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ESCAPEMENT MECHANISM

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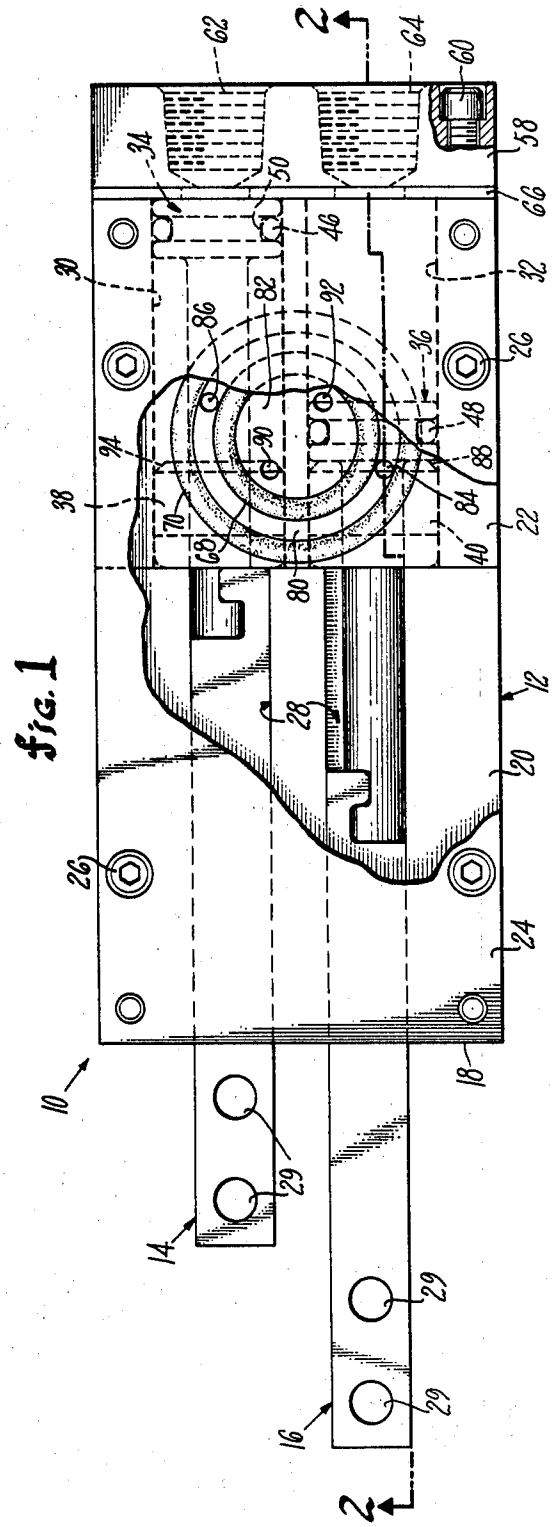


Fig. 1

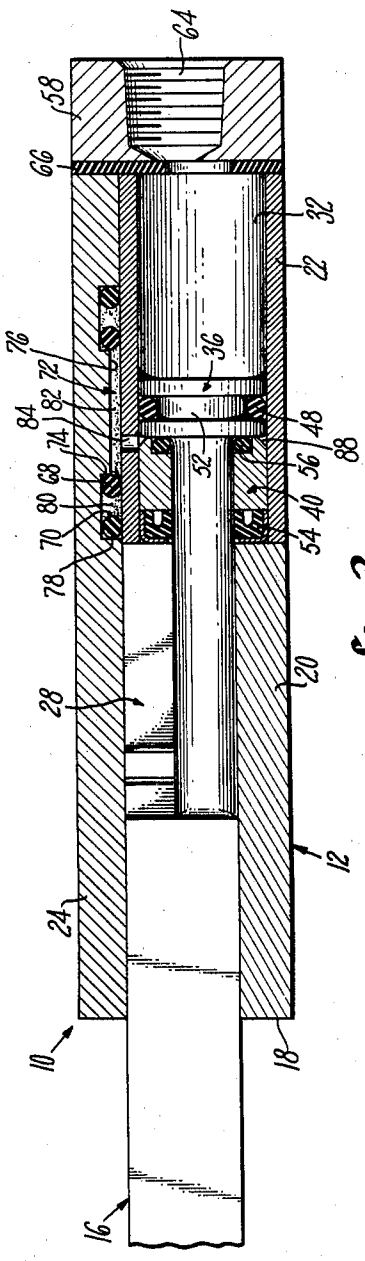


Fig. 2

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ESCAPEMENT MECHANISM

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ABSTRACT OF THE DISCLOSURE

Mechanism comprising a pair of operating rods reciprocable within a pair of passageways formed in a housing, and fluid operating means for controlling reciprocation of the operating rods, the fluid operating means including internal fluid passages connecting a forward portion of each one of the passageways with a rear portion of the other of the passageways only when both operating rods are in extended positions.

This invention generally relates to article handling mechanisms and particularly concerns escapement mechanisms for successively releasing a series of objects in a continuous operation.

A principal object of the invention is to provide an improved escapement mechanism of the reciprocating type for successively releasing a series of objects one at a time, as well as for releasing several objects at a time, in a controlled manner and at high delivery rates.

Another object of the invention is to provide an improved fluid operated escapement mechanism which is easily installed as an accessory in both new and existing equipment and which is particularly suited for feeding and counting applications.

A further object of the invention is to provide an escapement mechanism of the above described type incorporating a minimum number of parts essentially free of maintenance requirements.

Still another object of the invention is to provide an improved escapement mechanism which is both durable and dependable in operation for extended use over a long service life and which is provided in a rugged, compact assembly.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

In the drawing:

FIG. 1 is an elevational view, partly in section and partly broken away, showing a preferred embodiment of the invention; and

FIG. 2 is a section view, partly broken away, taken generally along line 2—2 of FIG. 1.

Referring now to the drawing in detail, an escapement mechanism **10** is illustrated having a rectangular housing **12** and a pair of axially movable operating rods **14, 16** projecting outwardly from a forward end **18** of the housing **12**. It will be understood that the housing **12** may be mounted on a supporting structure, not shown, and the rods **14, 16** are alternately axially reciprocated for feeding or releasing a series of objects one at a time, e.g., in accordance with the demands of an associated machine. The escapement mechanism **10** can also be used to release several parts at a time, as in counting applications.

In the preferred embodiment, the housing **12** is shown as being a solid body having forward portion **20** and rear portion or cylinder block **22** maintained in assembled relation by an overlying cover plate **24** secured by screws **26**, and a pair of longitudinally extending passageways **28** are provided in the housing **12** receiving the rods **14, 16** for sliding movement. The outwardly projecting portions of the rods **14, 16** preferably are provided with threaded holes **29** for mounting suitable escapement fingers, not shown conforming to the objects which are to be handled.

The rear portions of the passageways **28** are of enlarged size to provide a pair of operating cylinders **30, 32** longitudinally extending side-by-side through the cylinder block **22**, and actuating pistons **34, 36** on the rear ends of the rods **14, 16** are received in the cylinders **30, 32** for longtudinal reciprocating movement. Sleeves **38, 40** are secured in the forward ends of the cylinders **30, 32** forming seats for the pistons **34, 36** which divide their respective cylinders **30, 32** into forward and rear chambers.

A tight fluid seal is provided between the forward and rear chambers of the cylinders **30, 32** by annular seals **46, 48** retained in grooves **50, 52** extending around pistons **34, 36**, and the forward chamber of cylinder **32** is sealed against fluid leakage past the sleeve **40** by an annular seal **54** securely seated in cylinder **32** (FIG. 2) to encircle the rod of piston **36**. An O-ring **56** seated in sleeve **40** acts as a cushion for piston **36**. A similar arrangement is provided for sealing the forward chamber of cylinder **30** and for cushioning piston **34**.

An end member **58** of the housing **12** is fixed as by screw **60** to the rear end of the cylinder block **22**. A pair of threaded ports **62, 64** are formed in the end member **58** which serve to connect the rear chambers of each operating cylinder **30, 32** with a pair of conventional hose connectors, not shown, whereby the cylinders **30, 32** are both adapted to be connected to a source of fluid under pressure, preferably compressed air. A gasket **66** is interposed between the end member **58** and the cylinder block **22** to provide a tight fluid seal at the rear ends of the cylinders, and the gasket **66** in conjunction with end member **58** of the housing **12** establishes seats for the pistons **34, 36** in their retracted positions.

It will be understood that a conventional multiway reversing valve is provided in the fluid circuit upstream of the ports **62, 64** for alternately supplying compressed air to each one of the cylinders **30, 32** and for successively venting the rear chamber of the other cylinder in turn. Timing of the valving operation may be obtained by a conventional cycle control device automatically operated in a well-known manner from the above-mentioned associated machine.

While it is customary in escapement mechanisms to provide alternate operation of each operating rod at a specific point in the operating cycle of the other operating rod, the present invention effects an escapement operation wherein the operating rods **14, 16** are alternately power driven and are solely controlled by the simple expedient of internal porting of the cylinders **30, 32** while at the same time completely eliminating any necessity for mechanical linkage, return springs and the like.

In accordance with the invention, a pair of radially spaced concentric O-rings **68, 70** are seated in a shallow cylindrical chamber **72** jointly formed by cylinder block **22** and cover plate **24** which has an internal recess facing cylinder block **22** in overlying relation to the forward end region of both cylinders **30, 32**. The inner O-ring **68** is seated on a circular shoulder **74** provided by an annular extension **76** centrally disposed in chamber **72** to project toward the cylinder block **22**. The O-ring **70** is of larger diameter and is seated against the outer peripheral wall **78** of chamber **72**. Thus, a first fluid compartment or annulus **80** is provided in chamber **72** between the O-rings **68, 70** which effectively seal off annulus **80** from fluid communication with a second fluid compartment **82** formed in chamber **72** inwardly of O-ring **68**.

By virtue of the above described structure, alternate action of the operating rods **14, 16** is readily achieved whereby one rod is driven and the other rod is power retracted only after the first rod reaches its extended position at the forward limit of its stroke. Only two pairs of passages need be formed in cylinder block **22** for successively effecting alternate reciprocation of each one of the pistons **34, 36** between its extended and retracted positions.

More specifically, a first pair of fluid passages **84, 86** are formed in cylinder block **22** to interconnect cylinders **30, 32** through the annulus **80**. Passage **84** extends directly between the extreme forward end of cylinder **32** and the annulus **80**. In order that annulus **80** will be in continuous communication with the forward chamber of cylinder **32** irrespective of the position of piston **34**, sleeve **40** has a chamfered inner end **88** which provides a small annular forward chamber of triangular cross section when piston **36** is seated against sleeve **40** in its illustrated extended position. Passage **86** communicates the other cylinder **30** with annulus **80** and is shown opening into annulus **80** in diametrically opposed relation to passage **84**.

A second pair of passages **90, 92** are formed in cylinder block **22** to interconnect the cylinders **30, 32** through the other fluid compartment **82**. Passage **90** opens into cylinder **30** at its extreme forward end defined by sleeve **38** which is chamfered at **94** as described above in connection with sleeve **40**. Passage **92** opens into the other cylinder **32** immediately behind piston **44** when it is in its extended position shown in the drawing.

Now assuming that compressed air is being supplied to the rear chamber of cylinder **30** via port **62** and that cylinder **32** is open to atmosphere through port **64**, the force of the compressed air will thrust piston **34** forwardly from its illustrated retracted position causing the air to exhaust from the forward chamber of cylinder **30** through passage **90** and fluid compartment **82** and then out passage **92** and into the rear chamber of cylinder **32** to vent to atmosphere through port **64**. Since the pressure at ports **92** and **84** are equal during the forward stroke of piston **34**, there is no pressure differential across piston **36** and thus no tendency for piston **36** to retract until piston **34** crosses port **86**. The frictional forces exerted by the annular seals **48** and **54** maintain piston **36** is position while piston **34** is advanced toward its extended position.

Upon continued forward travel, piston **34** closes off passage **86** and the air remaining in the forward chamber of cylinder **30** exhausts through passage **90** and into the rear chamber of cylinder **32**. Passage **86** is formed to open into cylinder **30** immediately behind piston **34** when it is in its extended position, similar to passage **92** as described above in connection with piston **36**, and upon bottoming against sleeve **38**, piston **34** covers passage **86** to port compressed air directly into the forward chamber of cylinder **32** to overcome atmospheric pressure and the frictional resistance of the seals **48** and **54** to drive piston **36** into its retracted position and to exhaust air behind piston **36** to atmosphere through port **64**. The full line supply pressure in the rear chamber of cylinder **30** and in the forward chamber of cylinder **32** maintains pistons **34, 36** in their extended and retracted positions, respectively, whereby the pistons or rods **14, 16** are reversed from that shown in the drawing.

Thereafter, upon reversing the fluid circuit to supply compressed air through port **64** to the rear chamber of cylinder **32** and upon opening cylinder **30** to atmosphere through port **62**, rod **14** will be power retracted only after rod **16** is again advanced into its fully extended position. The escapement mechanism **10** will then be conditioned for a repeat cycle.

It will now be seen that the forward chambers of each one of the cylinders **30, 32** are respectively connected with the rear chamber of the other cylinder only when both pistons **34, 36** are bottomed at their forward stroke limits

to effect the above described internal porting of the cylinders **30, 32**. While the construction is of notable simplicity and incorporates a minimum number of parts, proper escapement operation of the rods **14, 16** is ensured without requiring any interconnecting mechanical linkage, spring members and similar parts commonly associated with conventional mechanisms of this type.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

We claim:

1. An article handling mechanism for effecting an escapement operation in feeding a series of articles and comprising a housing having a pair of longitudinally extending passageways, a pair of operating rods projecting outwardly of said housing, said operating rods each having a piston at one end thereof reciprocable in said passageways and dividing their respective passageway into forward and rear chambers, each said piston cooperating with said housing to establish extended and retracted positions at opposite ends of their respective passageway, and fluid operating means including internal fluid passages within said housing for porting the forward chambers of said passageways, said fluid passages including a chamber portion formed in said housing in overlying relation to said passageways, and a pair of radially spaced concentric O-rings seated in said chamber portion and forming first and second isolated fluid compartments therein providing fluid communication between the forward chamber of each one of said passageways and the rear chamber of the other of said passageways only when both said pistons are in their extended positions, said operating rods being controlled solely by said fluid operating means for driving one of said pistons and power retracting the other thereof after said one piston reaches said extended position thereby to alternately actuate said operating rods.

2. An article handling mechanism for effecting an escapement operation in feeding a series of articles and comprising a housing having a pair of longitudinally extending passageways, a pair of operating rods projecting outwardly of said housing, said operating rods each having a piston at one end thereof reciprocable in said passageways and dividing their respective passageway into forward and rear chambers, each said piston cooperating with said housing to establish extended and retracted positions at opposite ends of their respective passageway, and fluid operating means solely controlling said operating rods for driving one of said pistons and power retracting the other thereof after said one piston reaches said extended position thereby to alternately actuate said operating rods, said fluid operating means including internal fluid passages within said housing for porting the forward chambers of said passageways, said fluid passages connecting the forward chamber of each one of said passageways with the rear chamber of the other of said passageways only when both said pistons are in their extended positions, and said internal fluid passages further including a pair of ports in said housing in communication with the rear chambers of said passageways for successively supplying fluid under pressure to each one of the rear chambers in turn and exhausting fluid from the other thereof whereby each said piston is reciprocated between its extended and retracted positions only after the other piston is moved into its extended position.

3. An article handling mechanism for effecting an escapement operation in feeding a series of articles and comprising a housing having a pair of longitudinally extending passageways, a pair of operating rods projecting outwardly of said housing, said operating rods each having a piston at one end thereof reciprocable in said passageways and dividing their respective passageway into forward and rear chambers, each said piston cooperating with said housing to establish extended and retracted

positions at opposite ends of their respective passageway, and fluid operating means solely controlling said operating rods for driving one of said pistons and power retracting the other thereof after said one piston reaches said extended position thereby to alternately actuate said operating rods, said fluid operating means including internal fluid passages within said housing for porting the forward chambers of said passageways, said fluid passages including first and second passages formed in said housing and extending between said passageways for connecting the forward chamber of each one of said passageways with the rear chamber of the other of said passageways, said first and second passages each communuicating continuously with the forward chamber of one of said passageways, irrespective of the position of its piston, and opening into the other of said passageways immediately behind its piston when the same is in its extended position thereby to establish fluid flow between said passageways which varies with the position of said pistons.

4. The mechanism of claim **3** wherein said housing includes a cylinder block having said passageways formed therein in side-by-side relation, and a plate secured in face-to-face relation to said cylinder block, said plate

having a recess therein facing said cylinder block, said cylinder block together with said plate defining an internal chamber within said housing, and said chamber having first and second isolated fluid compartments formed therein and respectively constituting a part of said first and second passages for establishing fluid communication between said passageways.

5. The mechanism of claim **4** including a pair of radially spaced concentric O-rings seated in said chamber providing said first and second isolated fluid compartments and sealing off said first passage from fluid communication with said second passage.

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PAUL E. MASLOUSKY, *Primary Examiner.*

U.S. Cl. X.R.

277—59, 71; 92—168