Feb. 2, 1960 F. W. WALSH 2,923,164

IMPROVED ROTARY TO RECIPROCAL MOTION CONVERTER

Filed Dec. 30, 1957

FIG. 1

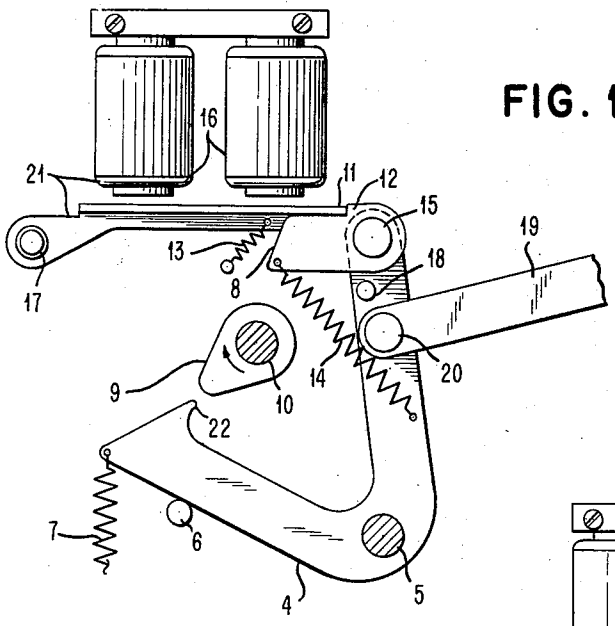


FIG. 2

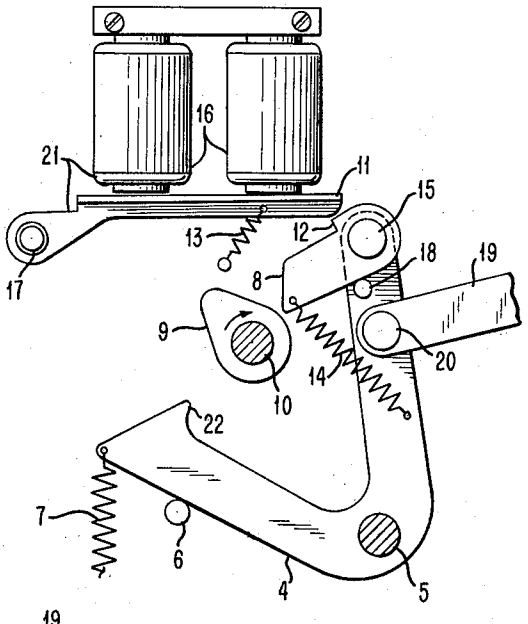
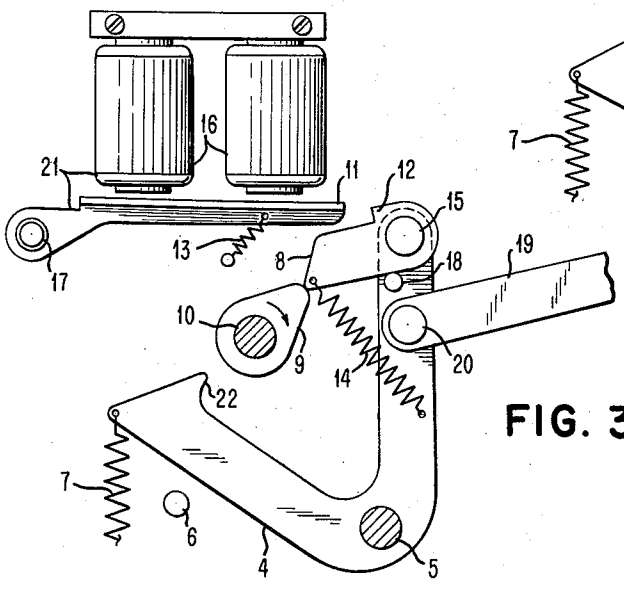


FIG. 3



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United States Patent Office 2,923,164 Patented Feb. 2, 1960

2,923,164

IMPROVED ROTARY TO RECIPROCAL MOTION CONVERTER

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Application December 30, 1957, Serial No. 706,068

1 Claim. (Cl. 74—54)

This invention relates to an improved device for converting a continuous rotary motion to selective reciprocal motion in a link, and more particularly to a device of the kind described which is adaptable for use in automatic machinery.

In data processing, there are many applications in which a record card is moved past data-sensing elements, and the path over which the card will travel is determined by data so sensed. The process of automatic quality control testing frequently includes moving an article past various quality-sensing elements, which elements can detect conditions of below-minimum standards as the article feeds past them. In both of these applications, it is desirable to provide means which can respond to said random sensing, at any of a plurality of times, by mechanically pushing the card or article into a different path of motion; the pushing must be synchronized with the movement of the cards or articles so as to act on only the selected one thereof. Since the motion of the cards or articles is in synchronism with the main rotary power of the machine, a rotary-to-reciprocal motion converter designed for random stroking is suitable for this purpose.

Certain of these devices are known in which friction is used to transmit the rotary force; other devices are known in which the occurrence of a stroke will condition additional outside mechanism so as to reach in and reset the mechanism following the stroke in preparation for a further stroke; still other devices are known to have one or more sets of moving parts in contact whether the device is in operation or not.

A more suitable type of device is that which has a rotating cam or eccentric and a cam follower which may selectively be placed in the path of the cam. In some devices of this type a cam follower is resiliently urged out of the path of the cam and is selectively pressed into the path of the cam by some mechanical means. In others the cam follower is resiliently urged into the path of the cam, and is restrained from so doing by some mechanical means; in devices of this type heretofore available, the permissive passing of the cam follower into the path of the cam is effected in such a way that should the permissivity be applied only for an instant, the cam follower will be in the path of the cam only for an instant, the position of the cam follower being dependent upon the absolute position of the mechanical permissive means. In the above recited applications, both of these types of devices must provide for the cam follower to be mechanically pushed into the path of the cam for a suitably long time so that the cam can engage the follower and rock it. Alternatively, use of these devices requires that the mechanical means used to force the cam follower into the path of the cam be synchronized with the rotation of the cam so that the force will be applied at the exact instant during which the cam may engage the follower.

Accordingly, the main object of the invention is to provide a reliable, high speed random stroking device of

the type which positively converts the rotary power of a shaft into reciprocating power in a connecting link, with no moving parts in contact during its quiescent state, and which is completely self-reset so that there are no moving parts in contact except during a power stroke.

Another object is to provide a random stroking device which can be enabled for a stroke by a momentary condition occurring at any time within a period, and which can execute said stroke at a particular time with respect to said period.

Another object is to provide a device of the class described in which maximum time is allowed for the movement of each of the functional parts of a device.

It is a further object of the invention to provide a device of the class described with essentially a foolproof latching mechanism which may be operated without being synchronized to the main rotating power.

A more particular object is to provide a random stroking device in which a cam follower pivotably restrained on a bell crank may be urged into the path of a rotating camming lobe, the lobe then acting on said follower causing the bell crank to rotate so as to execute a stroke, said follower being latched out of the path of said lobe in response to the motion of said bell crank, said latch being ineffective to otherwise restrain said follower once said follower is released therefrom.

This invention contemplates the use of a mechanical latch which will hold a cam follower out of the path of a cam, said cam follower being operable in response to the motion of said cam to cause a link to reciprocate, characterized by the provision of a mechanical latching means which moves in and out of the latching position in such a manner as to latch the cam follower reliably, the follower being completely immune from the latching means after release therefrom and until the link completes a stroke.

Other objects of the invention will be pointed out in the following description and claim and illustrated in the accompanying drawing, which disclose, by way of example, the principle of the invention and the best mode which has been contemplated of applying that principle.

In the drawing:

Fig. 1 is a front elevation of the device, shown in the inoperative, or rest position.

Fig. 2 is a front elevation showing the device unlatched for operation within the current cycle.

Fig. 3 is a front elevation showing the maximum displacement of the device in its operating cycle.

Referring to Fig. 1, a bell crank **4** rotatable on a pivot **5** is held against a stop pin **6** by a spring **7**. The bell crank has fastened to it a pivot **20** rotatably restraining a link **19**, a pivot **15** about which an operator **8** may rotate, a stop pin **18**, and one end of a spring **14**. An eccentric **9** is fixed to a shaft **10** rotating at machine speed. A magnetic latch **21** fitted with two coils **16** and an armature **11** rotatable about pivot **17** is mounted to cooperate with the operator.

When the device is at rest as shown in Fig. 1, the bell crank **4** is against the stop **6** and the link **19** is in the leftward position. The coils **16** of the magnetic latch are not energized, and the armature **11** is interfering with the lip **12** of the operator so as to prevent the spring **14** from rotating the operator into the path of the eccentric.

Referring now to Fig. 2, the coils **16** are energized in response to the random occurrence requiring operation of the device. The magnetic force has rotated the armature **11** away from the lip **12** permitting the spring **14** to rotate the operator **8** into the path of the eccentric **9**. The eccentric rotates into contact with the operator and applies a force slightly downward and to the right. Since the stop pin **18** restrains the operator from rotating about the pivot **15** in a counterclockwise direction, the force

applied to the operator is transmitted through the stop pin to the bell crank.

The bell crank is then positively rotated in a clockwise direction about its pivot **5**, as shown in Fig. 3. As the bell crank rotates, the pivot **20** forces the arm **19** to the right. This motion of the arm is the desired result. As the high point of the eccentric rotates past the operator, the bell crank starts to rotate in the counterclockwise direction under the restoring action of spring **7**. If the coils **16** have been de-energized by this time, the lip **12** will contact the armature **11** as the bell crank rotates, and the operator **8** will then rotate clockwise on its pivot **15** against the action of spring **14**. Should the action of spring **7** be ineffective in returning the bell crank in high speed operation, the eccentric will contact the projection **22** on the bell crank and force it in a counterclockwise direction sufficiently to relatch the operator. If another stroke is required, the operation may be repeated. If several strokes are required in succession as a group, the magnetic latch coils may remain energized through several cycles; the operator will not rotate about its pivot and will therefore be in the path of the eccentric as soon as the bell crank has rotated to its rest position.

Reviewing the desirable features of the invention, it should be noted that there is contact between moving parts only during the portion of an operating cycle in which the link is being driven, eliminating unnecessary wear and noise.

The bell crank is positively rotated to a point where the operator is past the latch and positively returned therefrom. As the bell crank returns, the armature may positively engage the lip on the operator and cause rotation of the operator with respect to the bell crank, and thereby positively remove the operator from the path of the cam.

Similarly, the drive to the link is positive and therefore capable of great force.

The coils may be energized anytime within a quarter of a cycle after the eccentric has rotated past the projection **22** on the bell crank; since the operator will be acted on by the eccentric at the same point in each cycle, the device is self-synchronizing.

The armature may be released by the magnet to be returned to a latched condition by the spring **13** immediately after the operator has rotated against its stop pin; the armature will ride above the lip on the operator until the bell crank reaches its maximum displacement, and will then engage the lip. Also, as mentioned before, there is over a quarter of a cycle available in which to unlatch the operator and rotate it into the path of the eccentric. These two features allow very fast reliable operation.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claim.

What is claimed is:

A device having no moving parts in contact during its quiescent state for selectively converting the rotation of a power shaft to a reciprocable link with inherent reliability at high speed, comprising with said shaft and said link, an eccentric camming lobe continuously rotating with said shaft, a bell crank disposed for rotation near said lobe; a cam follower pivotably mounted on said bell crank so as to be rotatable in one direction into the path of said lobe, said follower having a lip thereon; means to resiliently urge said follower into the path of said lobe, the shape of said lobe and said follower being effective to cause said follower to be driven into rather than out of the path of said lobe whenever said lobe contacts said follower; a pin on said bell crank adapted to limit the rotation of said follower on said bell crank in the direction of rotation caused by the force of said lobe on said follower, whereby said follower and said bell crank rotate as a unit in response to the force of said lobe, and said lip travels over a definite path; means to return said bell crank to its rest position after the high point on said lobe passes said follower, said lip thereby returning on said definite path; a latch normally positioned to intercept said lip as said bell crank is returned to withdraw said follower from the path of said lobe and to latch said follower in an inoperative position; and means to move said latch in a direction substantially perpendicular to the motion of said follower to thereby retract said latch and allow said follower to move into the path of said lobe, said latch being ineffective to withdraw said follower except on the return of said bell crank.

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