March 19, 1957 H. B. YOUNG 2,785,454

SLIPS FOR SUPPORTING PIPE IN WELLS

Filed Dec. 29, 1952 2 Sheets-Sheet 1

Fig. 1

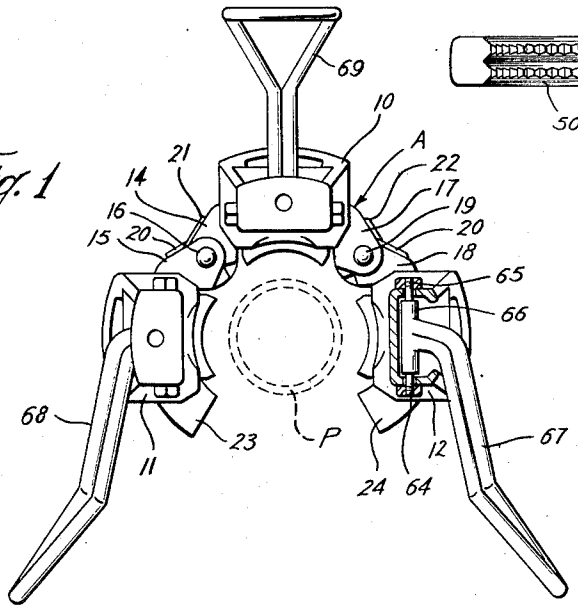


Fig. 8

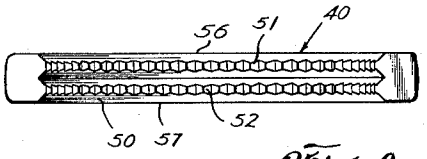


Fig. 9

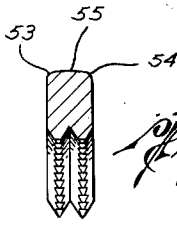


Fig. 2

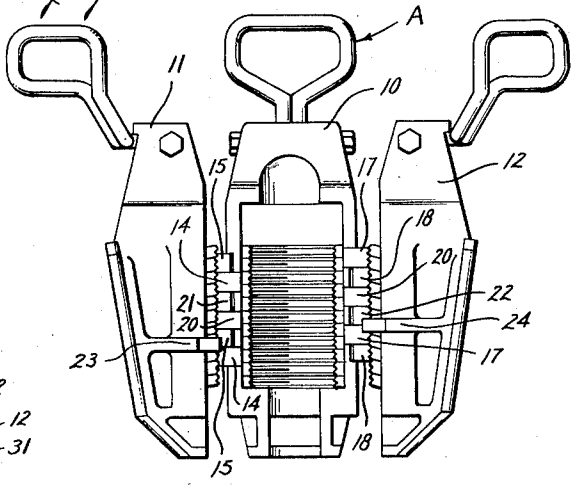
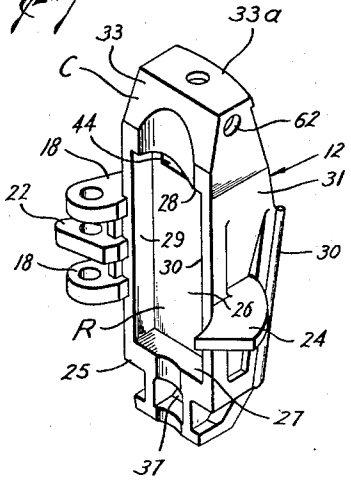


Fig. 3



Henry Ben Young
INVENTOR.

BY J. Vincent Martin
Joe E. Edwards
B. R. Pravel
ATTORNEYS

March 19, 1957 H. B. YOUNG 2,785,454

SLIPS FOR SUPPORTING PIPE IN WELLS

Filed Dec. 29, 1952 2 Sheets-Sheet 2

Fig. 4

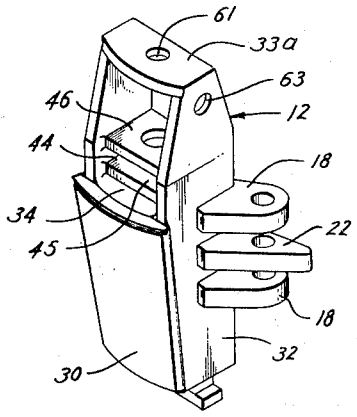


Fig. 5

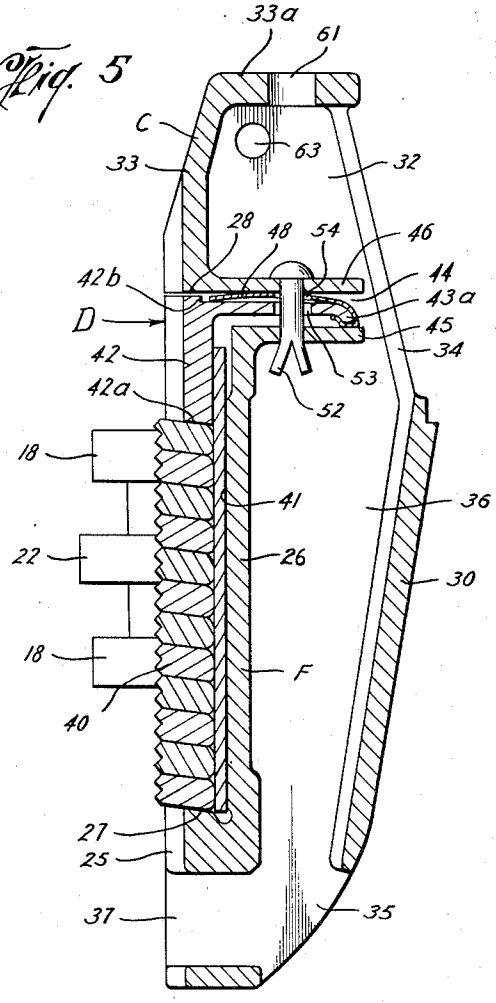


Fig. 6

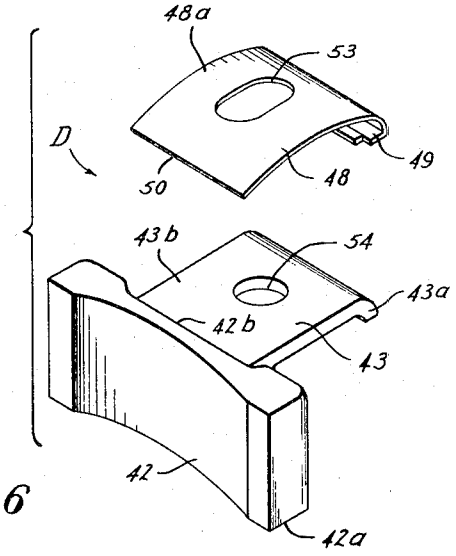
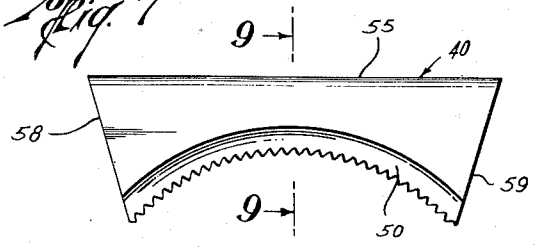


Fig. 7



Henry Ben Young
INVENTOR.
BY J. Vincent Martin
Joe E. Edwards
B. R. Pravel
ATTORNEYS

United States Patent Office

2,785,454

Patented Mar. 19, 1957

2,785,454

SLIPS FOR SUPPORTING PIPE IN WELLS

Henry B. Young, Houston, Tex., assignor to Mission Manufacturing Company, Houston, Tex., a corporation of Texas

Application December 29, 1952, Serial No. 328,309

1 Claim. (Cl. 24—263)

This invention relates to new and useful improvements in slips for supporting pipe in wells.

This application is a continuation of my co-pending United States patent application, Serial No. 90,310, filed April 29, 1949, now abandoned.

Pipe gripping slips of the type employing what is known in the industry as a rolling dog construction are well known, examples of which are disclosed in the U. S. patents to Adair, No. 1,908,652 and No. 1,908,675. Such rolling dog slips employ a stack of dogs which are inclined upwardly in the slip body and which are adapted to grip a pipe to suspend same in a well or the like, but are tiltable or rollable upwardly to a small extent to release the pipe upon raising the pipe relative to the slip.

In the usual rolling dog slips, each jaw of the slip has a longitudinal recess in the inner surface thereof into which the dogs are stacked. The stack of dogs is generally retained in the recess by some type of projection or retainer which extends laterally over a portion of the upper dog in the stack so as to retain the dogs in their inclined position in the recess. The difficulty with the previously known rolling dog slips is that the projection or retainer is often bent or twisted upwardly when an unintentional upward jar or blow is imparted to the dogs by the well pipe striking the dogs during upward movement of the pipe. Once the retainer is bent or twisted, the slip becomes useless because the dogs are easily jarred out of the recess which results in ineffective gripping of the pipe by the slips and serious jamming of the pipe in the slips due to the loose dogs. This defect in the prior rolling dog slip assemblies has resulted in rendering many of them worthless after a short period of use, thereby requiring their removal for repair, with consequent expense, inconvenience and loss of drilling time.

Another major defect in the prior known slips has been in the lack of protection for the slip handles against downward blows from the pipe elevators. In the usual slip construction, the handles are disposed at or near the top of the slip body and when the pipe is supported by the elevators and lowered thereby through the slips, the operator frequently permits the elevators to fall with such a force as to bend, crack, or otherwise damage the slip handles, so that they either become unusable or difficult to use.

One object of this invention is to provide a slip wherein each jaw thereof includes a body portion in which a stack of rolling dogs are supported, together with a dog retainer mounted on the body portion for rocking or pivotal movement in accordance with the rolling or tilting of the dogs; said body limiting the movement of the retainer upwardly to prevent excessive upward movement thereof which might result in bending or otherwise deforming said retainer.

An important object of this invention is to provide a slip jaw wherein a stack of rolling dogs are disposed within a recess in the inner surface of the jaw body with

the top wall of said recess being spaced above but overhanging the uppermost dog, and a retainer rockably mounted in said body between the top wall of the recess and the uppermost dog in the stack whereby a sharp upward thrust, jar or blow upon the dogs is transmitted to the retainer and through said retainer directly to the jaw body to thereby protect said retainer against damage.

Another object of this invention is to provide a slip jaw body wherein a stack of rolling dogs are mounted in a pocket in the body, the dogs being held in position by a dog retainer mounted to undergo limited movement on the body and resiliently urged into constant engagement with the upper dog in the stack whereby said retainer maintains the dogs in the body and may move or rock therewith in response to the normal tilting or rolling of the dogs; movement of the dogs beyond their normal tilting in an upward direction being prevented by the retainer reaching its limit of movement on the body.

It is another object of this invention to provide a slip dog which has a double row of pipe-gripping teeth symmetrically disposed and also has rounded upper and lower rear corners thereon whereby the dog is reversible.

A further object of this invention is to provide a slip jaw wherein the slip body has a handle pivotally connected thereto, with the pivotal connection being protected from impacts by a top plate of the body overlying said connection.

A still further object of this invention is to provide a slip jaw having a vertical passage disposed between a front wall in which pipe-gripping dogs are mounted and a rear wall whereby mud or slush may flow therethrough while the dogs are gripping a pipe.

The construction designed to carry out the invention will be hereinafter described together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

Figure 1 is a plan view of the slip of this invention.

Figure 2 is an elevational view of the slip of this invention in its open position,

Figure 3 is an oblique view of one of the bodies of the slip jaws of this invention.

Figure 4 is an oblique view of the slip jaw illustrated in Figure 3 as viewed from the back thereof.

Figure 5 is a vertical sectional view of one of the slip jaws of this invention.

Figure 6 is an exploded view, illustrating the dog retainer and the spring therefor.

Figure 7 is a plan view of one of the slip dogs of this invention.

Figure 8 is an elevational view of one of the slip dogs of this invention.

Figure 9 is a view of one of the dogs of this invention taken on line 9—9 of Figure 7.

In the drawings, the letter A designates the slip of this invention which includes a central slip jaw 10 and two end jaws 11 and 12. The central jaw 10 has laterally extending lugs 14 on one side thereof which are vertically staggered with respect to, and interfit with, similar lugs 13 on the adjacent end of the slip jaw 11. The adjacent lugs 14 and 15 are hinged together by a hinge pin 16 extending therethrough so that the slip jaw 11 may pivot or swing laterally relative to the central jaw 10. Lugs 17 are provided on the side of the central jaw opposite from the lugs 14 and are similar in construction. These lugs 17 interfit and are vertically staggered with respect to lugs 18 on the adjacent side of the slip jaw 12 with a hinge pin 19 providing the connection between the adja-

cent lugs 17 and 18, whereby pivotal swinging of the slip jaw 12 with respect to the central jaw 10 is made possible. Thus, the slip A of this invention provides for the lateral swinging or pivoting of the end jaws 11 and 12 with respect to the central jaw 10 whereby a pipe P may be gripped by the slip to prevent movement thereof. The extent of outward opening of the end jaws 11 and 12 is limited by stop ears 20 on the central jaw and 21 and 22 on the end jaws 11 and 12, respectively. The extent of inward swinging of the end jaws 11 and 12 is determined by the stop ears 23 and 24 on the end jaws 11 and 12, respectively, such ears 23 and 24 being spaced vertically with respect to each other so that the bodies of the jaws will be contacted by the ears. Thus, although the slip A of this invention is adapted to grip various sizes of pipe P, the stop ears serve to limit the various sizes of pipes which the slip can effectively grip to thereby assure that the proper size of the slip A is used with a particular pipe.

Each of the slip jaws 10, 11 and 12 are substantially identical except for the arrangement of the hinge lugs and the stop ears previously described. Therefore, only the details of the slip jaw 12 will be explained, since such details are applicable to the slip jaws 10 and 11, as well as the slip jaw 12. The body of the slip jaw 12, as best illustrated in Figures 3 and 4, has a recess R in its inner surface 25, which recess R has a back or rear wall 26, a bottom wall 27, a top wall 28, and side walls 29 and 30. The inner surface 25 and the inner or rear wall 26 of the recess R are actually formed on the front wall or plate F of the slip jaw body, which front plate F is connected to a rear downwardly inclined plate or wall 30 of the body by end or side plates 31 and 32. The upper end of the body which may be referred to as a cap portion comprises the wall section 33 which is connected between the side plates and which has its lower inner edge forming the top wall 28 of the recess R. A lateral top plate 33*a* projects laterally between the side plates, and the front wall, rear wall and cap portion may all be made integral as by casting or if desired may be fabricated and welded.

The back or rear plate 30 of the body is inclined downwardly for fitting within the conventional slip bowl (not shown), and the upper end of the rear plate 30 has an opening 34 while the lower end of the plate 30 has an opening 35 therein, which openings communicate with a vertical passage 36 between the front plate F and the rear or back plate 30, whereby mud or slush may flow through the passage 36 when the slip A is in a slip bowl in gripping contact with the pipe. The front wall F may also be provided with an opening 37 at its lower end which also communicates with the vertical flow passage 36 for the flow of mud or slush therethrough.

As shown in Figure 5, dogs 40 are arranged in a vertical stack in the recess R with the lower dog in the stack resting upon the bottom wall 27 of the recess and the upper dog in the stack being spaced vertically downwardly from the top wall 28 of the recess. The dogs 40 are of a particular construction which will be described in detail hereinafter, but generally they may be referred to as rolling dogs since they are adapted to roll or tilt upwardly upon movement of a pipe upwardly in contact with the teeth thereof. The rear surfaces of the dogs 40 contact a wear plate 41 positioned against the inner wall 26 of the recess R. This wear plate 41 is of a slightly softer material than the material of the dogs 40, whereby the wear during the tilting or rolling of the dogs 40 will be on the plate 41 rather than the rear surfaces of the dogs 40, as well as to provide for a slight indentation of the plate 41 by the dogs 40 to compensate for any irregularities in the surface of the pipe or the width of the dogs themselves, whereby uniform contact of the teeth of the dog with the pipe is effected.

The stack of dogs are held in the recess R by a dog retainer element D positioned in contact with the upper dog in the stack and spaced slightly below the top wall 28 of the recess R. The dog retainer D (Figure 6) has a vertical generally arcuate part or portion 42 with the lower end 42*a* thereof contacting the upper dog in the stack. Extending rearwardly from the vertical portion 42 is a lateral section or arm 43 which is substantially perpendicular to the vertical section 42 and is of a reduced width as compared to the vertical section 42. This lateral section 43 fits within a lateral slot 44 in the body of the slip jaw, such lateral slot being formed by a rearwardly extending flange 45 forming the bottom wall or surface of the slot 44 and having connection with the front wall F of the body, with the top surface or wall of the slot 44 being formed by a rearwardly extending flange 46 substantially parallel to the flange 45 and being a continuation of the upper or top wall 28 of the recess R. The flanges 45 and 46 may be cast integral with the body and are actually a part thereof. The lateral slot 44 opens into the upper end of the recess R and is adapted to receive the lateral arm or section 43 of the dog retainer D. When the dog retainer D is assembled with the body (Figure 5), it is urged downwardly into constant engagement with the upper dog by a leaf spring 48 which has a reverse bent end 49 which fits underneath a downward projection 43*a* at the outer end of the lateral arm 43. The forward end 50 of the spring 48 contacts the upper surface 43*b* of the lateral arm 43 so that when the dog retainer D and the spring 48 are assembled and held in the slot 44 by the cotter pin 52 extending through the aligned openings 53 and 54 in the spring 48 and the lateral arm 43, respectively, the upper surface 48*a* of the spring 48 contacts the flange 46, whereby the spring 48 is maintained under a slight compression at all times. It will be observed that the openings 53 and 54 are of a slightly larger diameter than the external diameter of the cotter pin 52. This permits the dog retainer D to move upwardly without interference from the cotter pin 52 and also permits a lateral sliding movement of the spring 48 relative to the arm 43 and toward the shoulder 42*b* as the dog retainer D moves upwardly for contact with the upper wall 28. It will be observed that the downward projection 43*a* serves as a fulcrum point for the rocking or pivotal movement of the dog retainer D which moves in response or in accordance with the tilting or rolling of the dogs 40.

An important feature of this invention is the fact that the upper wall 28 of the recess R completely overlies, or extends inwardly substantially the same distance as, the dog retainer D so that the upper wall 28, which is part of the body of the slip jaw, limits the upward movement of the dog retainer D by abutment therewith to thereby prevent the upward bending of such dog retainer. It will be observed that the lower wall 27 of the recess R is inclined inwardly and upwardly at about a ten degree angle so as to cant the dogs 40 upwardly, and that the lower end 42*a* of the dog retainer D is similarly inclined whereby upon the rolling or tilting of the dogs 40 and a consequent rocking or pivotal movement of the dog retainer D about its fulcrum point, the dogs 40 are securely held at all times in the recess R with the lower end 42*a* of the dog retainer D being constantly in engagement with the upper dog in the stack.

The dogs themselves are shown in detail in Figures 7–9, each dog 40 having a forward arcuate edge 50 with two rows 51 and 52 of pipe engaging teeth which are symmetrically disposed on the forward arcuate edge of the dog plate (Figure 8). The corners 53 and 54 formed at the intersection of the rear surface 55 of the plate with the top surface 56 and the bottom surface 57 are rounded to permit the dog to roll or tilt and also so that the dog is reversible. Thus, with the particular construction of the dog 40, namely, with the two rows of symmetrically disposed gripping teeth on the forward

arcuate edge of the plate and the rounded rear corners 53 and 54, each of the dogs 40 may be used with either the row 51 of teeth or the row 52 of teeth disposed upwardly. Thus, assuming that the dogs have been used for a period of time with the row 51 of the gripping teeth disposed upwardly and have been subjected to considerable wear, the dog may then be reversed so that the row 52 of teeth is positioned upwardly whereby such row will then receive the majority of the wear. It will also be noted that the sides 58 and 59 of the dog 40 are flared rearwardly and that the walls 29 and 30 of the recess R in the body must have a corresponding inclination or outward flaring, which further assists in retaining the dogs 40 in the recess. Because of the flared ends or sides 58 and 59, to assemble the dogs 40 in the recess they must be cocked at an angle to the vertical for insertion, and this is possible because even the upper dog in the stack is spaced somewhat below the top wall 28 of the recess and there is, therefore, sufficient space for such cocking of the dogs during insertion.

As has been explained, the cap portion C is part of the slip jaw body and has a hollow portion or space below the top plate 33*a*. An opening 61 in the top plate 33*a* is formed in order to drill downwardly through the lateral flanges 45 and 46 to form the openings therein for receiving the cotter pin 52. The side or end plate 31 has an opening 62 therein below the top plate 33*a* and the end plate 32 has a similar opening 63 therein. These openings 62 and 63 are in the same lateral plane and receive the end pins 64 and 65 of a trunnion 66 having connection with a handle 67 (Figure 1). The trunnion 66 for the handle 67 is thus pivotally connected to the body of the slip jaw through the end pins 64 and 65, with the pivotal connection being disposed below the top plate 33*a* for protection against impacts or blows which may be applied to the body of the slip jaw. This often occurs in the lowering of pipe due to the inadvertent release of the elevators lowering the pipe, whereby the elevators hit the top plate 33*a* with a terrific blow which would damage the pivotal connection for the handle unless such protection of the top plate is provided. The handles 68 and 69 on the jaws 11 and 10, respectively, are connected in the same manner as the handle 67 on the slip jaw 12. The handle 69 on the central jaw 10 extends substantially perpendicular to the trunnion thereof, while the handles 67 and 68 are bent so as to extend substantially parallel to the trunnion, which arrangement provides for easier movement of the handles 67 and 68 toward each other for closing the slip about the pipe P. All of the handles are pivoted so that they will move downwardly below the lateral plane of the top plate 33*a* of each of the slip jaws whereby they will be below, and protected by said top plates against impacts from the elevators or similar means.

In the use of the slip A of this invention, it is placed in a conventional slip bowl with the pipe P extending between the jaws (Figure 1). The end jaws 11 and 12 are moved toward each other so as to permit the dogs 40 to grip the pipe P to prevent downward movement of the pipe. With the rolling dog construction, the pipe P may be moved upwardly without releasing or moving the slips, because as the pipe moves upwardly, even though it is in contact with the teeth of the dogs, the dogs will tilt or roll upwardly to permit the upward release and movement of the pipe P. Upon the upward tilting of the dogs 40, the dog retainer D will rock or pivot about its fulcrum point between the projection 43*a* and the bottom flange 45 with the upward movement of the arcuate portion 42 being limited by the top wall 28 of the recess.

The space between the upper surface of the portion 42 of the retainer and the top wall 28 is such that the retainer may undergo the movement necessary during normal upward movement of the pipe and during normal operations the retainer does not engage the top wall 28 with any appreciable force. However, in the event a sharp upward thrust, jar or blow is applied to the dogs by a collar on the pipe striking same, such thrust, jar or blow will rock the dog retainer D upwardly against the top wall 28 and since the dog retainer is confined entirely therebelow, the impact is transmitted to the slip jaw body which comprises the main portion of the unit and is of sufficiently heavy material and has sufficient strength to absorb the blow. Thus, the retainer is not required to absorb or withstand these upward jars and merely functions as an intermediate element through which the impact is transmitted from the dogs directly to the jaw body. This arrangement prevents bending, deformation or damage to said retainer.

The spring 48 will constantly maintain the bottom surface 42*a* of the dog retainer D in contact with the upper dog in the stack so that the dogs 40 are prevented from turning or falling out of the recess R during their tilting or rolling movement. When it is desired to replace the dogs or to reverse same, the cotter pin 52 is readily accessible to the opening 34 whereby the removal of the dog retainer D and the dogs 40 is facilitated.

It should be pointed out that although the particular construction of the hinges between the slip jaws as shown in the drawings locates the same between the upper lateral plane of the stack of dogs and the lower lateral plane of the stack of dogs to reduce the moment couple or torque exerted on the hinges, such construction is not required, as any suitable arrangement of the hinges with respect to the stack of dogs can be utilized within the scope of this invention.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof, and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made, within the scope of the appended claim without departing from the spirit of the invention.

What is claimed is:

In a slip adapted to engage a pipe to prevent movement thereof, a slip jaw having a body with an arcuate inner surface, said body having a longitudinal recess in said inner surface, a stack of pipe-gripping dogs which are constructed for tilting or rolling being disposed in said recess and extending beyond said inner surface, the lower dog in the stack resting on the bottom wall of the recess and the upper dog being spaced from the top wall of the recess, a dog retainer positioned in contact with said upper dog to prevent displacement of said dogs from said recess, a pivotal connection between said dog retainer and said body to provide for pivotal movement of said retainer as said dogs roll or tilt in said recess, said body having a lateral slot opening into the upper end of the inner wall of said recess, and said dog retainer having a lateral portion thereof extending into said slot, said lateral portion of said retainer having a projection thereon in contact with the bottom wall of said lateral slot to provide the fulcrum point for said pivotal movement of said dog retainer.

References Cited in the file of this patent

UNITED STATES PATENTS

1,400,701	Vreeland	Dec. 20, 1921
1,907,685	Tilbury	May 9, 1933
1,908,652	Adair	May 9, 1933
1,999,279	Burns	Apr. 30, 1935
2,030,499	Church	Feb. 11, 1936
2,245,979	Johnson	June 17, 1941
2,274,273	Miller	Feb. 24, 1942
2,288,851	Sharp	July 2, 1942