May 21, 1968 K. A. KLENZ 3,383,754

FLUID DRIVEN MECHANISM WITH PROTECTIVE STROKE FOR APPLYING A CLIP AROUND A CASING

Filed Jan. 10, 1967 4 Sheets-Sheet 1

FIG. 1

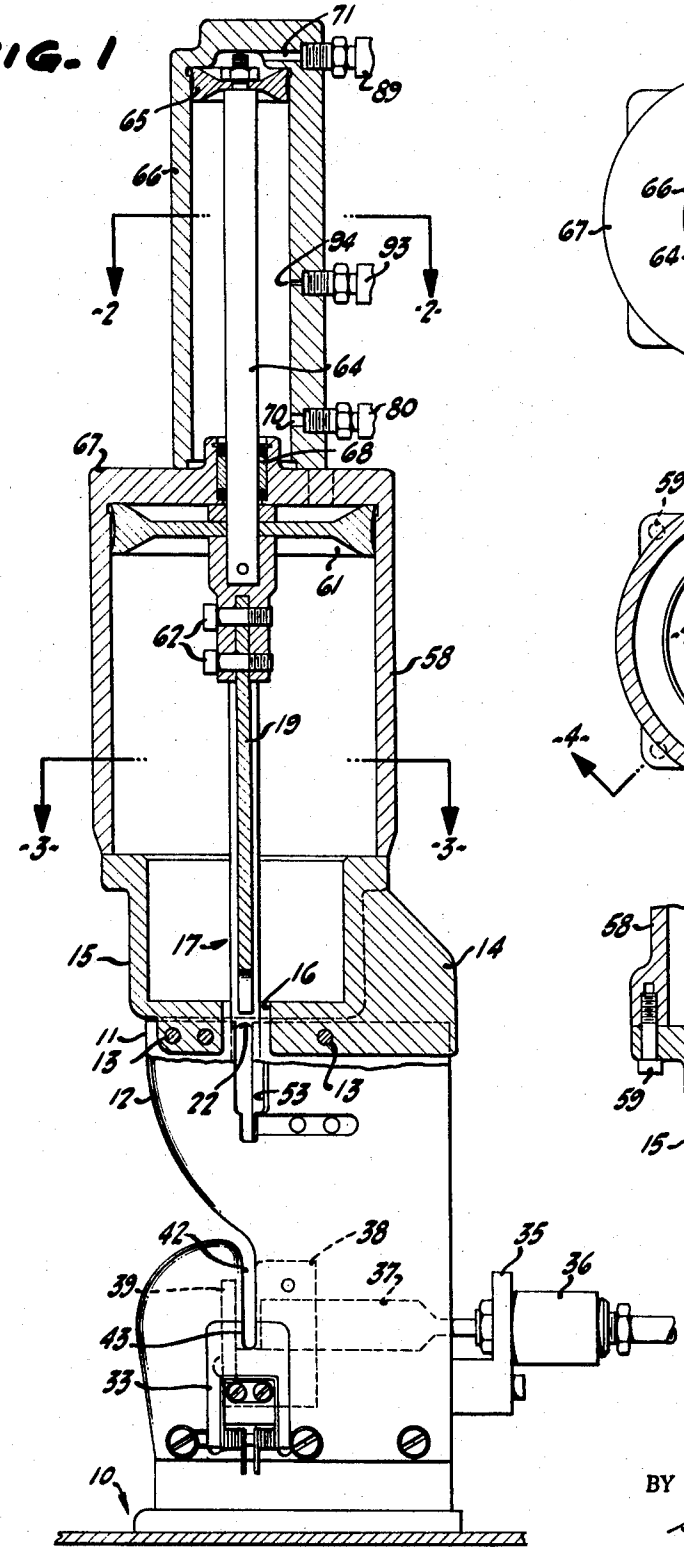

FIG. 2

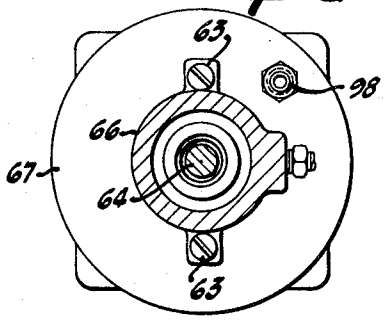

FIG. 3

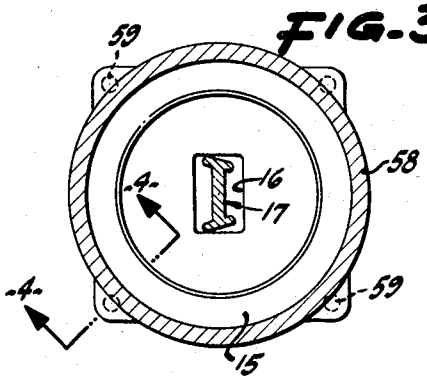

FIG. 4

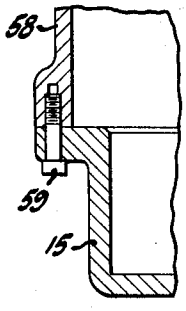

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FIG-5

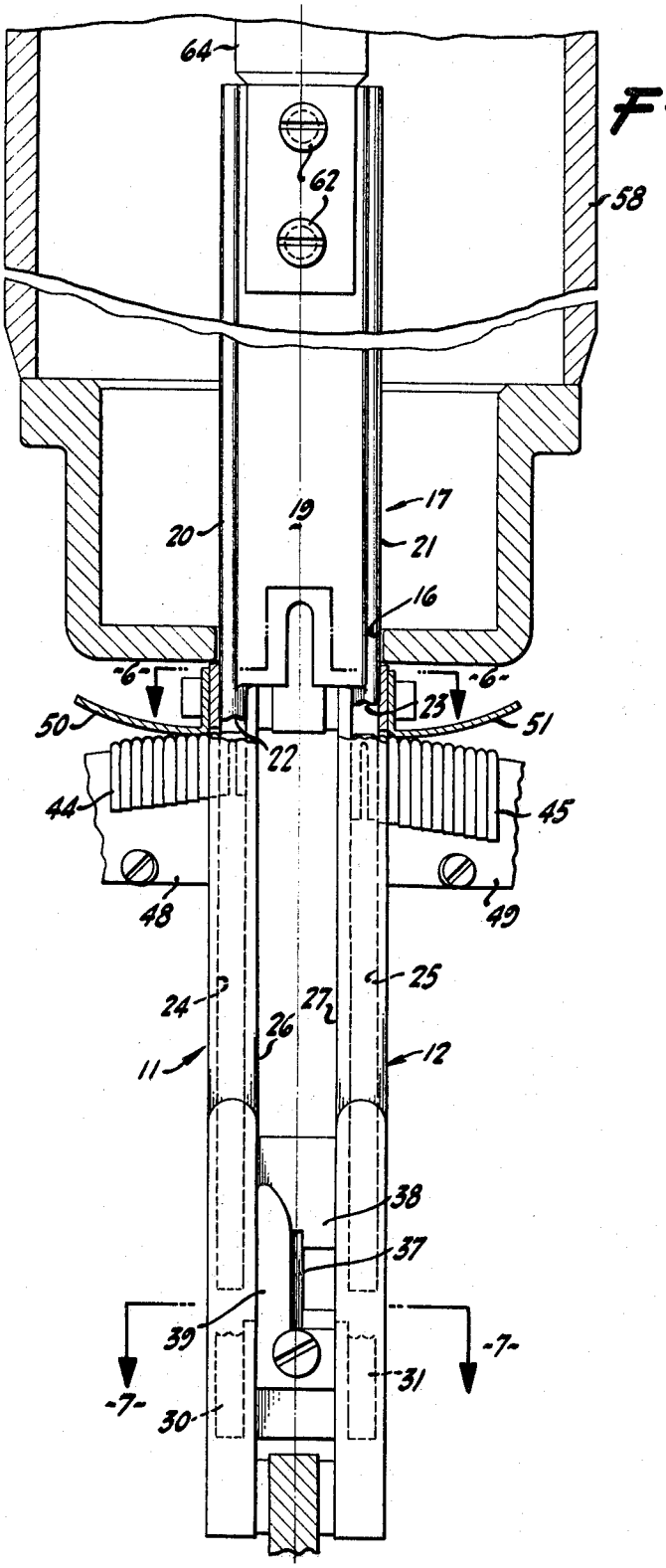


FIG-6

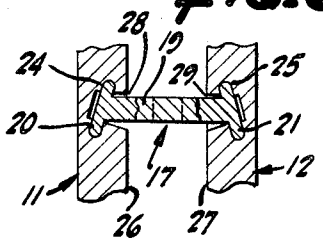
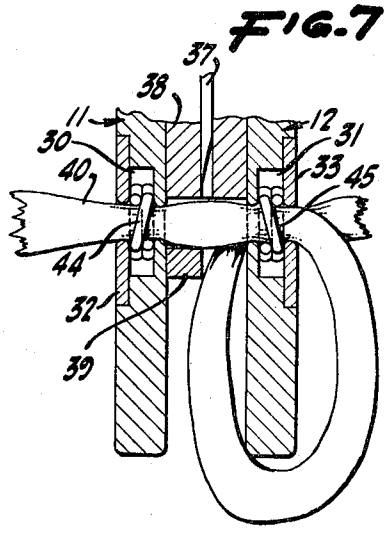


FIG-7



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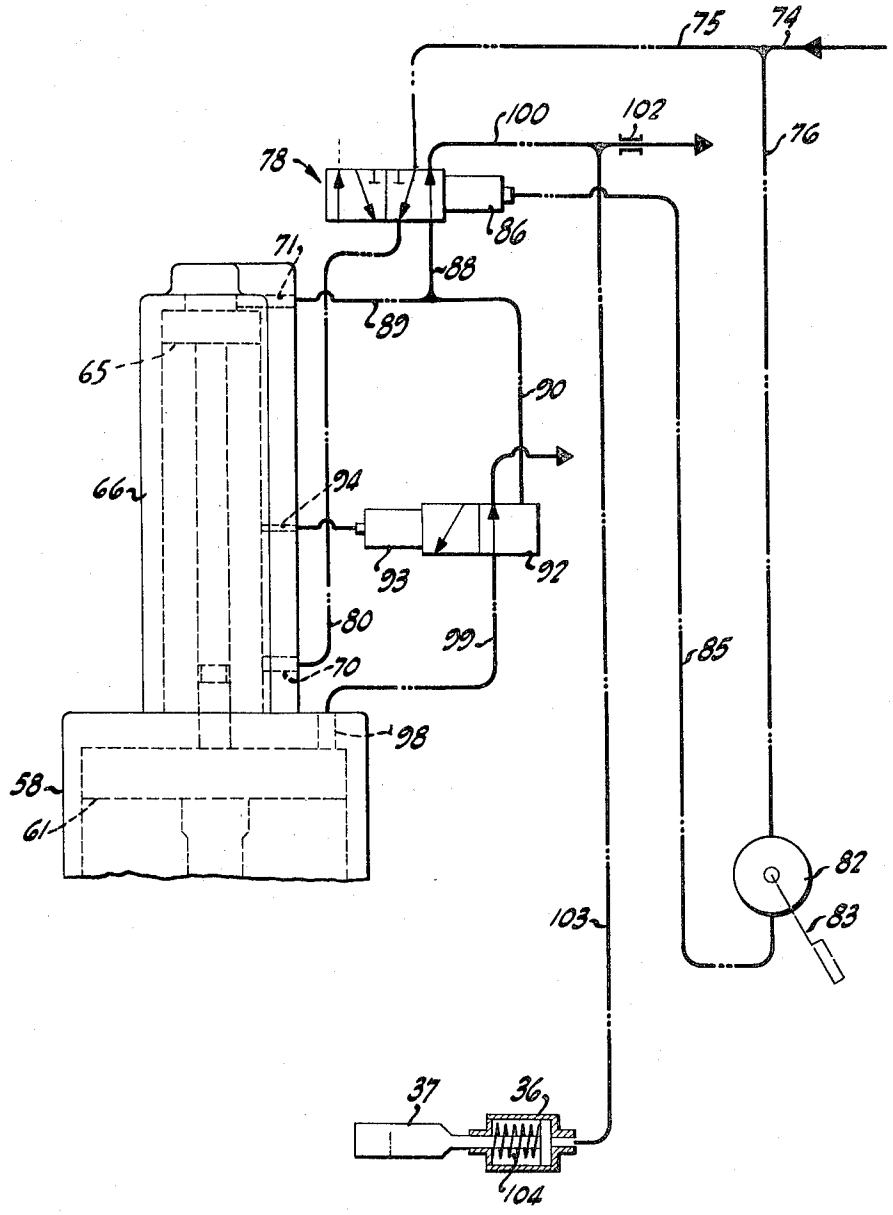

FIG. 8

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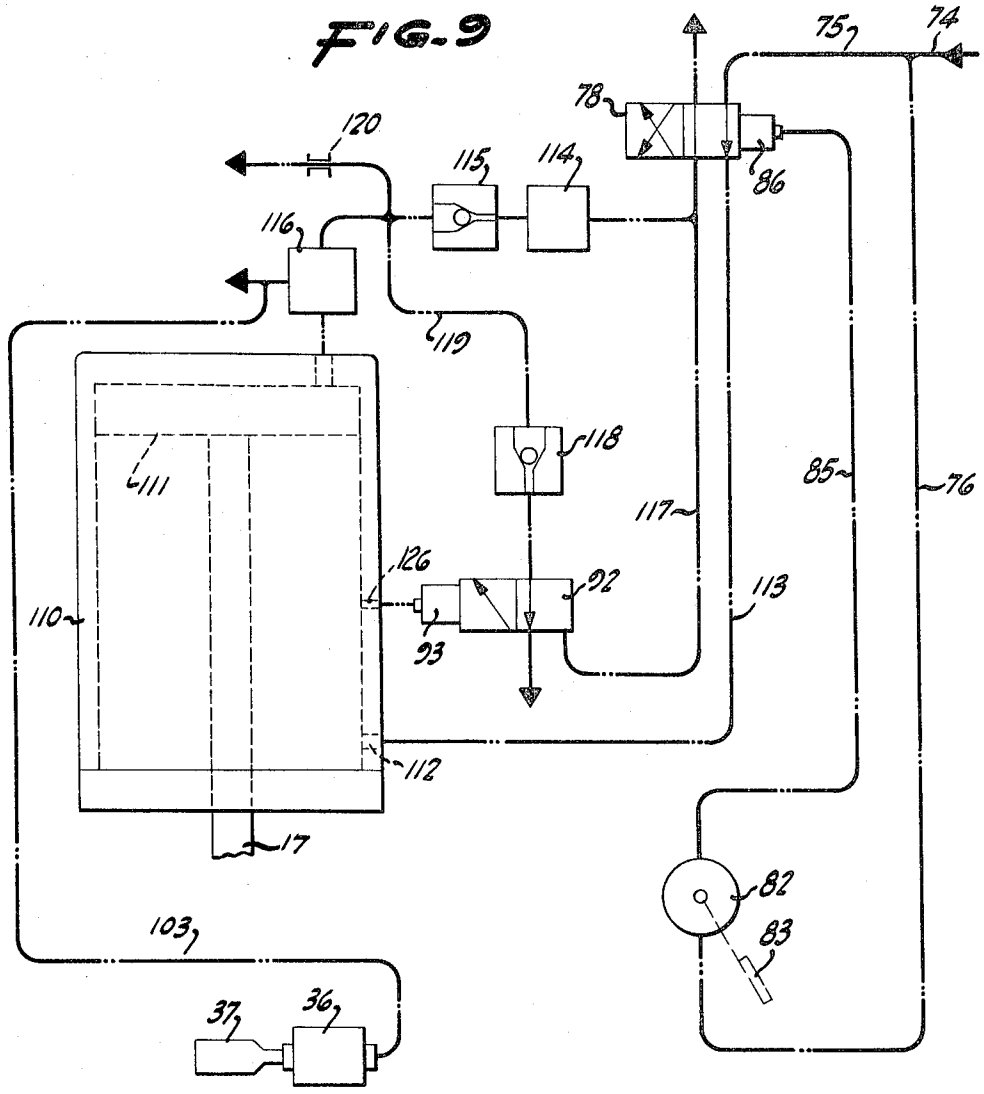
FIG. 9



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3,383,754

FLUID DRIVEN MECHANISM WITH PROTECTIVE STROKE FOR APPLYING A CLIP AROUND A CASING

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6 Claims. (Cl. 29—243.57)

ABSTRACT OF THE DISCLOSURE

A fluid driven tool in which a piston is driven through a working stroke and applies a relatively heavy load to a workpiece or workpieces and wherein a relatively light load is applied to the tool during the first portion of its stroke and a relatively heavy load is applied at the terminal portion of the stroke for the purpose of minimizing damage to the apparatus.

This invention relates to a fluid driven mechanism which includes a tool driven through a working stroke by fluid pressure into engagement with a workpiece for exerting a relatively heavy load on such workpiece. More particularly the invention is directed to a clipping apparatus for applying a U-shaped clip around a flexible article such as a sausage casing or the mouth of a plastic bag in order to create a tight seal.

Heretofore there have been provided various types of apparatus for translating a U-shaped staple or clip along a track and into engagement with a die at which the article to be sealed is placed so that the legs of the clip are bent toward each other and into encircling relationship with such article for tightly sealing the same. Devices have also been provided for simultaneously applying two clips to the article at closely spaced points along the length of the material of the article and then cutting the material between the clips. Such a procedure is followed in forming sausages, for example, and is also followed in the invention disclosed in copending application Ser. No. 526,301 filed Feb. 9, 1966, and involving an apparatus for packaging relatively large articles such as hams and turkeys.

The present invention lends itself to use for the same purpose as that disclosed in the above noted copending application and may be considered to be an improvement thereover.

In apparatus of the subject type a punch attached to a fluid driven piston is urged along the length of a clip track and means is provided for feeding one clip at a time into said track so that said clip is driven into engagement with a die. The article to which the clip is to be applied is positioned adjacent the die so that the legs of the clip surround such article and are deformed into tight sealing engagement with such article.

The distance between the point at which the clip is picked up by the punch and the point at which the clip surrounds the article to be sealed is usually relatively great so that sufficient room is provided for feeding the article into the proper position for the clipping step to be performed. In the event that a clip is improperly fed into the track for some reason the relatively heavy load which is applied by the high pressure fluid acting on the piston of the punch can result in serious damage to the clip track necessitating replacement of the die supports in which the tracks are formed or an expensive machining operation to correct the damage. By the present invention means is provided for preventing the load on the punch from exceeding a nominal amount during the portion of the stroke in which the clip is translated from the feeding point to the die. In this manner, if a clip becomes skewed in the track, or for some other reason more than a light resistance is offered to the movement of the punch, the mechanism stalls thereby giving the operator an opportunity to reverse it and correct the condition without causing damage to the apparatus.

The main object of the invention is therefore the provision of a protective stroke fluid actuated mechanism in which the loading on the tool is minimized during that portion of the stroke wherein the device is vulnerable to damage and said loading is automatically increased at the point at which the actual deformation of the workpiece takes place.

Another object of the invention is the provision of a novel punch adapted for use in applying two clips at closely spaced points along the length of a flexible article such as a sausage casing and which punch is extremely rugged so as to minimize damage to the same, and at the same time the form of the punch is such that optimum accuracy in the movement of the clips along the clip track is insured.

Still another object of the invention is the provision of a double acting clipping apparatus which eliminates the usual return spring and is therefore more positive in operation and more dependable.

Other objects and advantages will be apparent from the following specification and drawings.

FIG. 1 is a vertical section, partly in elevation, of a clipping apparatus constructed in accordance with the preferred form of the present invention.

FIG. 2 is a horizontal section taken in a plane indicated by lines 2—2 of FIG. 1.

FIG. 3 is a horizontal section taken in a plane indicated by lines 3—3 of FIG. 1.

FIG. 4 is a fragmentary vertical section through the large cylinder of the apparatus.

FIG. 5 is a greatly enlarged fragmentary vertical sectional view of the lower end of the large cylinder and also showing the double feed punch.

FIG. 6 is a horizontal section taken in a plane indicated by lines 6—6 of FIG. 5.

FIG. 7 is a horizontal section taken in the plane indicated by lines 7—7 of FIG. 5.

FIG. 8 is a semischematic diagram showing the piping arrangement.

FIG. 9 is a semischematic arrangement of a modified form of the invention.

In detail, and first with reference to FIG. 1, the invention includes a base 10 to which is secured a pair of upstanding parallel die support plates 11, 12. At the upper ends of said die supports the same are secured by means of bolts 13 to a relatively narrow flange 14 integral with and depending from a cylinder support 15. The lower side of cylinder support 15 is provided with a rectangular opening 16 for receiving therethrough an elongated punch generally designated 17 (FIGS. 3, 6). The punch 17 includes a relatively wide thick central section 19 and a pair of integral flanges 20, 21 along the vertically extending side edges of central section 19. As best seen in FIG. 5, the flanges 20, 21 extend past the lower end of the central section 19 and are formed at their lower ends to provide clip engaging surfaces 22, 23 respectively.

The flanges 20, 21 of punch 17 are formed complementary in cross section to a pair of clip tracks 24, 25 formed in die supports 11, 12 respectively and in which tracks said flanges are slidable. The opposed sides 26, 27 of die supports 11, 12 are formed with vertically extending slots 28, 29 respectively through which the central section 19 of the punch 17 extends. At this point it will be noted that the relatively heavy punch 17 extending between the two die supports 11, 12 functions to retain

said die supports in their proper position relative to each other so that said supports act as a unitary member without requiring means extending between the same to stiffen them.

The die supports 11, 12 are recessed at their lower ends to receive therein dies 30, 31 respectively against which the clips in tracks 24, 25 are urged in order to deform the clips about the article to be sealed. Recessed in the outer sides of die supports 11, 12 are swinging guards 32, 33 respectively which may be swung outwardly when the casing or other article to be sealed has been cut between the two die supports 11, 12 in a manner to be described. The swinging guards 32, 33 are not described in detail herein and details of the same may be seen in Patent No. 3,210,835 of Oct. 12, 1965.

Mounted on die supports 11, 12 by means of a bracket 35 is a fluid actuated cylinder 36 the piston of which is connected to a knife blade 37 (FIG. 1). Said knife blade 37 is slidably supported in a guide 38 and cooperates with a shear bar 39 to cut the clipped material (see FIG. 7). As best seen in FIG. 1 the die supports 11, 12 are each provided with a vertically extending throat 42 flaring upwardly and outwardly at its upper end so as to facilitate the manual insertion of the material 40 into a position just above the dies 30, 31. Swinging guards 32, 33 are each similarly provided with an upwardly opening throat 43 in which the material to be clipped is received. As will be explained later on in greater detail, after the clipping step has been performed by the downwardly moving punch 17, the cylinder 36 is actuated to reciprocate the knife blade 37 to the left as seen in FIG. 1 so that the material 40 is cut between the two clips 44, 45.

In the particular form of the clipper shown in FIGS. 5 and 7 the clips 44 which are inserted into clip track 24 are formed with shorter legs than the clips 45 that are fed into clip track 25. This form of double clipper, which is more specifically described in the above noted copending application Ser. No. 526,301, is required for the purpose of gripping two thicknesses of the material 40 by the clips 45 while clips 44 surround only one thickness of the material. As pointed out in the copending application it is desirable to have the final clinching of both clips 44, 45 take place to substantially the same degree of closure and at substantially the same time. If this were not done undesirable unbalanced forces would be impressed on the mechanism including the piston which drives the punch 17. By the present invention the effect of such unbalanced forces that do exist is minimized by the provision of the above described punch 17 which, because of its inherent resistance to bending and because of the fact that it is slidably supported within both die supports, tends to dissipate any such unbalanced forces and prevent the transmittal of such forces to the piston.

The clips 44, 45 are fed into the respective clip tracks on rails 48, 49 respectively (FIG. 5), the outer ends of which (not shown) are directed uppwardly so that said clips may be fed by gravity into said clip tracks. In order to insure proper positioning of the clips relative to the tracks 24, 25 it is desirable to provide curved shoes 50, 51 on die supports 11, 12 just above the rails 48, 49 so that said clips are in an exact predetermined position as they enter the openings 53 (FIG. 1) in the die supports 11, 12. However, in some instances sufficient weight may not be imposed on the clips to insure proper feeding movement or for some other reason the clips 44, 45 may become cocked in the tracks 24, 25 thus causing damage to the accurately machined clip tracks 24, 25 when the punch 17 is forceably urged downwardly. It is to obviate this sort of damage that the present invention provides for the imposition of a relatively light force on punch 17 along most of the length of the tracks 24, 25 and a relatively heavy force only at that point in its stroke at which punch 17 forces the clips 44, 45 against the dies 30, 31. In the event one of the clips 44, 45 does become cocked in its feeding track, or for some other reason more than normal resistance is created to downward movement of the clip, the light force applied to said punch by the present invention is insufficient to overcome the resistance offered by the clip and the device stalls. In such a case the operator may then reverse the mechanism, correct the condition causing the abnormal resistance, and then permit the punch to again go through its clipping stroke.

Secured to the cylinder support 15 is a relatively large diameter cylinder 58 which is secured to support 15 by a plurality of bolts 59 (FIG. 4). Slidably supported within the cylinder 58 is a piston 61 which is secured by means of bolts 62 to punch 17. It will be understood that the lower side of piston 61 is open to the atmosphere because of the presence of opening 16 through which the punch 17 projects. In other words, cylinder 58 is single acting in the sense that pressure is applied only to the upper side thereof for moving the same. However by the present invention it is not required to provide a return spring within cylinder 58 since the return stroke of piston 61 and punch 17 is achieved by means of a second cylinder which will now be described.

Fixedly secured at its lower end to piston 61 is a piston shaft 64 which is connected at its upper end to a piston 65. Piston 65 is reciprocable within a relatively smaller cylinder 66 which is secured to the upper end 67 of cylinder 58 in fluid tight relation thereto by bolts 63 (FIG. 2). Said upper end 67 of cylinder 58 is provided with a fluid tight packing 68 around piston shaft 64 to create a sliding seal between the two cylinders.

Small cylinder 66 is provided at its lower end with a port 70 through which fluid is introduced in order to return the piston mechanism to its retracted or upper position shown in FIG. 1. At the upper end of cylinder 66 the same is provided with a port 71 through which fluid under pressure is admitted to force the piston structure downwardly on its working stroke. During such working stroke it will be understood that port 70 is connected to the atmosphere. At this point it will be noted that, considering the piston structure as a whole, the same is double acting in the sense that no spring is required to return the mechanism to its retracted position since the retracting stroke is accomplished by admitting fluid under pressure through port 70. This is an important advantage in mechanisms of this sort since dependence on springs for the return stroke creates certain problems which it is desirable to avoid.

Referring now to FIG. 8 fluid under pressure is conducted from any suitable source (not shown) through line 74 which connects with lines 75 and 76. Line 75 is connected to a four-way two-position pilot actuated valve 78 which in its normal position connects the high pressure in line 75 with a line 80 which in turn connects with port 70 in small cylinder 66. In the inoperative position of the mechanism the piston structure is therefore in its retracted position shown in FIGS. 1 and 8 since the full line pressure is imposed on the underside of small piston 65.

Line 76 is connected through a manually actuatable valve 82 which is preferably positioned adjacent one of the die support plates 11, 12 so that the lever 83 of valve 82 may be manually swung downwardly by the operator after the material 40 has been properly positioned above dies 30, 31. Upon actuation of valve 82 the line pressure is connected through a line 85 with the pilot 86 of said four-way valve 78. Imposition of the line pressure on pilot 86 causes movement of the valve 78 to its operative position at which the line 75 is connected to valve outlet line 88 which in turn connects through line 89 with the upper port 71 of cylinder 66 and also connects by line 90 to a three-way valve 92. This valve 92 is provided with a pilot 93 connected to a port 94 in small cylinder 66. Port 94 is intermediate ports 70 and 71 but is preferably closer to port 70 so that the small piston 65 has traversed the major portion of its working stroke before the line pressure on the upper side of said piston is imposed on pilot port 94. However, during the initial portion of the working stroke the line pressure is connected with valve 92

through line 90 but does not pass through said valve until the pilot 93 is actuated by the high pressure in cylinder 66 being imposed on the same through port 94. During said initial portion of the working stroke the large cylinder 58 is exhausted through a port 98 and line 99 through the three-way valve 92 to atmosphere.

After the small piston 65 passes the port 94 the full line pressure is imposed on pilot 93 moving the same to its second position at which line 90 is connected to line 99 thereby imposing the full line pressure on the large piston 61. Actuation of threeway valve 92 should preferably be accomplished as the lower end of the punch 17 is approaching its lowermost position in which the clips 44, 45 engage the dies 30, 31.

After the working stroke has been completed the operator releases lever 83 of valve 82 returning four-way valve 78 to its normal position at which line 88 is connected through said valve to line 100 and then to atmosphere. At the same time the full line pressure is imposed through valve 78 and line 80 to the underside of piston 65 causing the piston structure to return to its upper retracted position as shown in FIGS. 1 and 8.

In order to actuate cylinder 36 for reciprocating knife blade 37 exhaust line 100 is connected through a restriction 102 to atmosphere and is also connected by line 103 to knife cylinder 36. The amount of resistance built in to restriction 102 is sufficient to cause a relatively small volume of air to pass through line 103 and activate the working stroke of cylinder 36 against the resistance of helical spring 104 therein. By this arrangement automatic actuation of knife blade 37 is insured but only after the punch has completed the clipping step and has commenced its return stroke. During the working stroke it will be noted that the underside of piston 65 is exhausted through port 70 and valve 78 to atmosphere, an extra exhaust port being provided in valve 78 for this purpose.

A modified form of piping arrangement adapted to achieve somewhat the same result as that shown in FIG. 8 is shown in FIG. 9. In this case only one cylinder 110 having a sufficiently large piston 111 to perform the clipping operation is provided, and the desirable light load on the punch 17 is achieved by impressing a low fluid pressure on piston 111 during the initial portion of its stroke and then impressing the full line pressure as the punch 17 approaches its clipping position. As in the previously described arrangement the full line pressure is imposed through manually actuatable valve 82 on pilot 86 of the four-way valve 78. In the normal inoperative position of said valve 78 the full line pressure is imposed on the underside of piston 111 through line 113 and port 112. Upon actuation of the pilot 86 by valve 82 the full line pressure is applied to three-way valve 92, as before, and also through a regulator 114 for the purpose of reducing the pressure to a point at which the force on piston 111 is not sufficient to cause damage. Said reduced pressure is applied through a check valve 115 and through a quick exhaust dump valve 116 into the upper end of cylinder 110. This last mentioned dump valve is of the type that incorporates therein a frustoconical element which when pressure is applied to one side thereof seats against a complementarily formed seat causing the full line pressure to be directed therethrough. However, upon reversal of the flow when piston 111 is on its upward stroke the conical element in valve 116 is unseated causing the exhaust air to be directly connected with atmosphere against only minimal resistance.

After the piston 111 has passed port 126 which connects with the pilot 93 of three-way valve 92 the latter is actuated to direct the full line pressure from line 117 through check valve 118, through valve 116 and into the upper end of cylinder 110. In this way the full line pressure is applied to the upper side of piston 111 and the desirable heavy clipping load is thereby achieved. In this case, in order to prevent the locking of fluid in the various lines when cylinder 110 is exhausted, it is preferable to connect line 119 with a relatively small bleed hole 120 which is not sufficiently large to reduce the full line pressure during the working stroke to any appreciable degree. In the form shown in FIG. 9 the exhaust may also be connected through line 103 with the knife cylinder 36 for cutting the clipped material.

The very detailed description of the preferred forms of the invention should not be taken as restrictive as it will be apparent that various modifications in design may be resorted to by those skilled in the art without departing from the scope of the following claims.

I claim:

1. In a fluid pressure actuated clipping apparatus for applying a clip around an article such as a casing or the like:
- an elongated feed track adapted to receive a clip therein for movement of said clip along the length of said track,
- a punch supported for translation in said track through a clipping stroke from a retracted position to an extended clipping position,
- means for feeding a clip into said track at a loading point between said retracted and extended positions of said punch,
- a die adapted to be engaged by said clip when said punch approaches said extended position for deforming said clip about said article,
- fluid pressure means for applying a relatively small force to said punch when the latter moves from said retracted position to a point past said loading point, and
- means for automatically applying a relatively large force to said punch during the remainder of its clipping stroke.

2. Apparatus according to claim 1 wherein said fluid pressure means and the last mentioned means comprising a differential piston structure connected to said punch, said differential piston structure including a small piston area and a large piston area, and wherein fluid pressure is applied to only said small piston area during the first portion of said clipping stroke and is applied to said large piston area during said remainder of the clipping stroke.

3. Apparatus according to claim 2 wherein means is provided for applying fluid pressure in a reverse direction to said small piston area upon completion of said clipping stroke for returning said piston structure and said punch to said retracted position.

4. Apparatus according to claim 3 wherein said fluid pressure means, the means for automatically applying a relatively large force and the means for applying fluid pressure in a reverse direction includes:
- first valve means for normally applying fluid pressure on the return side of the small piston area for holding said piston structure and punch in retracted position and for normally supplying fluid pressure to a manually actuatable control valve,
- said first valve means being actuatable upon actuation of said control valve to apply said fluid pressure to the driving side of said small piston area,
- second valve means actuatable by the fluid pressure on said small piston area when the latter reaches a predetermined point in its clipping stroke for applying fluid pressure to the driving side of said large piston area for exerting a relatively heavy force on said punch,
- said manually actuatable control valve being operable to actuate said first and second valve means to positions connecting said driving sides of said pistons with atmosphere.

5. In a clipping apparatus for applying a pair of U-shaped clips around an article such as a sausage casing or the like and at points spaced apart longitudinally of said article and which apparatus includes a pair of die supports each provided with an elongated clip track adapted to receive a clip therein for movement of said

clips along the length of said tracks, the improvement that comprises:

a unitary punch formed to provide a pair of spaced apart clip engaging ends with said ends being received in said tracks respectively,

said punch including a central section integral with and extending between said ends,

said die supports being formed with longitudinally extending slots on their opposed sides for receiving said central section therethrough.

6. Apparatus according to claim 5 wherein said ends are formed on a pair of flanges which extend along the outer side edges of said central section and are integrally secured to said section thereby enhancing the resistance of said punch to bending loads.

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