United States Patent [19]

Niedecker

[11] **3,717,972**

[45] **Feb. 27, 1973**

[54] **APPARATUS FOR CLOSING OPEN-TOPPED FLEXIBLE CONTAINERS**

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[22] Filed: **Feb. 22, 1971**

[21] Appl. No.: **117,570**

[30] **Foreign Application Priority Data**

Feb. 28, 1970 Germany.....P 20 09 541.4
Sept. 12, 1970 Germany.....P 20 45 229.3

[52] **U.S. Cl.**.....**53/138 A,** 29/243.57
[51] **Int. Cl.**.....**B65b 51/04**
[58] **Field of Search**.....29/211 D, 243.56, 243.57; 53/138 A

[56] **References Cited**

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3,381,359 5/1968 Schroeder .....29/243.57 X

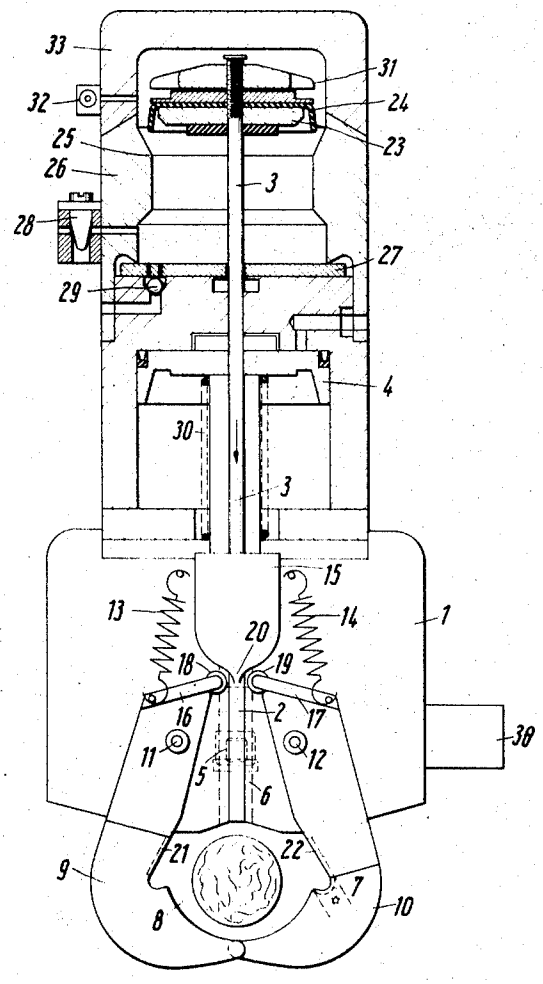
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[57] **ABSTRACT**

In an apparatus for closing open-topped containers made of flexible material, such as sausage casings, displacement of a single drive element serves to flatten the mouth of the container and then to compress it transversely, surround it with a U-shaped clip and close the clip to seal the container. The drive element is a punch which carries a cam whose advancing contour causes a pair of gathering arms surrounding the top of said container to pivot about pins against the action of springs and thereby flatten the container top. Further advance of the punch carries the clip and ultimately closes it.

Braking means such as a piston-cylinder or springs may be provided to slow down the advance of the punch during a part of the stroke as compared to the final part of the stroke when the full velocity is desired to close the clip.

11 Claims, 6 Drawing Figures



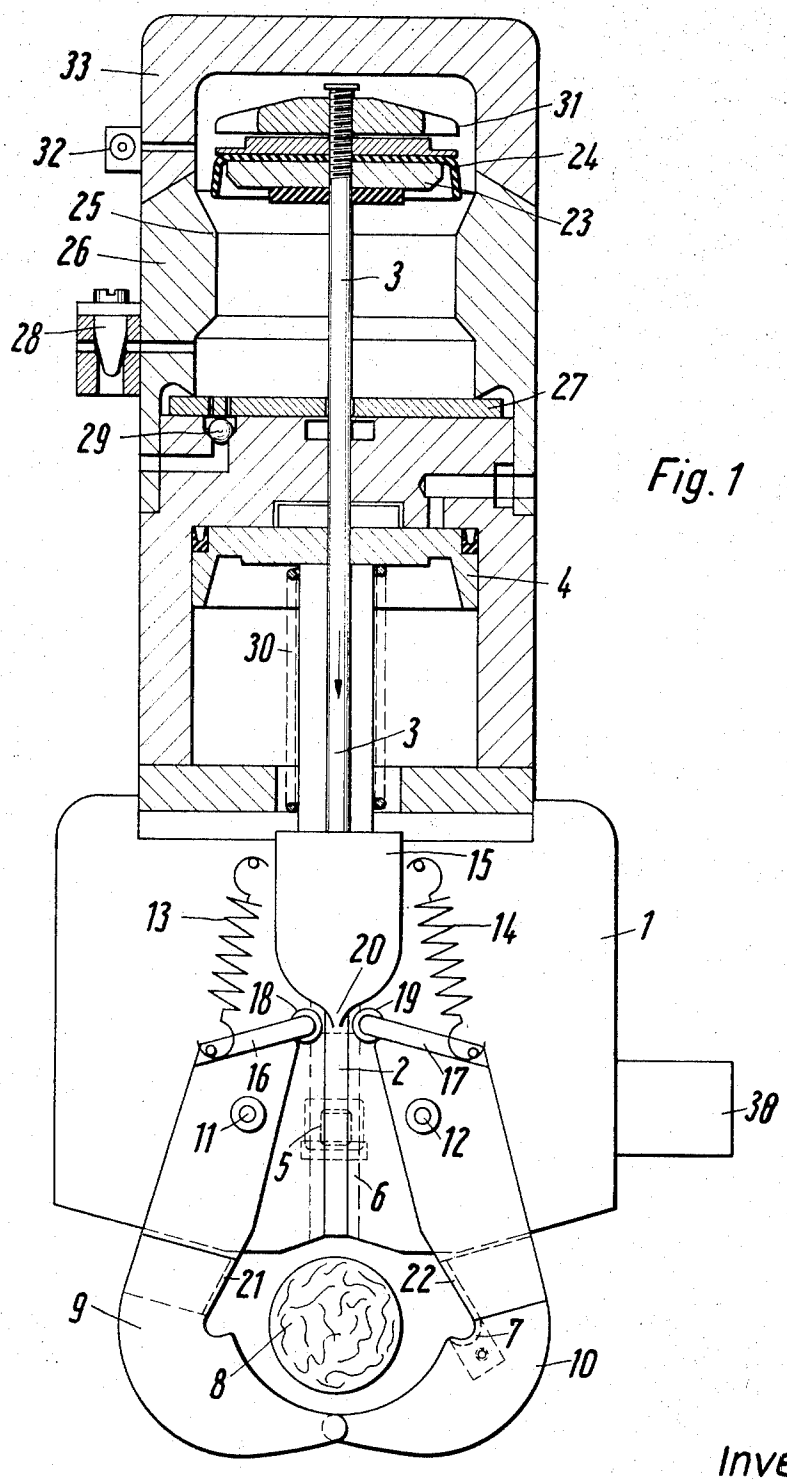


Fig. 1

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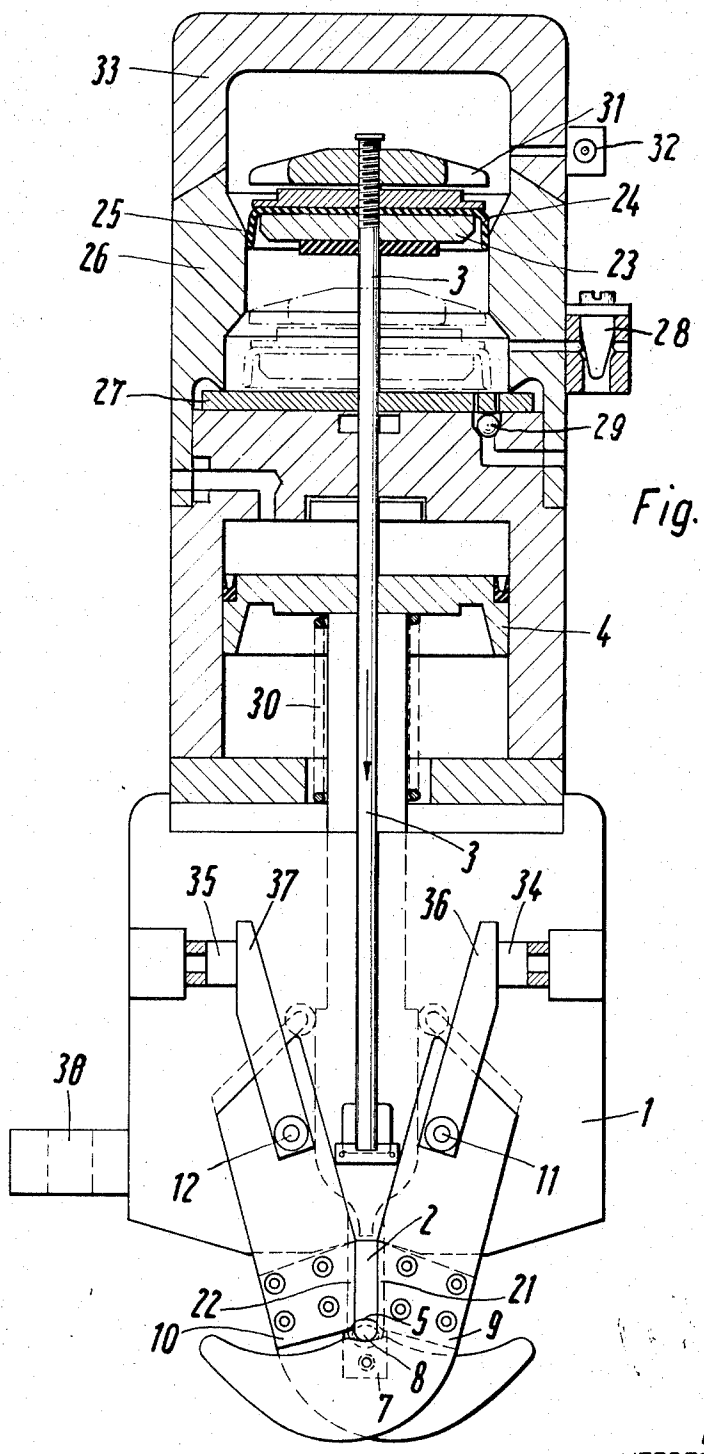


Fig. 2

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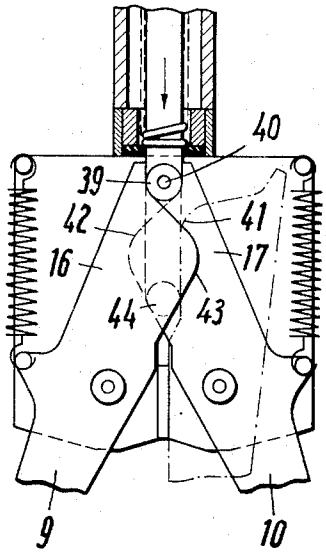


Fig. 3

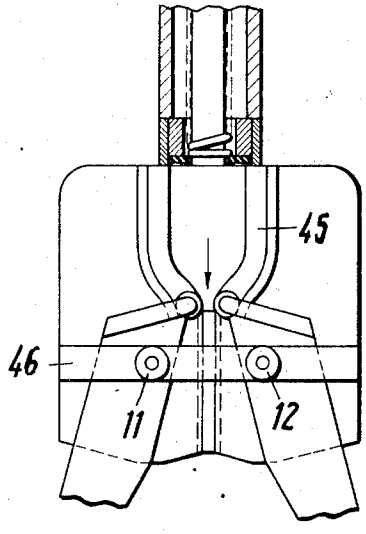


Fig. 4

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Fig. 6

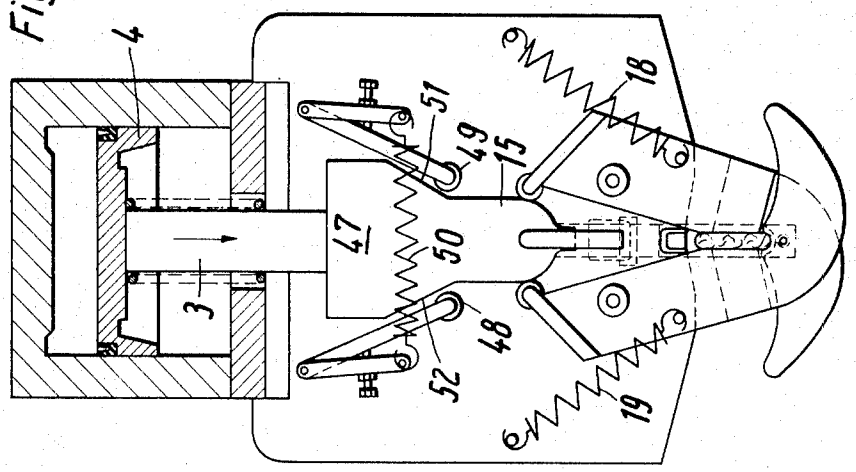
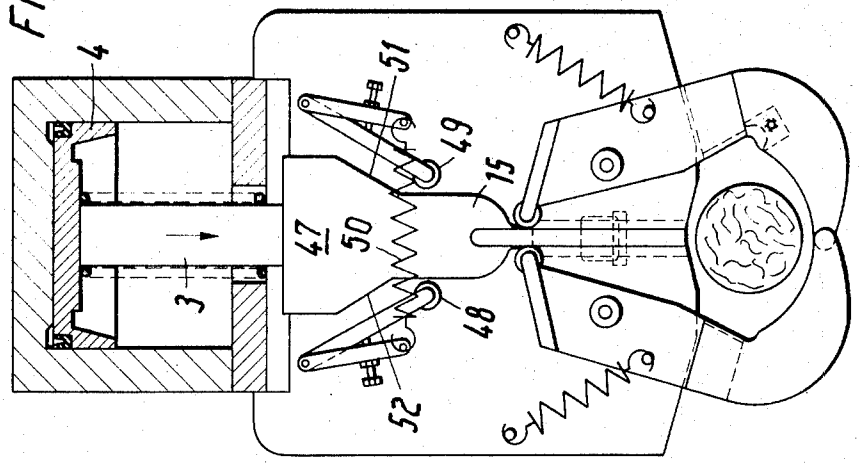


Fig. 5



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APPARATUS FOR CLOSING OPEN-TOPPED FLEXIBLE CONTAINERS

The invention relates to an apparatus for closing packages of a flexible material, such as plastic film, used for packaging food products and other articles e.g., sausage casings.

Such machines are frequently required in sausage factories, for example, for the rapid and dependable closing of sausage casings, particularly sausages of relatively large diameter, immediately after being filled. In operation, the top of the package is displaced by gathering it toward the axis of the package, followed by sealing the top with a U-shaped clip whose legs are displaced and closed by a punch and die.

Machines which perform these operations are known. They usually consist of a pneumatically actuated punch and a die for closing the closure clip. One such machine, shown in U.S. Pat. No. 3,293,736, is provided with two gathering arms which are supported on a common pin and are driven by two separate, additional compressed-air cylinders.

In another machine for this purpose, shown in U.S. Pat. No. 3,377,692, two prism-shaped gathering plates are provided which are carried in guides and which work against each other in gathering. A compressed-air cylinder with a piston is provided for actuation of the gathering plates, and another compressed-air cylinder for driving the punch. From U.S. Pat. No. 2,756,428 it is known to close two closing arms through a lever linkage from a common drive so as to close a clip.

These prior-art devices are rather complicated technically and, since they comprise a plurality of drives, they are susceptible to trouble in several respects.

It is accordingly an object of the invention to provide a sealing apparatus of the general type described wherein a single drive mechanism effects both gathering of the container top and its closure.

It is a further object to provide such an apparatus wherein the rate of advance of the drive mechanism is controlled so as to be at different levels at different portions of the stroke or cycle, the particular level being coordinated to the function being performed.

These and other objects and advantages are realized in accordance with the present invention wherein a single drive element is provided on an apparatus suited for sealing sausage casings with U-shaped clips. The apparatus comprises a base provided with a longitudinal guide channel and a punch movable longitudinally of said guide channel. The U-shaped clips are successively movable, from a supply, in said guide channel. A pair of gathering arms are pivotally connected to said base on opposite sides of the channel, surrounding the top of the container. A punch is caused to advance and, by the interaction of a cam-and-follower, one connected to said punch and the other to said gathering arms, the gathering arms are pivoted so as to flatten the top of the container. Further advance of the punch carries the closure clip transversely of the flattened top, compressing it to approximately circular configuration, after which the legs of the clip are displaced to seal the top.

As the punch is retracted, springs, for example, open the gathering arms and restore them to their starting position. A symmetrical cam is preferably provided which is so designed that it effects the opening of the gathering arms during the return motion of the punch. Conversely, the upper ends of the gathering arms may be provided with cam surfaces over which a roller rides, the roller being carried by the punch. The punch may be conventionally driven pneumatically, hydraulically, electrically or manually.

Through a holding device the apparatus in accordance with the invention may be associated, displaceable or rotatably, with the spout of a filling machine so that when the apparatus is swung or moved out of the way a tube can be slipped onto the filling spout. Generally a length of tubing which has first been closed at one end will be slipped onto the filling spout, then the apparatus in accordance with the invention will be moved to align its closure axis with that of the filling spout and, after filling, the open end of the filled container will be gathered and closed by means of the apparatus in accordance with the invention.

The apparatus in accordance with the invention has the advantage that but a single drive element, usually a drive piston, is required for the gathering and sealing operation. During the down stroke of the punch drive, the two gathering arms are automatically brought together concentrically around the packaging tube, and the continued advance of the punch causes the closure clip on the die to be applied around the gathered top. The requisite synchronization of the gathering and closing operations and axial sealing are thus assured. Moreover, the apparatus is much simpler than the prior-art closing machines in which two separate drives are provided for each gathering arm plus another separate drive for the punch. Because of its simpler design, the apparatus in accordance with the invention is reliable and trouble-free in operation.

A special embodiment of the invention relates to a further improvement. When the packaging tube is first gathered laterally into a flattened top by gathering arms which are closed by the punch drive, and then gathered into a round top by the clip advanced by the punch, a rise in pressure will be produced behind the piston of the pneumatically actuated punch drive due to the resistance to be overcome in the first gathering operation, i.e., flattening. Upon completion of that gathering operation, the increased pressure will have a deleterious effect in the last gathering operation, i.e., formation of a circular bundle, in that the stroke velocity of the punch will be excessive, as a result of which the wrapper may well be damaged and packaged product, such as sausage meat, may be squeezed out. This disadvantage could not be adequately remedied by reducing the speed of the punch drive, in a manner which in itself is known, as this would have the drawback of slowing down the entire operation, with the machine then working uneconomically.

The invention therefore provides for connecting the punch drive with a brake mechanism that reduces the stroke velocity of the punch over a certain section of its path to the die. This is accomplished by causing the punch to move at full speed over the first portion of its path to the die; then the punch motion is decelerated over a certain portion of the stroke, with the clip carried by the punch at the same time performing the second gathering operation. At the end of this portion the brake is released and the punch drive is allowed to operate at full force to provide the necessary pressure for closing the clip.

In a preferred embodiment, the brake mechanism in accordance with the invention consists of a brake piston which is connected to the punch drive piston, and to the punch itself, the braking path being determined by the length of a cylinder surface which cooperates with the brake piston. In addition, the braking force may be adjusted by means of a pressure-regulating valve. The stroke-limiting means for the punch drive, which is advisable in the case of air-powdered closing machines and through which the desired closing pressure is set, may be fixed to a piston rod coaxial with and preferably integral with the drive piston and the brake piston. The cylinder for the brake piston then also serves as a protective sleeve for the stroke-limiting means.

In another embodiment of the invention, the brake mechanism consists of one or more springs whose force opposes the stroke velocity over the desired brake path in conjunction with an appropriately constructed part of the punch drive.

The design in accordance with the invention of air-powered closing machines has the advantage that it precludes damage to the packaging material as it is gathered by the closure clip prior to being closed. The closing machine thus is more reliable and trouble-free in operation.

The invention will now be described in greater detail with reference to the accompanying drawings, wherein:

FIG. 1 is a top plan view of one apparatus embodiment in open position;

FIG. 2 is a bottom plan view of the apparatus of FIG. 1 in closed position;

FIG. 3 is a fragmentary view of another apparatus embodiment with cam parts on the gathering arms;

FIG. 4 is a fragmentary view of still another embodiment with a cam for opening the gathering arms;

FIG. 5 shows another embodiment with a spring brake in the starting position; and

FIG. 6 shows the apparatus of FIG. 5 at the commencement of the braking action.

Referring now more particularly to the drawings, in FIGS. 1 and 2 there is shown an air-powered closing machine having a base 1 with a punch 2 which is rigidly fixed to the piston rod 3 of a drive piston 4. During its stroke, the punch 2 drives a U-shaped clip 5 through a clip guide channel 6, defined in base 1, against a closing die 7.

Before the clip 5 is closed, the packaging material 8 must be gathered so that it can be closed by the clip 5. Gathering is accomplished by means of gathering arms 9 and 10 which are pivotally carried on respective pins 11 and 12 and held in the open starting position by extension springs 13 and 14. Mounted fixedly or adjustable on rearward extensions 16 and 17 of the gathering arms 9 and 10 are cam roller followers 18 and 19. In the starting position of the gathering arms, the cam roller followers 18 and 19 are located at point 20 of the cam 15, thus limiting the open position. The gathering arms are closed by means of the cam 15, which is fixed to the piston rod 3 and the closing punch 2, and in the process laterally constrict the packaging material so that initially a flattened top is produced (FIG. 2). This forms a clip guide channel defined by surfaces 21, 22 which channel is aligned with channel 6. The closing punch 2 then enters this channel along with the clip 5 which gathers the packaging tube 8 into circular configuration and closes it against the die 7.

After the closing of the gathering arms 9 and 10, there occurs behind the closing piston 4 a pressure rise which would increase the stroke velocity of the punch 2, as a result of which the packaging tube would be damaged by the force of clip 5 against the die 7. To prevent this, there is secured to the piston rod 3 a further brake piston 23 which upon completion of the initial gathering operation comes to bear, by its collar 24, on the rim 25 of a brake cylinder 26 (FIG. 2). When the packaging tube has been laterally gathered to a flattened top with the machine in this position, the rollers 18 and 19 of the gathering arms 9 and 10 leave the inclined faces of the cam 15 to ride along the parallel faces of the cam 15 with less resistance. As a result, the braking action of the brake piston 23 becomes effective at this point. After leaving the surface of the brake cylinder 26, the braking action ceases. The full force of the closing piston 4 then is available for the closing process.

The brake cylinder 26 is sealed with a gasket 27, and the air undergoing compression can therefore escape only through pressure-regulating valve 28, which also serves to regulate the braking force. A check valve 29 is provided to prevent compression from occurring during the return motion of the punch 2 and of the piston rod 3, and to enable the brake piston 23 to return rapidly to its starting position, actuated by the restoring force of a spring 30.

At its upper end, the piston rod 3 is provided with a screw thread onto which a stroke-limiting nut 31 is screwed. This permits the desired closing pressure to be set. For reasons of safety, the extended piston rod with the stroke-limiting nut 31 is provided with a protective sleeve. The latter is formed by the brake cylinder 26. To permit ready access to the stroke-limiting nut 31, a cap 33 provided with a hinge 32 is disposed on the protective sleeve. The hinge can be positioned so that the cap 33 automatically closes, the cylinder 26 with the brake piston 23 and the stroke-limiting nut 31 then being protected at all times against dirt.

The gathering arms 9 and 10 with the clip guide surfaces 21 and 22 and the die 7 are prevented from striking metallically hard against each other during the rapid closing motion by means of elastic stops 34 and 35 on base 1 which are struck by check arms 36 and 37, carried as rearward extensions of the gathering arms 9 and 10. During the return, the cam 15 gradually releases the roller followers 18 and 19, so that the gathering arms 9 and 10 can likewise be pulled into their starting position, shown in FIG. 1, by the extension springs 13 and 14. The closing apparatus is connected to the filling machine through a holding device, not shown, so as to be displaceable with it or rotatable about a bore 38.

In the embodiment shown in FIG. 3, the cam 15 is replaced by another cam mechanism. Two rollers 39 are rotatably carried on a pin 40 which is fixed to the punch 2 and the piston 4. The rearward extensions 16 and 17 of the gathering arms here are provided with cam surfaces 41 and 42 which cooperate with the rollers 39. FIG. 3 is a fragmentary view of the gathering arms in the open position. The closed position of the gathering arm 10 is indicated in phantom lines. The gathering operation is completed with the cam surface 41 in position 43 and is followed by the closing operation. At 44 the roller 39 is in the closing position.

A further example of a cam mechanism is shown in FIG. 4. Here the open cam **15** is replaced by a closed cam track **45**, and the two extension springs **13** and **14** may therefore be dispensed with. The two pins **11** and **12** are disposed on a bridge **46** in order that the downward movement of the cam **45** may not be impeded by the pins.

FIGS. **5** and **6** show another embodiment wherein the punch drive with the cam **15** is braked directly by spring force over a certain portion of the stroke. A cam **47** is secured, in conjunction with the cam **15**, to the piston rod **3** of the drive piston **4**. On cam **47** ride rollers **48** and **49**, which are subject to the adjustable tension of a spring **50**, and which, by reason of the inclined surfaces **51** and **52**, produce a braking action during gathering by the closure clip. Upon completion of the gathering process rollers **48**, **49** reach the parallel sides of cam **47** so that the braking action is discontinued and the full force of the drive piston is available for closing the clip.

As noted, the stroke can be initiated manually, return being achieved by spring action. Preferably, however, the stroke is carried out pneumatically, compressed air being supplied above piston **4** through the aperture above it and to the right in FIGS. **1** and **2**. Means, not shown, are provided to allow venting of such compressed air during the return stroke.

It will be appreciated that the instant specification and examples are set forth by way of illustration and not limitation, and that various modifications and changes may be made without departing from the spirit and scope of the present invention.

What is claimed is:

1. An apparatus for closing open-topped containers of flexible material such as sausage casings, said apparatus comprising a base provided with a longitudinal guide channel, a punch movable longitudinally of said guide channel, a plurality of U-shaped closure clips successively moved in said guide channel from an initial position to a final closed position sealing a container, a pair of gathering arms pivotally connected to said base on opposite sides of said guide channel and surrounding and spaced from the top of said open-topped container, a pair of pins on said base each serving as the pivot axis of one of said gathering arms, means for closing said gathering arms, and means for advancing said punch and one of said clips to final position after said gathering arms have been closed, said means for closing said gathering arms comprising cam-and-follower means mounted on said means for advancing said punch and on said gathering arms, whereby during advance of said punch said cam-and-follower means first produces pivoting of said arms toward one another to form a flattened area embracing the now-flattened container top, further advance of said punch carrying a clip in the guide channel transversely of the flattened top to compress the top to an approximate circle and finally to seal it by displacing the legs of the U-shaped clip, gathering of said container top and its further compression and sealing being thereby effected by a single mechanism in a single continuous stroke.

2. An apparatus according to claim **1**, wherein said cam-and-follower means comprises symmetrical cam and follower means, said cam means being on one of (a) said means for advancing said punch and (b) said gathering arms, and said follower means being on the other of (a) and (b), said apparatus further including spring means extending between said base and said gathering arms, whereby advance of said punch through the intermediary of said cam means and follower means causes said gathering arms to pivot about their pins against the action of said spring means.

3. An apparatus according to claim **3**, wherein said cam means is on said means for advancing said punch, and said follower means comprises a pair of followers each on one of said gathering arms.

4. An apparatus according to claim **3**, wherein said follower means is on said means for advancing said punch, and said cam means comprises a pair of guide surfaces each on one of said gathering arms.

5. An apparatus according to claim **1**, including brake means carried by said means for advancing said punch, whereby the forward velocity of said punch is reduced during a predetermined portion of its advance.

6. An apparatus according to claim **6**, wherein said brake means is positioned so as to reduce the forward velocity of the punch during a portion of the stroke to a level below its final velocity during displacement of the legs of said U-shaped clip.

7. An apparatus according to claim **6**, wherein said brake means comprises a piston connected with said means for advancing said punch, and a cylinder in which said piston operates.

8. An apparatus according to claim **8**, including an adjustable member on said piston and a stop in fixed position relative to said base, abutment between said member and said stop determining the end of a stroke.

9. An apparatus according to claim **6**, wherein said punch carries the cam of said cam-and-follower means, and said brake means comprises a spring which is distended upon displacement of said cam, the shape of said cam controlling the extent of braking.

10. An apparatus according to claim **4**, including a piston connected with said means for advancing said punch,

a cylinder in which said piston operates, whereby the forward velocity of said punch is reduced during a predetermined portion of its advance, an adjustable member on said piston, and a stop in fixed position relative to said base, abutment between said member and said stop determining the end of a stroke.

11. An apparatus according to claim **1** in combination with an open-topped sausage casing disposed between said gathering arms and means for filling said sausage casing while so positioned.

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