rotor, a continuous channel carried by the driven rotor and formed around the outer periphery thereof, a channel follower engaging said channel and connected to the memeber to which the reciprocatory motion is imparted, one part of the channel imparting motion to the channel follower in one direction and another part of the channel imparting motion to the channel follower in the opposite direction, the two parts of the channel intersecting at an angle requiring the channel follower to change direction abruptly in passing from one part to the other, an open zone in the outer wall of the channel between the two parts thereof, and resilient impact absorbing means mounted in position to be aligned with said opening on each revolution of the driven rotor to enable the channel follower to engage the impact absorbing means through the opening at the end of the stroke of the channel follower whereby each time the channel follower passes from one part of the channel to the other the resilient impact absorbing means decelerates the channel follower as it completes its movement in one direction and accelerates its movement in the opposite direction.

2. A device for imparting reciprocatory motion to a moving element comprising a driven rotor, a continuous channel carried by the driven rotor and formed around the outer periphery thereof, a channel follower engaging said channel and connected to the member to which the reciprocatory motion is imparted, one part of the channel imparting motion to the channel follower in one direction and another part of the channel imparting motion to the channel follower in the opposite direction, the two parts of the channel intersecting at an angle requiring the channel follower to change direction abruptly in passing from one part to the other, and open zone in the outer wall of the channel between the two parts thereof, a tubular element connecting the channel follower and the moving element and a guide rod in telescoping engagement with an end of the tubular element to support it for reciprocatory motion.

* * * * *