

April 17, 1945.

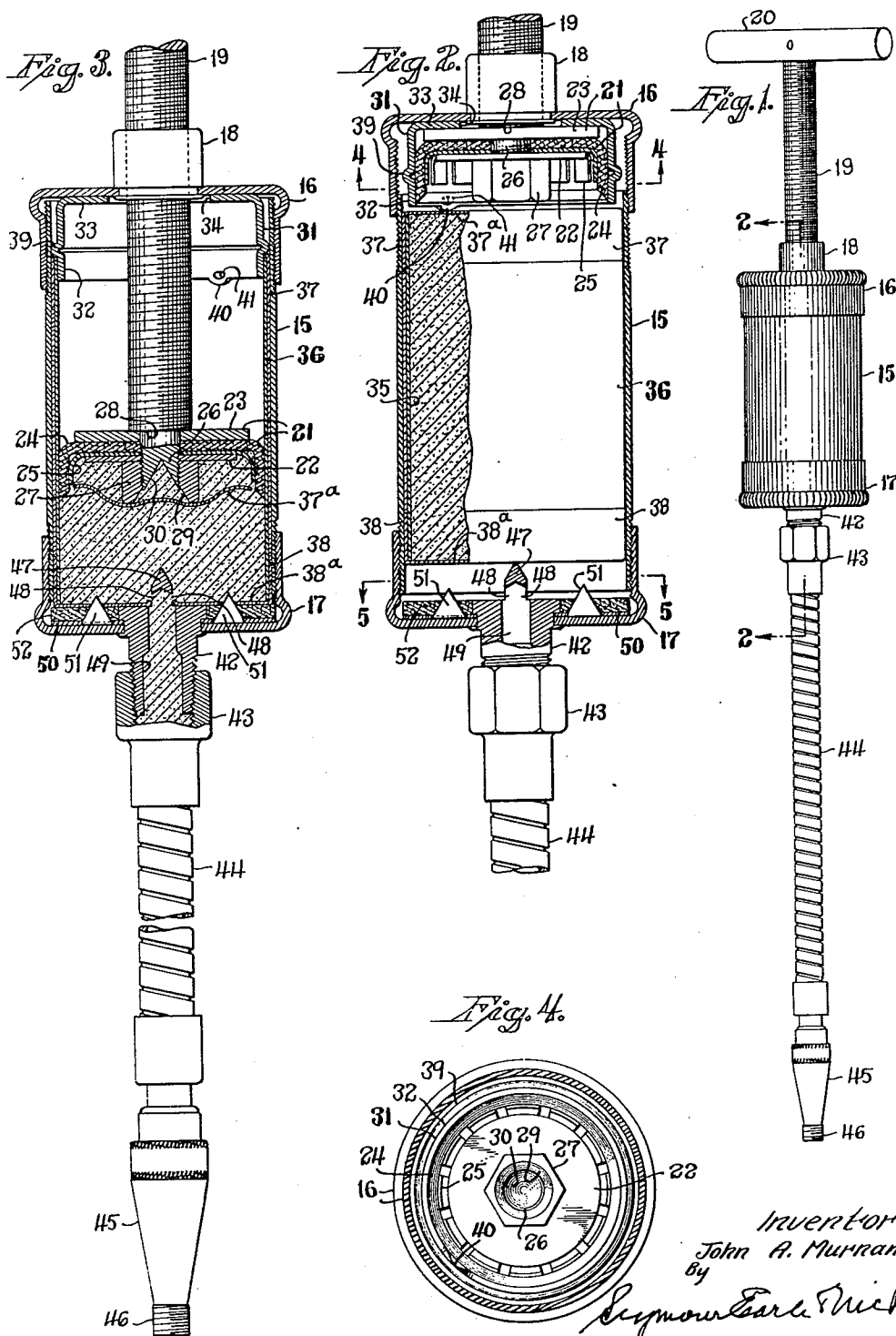
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2,373,774

DEVICE FOR INJECTING VISCOUS MATERIALS

Filed Aug. 31, 1943

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 5.

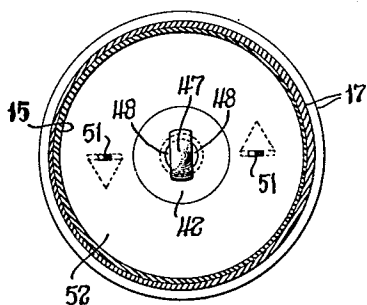


Fig. 6.

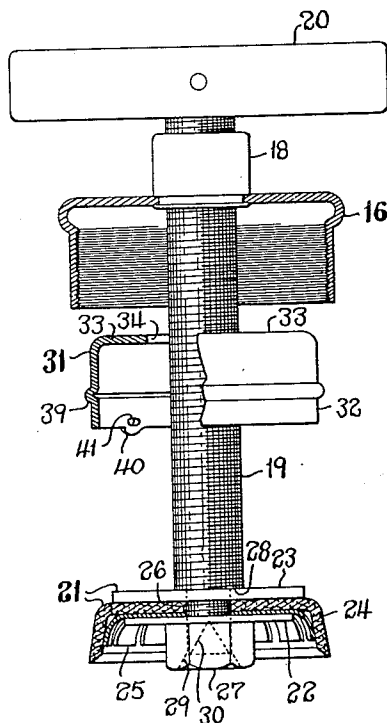


Fig. 7.

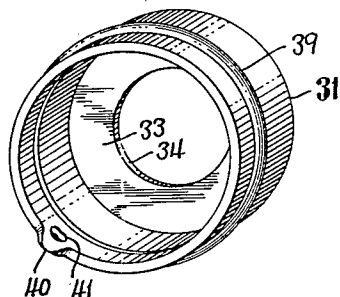


Fig. 10.

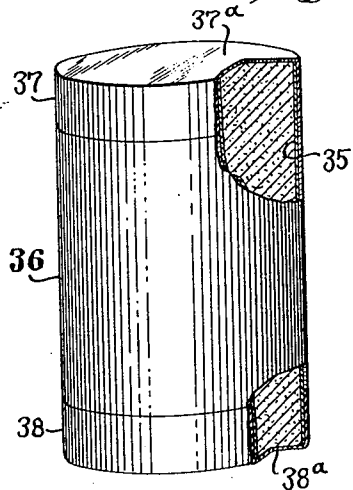


Fig. 8.

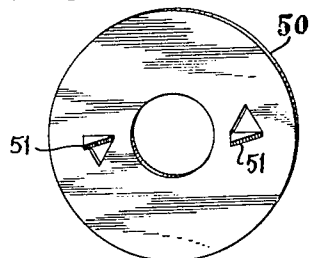
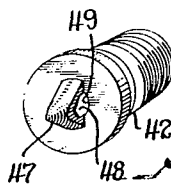


Fig. 9.



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UNITED STATES PATENT OFFICE

2,373,774

DEVICE FOR INJECTING VISCOUS MATERIALS

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4 Claims. (Cl. 222—83)

The present invention relates to improvements in devices for injecting viscous or plastic materials under pressure into extraneous devices or locations. The devices of the present invention are especially well suited for injecting or feeding packaged insulating or sealing material into the cavities in the spark plugs of aircraft engines, though available for many other uses where it is desired to inject viscous materials.

One of the objects of the present invention is to provide a superior device of the character referred to and having reliable and effective means whereby sealed packages of viscous materials may be installed in the device and the contents of such package then expelled from the device and delivered to the desired location.

Another object of the present invention is to provide a superior device of the character referred to having reliable and effective means whereby a sealed package of viscous material may be installed in the device and the package suitably opened while in the device, followed by the expulsion of the contents of the said package from both the package and the device.

A further object of the present invention is to provide a superior device for injecting viscous material and having the general features set forth in either of the foregoing objects and, in addition, having superior means whereby the viscous material may be prevented from escaping in appreciable amount from the package other than through the designed and intended delivery-opening of the device.

Still another object of the present invention is to provide a superior device of the character referred to in which the contents of a package of viscous or plastic material may be cleanly and substantially completely removed from the package and expelled from the device to the desired locations.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a view in side elevation of one form of a device for injecting viscous materials, embodying the present invention;

Fig. 2 is a broken view mainly in central-longitudinal section on the line 2—2 of Fig. 1 and partly in side elevation, a sealed package of plastic material being shown within the device

and the parts of the latter assembled and in position just prior to the severance of the end-wall of the package;

Fig. 3 is a view similar to Fig. 2 but showing the feeding-head advanced into the interior of the package;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a similar view, but taken on the line 5—5 of Fig. 2;

Fig. 6 is a view partly in side elevation and partly in central-longitudinal section of the unit comprising the inner cap, contractor, operating-rod and feeding-head, together with associated parts;

Fig. 7 is a perspective view of the contractor;

Fig. 8 is a similar view of the anchoring-plate;

Fig. 9 is a perspective view of the outlet-nipple; and

Fig. 10 is a perspective view of a sealed package suitable for use in the injecting device shown.

The particular device for feeding viscous or plastic materials herein chosen for purposes of illustrating one form of the present invention, includes a tubular body or barrel 15 which is externally threaded adjacent each of its respective opposite ends. Normally threadedly connected to one end of the body 15 is an inner cap 16 and similarly connected at the opposite end of the said body is an outer cap 17.

The inner cap 16 has rigidly projecting outwardly from it an internally-threaded bushing 18 threadedly receiving an externally-threaded operating-rod 19. At its exposed end, the operating-rod 19 has rigidly secured thereto a bar-like handle 20 and at its opposite end the said operating-rod has a feeding-head generally designated by the reference character 21 fixedly secured thereto.

The feeding-head 21 just above referred to includes a lower or outer clamping-washer 22 and an inner or upper clamping-washer 23 clamping between them a cup-washer 24 and a cup-like expander 25. The said cup-washer 24 may be formed of leather or other suitable flexible material, while the said expander 25 may be formed of spring metal so as to exert a constant effort to yieldingly urge the flange of the cup-washer 24 outwardly in a generally radial direction. All of the elements 22 to 25 inclusive above referred to are mounted upon a stem 26 formed integral with the end of the operating-rod 19 at the end thereof opposite the handle 20. The said stem 26 is externally threaded for the reception of a clamping-nut 27 which bears against the lower

face of the outer or lower clamping-washer 22, so as to grip and rigidly hold all of the said elements 22 to 25 inclusive between the said clamping-nut and the shoulder 28 formed at the junction of the operating-rod 19 proper with its said stem 26. The inner or lower face of the clamping-nut 27 is formed with a conically-contoured clearance-recess 29 which merges into a similarly-contoured clearance-recess 30 formed in the end of the stem 26 of the operating-rod 19, for purposes as will hereinafter appear.

Normally located within the inner cap 16 is a cup-shaped contractor 31 comprising a flange 32 and an end or bottom wall 33. Formed in the end-wall 33 of the said contractor is a central clearance-opening 34 having a diameter very materially larger than the diameter of the operating-rod 19 to permit lateral movement of the said contractor with respect to the said operating-rod 19. The diameter of the flange 32 of the contractor 31 is proportioned to have a snug fit within the interior of the tubular side-wall or body 35 of a cylindrically-contoured sealed package generally designated by the reference character 36 and shown in Figs. 2, 3 and 10. The said package 36, in addition to its tubular body 35, includes end-caps 37 and 38 respectively located at the opposite ends of the said body. The package 36 may be composed of any suitable airtight material such, for instance, as synthetic resin. Preferably, the diameter of the package 36 is such as to snugly fit the interior of the barrel or body 15.

Adjacent its lower end (as viewed in the drawings), the contractor 31 is formed upon its outer periphery with an annular sealing-abutment 39 which is adapted, under conditions as will hereinafter appear, to have sealing engagement with the upper or inner edge of the body or side-wall 35 of the package 36. The said sealing-abutment may be conveniently produced by spinning or otherwise outwardly deflecting, the metal of the flange 32. On its edge the flange 32 is formed with a cutting-nib 40 which may be produced by first providing the said flange with a radial perforation 41 and then deflecting the adjacent metal outwardly to form the said cutting-nib by means of a tool inserted into the said perforation.

The outer cap 17 has staked or otherwise rigidly centrally secured thereto, an outlet-nipple 42 extending both interiorly and exteriorly of the said cap. The portion of the outlet-nipple 42 extending exteriorly of the cap is externally threaded for the reception of an internally-threaded coupling 43 rigidly attached to the inner end of a flexible metallic hose 44.

The outer end of the metallic hose 44 is provided with an outlet-fitting 45 having an outer portion of tapering form. The said outlet-fitting 45 is formed at its extreme outer end with external threads 46 adapting the fitting to be threadedly connected to another fitting or to a spark-plug aperture or the like.

Returning now to the outlet-nipple 42, it will be noted that the said nipple is formed on its upper or inner end with an integral outlet-stud 47 of a pointed character and having two diametrically-opposite ports 48—48. The two ports 48—48 just referred to communicate with an axial passage 49 in the outlet-nipple 42, so that material may flow from within the body 15 outwardly into the coupling 43 and thence through the hose 44 and out through the outlet-fitting 45 to the desired destination.

Resting against the upper face of the end-wall of the outer cap 17 is an anchoring-plate 50 which may be conveniently formed of sheet steel and which is apertured in its center to fit over the portion of the outlet-nipple 42 located above the end-wall of the said cap 17. At substantially-diametrically-opposite points, the material of the anchoring-plate 50 is cut and struck-up to provide two similar anchoring-prongs 51—51, for purposes as will hereinafter appear. Placed over the anchoring-plate 50 is a ring-like sealing-pad 52 which may be formed of leather or other suitable resilient material. The said sealing-pad is suitably perforated to permit the anchoring-prongs 51—51 of the anchoring-plate 50 to extend upwardly therethrough, as is clearly shown in Figs. 2 and 3.

A preferred mode of loading the device with packaged viscous or plastic material and of expelling the said material therefrom will now be described.

The unit comprising the features 16 and 18 to 31 inclusive may first be detached from the body of barrel 15 of the device by unthreading the inner cap 16 therefrom. The operating-rod 19 may now (if not previously done) be backed-up with reference to the cap 16 until the features 19 to 31 inclusive assume, with respect to each other, substantially the relationships shown in Fig. 2. In Fig. 2 it will be noted that the cup-washer 24 has been drawn up inside of the contractor 31, so that the diameter of the said cup-washer is materially reduced against the tension of the expander 25. A sealed package such as 36, may now be inserted into the body or barrel 15 through the now-open upper or inner end thereof. The unit comprising the features 16 and 18 to 31 inclusive may now be reassembled with the body or barrel 15 by partially threading the inner cap 16 onto the said body, as is illustrated in Fig. 2.

A further threading-on of the cap 16 will cause the cutting-nib 40 of the contractor 31 to engage with the end-wall 37a of the inner or upper cap 37 of the package 36. In the process of further threading the cap 16 onto the body 15, the contractor 31 will be caused to turn therewith, thus causing the cutting-nib 40 to sever the end-wall 37a of the cap 37 of the package. The rotation of the normally-floating contractor 31 to effect the movement of the cutting-nib 40 will be caused by the pinching of the end-wall 33 of the contractor between the clamping-washer 23 and the end-wall of the cap 16, as well as by the frictional engagement of the skirt of the cup-washer 24 with the interior of the said contractor.

The downward or outward pressure exerted upon the package 36 by the cutting action of the cutting-nib 40, will partially, at least, force the said package downwardly so that the outlet-stud 47 and the anchoring-prongs 51—51 penetrate the end-wall 38a of the outer cap 38 of the said package. The engagement of the lower or outer cap 38 with the anchoring-prongs 51—51 will hold the package 36 against rotation within the body or barrel 15 as the cutting-nib 40 performs its function of cutting out the end-wall 37a of the upper or inner cap 37.

Ultimately, in the operation of threading-on the inner cap 16, the end-wall 37a of the cap 37 of the package will be completely severed (and forced partially into the hollow interior of the feeding-head 21). Shortly after the cutting-nib 40 has completed its task, the lower portion of

the flange 32 of the contractor 31 will enter the upper end of the package 36, and the annular sealing-abutment 39 of the contractor 31 will engage with the upper edge of the unsevered rim-portion of the end-wall 37a of the cap 37 of the package 36 and effectively seal the package against undue leakage of the plastic material upwardly into the inner cap 31. The described engagement of the sealing-abutment 39 will force the package downwardly so that the end-wall 38a of the cap 38 thereof will be fully penetrated by the outlet-stud 47 and the anchoring-prongs 51-51, and the said cap 38 will be brought into sealing engagement with the sealing-pad 52, all as shown in Fig. 3.

Now by turning the operating-rod 19 by means of its handle 20, the feeding-head 21 will be caused to ride out of the contractor 31 smoothly into the interior of the package 36. Upon emergence from the lower end of the contractor 31, the cup-washer 24 will immediately expand under the action of the expander 25 and the lower beveled-edge of the said cup-washer will ride along the inner surface of the body or side-wall 35 of the package 36. The continued downward or outward movement of the feeding-head 21 will cause the viscous or plastic material within the said package to flow laterally into the axial passage 49 of the outlet-nipple 42 through the complemental ports 48-48. From the interior of the outlet-nipple 42, the material will be forced downwardly through the flexible metallic hose 44 and out through the outlet-fitting 45 to the desired location.

When the feeding-head 21 reaches the limit of its downward movement, the outlet-stud 47 will be accommodated within the clearance-recess 29 in the clamping-nut 27 and the clearance-recess 30 in the stem 26 of the operating-rod 19, thus avoiding injury to the said outlet-stud.

In lieu of the procedure above described for inserting and opening a package of sealed viscous or plastic material, a reverse operation may be performed, though such procedure is not recommended over the procedure first described.

In the reverse procedure, the unit comprising the parts 16 to 31 inclusive might be fully applied to the upper or inner end of the barrel or body 15 and the lower or outer cap 17 removed to permit the insertion of the package 36 or its equivalent into the said body. Now by screwing the lower or outer cap 17 back onto the body 15, the outlet-stud 47 and the anchoring-prongs 51-51 would be engaged with the end-wall 38a of the outer cap 38 of the said package.

By continuing to thread the lower or outer cap 17 on to the body 15, the package 36 would be rotated and ultimately brought into engagement with the cutting-nib 40. The continued threading-on of the cap 17 would ultimately effect the severance of the end-wall 37a of the cap 37 of the package, so that the ejection of the contents of the package could be effected in a manner similar to that previously described. This second procedure is not recommended, however, mainly for the reason that the peripheral surfaces of the body or side-wall 35 of the package 36 would normally cause excessive friction with the inner periphery of the body or barrel 15 of the device, thus making the operation unduly difficult.

It is to be borne in mind that in many instances certain plastic or semiliquid materials deteriorate during storage or transportation if air and moisture are given access thereto. By way of example, the plastic sealing-and-insulating compound now commonly used in the interiors of air-

craft spark plugs are of such character as require protection from both air and moisture.

By means of the present invention, a sealed package of plastic or viscous material may remain sealed during its insertion into the device described until such time as it is desired to expel the contents of such sealed package and inject the same into a spark plug or other device. The user may then, in effect, "open" the package while the same is within the device and proceed smoothly and effectively to inject the same into the desired location without the appreciable entrapment of air or moisture.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A device for injecting viscous material, including in combination: a tubular body constructed and arranged to receive a package of viscous material and having opposite end-walls, at least one of the said end-walls being removable from the said tubular body to permit the introduction therinto of a package of viscous material; an operating-rod extending through one end-wall of the said tubular body; a feeding-head carried by the said operating-rod at a location within the said body and having a laterally-contractible portion adapted to fit within the said package; a laterally floating cup-shaped contractor located intermediate the said feeding-head and the end-wall of the said body through which the said operating-rod extends and having an external diameter smaller than the internal diameter of the said tubular body to thus permit the said contractor to float laterally therein, the said cup-shaped contractor having an end-wall centrally apertured to receive with freedom for lateral movement the said operating-rod, the said contractor having a substantially-annular flange projecting from the said end-wall and constructed and arranged to engage with and contract the laterally-contractible portion of the said feeding-head when the latter is retired toward the end-wall of the body through which the said operating-rod extends; and a cutter carried by the substantially-annular flange of the said contractor and constructed and arranged to cut through the end-wall of a package contained within the said body when relative movement takes place between the said contractor and the said package.

2. A device for injecting viscous material, including in combination: a tubular body constructed and arranged to receive a package of viscous material and having opposite end-walls, at least one of the said end-walls being removable from the said tubular body to permit the introduction therinto of a package of viscous material; an operating-rod extending through one end-wall of the said tubular body; a feeding-head carried by the said operating-rod at a location within the said body and having a laterally-contractible portion adapted to fit within the said package; a cup-shaped contractor within the said tubular body and having an end-wall and a substantially-annular flange projecting therefrom, the said flange being constructed and arranged to fit within the said package and engage with

and contract the laterally-contractible portion of the said feeding-head when the latter is retired toward the end-wall of the body through which the said operating-rod extends; a cutter carried by the substantially-annular flange of the said contractor and constructed and arranged to cut through the end-wall of a package contained within the said body when relative movement takes place between the said contractor and the said package; and a sealing-abutment carried on the exterior periphery of the flange of the said contractor in position to engage with the end of the package through which the said cutter has penetrated.

3. A device for injecting viscous material, including in combination: a tubular body constructed and arranged to receive a package of viscous material and having opposite end-walls, at least one of the said end-walls being removable from the said tubular body to permit the introduction therinto of a package of viscous material; an operating-rod extending through one end-wall of the said tubular body; a feeding-head carried by the said operating-rod at a location within the said body and having a laterally-contractible portion adapted to fit within the said package; a laterally-floating cup-shaped contractor located intermediate the said feeding-head and the end-wall of the said body through which the said operating-rod extends and having an external diameter smaller than the internal diameter of the said tubular body to thus permit the said contractor to float laterally therein, the said cup-shaped contractor having an end-wall centrally apertured to receive with freedom for lateral movement the said operating-rod, the said contractor having a substantially-annular flange projecting from the said end-wall and constructed and arranged to engage with and contract the laterally-contractible portion of the said feeding-head when the latter is retired toward the end-wall of the body through which the said

operating-rod extends; a cutter carried by the substantially-annular flange of the said contractor and constructed and arranged to cut through the end-wall of a package contained within the said body when relative movement takes place between the said contractor and the said package; and a sealing-abutment carried by the flange of the said contractor in position to engage with the end of the package through which the said cutter has penetrated.

4. A device for injecting viscous material, including in combination: a tubular body constructed and arranged to receive a package of viscous material and having opposite end-walls, at least one of the said end-walls being removable from the said tubular body to permit the introduction therinto of a package of viscous material; an externally-threaded operating-rod threadedly connected to and extending through one end-wall of the said tubular body; a feeding-head carried by the said operating-rod at a location within the said body and having a laterally-contractible portion adapted to fit within the said package; a contractor within the said tubular body and constructed and arranged to contract the laterally-contractible portion of the said feeding-head when the latter is retired toward the end-wall of the said body through which the said operating-rod extends; a cutter carried by the said contractor and constructed and arranged to cut through the adjacent end-wall of a package contained within the said body when relative movement takes place between the said contractor and the said package; and anchor-means carried by the end-wall of the said tubular body which is opposite the end-wall through which the said operating-rod extends, the said anchor-means being constructed and arranged to engage with the end-wall of the said package opposite the end-wall with which the said cutter engages.

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