June 19, 1962 N. H. SWANSON 3,039,665

WORK FEEDING DEVICES

Filed April 2, 1959

FIG. 1

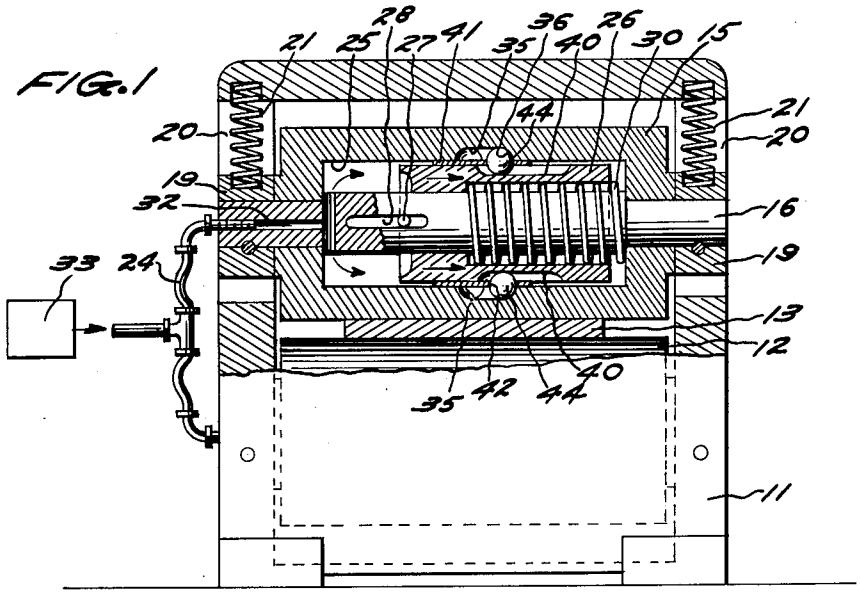


FIG. 2

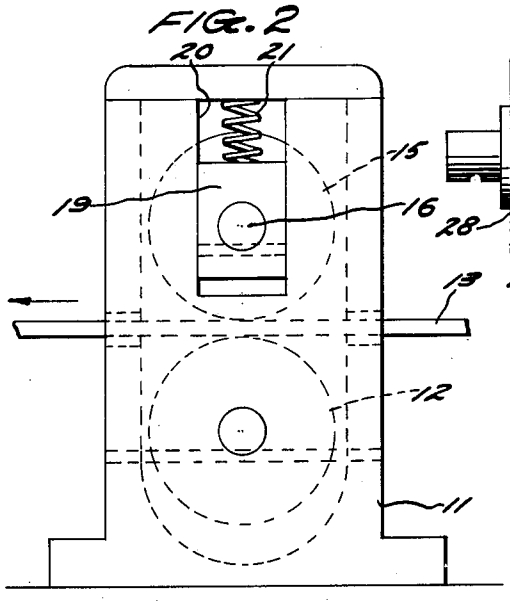
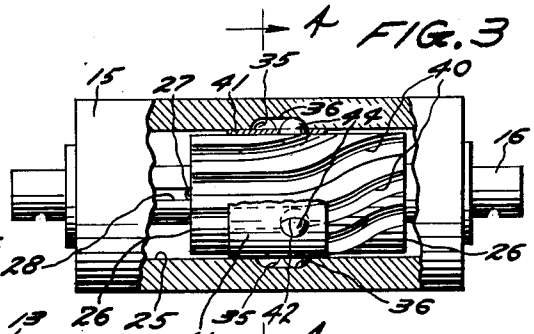


FIG. 3



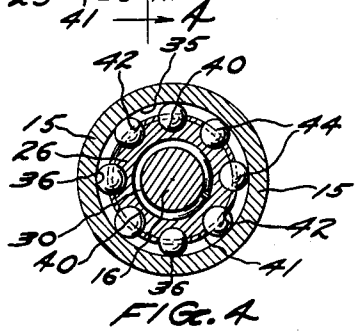


FIG. 4

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WORK FEEDING DEVICES

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6 Claims. (Cl. 226—152)

This invention relates to work feeding devices and more particularly to devices for advancing a strip intermittently.

It is often desirable to feed strip stock in intermittent steps rather than continuously, and in cases where the stock is fed to a punch press it is necessary to so advance the stock. Also, it is further desirable, in certain cases where a feed roller is used, to provide a roller which is not rigidly held in the intervals between feeding strokes.

One of the objects of this invention is to provide a novel and improved device for feeding strip stock.

Another object of this invention is to provide a device for feeding strip stock in intermittent steps.

Still another object of this invention is to provide a device having a driven feed roller which may be rotated manually between feeding strokes so as to facilitate the insertion of a strip into position to be advanced by the feed roller.

One embodiment of the present invention may include a pair of rollers which cooperate to advance a strip, one of the rollers having a piston movable back and forth in a cylindrical recess therein. The piston, which is fixed for translational motion only, is provided with a plurality of generally helical grooves in the cylindrical face thereof in which a plurality of spherical members are positioned. The members are spaced in relation to one another by a retainer which is mounted yieldably about the piston face. As the piston moves in one direction the retainer is moved axially by frictional contact with the piston a distance to carry the spherical members into an annular groove in the wall forming the recess of the one roller. The roller is free to be rotated when the spherical members are within the annular groove. However, when the piston is moved in the opposite direction, the retainer moves axially with the piston by frictional contact therewith such that the spherical members are rolled into longitudinally extended pockets interconnected with the annular groove. As the piston continues its movement in this direction, the axial movement of the retainer is arrested when the members reach the end walls of the pockets and the piston slides within the retainer such that the members follow the helical grooves in the piston face to cause the one roller to rotate, thereby advancing the strip. Movement of the piston is effected in one direction by compressed air and in the other direction by a spring.

Other objects and advantages of the invention will be apparent by reference to the following detailed description and the accompanying drawing illustrating a preferred embodiment of the invention in which:

FIG. 1 is a sectional front view showing the structural relationship of the various elements of a device embodying the principles of the invention;

FIG. 2 is an end view of the device showing the manner in which a driving roller and its associated mechanism is spring loaded downward onto a strip to be advanced;

FIG. 3 is a fragmentary sectional view illustrating the configuration of grooves in a piston which actuates a driving roller; and

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3 showing a plurality of spherical members which interconnect the piston and the driving roller.

Referring now in detail to the drawing, a base **11** is shown supporting an idler roller **12** across which a strip **13** is to be advanced intermittently. A driving roller **15** is mounted for rotation on a shaft **16** and cooperates with the idler roller **12** to move the strip **13**. The shaft **16** is keyed to blocks **19** slidably mounted in slots **20** in the upper portion of the base **11** and urged downward by compression springs **21**.

The driving roller **15** is provided with a cylindrical internal recess **25** within which a piston **26** is positioned. The piston **26** is mounted slidably on the shaft **16** and is connected or keyed thereto by a pin **27** which extends through a slot **28** in the shaft **16**, this connection preventing rotation of the piston. A compression spring **30** (FIG. 1) normally urges the piston **26** to the left as shown in FIG. 1. Compressed air from a source **33** is passed into the recess **25** through a flexible coupling **24** and an opening **32** in the shaft **16** to move the piston **26** to the right against the action of the spring **30**.

The driving roller **15** is provided with an annular groove **35** which lies in a plane normal to the axis of the shaft **16** and has interconnected therewith a plurality of spaced pockets **36** which extend axially from the groove **35**, the annular groove and the pockets opening on the recess **25**. The piston **26** is provided with a plurality of spaced grooves **40** which are straight for a first portion of their lengths and helical for a second portion of their lengths. The grooves **40** are spaced a distance apart equal to the distance between adjacent pockets **36**.

A tubular retainer **41** is positioned to slide between the piston **26** and the driving roller **15** and is provided with a plurality of openings **42** in which are positioned spherical metal members **44**. The spherical members **44** are positioned partially in the grooves **40** in the piston **26** and partially in the groove **35** or the pockets **36** of the driving roller **15** and serve to interconnect the piston to the driving roller. The retainer **41** maintains the spacing between the members **44** equal to the spacing of the grooves **40** of the piston and the spacing of the pockets **36**. The structure effecting the interconnection between the piston **26** and the roller **15** is disclosed and claimed in Patent No. 2,556,010, issued to N. H. Swanson on June 5, 1951, for "Indexing Mechanism for Translating a Reciprocatory Motion Into a Step-By-Step Rotary Motion."

In operation of the device, a strip **13** is inserted between the rollers **12** and **15** and compressed air is admitted to the recess **25** through the flexible coupling **24** and the opening **32** to move the piston **26** to the right (FIGS. 1 and 3). As the piston **26** moves to the right the spherical members **44** are carried by the retainer **41** from the annular groove **35** into the pockets **36**. As the piston **26** continues its movement, the axial movement of the retainer **41** is arrested by abutment of the members **44** against the end walls of the pockets **36**. When the retainer **41** stops its movement axially, the piston **26** continues its axial movement and cams the spherical members **44** against the walls of the helical grooves **40** in the piston **26** to rotate the retainer **41** and with it the roller **15** to advance the strip **13**.

The compressed air is then released from the recess **25** to permit the spring **30** to return the piston **26** to its normal starting position. During the first part of the movement of the piston **26** to the left, the spherical members **44** move axially with the retainer **41** to roll out of the pockets **36** into the annular groove **35**. The axial movement of the retainer is arrested when the members **44** abut the wall of the annular groove **35**.

and the retainer 41 is then rotated by camming action of the helical portion of the grooves 40. The roller 15 is not rotated when the members 44 are within the annular grooves 35, the retainer 41 being rotated the incremental distance equal to the spacing between pockets 36 instead. Also, so long as the members 44 are in the annular groove 35, the driving roller 15 can be rotated freely upon the members 44.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A device for feeding a strip, comprising a base, a first shaft mounted fixedly to the base, an idler roller mounted rotatively on the first shaft for supporting a strip to be advanced, a second shaft secured to the base spaced above the first shaft in a vertical plane including the first shaft, a driving roller mounted on the second shaft for cooperation with the idler roller, said driving roller having an internal cylindrical recess therein, a piston reciprocably mounted in said recess, means for reciprocating the piston, and means mounted yieldably on the piston for axial movement with the piston and rotatable movement about the piston interconnecting the piston with the driving roller for rotating by cam action said driving roller after the piston is moved axially a predetermined distance.

2. A device for feeding a strip, comprising a base, a first shaft mounted fixedly to the base, an idler roller mounted rotatively on the first shaft for supporting a strip to be advanced, a second shaft secured to the base spaced above the first shaft in a vertical plane including the first shaft, a driving roller mounted on the second shaft for cooperating with the idler roller to advance the strip, said driving roller having an internal cylindrical recess extending longitudinally therein, said driving roller also having an annular groove and a plurality of longitudinally extending pockets opening on said recess, a piston keyed to and slidably mounted for reciprocation on the second shaft in the recess in the driving roller and having a plurality of helical grooves in its outer surface, means for reciprocating the piston, a tubular retainer mounted yieldably on the piston for axial movement therewith and rotation thereon and positioned between the piston and the driving roller, the retainer having a plurality of spaced apertures around the periphery thereof, and a plurality of spherical members positioned in the apertures in the retainer and extending into the grooves in the piston and also extending into the annular groove in the driving roller, said spherical members being movable while positioned by the retainer from said annular groove into said pockets when the piston is moved so as to connect drivingly the driving roller to said piston whereby the roller is rotated incrementally by coaction of the members in the pockets and the piston grooves, and the retainer is rotated incrementally by coaction of the members when in the annular groove and the piston grooves.

3. A device for feeding a strip, comprising a base, an idler roller mounted rotatively on the base for supporting a strip to be advanced, a pair of blocks slidably mounted on the base, a shaft secured to the blocks, a driving roller rotatably mounted on the shaft and having a cylindrical internal recess extending along the shaft, a pair of springs engaging the blocks for urging the driving roller toward the idler roller, said driving roller also having an annular groove and a plurality of longitudinal pockets extending from the annular groove, said groove and said pockets opening on the cylindrical recess, a piston slidably mounted for reciprocation on the shaft in the recess and having in the periphery thereof a plurality of helical grooves, a tubular retainer mounted yieldably on the piston for axial movement therewith and rotation thereon and positioned between the piston and the driving roller and having a plurality of spaced apertures around the periphery thereof, a plurality of spherical members positioned in the apertures in the retainer and extending into the helical grooves in the piston and the annular groove in the driving roller, said spherical members being movable while positioned by the retainer from the annlar groove into the pockets so as to connect the piston to the driving roller when the piston is moved along the shaft, a spring positioned in the recess in the driving roller for urging the piston in one direction, and air supply means interconnected with the recess in the driving roller for urging the piston in the other direction against the action of the spring.

4. A stock advancing mechanism comprising a base, a pair of spaced blocks slidably mounted in the base, means for resiliently supporting the blocks, a shaft secured to and extending between the blocks, a drive roller rotatively mounted on the shaft and having a cylindrical recess extending longitudinally therein, a piston mounted for axial movement in said recess, a source of compressed fluid, a flexible coupling extending from said source to said recess to apply fluid to axially move said piston, said piston having helical cam slots extending along the peripheral surface thereof, means extending from the roller into said cam slots to translate axial movement of the piston into rotary movement of the roller, and means for supporting and guiding the stock against the drive roller.

5. A device for translating reciprocatory motion into rotary motion comprising a shaft, a pair of spaced bearing blocks for supporting the shaft, means for resiliently supporting the blocks for movement transverse of the axis of the shaft, a roller mounted for rotation on the shaft, the roller having a cylindrical recess extending longitudinally therein, the roller also having an annular groove and a plurality of longitudinally extending pockets joining the groove, the groove and pockets opening on the recess, a piston slidably mounted for reciprocation on the shaft within the recess in the roller and having a plurality of helical grooves in its outer surface, means including a source of compressed air and flexible couplings interconnecting the source of compressed air to the cylindrical recess for applying air to the recess for reciprocating the piston, a tubular retainer mounted yieldably on the piston for axial movement therewith and rotation thereon and positioned between the piston and the roller, the retainer having a plurality of spaced apertures around the periphery thereof, and a plurality of spherical members positioned in the apertures in the retainer and extending into the grooves in the piston and into the annular groove and pockets in the roller, the spherical members within the apertures being movable while positioned by the retainer from the annular groove into the pockets when the piston is moved for connecting drivingly the roller to the piston whereby the roller is rotated incrementally by coaction of the members in the pockets and the piston grooves, and the retainer is rotated incrementally by coaction of the members when in the annular groove and in the piston grooves.

6. A device for translating reciprocatory motion into rotary motion comprising a shaft, a pair of spaced bearing blocks for supporting the shaft, means for resiliently supporting the blocks for movement transverse of the longitudinal axis of the shaft, a roller mounted for rotation on the shaft having a cylindrical internal recess coaxial with the shaft, the roller also having an annular groove and a plurality of longitudinal pockets extending from the annular groove, the groove and the pockets opening on the cylindrical recess, a piston slidably mounted for reciprocation on the shaft and within the recess and having a plurality of helical grooves formed in the piston surface, a tubular retainer mounted yieldably on the piston for axial movement therewith and rotation thereon and positioned between the piston and the roller and

having a plurality of spaced apertures around the periphery thereof, a plurality of spherical members positioned in the apertures in the retainer and extending into the helical grooves of the piston surface and the annular groove in the roller, the spherical members being movable while spacially positioned by the retainer from the annular groove into the pockets for connecting drivingly the piston to the roller when the piston is moved along the shaft, resilient means positioned in the recess within the roller for urging the piston in one direction, and fluid power means in communication with the piston for urging the piston in the other direction against the action of the resilient means.

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