

[54] **WIRE CLIP CLOSURE MACHINE**

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[58] Field of Search.....29/243.56, 243.57,
29/208 D; 227/85, 88; 53/138 A

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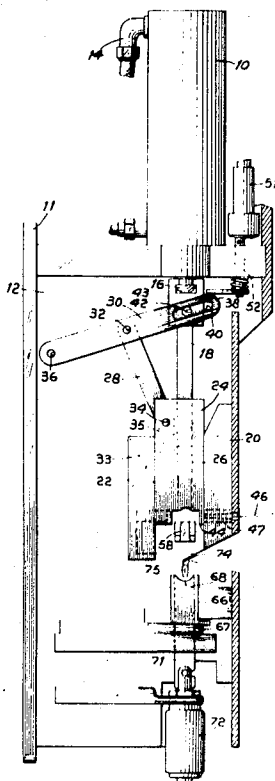
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[57] **ABSTRACT**

A machine for fastening wire clips around the ends of

bags or casings, such as used for packaging meats and foods, includes an air actuated cylinder which drives a movable block having a cutting edge at the forward end. The cylinder rod is also connected to a plunger which reciprocates within a longitudinal channel in the block. A section of wire is fed into the path of the block which moves forward to cut off a desired length and form the wire over an inverted U-shaped die. The like shaped wire is forced into the channel while another internal surface of the block moves the die back out of the path. The plunger also moves along the channel to force the ends of the wire into curved grooves in a closure die which wraps the ends of the wire together to form an overlapping loop around the end of a bag to enclose the package. All of the operations are performed in one continuous stroke of the main air cylinder with the sequence controlled by different linkages connecting the block and plunger so that the block has a shorter slower stroke than the plunger. Two additional air cylinders are operated following the closure of the bag. One actuates a knife to cut the trailing end of the enclosed bag and the other feeds the proper length of wire under the block upon the return stroke of the main cylinder and before the start of the next sequence of operation.

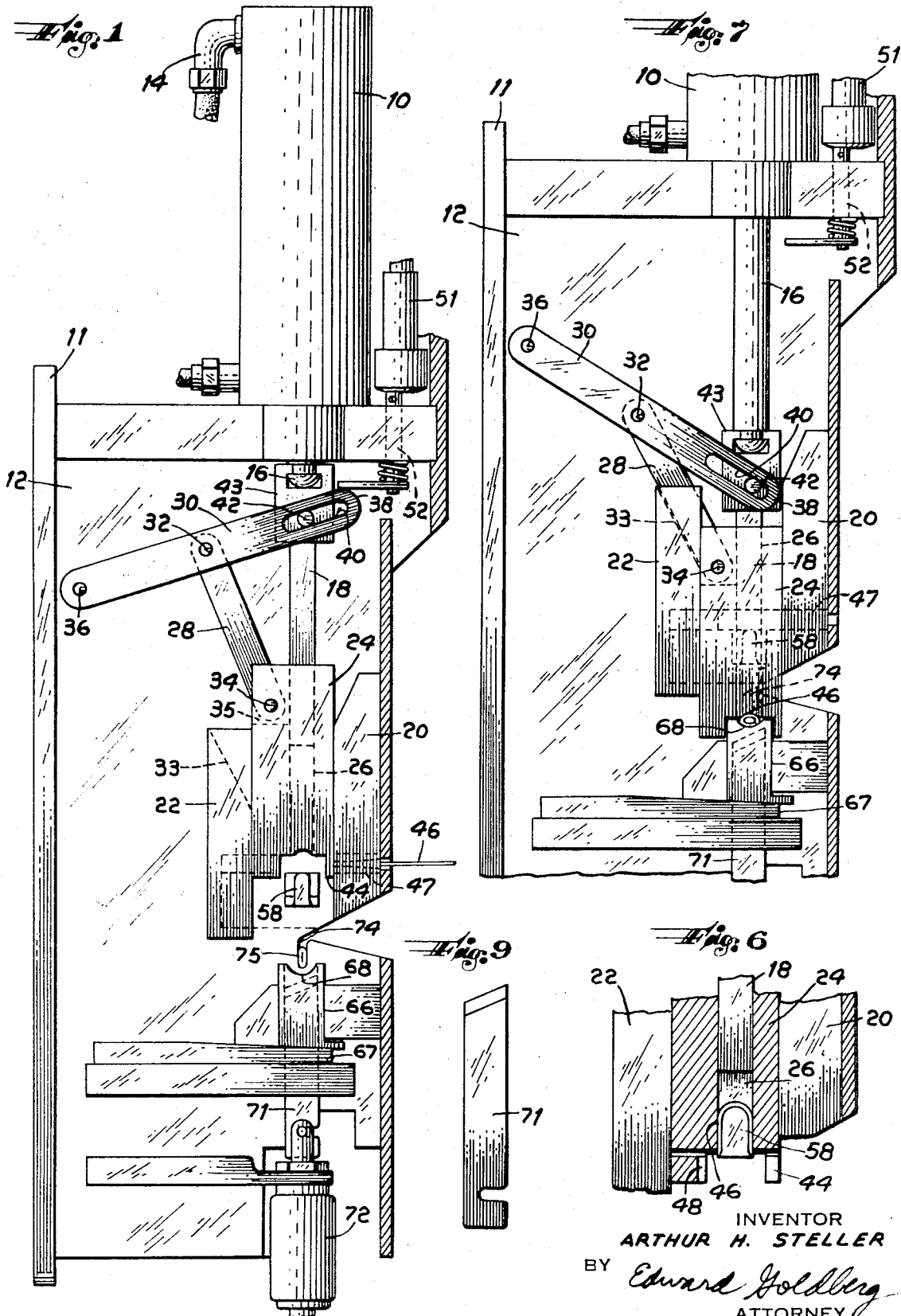
11 Claims, 11 Drawing Figures



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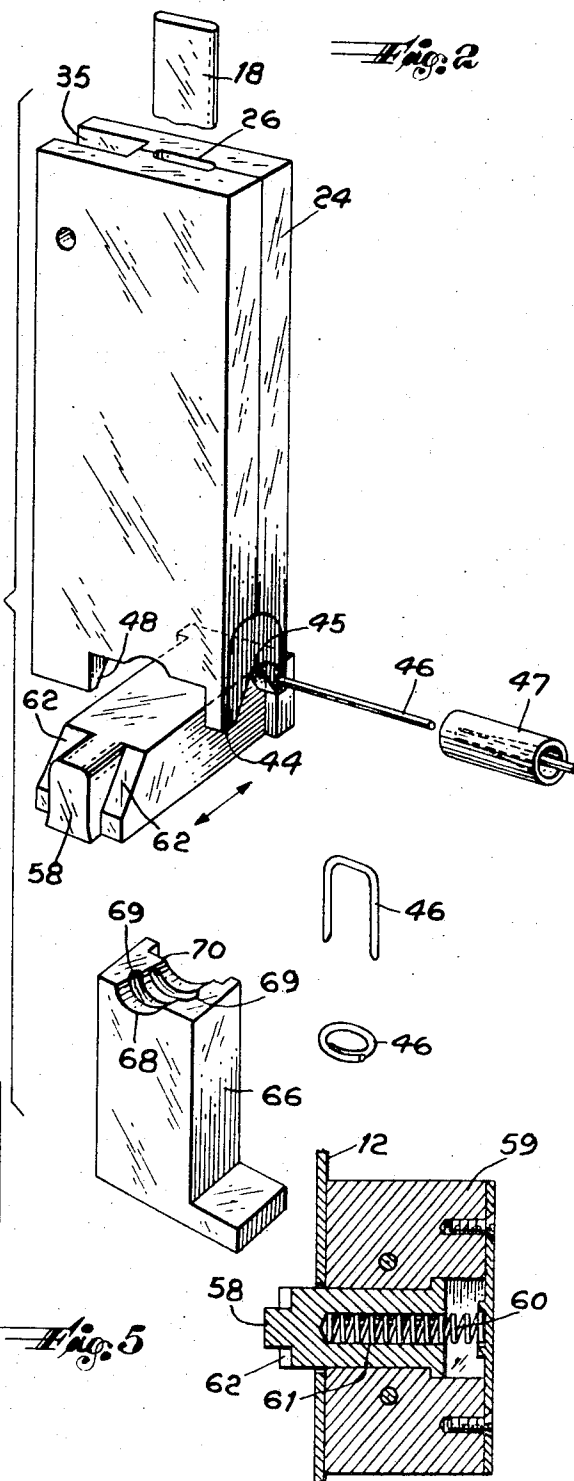
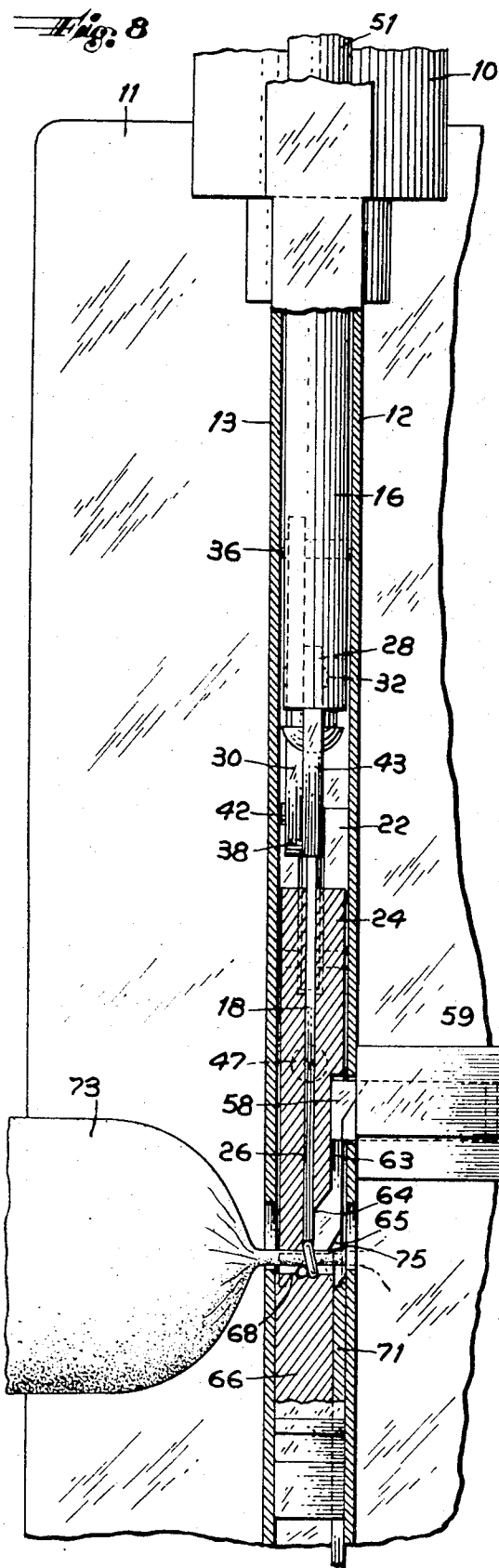


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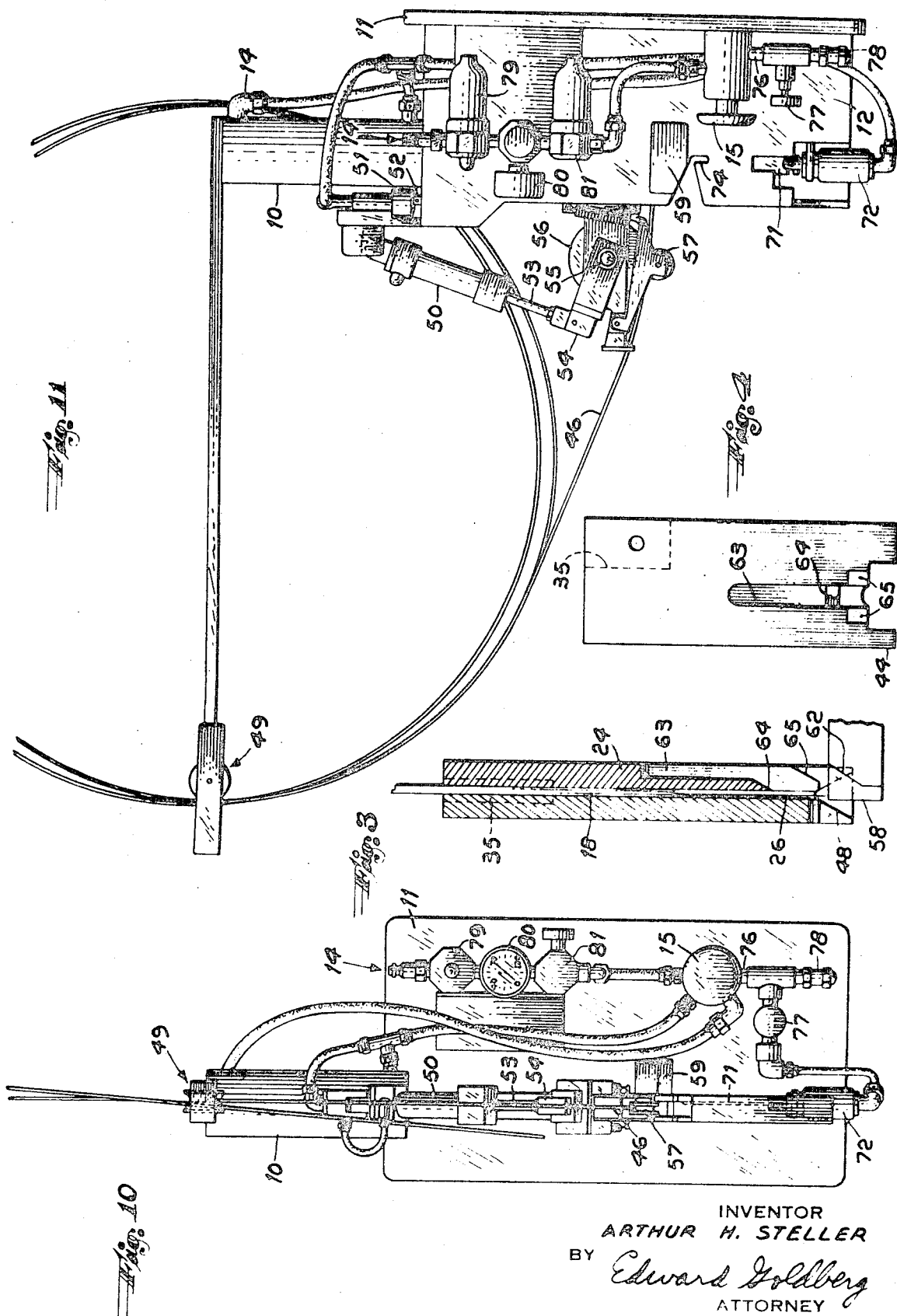
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WIRE CLIP CLOSURE MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to devices for fastening wire clips around the ends of food casings and particularly to an improved mechanism providing a simplified closure operation occurring during one continuous stroke of a fluid actuated cylinder rod.

2. Description of the Prior Art

Present devices for enclosing the ends of food casings are relatively complex, inefficient and costly. One known machine of this type utilizes a plurality of preformed U-shaped metal clips held together by adhesive tape in a common stack which is inserted into a track feeding a bag fastening mechanism. The clips are driven into the grooved die which forms the ends into a band about the bag or casing. The U-shaped wire clips are cut, formed and stacked in a preliminary production step and then supplied to the packaging machine operator to complete the processing. The separate operations and purchase of clips make this method less desirable. In another device for this purpose, such as shown in U.S. Pat. No. 3, 368,322, issued Feb. 13, 1968, one machine cuts, forms and wraps the wire clips around the ends of bags. The mechanism however is somewhat complex and operates in an intermittent manner.

SUMMARY OF THE INVENTION

It is therefore the primary object of the present invention to provide a simplified efficient device for cutting, forming and wrapping wire clips around the end of food casing in one continuous operation.

A further object is to provide an improved wire clip closure device wherein the various steps are performed during one stroke of a fluid cylinder having different linkage connections which control the sequence of operations.

A still further object is to provide bag cutting and wire feeding mechanisms operated by separate cylinders synchronized with the return of the main cylinder.

This is achieved by a novel mechanism including a main fluid actuated cylinder supported on a frame and having a reciprocating piston rod connected to a movable block and plunger. The block has a cutting edge for wire and a longitudinal channel to accommodate the plunger. A predetermined length of wire is fed into the path of the block which moves forward to cut and form the wire over an inverted U-shaped die. Continued movement of the block causes engagement of the wire by the channel while an internal tapered surface of the block moves the die out of the path. The plunger, having a longer faster stroke than the block, moves along the channel and forces the ends of the wire into rounded grooves in a stationary closure die. The wire is formed into a loop with overlapping adjacent ends wrapped around the end of a bag which is inserted between the block and closure die. Different linkages connected between the piston rod, block and plunger provide different speeds and strokes for the continuous sequence of operations. Separate cylinders synchronized with the return of the main cylinder operate a knife to cut the end of the enclosed bag and feed the next length of wire into the mechanism for the following operation. The details of the invention will be

more fully understood and other objects and advantages will become apparent in the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top side view of the novel wire clip closure machine in the starting position of the sequence of operation,

FIG. 2 is an exploded side isometric view of various elements of the mechanism,

FIG. 3 is a partial front sectional view of the movable block and shaping die,

FIG. 4 is a bottom side view of the block,

FIG. 5 is a front sectional view of the shaping die and housing,

FIG. 6 is a partial top side sectional view showing a portion of the mechanism in an intermediate position,

FIG. 7 is a partial top side view of the device at the end of the closure operation,

FIG. 8 is a front top view in partial cross-section showing a food casing in position for enclosure by a wire clip,

FIG. 9 is a top side view a knife for cutting the end of the casing,

FIG. 10 is a top front view of the device showing the various air cylinders and control valves, and

FIG. 11 is a top side view of the device including a wire feed mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, a main air actuated cylinder 10 is mounted on the end portion of a base supporting frame 11 which includes two side panels 12, 13, the latter being removed in this view. The cylinder is connected to a suitable source of compressed air 14 which may be controlled by a manually actuated air valve 15, shown in FIGS. 10 and 11, for each bag closure operation. The valve admits air into the cylinder in one direction causing rapid forward movement of a reciprocating piston rod 16 which is connected to a plunger 18. Release of the valve causes the air to exhaust and move the rod back to return to the original position. The operation may also be made automatic, if so desired for use in continuous production lines.

A pair of guides 20, 22 are mounted at a central location on the frame and provide a guideway for a longitudinally movable block 24. The block includes an internal channel 26 for plunger 18. A pair of linkages 28, 30 connect the block to the plunger and rod. One end 32 of linkage 28 is pivotally coupled to linkage 30 at about the mid-point and the other end 34 is pivotally mounted within a slot 35 in block 24. Guide 22 also has a slot 33 to receive linkage 28 in the forward position. The end 36 of linkage 30 is mounted pivotally on the sides of the frame, while the other end 38 is slidably connected through a slot 40 to a pin 42 on a hub 43 joining plunger 18 to rod 16.

The forward end 44 of block 24, as shown more clearly in FIG. 2, has a cutting edge 45 for cutting wire rod 46 which is fed into the mechanism through a bushing 47. The free end of the wire engages a guide 48 at the bottom of the block, with about one inch of wire being drawn and cut from a wire reel supply device 49,

as shown in FIG. 11. The wire is preferably of round aluminum rod of about 0.10 inch in diameter of sufficient flexibility and strength to permit deformation into and retention of a ring or band shape. The wire is inserted into the area ahead of the block by a separate air cylinder actuated fed mechanism 50 which is synchronized with the main air cylinder operation. An air valve switch 51 for the wire feed cylinder is actuated at the end of the wire clip closure operation upon the return of rod 16 and linkage 30 into the initial position. The end 38 of linkage 30 engages a movable contact arm 52 mounted on the frame. The contact arm then actuates the air valve switch 51 and cylinder 50. The cylinder rod 53 moves a rocker arm 54 about a one way bearing 55 connected to drive wheel 56 which with idler wheel 57 feeds the length of wire into position before the start of each operation.

At one side of the block and mounted to extend laterally into and out of the path of the block, is an intermediate inverted U-shaped anvil or die 58, shown in FIGS. 2 and 3, about which the wire rod is formed into an inverted U-shaped clip. The die is retractable into a transverse housing 59 as shown in FIGS. 5 and 8 and includes a spring 60 in a cylindrical opening 61 to normally bias the die to extend outwardly into the path of the block. The U-shaped portion 58 is positioned in line with channel 26 and includes tapered surfaces 62 extending along the sides of the die. The width of channel 26 is such as to accommodate the combined dimension of the U-shaped die portion and the wire formed around it, as shown in FIG. 6. As shown in FIGS. 3 and 4, an open channel 63 along the bottom side of block 24 connects with inner channel 26 toward the leading end 64. A pair of tapered surfaces 65 along the sides at the end of channel 63 are adapted to engage the like shaped surfaces 62 along die 58 to push the die down out of the path of channel 26 in the forward moving block. The U-shaped end of die 58 then rides back along channel 63.

A stationary closure die 66, shown in FIGS. 1 and 2, is positioned on a support 67 forwardly of die 58 and in the path of block 24 and channel 26. The back end of die 66 has an inwardly curved surface 68 having two rounded grooves 69 adapted to receive and close the ends of the wire clip. The side of die 66 also includes a shallow open channel 70 to accommodate a knife 71 shown in FIG. 9. The knife is operated by another air actuated cylinder 72 mounted at the other end of the base support, as shown in FIGS. 1 and 11, and is designed to cut the trailing end of a food casing 73, shown in FIG. 8.

At the start of the operation, the compressed folded end 75 of the food casing or bag 73 is inserted into a curved guideway 74 in sides 12, 13 to position the end in the path of block 24 over stationary closure die 66. At the same time the manually operated air valve switch 15 is depressed and held down to actuate the main air cylinder 10. Alternatively, if so desired, a miniature air valve switch can be mounted adjacent guideway 74 so that insertions of the bag end can trigger the operation of the device. The piston rod 16 then moves forward with block 24 likewise moved by the action of linkages 30 and 28 so that cutting edge 44 cuts off the desired length of wire rod 46. Further movement of the block forms the wire around the shap-

ing die 58 to provide a U-shaped clip which is then engaged and carried by channel 26. The tapered surfaces 65 and forward end of channel 63 then engage the tapered surface 62 of the die 58 to move it laterally out of the path of channel 26 with the U-shaped end of die 58 riding along channel 63 as block 24 continues moving forward.

Plunger 18 also moves forward in channel 26 at a faster speed and with a longer stroke than block 24 due to the action of linkages 30 and 28. Plunger 18 then engages the back portion of U-shaped wire 46 and drives the ends into the rounded grooves 69 of stationary die 66. The wire is thus formed into an oval loop having adjacent overlapping ends wrapped around the end 75 of bag 73. The extreme forward position of block 24 is shown in FIG. 7. At this point the air valve switch 15, shown in FIG. 10 and 11, is released and exhaust air through an exhaust port 76 passes through a shut-off valve 77 connected to air cylinder 72 which actuates knife 71 to cut the trailing end 75 of bag 73. Valve 77 may be closed if it is desired not to operate the knife or cut the ends of the bags. A speed control 78 is also provided in the exhaust air path. Other controls along the main air supply line include an air filter 79, a pressure gauge and regulator 80 and oiler 81. Upon release of air valve 15, the block 24, plunger 18 and linkages 28 and 30 return to the rear starting position. At this point air valve switch 51 is engaged by contact arm 52 to operate air cylinder 50 and the wire feed mechanism which inserts the next length of wire into position ready for the following bag closure operation.

While only a single embodiment of the invention has been illustrated and described, it is apparent that many variations may be made in the particular design and configuration without departing from the scope of the invention as set forth in the appended claims.

What is claimed is:

1. A wire clip closure machine comprising:
 - a support frame,
 - a first fluid actuated cylinder mounted at one end of said frame, said cylinder including a longitudinally disposed reciprocating rod driven by said cylinder,
 - a movable block spaced from said rod and having an inner longitudinal channel and a cutting edge on an outer end surface,
 - a plunger coupled to said rod and being slidably disposed in said channel,
 - means coupling said block to said rod and plunger so that said block has a shorter slower movement than said plunger,
 - an intermediate shaping die positioned for lateral movement into and out of the path of said block and channel and having an inverted U-shaped surface,
 - a stationary closure die positioned at an opposite end of said frame and having rounded angled grooves in a surface disposed in the path of said block and plunger,
 - means for feeding a fixed length of wire transversely into said path of said block and over said shaping die, and
 - means for actuating said cylinder and rod to cause forward longitudinal movement of said block to cut said length of wire and form said wire around said shaping die into an inverted U-shaped clip and

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move said shaping die laterally out of said path, said channel engaging said wire clip, further movement of said block directing the ends of said wire clip into engagement with said closure die, and forward movement of said plunger in said channel forcing said wire ends into said grooves to form a loop having adjacent overlapping ends, all of said movements occurring during one continuous stroke of said cylinder and rod.

2. The device of claim 1 including means for guiding an end of a food container of thin resilient material into said path in a lateral position over said closure die, said wire clip being formed into said loop around said end of said container.

3. The device of claim 2 wherein said means coupling said block to said rod and plunger includes a first linkage having one end pivotally mounted on said support frame and the other end slidably connected to said rod and plunger and a second linkage having one end pivotable on said first linkage and the other end pivotally secured to said block.

4. The device of claim 3 wherein said shaping die includes tapered surfaces extending along the sides of said inverted U-shaped surface and said block includes an outer longitudinal channel communicating at a forward end with said inner longitudinal channel, said end of said outer channel having tapered surfaces along the sides adapted to engage the tapered surfaces of said shaping die, forward movement of said block causing engagement of the respective tapered surfaces to move said shaping die laterally out of said path, said outer channel being slidable along and accommodating the end of said U-shaped surface out of said path.

5. The device of claim 4 including resilient means

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normally positioning said shaping die in said path and a housing accommodating the lateral movement of said shaping die.

6. The device of claim 5 including means for synchronizing Said wire feeding means with said cylinder actuating means to feed said wire into said block before the forward movement of said block.

7. The device of claim 6 wherein said fluid cylinder is a compressed air actuated cylinder and including manually operable valve control means for actuating said air cylinder, release of said valve control means causing the return of said rod, block and plunger.

8. The device of claim 7 wherein said wire feeding means includes a second air cylinder and a valve switch actuated by the return stroke of said first cylinder rod and coupling means.

9. The device of claim 8 wherein said support frame includes two side panels, a pair of spaced guide blocks mounted between said panels and having a third longitudinal channel therebetween, said movable block being slidably disposed in said third channel, said guiding means for said food container including guideways in said side panels for receiving said container end.

10. The device of claim 9 including means for cutting the trailing end of said food container, said cutting means including a third air cylinder positioned at the opposite end of said support frame and a knife connected to said third cylinder, said closure die including a shallow channel for said knife, and means for actuating said third cylinder and knife upon release of said valve control means.

11. The device of claim 10 including a shut-off valve connected between said valve control means and said third air cylinder for deactuating said knife.

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