July 27, 1965 L. A. PACE 3,196,736

SHELL LOADER WITH HEATER AND CRIMPER ATTACHMENTS

Filed May 22, 1964

FIG. 1

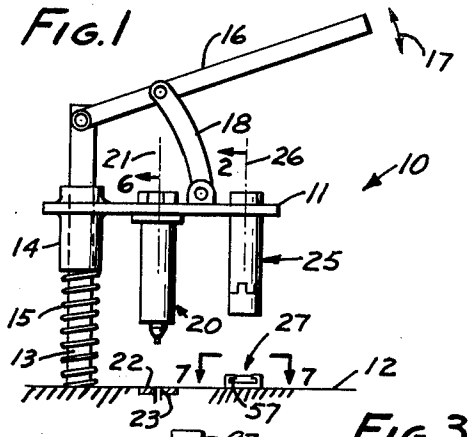


FIG. 2

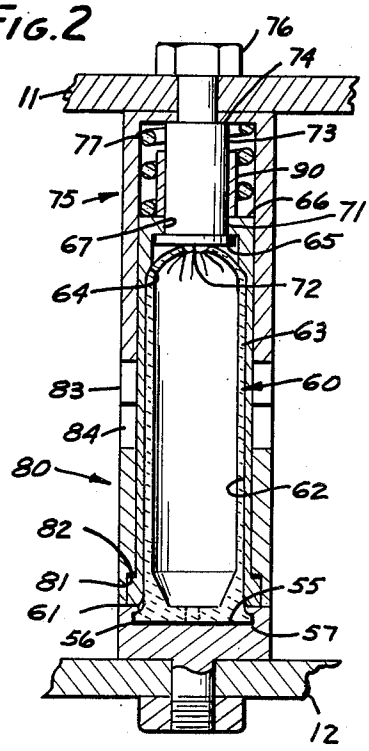


FIG. 7

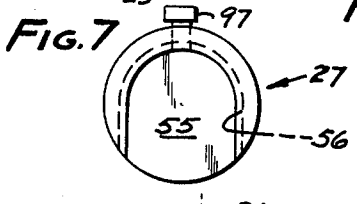


FIG. 3

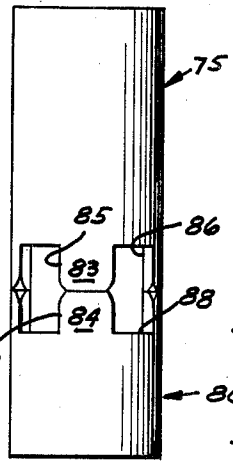


FIG. 6

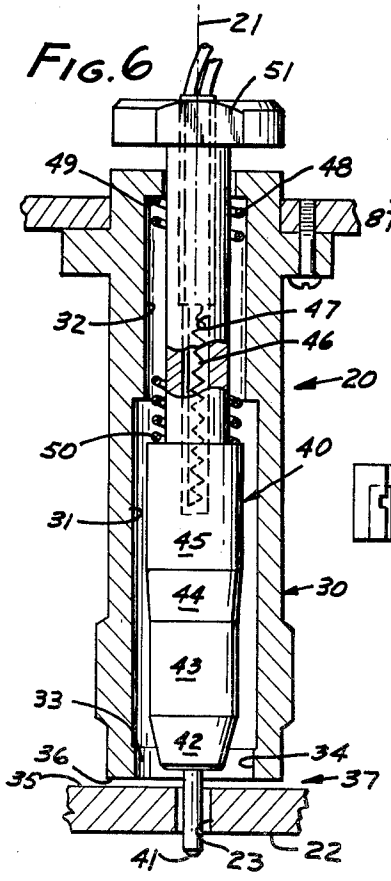


FIG. 5

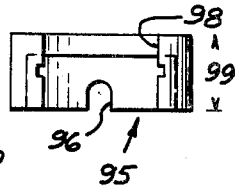
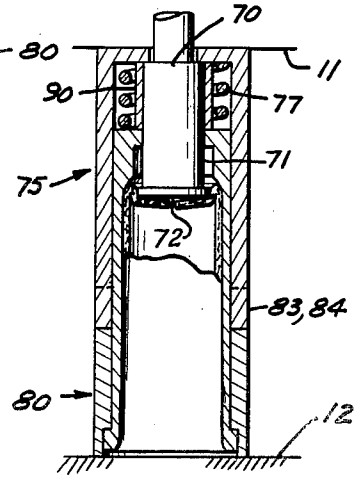


FIG. 4



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SHELL LOADER WITH HEATER AND CRIMPER ATTACHMENTS

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This invention relates to the reloading of shotgun shells.

Reloading of shotgun shells has long been known, and there are many devices in the field today which accomplish this purpose. The reason for reloading the shells is, of course, that a reloaded shell is just as effective for shooting purposes as a new shell, but is far less expensive because the shooter reloads the ammunition himself.

It is most common for shotgun shells to be manufactured of laminated paper in which some wax has been impregnated. In addition, there are available to the trade shells made of plastic. These account for the great preponderance of shotgun shells in use today.

It is essential to the proper reloading of a shotgun shell that the cylindrical portion be accurately sized and that the open end be closed at the precise distance from the base of the shell as properly to enclose the contents of the shell.

Devices hitherto known for shotgun shell reloading have been unable to accomplish these objectives, particularly when the shell has become frayed or heavily creased from previous reloading operations. Furthermore, there has been no means for accurately and adjustably settling the length of the shell or of finally finishing the crimp at the open end.

It is an object of this invention to provide a shell-loading device which by its provision of means for smoothing and initially sizing the shell and thereafter smoothly and accurately crimping over the end enables accurate reloading to be accomplished, using conventional reloading techniques in the intervening steps.

A device according to this invention includes a first and a second plate, one of which is movable toward and away from the other. To one of these plates, there is affixed a sizer which has an axis extending perpendicularly between the plates and which includes a body attached to a first of said plates, this body having a central bore with a cylindrical wall of the size desired for the exterior wall of the shell. Within this cylindrical wall and radially spaced therefrom, there is an expander which has at least one tapered section and one cylindrical section, the cylindrical section being disposed at the location where the open end of the shell terminates when the body is placed fully over the shell being sized.

The expander is adapted to receive a heater whereby to dry out wet shells, soften the wax impregnated into paper shells, or to soften the plastic shells in order that, under the influence of heat while the shell is in the sizer, a smooth and accurate cylinder will be derived.

According to a preferred but optional feature of the invention, a primer ejector pin may be placed at the end of the expander whereby to punch out the primer during the sizing operation.

According to another feature of the invention, a crimper is provided which includes a crimper sleeve having a passage therethrough with an axis parallel to the axis of the sizer. The crimper sleeve has an open mouth and an internal cylindrical wall with a crimping shoulder therein. The crimping shoulder is peripheral, and slopes toward the axis and away from the open mouth.

A crimp finisher includes a shank and a head, the head being adapted to force down the central section of a shell. The shank extends though the crimped sleeve and is attached to the first plate. The crimper sleeve is therefore movably mounted relative to the plates.

First and second stop sleeves are provided surrounding

the crimped sleeve, the first stop sleeve overhanging the crimper sleeve, and the second stop sleeve being adapted to force the crimper sleeve downwardly. The first and second stop sleeves have meshing teeth which are radially separated from each other and which are axially contactible to provide for first and second elevations when the stop sleeves are in first and second relative rotational positions.

According to a preferred but optional feature of this invention, a limit stop is placed between the first stop sleeve and the crimper sleeve to limit the motion of the first sleeve.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is a side elevation of the presently preferred embodiment of the invention;

FIG. 2 is a cross-section taken at line 2—2 of FIG. 1;

FIG. 3 is a side elevation of FIG. 2;

FIG. 4 is the same cross-section as FIG. 2 showing the device in a different operating position;

FIG. 5 is a side elevation of an accessory useful in this invention;

FIG. 6 is a cross-section taken at line 6—6 of FIG. 1 in a slightly different operating position; and

FIG. 7 is a top view taken at line 7—7 of FIG. 1.

The general construction and operation of the presently preferred embodiment of shell reloader 10 is shown in FIG. 1. The device includes first and second plates 11, 12. One of these plates, in this case first plate 11, is movable toward and away from the other plate. Second plate 12 therefore acts as a base and supports a post 13 which is surrounded by a bearing 14 that is biased upwardly by a compression spring 15. At the top of the post, there is pin-jointed a handle 16 which is adapted to be moved in the arc shown by arrow 17.

A drag link 18 is pin-jointed at both ends, one to the handle at a point spaced from its joint with post 13, and the other to the first plate. The first plate is therefore adapted to be moved upwardly and downwardly by motion of handle 16.

A sizer 20 is mounted to the first plate and extends downwardly along an axis 21 which is parallel to the axis of motion of bearing 14. This axis is aligned with a die 22 having a hole 23 therethrough through which an exhausted primer case may be ejected.

A crimper 25 is similarly mounted to the first plate and extends downwardly along an axis 26 which is parallel to axis 21. It overhangs a base member 27 which rests atop and is supported by the second plate in alignment with axis 26.

It is the function of the sizer to restore the shotgun shell to a generally circular cylindrical configuration and to restore the brass base to its proper size to fit in the breech of the gun. It is the function of the crimper to crimp over and finish the crimp on the closed case once it is completely filled. The design and operation of sizer 20 and crimper 25 will now be described with detailed reference to the remaining figures.

Sizer 20 is best shown in FIG. 6 which includes a body 30 coaxial about axis 21. This body has a central bore 31 which is generally cylindrical and stepped, there being a reduced portion 32 at the end farthest removed from open mouth 33. Adjacent to the mouth, there is a base sizer section 34 which comprises an internally projecting peripheral shoulder whose radius is equal to that of the properly finished radius of the brass base of a shotgun shell. When the sizer is in the position shown in FIG. 6, the base sizer section will embrace the brass portion and properly size its radius, while upper surface 35 of die 22 and the lower surface 36 of the body will squeeze between them in the region indicated by arrow 37, the flange on the

brass base so as to compress it and restore it to a proper axial thickness.

Within the bore of the body, there is disposed an expander **40**, which expander carries at its tip end a primer ejector **41**. This pin is adapted to enter hole **23** in die **22** and eject the primer from the brass base of a shotgun shell therethrough. The expander has an initial tapered section **42**, a first cylindrical section **43**, a second tapered section **44** and a final cylindrical section **45**. It is intended that the open end of a shotgun shell terminate when being sized as section **45**, and that the tapered sections **42** and **44** permit the gradual expansion thereof. Reduced cylindrical section **43**, which may also have a slight draft angle, is provided so that there will not be a continued full surface contact along the full length of the expander because this might cause the shell to jam in place.

A heater element **46** fits within a bore **47** in the upper end of the expander where, in particular, it heats cylindrical region **45**. This will cause the shotgun shell, whether plastic or wax-impregnated paper, to be heated and readily and more permanently assume the cylindrical surface desired.

A compression spring **48** fits between shoulders **49**, **50** on the body and on the expander, respectively, so as to bias the expander downwardly into the bore. A nut **51** is threaded on the upper end of expander to hold it in place. It will thereby be seen that there is axial motion possible between the body and the expander, but the spring is made strong enough that the expander will enter any shotgun shell which is not too badly deteriorated. This also provides for an override means which enables shotgun shells of different length to be handled on the same sizer and permits the surfaces **35** and **36** to come within the proper distance of each other while permitting the expander to move gradually backward to adjust for differences in shell lengths.

Crimper **25** will now be described in detail. Base member **27** (see FIG. 7) includes a support surface **55** which is bounded by a side surface **56** and which is partly overhung by a restraint surface **57**. The base of a shotgun shell may therefore be slid onto support surface from the bottom in FIG. 7 so as to be supported in position by side surface **56** and kept from toppling out or being pulled out upwardly by restraint surface **57**. At that time; the central axis of the shotgun shell will coincide with axis **26** and be directed upwardly toward crimper **25** of which base member **27** forms a cooperating portion.

FIGS. 2, 3 and 4 more particularly illustrate the crimper. It includes a central crimper sleeve **60** which has an open mouth **61** and an internal cylindrical wall **62**. The internal radius of wall **62** is substantially equal to the desired external radius of a finished shotgun shell. A shotgun shell **63** is shown in the process of being crimped in FIGS. 2 and 4. The cylindrical sleeve **60** also includes a crimping shoulder **64** which is fully peripheral and is disposed at a predetermined distance from the open end of the crimper sleeve. It extends axially and toward the central axis as it extends away from the open mouth. The crimper sleeve also includes an overhanging shoulder **65** and an upper abutment surface **66**. An opening **67** passes axially through the upper end of the crimper sleeve.

A crimp finisher **70** includes a shank **71** and a head **72**. The term "head" is used in the sense of a downwardly facing central region adapted to contact the top of a shotgun shell, and does not necessarily import an enlargement of the shank. The shank includes a shoulder **74**, which engages an under surface of a first stop sleeve **75**, and in cooperation with a nut **76** threaded onto the shank, engages both the shank and the first stop sleeve to the first plate **11**. The first stop sleeve and the crimp finisher are therefore rigidly attached to first plate **11**. A spring **77** is opposed between the first stop sleeve and surface **66** on the crimper sleeve, thereby biasing the crimper sleeve in the direction of its open mouth, but it will be observed that the crimper sleeve is axially shiftable relative to the crimp finisher and to the first stop sleeve.

A second stop sleeve **80** also surrounds the crimp finisher and includes an internal engagement shoulder **81** which is adapted to press downwardly against an upwardly-facing engagement shoulder **82** on the crimper sleeve. When the second stop sleeve presses downwardly, shoulders **81** and **82** engage each other, and the crimper sleeve is moved downwardly.

As can best be seen in FIG. 3, which is a side elevation of FIG. 2, first and second stop sleeves include at least one tooth **83**, **84**, respectively, and recesses **85**, **86** and **87**, **88**, respectively, on opposite sides of the teeth. Preferably, there will be a series of these teeth and recesses numbering four on each of the sleeves. When the teeth engage each other (as shown in FIG. 3), the axially opposite ends of the stop sleeves are spaced by a first distance. However, second sleeve **80** rotatably surrounds the crimper sleeve, and when it is rotated by a sufficient angularity so that the teeth clear each other and can enter into the opposing recesses, the opposed end surfaces can be moved toward each other.

Reference to FIG. 2 will show a solid line of metallic contact between plates **11** and **12** which extends through the first and second sleeves, the distance apart being set by the contact of the teeth as shown in FIG. 3. This measures the precise distance of separation of shoulder **64** from plate **12**, which in turn accurately determines the crimp location and the length of the finished shell. In FIG. 4, however, the second stop sleeve has been rotated relative to the first stop sleeve so that the teeth enter the opposed recesses and it will be seen that plates **11** and **12** are moved closer together.

A limit stop **90** comprising a metallic spacer is placed between surface **66** and the inside of the first stop sleeve. This metallic contact is the limiting feature in the second position illustrated in FIG. 4, because then the solid metallic contact between plates **11** and **12** extends through the limit stop and the crimper sleeve through the brass base of the shotgun shell to plate **12**. There is an optional limitation should the limit stop not be used, and that is when the stop plates contact each other in their new position which also limits the travel.

As can be seen from an examination of FIGS. 2 and 4, the location at which the actual crimp in the shell is made, depends upon the spacing of crimping shoulder **64** from the base of the shotgun shell. Customarily, the distance of shoulder **64** from the open mouth of the crimper sleeve **60** will be such as to accommodate the shortest shotgun shell expected to be reloaded with this equipment. Should axially longer shells be desired to be reloaded, then an accessory (shown in FIG. 5) will be utilized. This device comprises a spacer **95** which has a slot **96** adapted to go over a screw **97** so as to hold it over base member **27**. A shell will still be able to be entered through an opening **98** in the side of spacer **95** so as to be supported on surface **55** as before. However, the axial spacing **99** between the upper and lower surfaces of spacer **95** is different from the spacing between the upper and lower surfaces of base member **27**. Accordingly, the upper portion of the crimper will strike spacer **95** at a higher elevation than before, and the crimping action will occur at a distance farther from the base of the shotgun shell than before. It therefore follows that by appropriately dimensioning spacer **95**, shotgun shells of different length may be handled in the same device by the simple expedient of using spacers **95** of appropriate length.

The use of this device should be evident from the foregoing. Initially, current is supplied to the heater so as to warm up the expander. Then the shell is placed atop die **22** and the sizer is lowered over the shell. This will dry out any moisture from the shell and also soften the waxes and resins which impregnate the plastic or paper shells being treated. The expander then continues to

enter the shotgun shell, primer ejector **41** poking the primer down through hole **23** in the die, and the expander forcing itself in until section **45** is inside the end of the shotgun shell, thereby expanding it to a firm and fully round configuration. At this same time, base sizer section **34** swages down the brass base, while surfaces **35** and **36** work to flatten down the flange on the brass base. Then the handle is raised to remove the device from the shotgun shell, leaving it without primer and with a good round configuration of the correct size.

This expander is also useful apart from its incorporation in a press set up as shown, because occasionally it is desired simply to dry out a shell by thrusting it into the open mouth without actually carrying out all of the operations. For such purposes, the expander and body may be mounted on a different type of base and without the provision of the lower die.

Intervening steps, including the replacement of the primer, the addition of the charge and shot and the like, are carried out in accordance with known conventional techniques, but with far greater accuracy due to the improved sizing. Then the shotgun shell is set atop surface **55** and the stop sleeves are turned so that the teeth will engage each other. Then the handle is pulled down so that the device assumes the position shown in FIG. 2, which is the limiting position for the initial crimp of the end of the shotgun shell. As can be seen from FIG. 2, the crimp finisher is held at an elevation above the open end of the shotgun shell, because the stop sleeves prevent any further downward motion. The inside wall **62** has restrained the shotgun shell to its correct external radius, and shoulder **64** has turned in the open end. Then pressure between the plates is released by moving the handle up slightly, and the second stop sleeve is turned so that the teeth can enter the opposite recess. Then the handle is again pulled down so that the device assumes the position shown in FIG. 4. In this position, the crimper sleeve moves upwardly by virtue of its contact with the upper surface of base member **27** and this is permitted by spring **77**. The ultimate limit in the embodiment shown is exerted by limit stop **90** which limits the distance by which plate **11** and the crimp finisher may move downwardly as shown to finish the crimp of the end of the shell. Thereafter, the handle is moved upwardly again so as to free the shell from the crimper, and the shell is completed and ready to be fired.

This invention is not to be limited to the embodiment shown in the drawings and described in the description which is given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

I claim:

1. A shotgun shell reloading device comprising: a first and a second plate; means mounting the said plates so that one is movable toward the other along an axis; a sizer mounted to one of said plates, said sizer comprising a body with an axially-aligned central bore having a mouth open toward the other plate, a tapered expander inside the bore and narrowing toward the mouth, said expander including a peripheral cylindrical section, and a heater in said said expander to heat the same, there being an annular open space between the expander and the wall of the bore to receive a shell; a crimper having an axis, and mounted to one of said plates with its axis parallel to that of the plate motion, said crimper comprising a crimper sleeve having an internal cylindrical wall and an open mouth facing toward said other plate, and having an end adjacent to said mouth, a crimping shoulder on said internal wall, said crimping shoulder extending toward the axis as it extends away from the mouth, said crimping shoulder being spaced from said end by a fixed distance, a first and a second stop sleeve, both stop sleeves surrounding said crimper sleeve and being adapted to abut each other, the second stop sleeve being axially movable relative to the first stop sleeve, a tooth and a pair of adjacent recesses on the adjacent ends of the stop sleeves, the teeth being adapted to make contact in one relative rotational position of the stop sleeves, thereby establishing a first total axial length of the two stop sleeves, and to permit the teeth to mesh in another rotational position, thereby establishing a second total axial length of the two stop sleeves, the first stop sleeve being mounted to one of the plates, an external shoulder on the crimper sleeve adapted to be contacted by the second sleeve to force the crimper sleeve toward the second plate, a surface on said second plate contactible by one of said crimper or second stop sleeves, the crimper sleeve being axially movable relative to the first stop sleeve, and a spring urging the crimper sleeve away from said first stop sleeve; and handle means for moving the plates toward and away from each other.

2. A shotgun shell reloading device according to claim **1** in which a primer ejector pin extends axially from the end of the expander which is closer to the mouth of the bore, and in which a hole passes through the plate toward which the pin extends to pass an ejected primer.

3. A shotgun shell reloading device according to claim **1** in which the wall of the bore adjacent to the mouth is reduced and axially cylindrical in order to embrace and size the wall of the metal base of a shotgun shell.

4. A shotgun shell reloading device according to claim **3** in which a primer ejector pin extends axially from the end of the expander which is closer to the mouth of the bore, and in which a hole passes through the plate toward which the pin extends to pass an ejected primer.

5. A shotgun shell reloading device according to claim **1** in which a limit stop comprising a tubular member is placed between the crimper sleeve and the first stop sleeve to provide an ultimate limit on the movement of the two plates toward each other.

6. A shotgun shell reloading device according to claim **1** in which an incompressible spacer is adapted to be placed between the second stop sleeve and the second plate to set the distance of closest approach of the two plates.

7. A shotgun shell reloading device according to claim **1** in which a crimp finisher comprising a shank and a head is disposed axially in the crimper, said shank being rigidly mounted to the first plate.

8. A shotgun shell reloading device according to claim **7** in which an incompressible spacer is adapted to be placed between the second stop sleeve and the second plate to set the distance of closest approach of the two plates.

9. In a shotgun shell reloading device: a first and a second plate; means mounting the said plates so that one is movable toward the other along an axis; and a sizer mounted to one of said plates, said sizer comprising a body with an axially-aligned central bore having a mouth open toward the other plate, a tapered expander inside the bore and narrowing toward the mouth, said expander including a peripheral cylindrical section, and a heater inside said expander to heat the same, there being an annular open space between the expander and the wall of the bore to receive a shell, the radial width of the open space being substantially equal to the wall thickness of a shell to be resized, a shell in said open space thereby being simultaneously heated and mechanically held in proper dimensional relationships when in said open space.

10. A shotgun shell reloading device according to claim **9** in which a primer ejector pin extends axially from the end of the expander which is closer to the mouth of the bore, and in which a hole passes through the plate toward which the pin extends to pass an ejected primer.

11. A shotgun shell reloading device according to claim **9** in which the wall of the bore adjacent to the mouth is reduced and axially cylindrical in order to embrace and size the wall of the metal base of a shotgun shell.

12. A shotgun shell reloading device according to claim **11** in which a primer ejector pin extends axially from the

end of the expander which is closer to the mouth of the bore, and in which a hole passes through the plate toward which the pin extends to pass an ejected primer.

13. A shotgun shell reloading device comprising: a first and a second plate; means mounting the said plates so that one is movable toward the other along an axis; a crimper having an axis, and mounted to one of said plates with its axis parallel to that of the plate motion, said crimper comprising a crimper sleeve having an internal cylindrical wall and an open mouth facing toward said other plate, and having an end adjacent to said mouth, a crimping shoulder on said internal wall, said crimping shoulder extending toward the axis as it extends away from the mouth, said crimping shoulder being spaced from said end by a fixed distance, a first and a second stop sleeve, both stop sleeves surrounding said crimper sleeve and being adapted to abut each other, the second stop sleeve being axially movable relative to the first stop sleeve, a tooth and a pair of adjacent recesses on the adjacent ends of the stop sleeves, the teeth being adapted to make contact in one relative rotational position of the stop sleeves, thereby establishing one total axial length of the two stop sleeves, and to permit the teeth to mesh in another rotational position, thereby establishing a second total axial length of the two stop sleeves, the first stop sleeve being mounted to one of the plates, an external shoulder on the crimper sleeve adapted to be contacted by the second sleeve to force the crimper sleeve toward the second plate, a surface on said second plate contactible by one of said crimper or second stop sleeves, the crimper sleeve being axially movable relative to the first stop sleeve, and

a spring urging the crimper sleeve away from said first stop sleeve; and handle means for moving the plates toward and away from each other.

14. A shotgun shell reloading device according to claim 13 in which a limit stop comprising a tubular member is placed between the crimper sleeve and the first stop sleeve to provide an ultimate limit on the movement of the two plates toward each other.

15. A shotgun shell reloading device according to claim 13 is which an incompressible spacer is adapted to be placed between the second stop sleeve and the second plate to set the distance of closest approach of the two plates.

16. A shotgun shell reloading device according to claim 13 in which a crimp finisher comprising a shank and a head is disposed axially in the crimper, said shank being rigidly mounted to the first plate.

17. A shotgun shell reloading device according to claim 16 in which an incompressible spacer is adapted to be placed between the second stop sleeve and the second plate to set the distance of closest approach of the two plates.

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