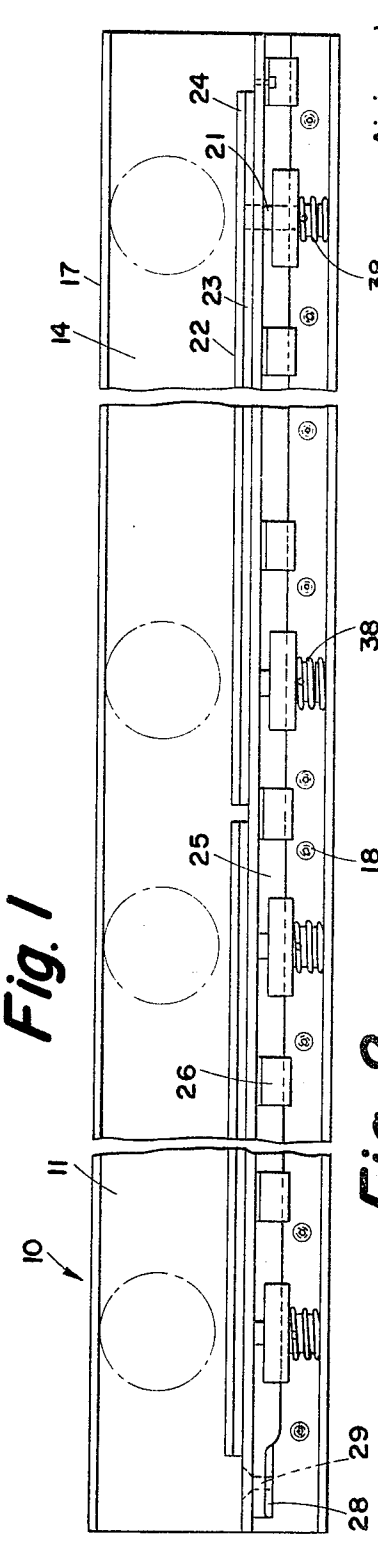
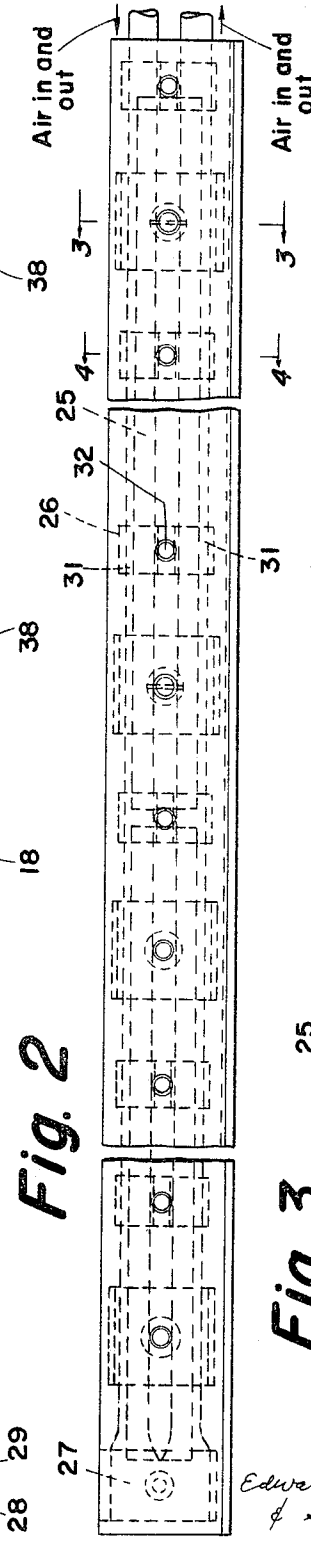
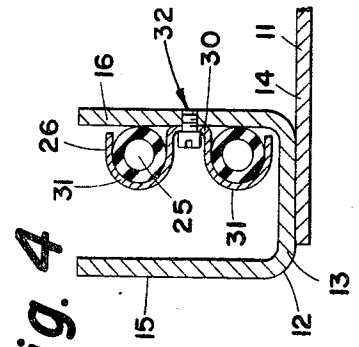
Aug. 23, 1966 R. H. NOBLE 3,268,048

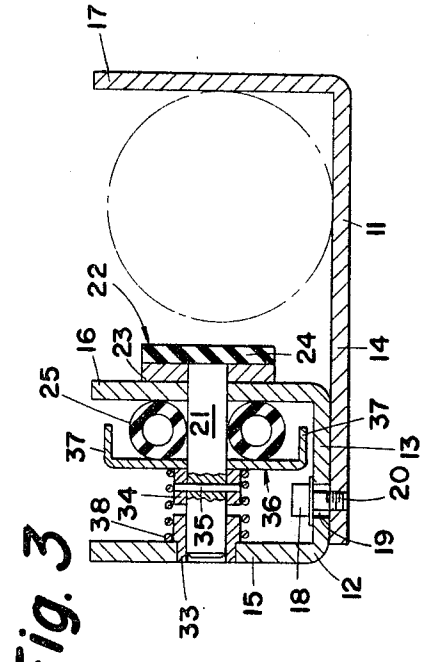
PNEUMATICALLY OPERATED LOADING CHUTE

Filed Nov. 4, 1964 2 Sheets-Sheet 1









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PNEUMATICALLY OPERATED LOADING CHUTE

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Fig. 5

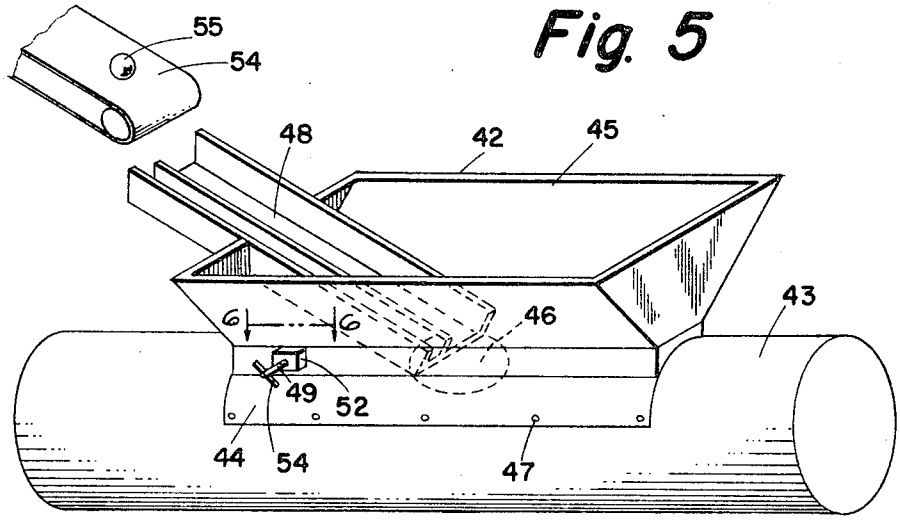


Fig. 6

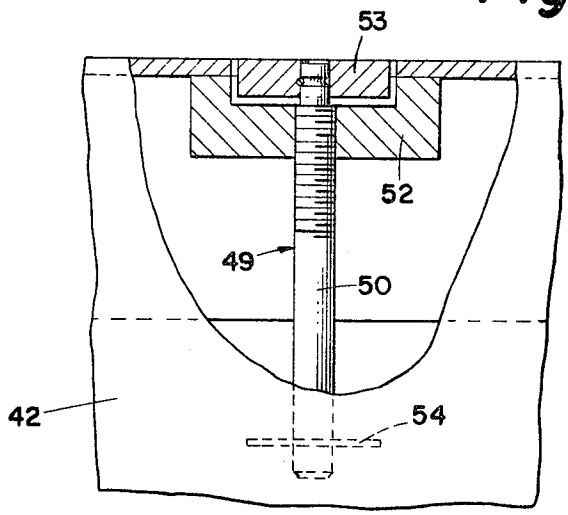
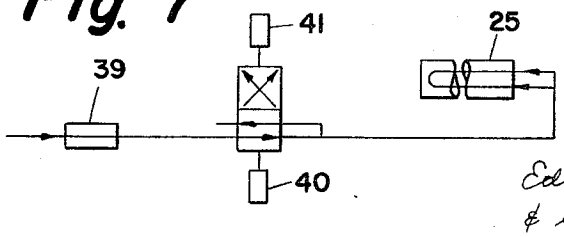


Fig. 7



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PNEUMATICALLY OPERATED LOADING CHUTE

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Filed Nov. 4, 1964, Ser. No. 409,033
5 Claims. (Cl. 193—32)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a loading chute and particularly to a chute for rapidly and safely loading explosive pellets into a carrier or dispenser.

It has heretofore been the custom in loading explosive pellets into carriers or dispensers to have an operator place a number of the pellets into a cloth bag, or the like, which was capable of being opened, by pulling on a draw string or the like. The operator would lower the bag of pellets into the carrier or dispenser and then retire to a remote safety area. He would then pull the draw string which would open the bag to drop the pellets into the carrier or dispenser. This procedure was repeated until the required number of pellets was loaded into the carrier or dispenser. This method of loading the pellets was extremely tedious and time consuming. More significantly it was dangerous to life and limb. The operating personnel were required to subject themselves to a proximate spaced relationship with the explosives whereby any spontaneous detonation of the explosives could possibly result in disastrous physical harm.

It is, therefore, an object of the present invention to provide a chute for loading explosive pellets into carriers or dispensers, operating in combination with a remotely loaded conveyor, which provides for rapid loading of the pellets and effectively eliminates the safety hazard to the operating personnel in the loading area.

It is a further object of this invention to provide a chute for loading explosive pellets into carriers or dispensers, which is adapted to control the rolling or sliding speed of the pellets to insure against any momentum buildup of a pellet great enough to result in an explosive impact with the carrier or dispenser.

It is also an object of this invention to provide a chute for loading explosive pellets into carriers or dispensers, which can be adjusted in cross sectional area to accommodate pellets of different cross-sectional dimensions.

It is still another object of this invention to provide a chute for loading explosive pellets into carriers or dispensers, which is of simplified and of low cost construction and which is adapted to be mounted on a carrier or dispenser eliminating external means for supporting the chute.

A still further object of this invention is to provide a chute for loading explosive pellets into carriers or dispensers which includes means for preventing spillage of pellets from the chute insuring that the pellets must ultimately be loaded into the carrier or dispenser thereby further enhancing safety in the loading operation.

In accordance with the invention the chute is provided with an elongate member substantially L shaped in cross section which comprises the base and one wall of the chute. Another elongate section substantially U shaped in cross section is firmly secured to the base portion of the L members. Disposed in the U member and at substantially right angles to and in movable relation to the walls thereof are rods, which are spring urged towards the inner wall of the U member. The rods extend through the inner wall of the U member where on their ends are rigidly secured a locking bar which is in substantially parallel spaced relation to the walls of the U member and coextensive therewith. The locking bar consists of a metal bar covered with a resilient friction material on its side portion away from the urging rods.

The rod, the wall of the L member, and the base of the L member therebetween form a trough area where the pellets may be rolled or slid. The U member may be moved a limited distance laterally over the surface of the base of the L member by loosening the screws which secure it to the L member. This permits adjustment of the rolling area of the chute to accommodate pellets of various cross-sectional dimensions.

A flexible rubber tubing is secured in abutting relationship to the inside of the inner wall of the U member and forms a substantially U shaped continuous length. The tubing is connected to a fluid supply through regulating valves. Means are provided between the tubes and the urging rods whereby upon supplying the fluid to the tubing the expansion thereof causes the springs to compress the locking bar to move laterally towards the inner wall of the U member. While this condition exists the explosive pellets are free to roll or slide down the chute. If the fluid supply is cut off the locking bar will resume its original position which is such that pellets in the chute will be held stationary. The chute is securely attached to the carrier or dispenser to be loaded.

The means for attaching the chute to the carrier or dispenser is also a funnelling means which functions to prevent spillage of the pellets from the chute during loading. A conveyor system delivers the pellets to the chute. During the entire loading operation no personnel are present in the area where the carrier or dispenser is being loaded, with observation of the operation being remotely viewed via a closed circuit television system.

The invention will however be further understood from the following description, when considered in connection with the accompanying drawings, and its scope is pointed out in the appended claims.

In the drawings:

FIG. 1 is a top plan view of a chute for loading pellets into a carrier or dispenser, embodying the invention;

FIG. 2 is a view in elevation of the chute of FIG. 1 showing further details of construction;

FIG. 3 is a vertical section on the line 3—3 of FIG. 2 looking in the direction of the arrows;

FIG. 4 is a partial vertical section on the line 4—4 of FIG. 2 looking in the direction of the arrows;

FIG. 5 is a view in perspective showing a chute for loading explosive pellets into a carrier or dispenser, a section of a conveyor belt delivering pellets to the chute, a funnelling apparatus fixed to a carrier or dispenser, representing an embodiment of the invention in an operational mode;

FIG. 6 is a section on the line 6—6 showing a detail of the funnelling apparatus of FIG. 5; and

FIG. 7 is a schematic of an air system used with the embodiment of the invention described herein.

Referring to the drawings, in which like reference characters refer to like parts throughout the various figures, and referring particularly to FIGS. 1, 2 and 3 there is shown a chute for use in loading explosive pellets into a carrier or dispenser, generally designated by the numeral **10**. The basic structure of the chute comprises a conventional elongate structural member **11** and a conventional elongate structural member **12** coextensive therewith. As shown in FIG. 3 member **11** is somewhat L shaped while member **12** is somewhat U shaped, and will be hereafter referred to as L member **11** and U member **12**. The U member **12** has the bottom surface of its base portion **13** arranged in substantially abutting relationship with the top surface of its base portion **14** of the L member **11** and spaced at the open end thereof, where-

by the outer wall portion **15** and inner wall portion **16** of the U member are substantially parallel to the wall portion **17** of the L member **11**. The U member **12** is movably fixed to the L member **11** by suitable means. In this embodiment a plurality of large headed screws **18** substantially parallel to each other in the same plane pass through registering openings in the base portion **14** and **13** of the members **12** and **11**. The openings **20** in the L member **11** are threaded whereby clockwise rotation (looking downward toward the chute) of the screws **18** will result in the downward movement of the screws and ultimately the securing together of the U member **12** and L member **11**. The openings **19** in the U member **12** are relatively larger in diameter than the openings **20** in the L member **11**. This relationship allows for a transversely movable adjustment of the relative positions of the L member **11** and U member **12**. Upon loosening all of the screws **18** the U member **12** may be moved transversely slidably over the surface of the L member **11** a maximum distance measured by the difference in diameters of the openings **19** and **20**. The significance of this adjustment will be indicated further on in this description.

A plurality of laterally movable shafts **21** extend transversely across the U member **12** substantially at right angles to the walls **15** and **16** thereof and through registering openings therein. The shafts **21** are in spaced relationship and substantially parallel in the same horizontal plane with each other. The shafts **21** are joined outside the inner wall **16** with a flat common carrier element or urging rod **22** which is substantially parallel to the walls **15** and **16** and approximately coextensive therewith. As shown in this embodiment the urging rod **22** may be smaller in width than the walls of this chute. The urging rod **22** is comprised of a rigid portion **23** fixed to the rod **21** by welding or the like, and a flexible rubber-like material **24** coextensive with and firmly fixed to the side of the rigid portion **23** facing the wall **17** of the L member. The urging rod **22**, the wall **17** of the L member **11** and the base portion **14** therebetween define a trough wherein the pellets to be transported may be moved.

The width of this trough may be adjusted by sliding the U member **12** of the L member **11** the distance desired by the method hereinbefore described. This allows the chute **10** to be used with varying sized pellets.

A continuous length of flexible tubing **25** made of rubber or the like is secured by a plurality of spaced clip members **26** to the inside of the inner wall **16** of the U member **12** and in substantially abutting relationship thereto. This length of tubing **25** is essentially in a U-shaped configuration in its relationship to the chute **10**. The U portion **27** of the tubing **25** is fixed to the inside of the inner wall **16** of the U member **12** by means of a plate **28** abutting the tubing and secured to the wall **16** with a screw **29** or the like.

A plurality of clip members **26** in spaced relationship with each other secures the remainder of the length of tubing **25** to the inside of the inner wall **16** of the U member **12**. As shown in FIGS. 2 and 4 the clip members **26** comprise a central flat body portion **30** and two curved clip elements **31** integral therewith and extending coextensively therefrom. The curved elements **31** are shaped to fit the contour of the tubing **25** and this shape of the members **26** maintains the tubing **25** in substantially parallel U-shaped relationship when the clip members **26** are secured by a screw **32** or the like to the inside of the inner wall **16**.

Coaxial with the shafts **21** are bushings **33** and **34**. The bushings **33** are situated in the openings in the outer wall **15** of the U member **12**. The shafts **21** are in slidable relationship with the bushings **33**. The bushings **34** are fixed to the shafts **21** by means of pins **35** or the like passing transversely radially through the bushings **34** and shaft **21**. Flat plates **36** are secured by some suitable means such as welding or the like to the bushings **34**. The plates **36** are in substantially abutting relationship with the tubing **25**. The plates **36** have two ends turned at **37** to a substantially parallel relationship with each other and at substantially right angles to the inner wall **16** of the U member **12**. Disposed between the inner surface of the outer wall **15** of the U member **12** and the plates **36** are helical compression springs **38** coaxial with the shafts **21**. The springs **38** urge a force against the plates **36** which is transmitted to the shaft through the bushings **34** to the urging bar **22**.

One end of the tubing **25** is connected to a pressurized fluid supply such as air or inert gas, for example. In this embodiment air at a pressure of 5 to 10 p.s.i.g. is used flowing through the tubing **25** as shown in FIG. 2. FIG. 7 schematically illustrates a fluid system which may be used with this invention. Air is admitted to the tubing **25** by opening the manual valve **39** and the solenoid valve **40**. Solenoid valve **41** is closed and the tubing **25** is pressurized whereby the tubing **25** expands and urges a uniform transversely directed force on the plates **36** thereby causing the shafts **21** and the urging rod **22** to move transversely in unison in the direction of the force. The springs **38** are compressed and, so long as the air pressure is maintained in the tubing **25**, urge a restoring force on the plates **36** which is imputed on the shafts **21** and urging rod **22**. This feature renders the chute "fail safe," that is, when the fluid supply to the tubing **25** is inadvertently shut-off, the urging rod **22** will be restored to its original position thereby precluding any pellets from being transported down the chute.

A funnelling apparatus **42** for preventing any spillage of pellets over the side of the chute **10**, as shown in FIG. 5, is secured to a carried or dispenser **43** which is to be filled with explosive pellets. The funnelling apparatus **42** comprises a base member **44** which is shaped to conform to the contour of the carrier or dispenser **43** to be filled. A funnel member **45** which is trough-like in shape comprising four flat sides, the end members tapering, is firmly fixed to a rectangular transition piece **46** which in turn is firmly fixed to the base member **44** by welding or the like. The funnelling apparatus **42** is secured to the carrier or dispenser **43** by screws or the like **47** passing through registering openings in the base member **44** and the carrier or dispenser **43**. The lower or narrow portion of the funnel member **45** registers with an opening in the carrier or dispenser **43**. One end of the funnel member **45** has a rectangular section identified as **48**, cut-out from the top of the wide portion to a depth approximately the height of the chute **10**. The chute **10** may be placed in the cut-out section **48**, tilted a desired angle and placed in communication with the opening in the carrier or dispenser **43**. A screw clamp **49** is provided in the transition piece **46** for securely holding the chute **10** to the funnelling apparatus **42**. As shown in FIGS. 5 and 6 the screw clamp **49** comprises a shaft member **50** passing through and in screw-threaded engagement with a screw-threaded opening in a pad **52** fixed by welding or the like to the outside wall of the transition piece **46** and preferably at the end thereof nearest the cut-out section **48** of the funnel member **45**. A circular metal disc **53** is firmly fixed at substantially right angles to the end of the shaft member **50** as shown in FIG. 6.

The shaft member **50** is rotatable about its axis and can be longitudinally moved in or out of the funnelling apparatus **42** by screwing the shaft member **50** clockwise or counterclockwise as desired. Holding means such as a rod **54** or the like is firmly fixed to the outside end of the shaft member **50** for facilitating screwing of the shaft member **50**. The chute **10** will be securely held to the funnelling apparatus **42** by screwing in the shaft member **50** until the disc makes substantially right angle abutting contact with a portion of the wall **17** of the L member **11**. The force applied to the wall **17** is transmitted to the chute **10** causing it to be moved until a portion **17**

of the wall 15 of the U member 12 opposite the disc 53 abuts against a portion of the inner surface of the wall of the transition piece 46. The shaft member 50 may be screwed in until the desired fixed relationship exists between the chute 10 and funnelling apparatus 42.

In operation, the funnelling apparatus 42 is secured to the carrier or dispenser 43 to be filled with explosive pellets. As hereinbefore described the chute 10 is adjusted for accommodating the diameter pellet to be loaded and fixed to the funnelling apparatus 42 at a slope angle dependent upon the downward speed of the pellets desired. The tubing 25 is then connected to the air supply system as shown schematically in FIG. 7. Valves 39 and 40 are opened and valve 41 closed thereby pressurizing the tubing 25 and positioning the urging bar 22 in substantially abutting contact with the ouside of the inner wall 16 of the U member 12. A commonly used horizontal and vertical conveyor 54 is loaded with explosive pellets 55 at a point remote from the carrier or dispenser 43. The conveyor 54 is mechanically passed over a protective wall and positioned in proximate spaced relationship with the chute 10. This operation is performed from a remotely and safely located control area and is continuously observed on a closed circuit television system receiver. The conveyor 54 is turned on and the pellets 55 are transported to the chute 10 where they roll or slide safely into the carrier or dispenser 43. If it appears that a pellet is moving at an unsafe speed down the chute 10 the air supply may be shut off and the urging rod 22 will move to stop the pellet. The air supply can be restored and the pellet will resume travelling down the chute at a safe speed into the carrier. The operation continues until the carrier or dispenser 43 is loaded with the amount of explosive pellets required. The entire loading operation is conducted without any personnel being in the area of the carrier or dispenser to be loaded.

I claim:

1. A chute for loading explosive pellets into a carrier or dispenser, comprising

means defining an open ended trough having at least two side walls in fixed space relationship with each other,

a flat rod mounted on one of said side walls coextensive therewith and movable with respect to the other of said side walls to vary the space therebetween,

actuating means connected with said rod comprising,

a laterally movable shaft mounted on one of said side walls and fixedly connected to said rod,

a length of flexible tubing in substantial abutting relationship with said movable shaft,

said flexible tubing being connected to a source of pressurized fluid whereby said tubing expands when the fluid is admitted thereto causing said rod to move in a direction to increase the distance between said rod and said other of said side walls, and

means mounted on said movable shaft urging a force on said shaft in a direction opposite to that exerted by the pressurized tubing whereby release of the pressure in said tubing effects restriction of the lateral distance between said rod and said other of said side walls.

2. A chute for loading explosive pellets into a carrier or dispenser, comprising

an elongate structural member substantially L-shaped defining a side wall and a base portion,

an elongate structural member substantial U-shaped defining an inner and an outer wall and a base portion,

said U-shaped member and said L-shaped member having their base firmly fixed to one another by suitable means and substantially coextensive with each other,

at least one laterally movable shaft member extending transversely across said U-shaped member and substantially at right angles to the walls thereof,

said shaft member having one end passing through the inside wall of said U-shaped member,

a flat rod connected to the end of said shaft member passing through the inside wall of said U-shaped member,

said flat rod substantially parallel to and coextensive with said walls of said U-shaped member,

a length of flexible tubing mounted on the inside of said inner wall of said U-shaped member,

said length of flexible tubing defining a substantially U-shaped configuration adjacent said walls with one leg above and one leg below said shaft member,

a flat plate member firmly fixed to said shaft member and in substantially abutting relationship with said flexible tubing, and

a compression spring member interposed between said flat plate member and outside wall of said U-shaped member.

3. A chute for loading explosive pellets into a carrier or dispenser as defined in claim 2, wherein said U-shaped member and said L-shaped member are laterally movable with respect to one another to vary the space therebetween.

4. A chute for loading explosive pellets into a carrier or dispenser as defined in claim 2 wherein a plurality of laterally movable shaft members in spaced relationship and substantially parallel in the same plane with each other extend transversely across said U-shaped member and substantially at right angles to the walls thereof.

5. A chute for loading explosive pellets into a carrier or dispenser as defined in claim 2 wherein said flat rod has a flexible rubber-like material coextensive with and firmly fixed to the side thereof facing said side wall of said L-shaped member.

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