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1,875,583 9/1932 Fox 166/217
2,132,061 10/1938 Walker 166/217

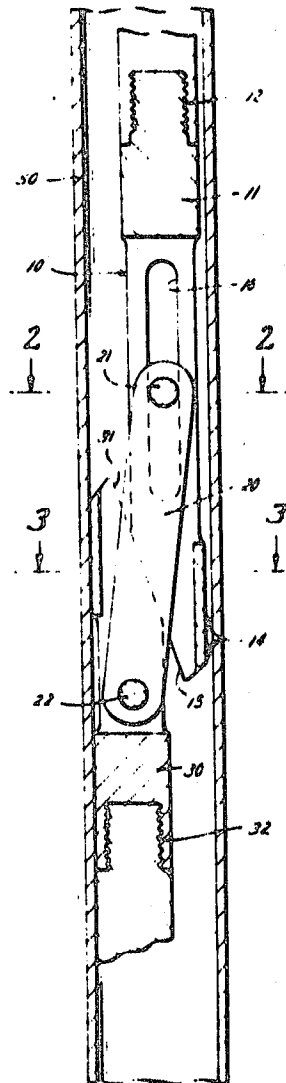
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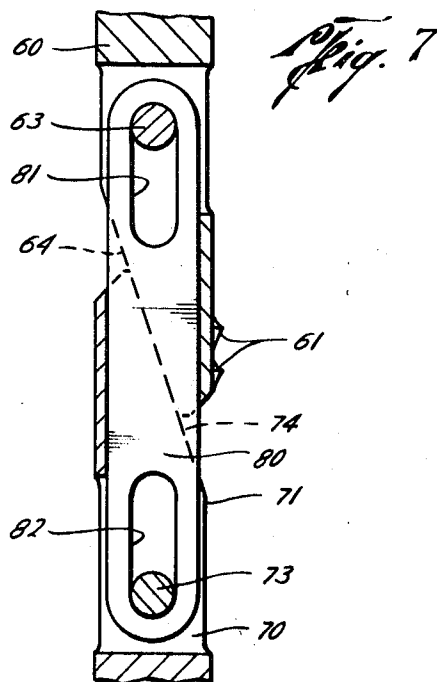
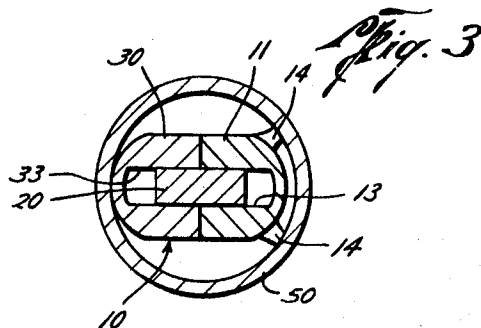
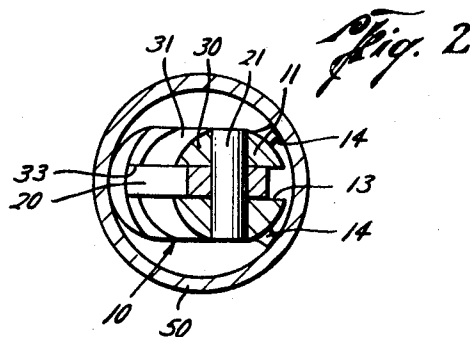
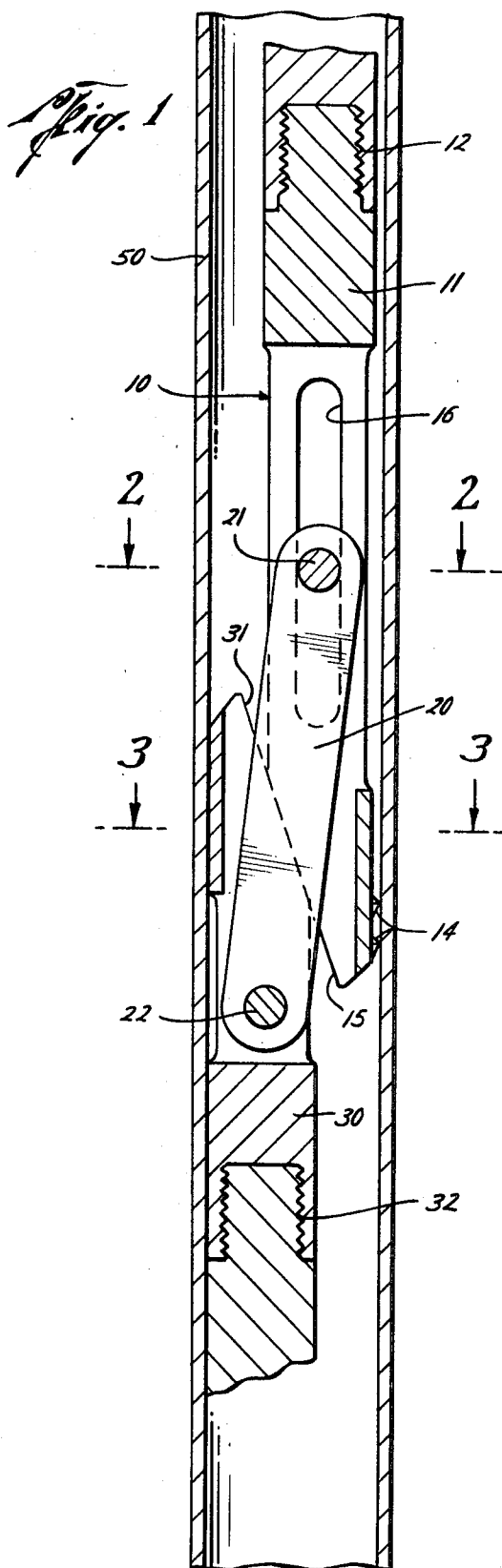
[54] **BLOW-UP PREVENTER**
4 Claims, 10 Drawing Figs.

[52] U.S. Cl. 166/217
[51] Int. Cl. E21b 23/00
[50] Field of Search 166/216,
217

[56] **References Cited**
UNITED STATES PATENTS
1,036,824 8/1912 Gable 166/217

ABSTRACT: An apparatus for arresting upward motion of a wire line tool blown up a production pipe by sudden excessive downhole pressure or fluid flow. The apparatus of the invention includes a wedging member having an oblique lower face, a connector member having a generally mating oblique upper face, and means for suspending a wire line tool therefrom. It also includes means for supporting the wedging member within the annulus of the well pipe and means for slidably coupling the wedging member and the connector member, whereby relative convergent motion between the two members moves the members into a braking or wedging attitude.

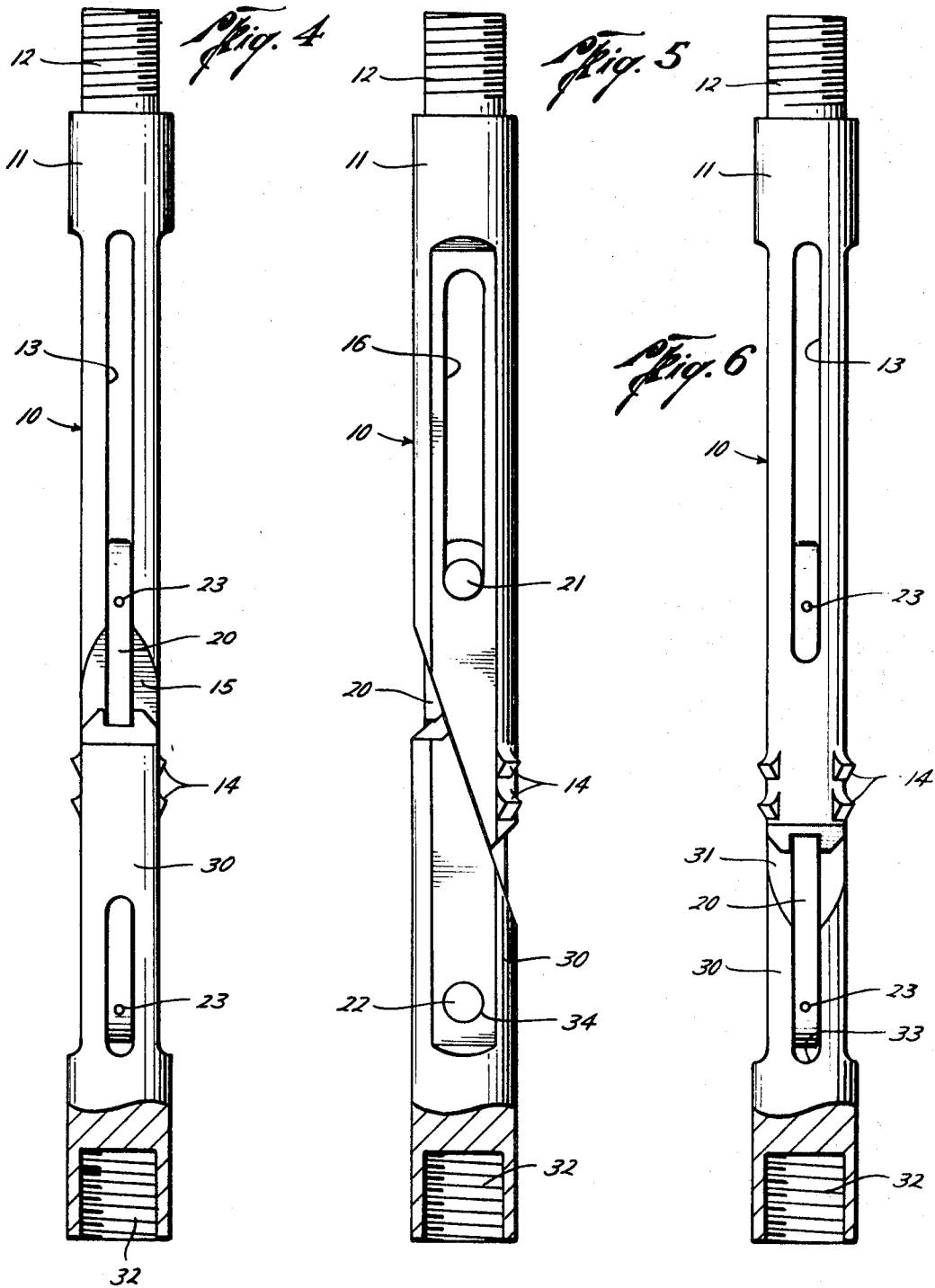




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Fig. 8

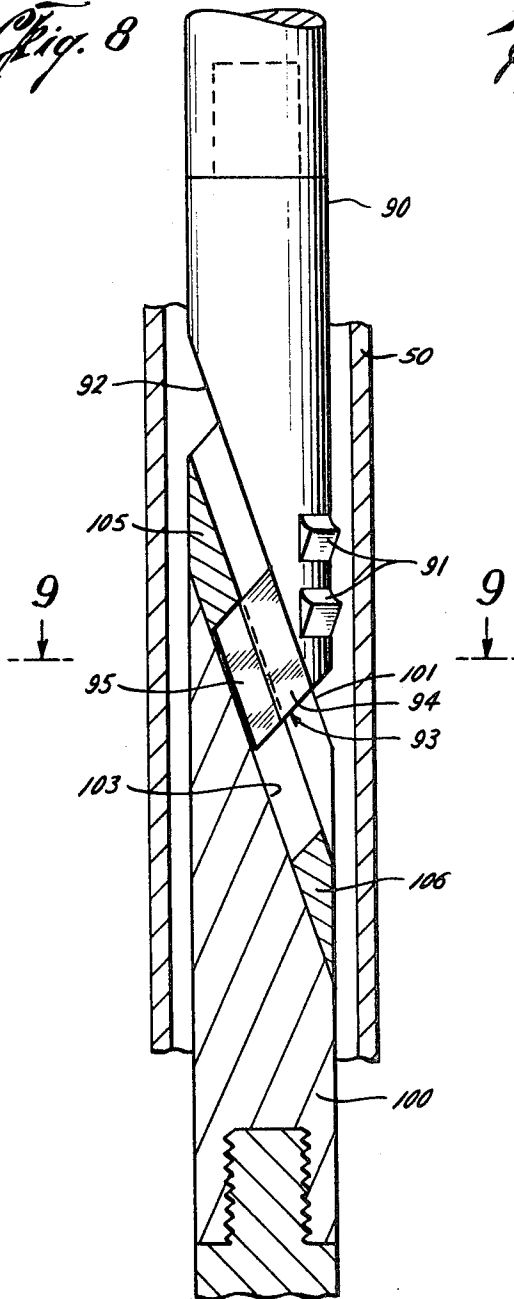


Fig. 10

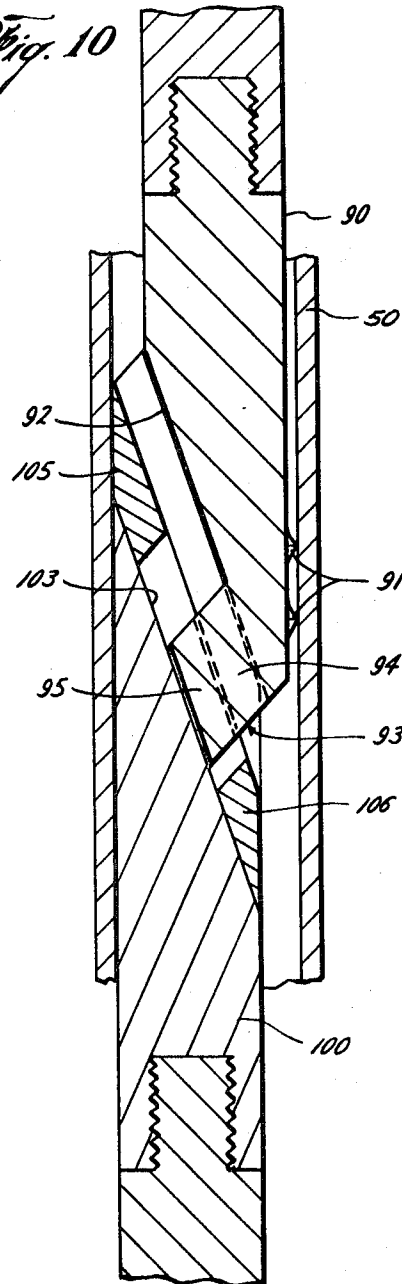
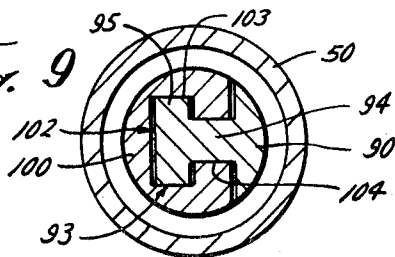


Fig. 9



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BLOW-UP PREVENTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to an apparatus for preventing hazardous ascent of wire line tools suspended within a production pipe. More particularly, this invention relates to an apparatus which will arrest upward movement of a wire line tool caused by a sudden fluid surge from below the tool.

2. Description of the Prior Art

Heretofore, there has been a need to prevent the sudden blowing up of wire line tools suspended within a well pipe. When performing routine or special wire line work on producing wells which flow by surges, either by gas lifting or naturally, there is always the danger of having the wire line tools blown or kicked up the tubing. When a tool is suddenly blown up, the wire line above the tools will slacken, ball up, kink and usually break, dropping the tools and creating a difficult fishing job.

The devices used to prevent these problems in the prior art have frequently been insensitive to small variations in bottom-hole pressure and have been extremely difficult to use. Certain of the prior art tools display the drawback of necessarily having a null point or relationship between the parts of the tool which will prevent the operation of that tool. Should a sudden surge of fluid be experienced when the prior art tool is in this null point configuration, the troublesome blowup of the wire line tool cannot be prevented.

This disadvantage in the prior art was alleviated by the addition of a spring at one of the pivot points, thereby longitudinally misaligning the tool slightly and eliminating the null point. The springed prior art device, however, displays an increased tendency to hang up when used to lower the wire line tool to its working position in the hole.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a slidably actuated improved brake for wire line tools which is both freely traveling in its longitudinally aligned attitude and a positive brake in its wedging attitude, while retaining enough sensitivity to be actuated to the wedging attitude by a relatively small pressure surge from below.

The apparatus of the invention for use with a wire line tool in an annular opening includes a wedging member having an oblique lower face and a connector member having a generally mating upper face which is also oblique to the longitudinal axis of the apparatus. It also includes means for supporting the wedging member within the annular opening for travel of the apparatus therethrough. It also includes means for coupling the wedging member and the connector member, whereby relative convergent motion between the connector member and the wedging member wedges the wedging member between the side of the annular opening and the connector member by sliding movement generally in the direction defined by the intersection of the mating oblique faces of the members.

In certain embodiments, the coupling means may take the form of an elongated linking member having a lateral lug connected to at least one of the wedging member and the connector member by the lateral lug slidably and rotatably engaged in elongated longitudinal slots in that member.

In certain other embodiments, the coupling means takes the form of slotted elongated coupler slidably and rotatably engaged with lugs extending laterally through the wedging member and the connector member. In certain embodiments, the coupling means may take the form of slot and key means along the oblique mating faces of the connector member and the wedging member. In certain other embodiments, at least one of the wedging member and the connector member is preferably provided with friction means for contacting the sides of the annular opening when the tool is in the wedging attitude, thereby ceasing travel of the apparatus therethrough.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may be further understood by reference to the drawings wherein like numerals refer to like parts and in which:

FIG. 1 is a central sectional elevation view of the preferred embodiment of the apparatus showing the tool in the converged or wedging attitude within a pipe.

FIG. 2 is a cross-sectional view of the apparatus as shown in FIG. 1, taken along line 2—2.

FIG. 3 is a cross-sectional view of the apparatus as shown in FIG. 1, taken along line 3—3.

FIG. 4 is a rear elevation view of the preferred embodiment of the invention showing the tool in its longitudinally extended or traveling attitude.

FIG. 5 is a side elevation view of the preferred embodiment of the apparatus showing the tool in the axially extended or traveling attitude.

FIG. 6 is a front elevation view of the preferred embodiment of the invention showing the tool in the axially extended or traveling attitude.

FIG. 7 is a section side elevation view of one alternate embodiment of the invention showing the embodiment in the axially extended or traveling attitude.

FIG. 8 is a partial sectional side elevation view of still another embodiment of the invention showing the slot and key coupler and showing the tool in the axially aligned attitude within a pipe.

FIG. 9 is a cross-sectional view of the apparatus shown in FIG. 8, taken along line 9—9.

FIG. 10 is a sectional side elevation view of the apparatus shown in FIG. 8 showing the tool in the converged or wedging attitude within a pipe.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 4, the apparatus, generally designated by the numeral 10, includes a wedging member 11, a connector member 30 and an elongated coupler 20. Wedging member 11 is provided with threads 12 on its uppermost portion for engagement with a supporting wire line. Wedging member 11 is also provided with a central slot 13 (FIGS. 2 and 3) which receives the upper portion of elongated coupler 20. Friction means in the form of a plurality of lateral projections are located at the lower portion of wedging member 11, which conveniently take the form of teeth 14. Teeth 14 contact the side of production pipe 50 when the apparatus assumes the wedging position, as shown in FIG. 1.

Wedging member 11 also includes a longitudinal slot 16 therealong which receives the upper lateral lug 21 of coupler 20 (FIG. 2). The sliding lug, as embodied by upper lateral lug 21, may be alternatively included in the lower, or connector, member 30 as well. In its lowermost portion, wedging member 11 is provided with an oblique planar face 15 (FIG. 4) which contacts the upper oblique planar face 31 (FIG. 6) of connector member 30 immediately therebelow.

Connector member 30 may be provided with threads 32 in its lowermost portion for receiving and supporting a wire line tool or series of tools (not shown). Connector member 30 also includes a central slot 33 (FIGS. 2 and 3) which receives the lower portion of coupler 20. Connector member 30 is rotatably fastened to coupler 20 by lower lateral lug 22 of coupler 20 projecting through lateral openings 34 (FIG. 5) in each side of connector member 30. Upper lateral lug 21 and lower lateral lug 22 are held in the body of coupler 20 by lockpins 23, or an appropriate weld.

The blow-up preventer is intended for use within a production pipe 50 or the like and is preferably inserted between the wire line and a wire line tool to be lowered down production pipe 50. The preferred embodiment of the invention is used in conjunction with a jar such as link jar immediately above the apparatus for dislodging it from the wedged position. This preferred position of the wire line tool, however, is not critical. It may be inserted above the blow-up preventer, as long as there is sufficient weight on connector member 30 to keep the

tool in longitudinal alignment for travel through the pipe. Both while being lowered down the production pipe and being raised back up the pipe by the wire line, the tool assumes a running or traveling position in coaxial longitudinal alignment, as shown in FIGS. 4, 5 and 6.

However, if any compressive force should be exerted across the apparatus, such as that encountered when a sudden surge of fluid causes the wire line tool suspended adjacent to the apparatus to move upward with respect to the wire line, the apparatus will move into the nonaligned or wedging position, as shown in FIG. 1, thus ceasing the upward motion of the tool and any equipment suspended therewith. In FIG. 1, coupler 20 has rotated with respect to wedging member 11 and connector member 30 and has slid into the wedging position by the action of opposing planar faces 15 and 31. Slot 16 in the body of wedging member 11 has allowed lateral lug 21 to slide upwardly with respect to wedging member 11 and has further facilitated generally linear sliding motion between wedging member 11 and connector member 30.

The contact of planar faces 31 and 15 gives this apparatus the advantage over the prior art of being very sensitive to small compressive forces exerted from below the tool in the production pipe. It has the additional advantage of having no null point as did tools with similar sensitivity in the prior art. The configuration of the apparatus is also beneficial in that, while under longitudinal tension, the tool aligns in its minimal lateral diameter for easy passage through the production pipe.

The alternate embodiment shown in FIG. 7 includes a wedging member 60, a connector member 70 and a slotted elongated coupler 80. Wedging member 60 is provided with teeth 61 for contact with the side of the wellbore when the tool is actuated to the wedging position. It also includes a central slot (not shown) to receive the upper portion of coupler 80 and a lateral lug 63 to slidably and rotatably affix coupler 80 therewithin.

Coupler 80 is provided with lateral openings 81, 82 to slidably and rotatably engage the lateral lugs 63, 73 in wedging member 60 and connector member 70, respectively. Connector member 70 includes a central slot 71 to receive the lower portion of coupler 80 and lateral lug 73 to slidably and rotatably fasten coupler 80 within central slot 71.

This alternate embodiment of the invention also operates by the aforementioned generally linear sliding motion when a compressive force is applied across the tool. Wedging member 60 and connector 70 slide in a generally linear motion to a wedging position which ceases the travel of the tool, the sliding motion being generally along the intersection of the plane of mating planar faces 64 and 74 and the plane of motion of coupler 80. Coupler member 80 rotates slightly in a clockwise direction, as seen in FIG. 7, with the relative sliding motion of wedging member 60 and connector member 70. As wedging member 60 and connector member 70 slide to the wedging position, lugs 63 and 73 converge in slots 81 and 82 of coupler 80. The sliding motion of lugs 63 and 73 in coupler slots 81 and 82 allows the relative motion of wedging member 60 and connector member 70 to be generally linear.

The alternate embodiment shown in FIGS. 8, 9 and 10 includes a wedging member 90 and a connector member 100. Wedging member 90 is provided with a plurality of teeth 91 for contact with the side of pipe 50 when the tool is actuated to the wedging position. It is also provided with a lower oblique face 92, projecting from the length of which is a key means conveniently taking the form of the projection, generally T-shaped in transverse cross-sectional configuration, designated by the numeral 93. Projection 93 includes along its length a narrowed portion 94 and a widened portion 95 for engagement with connector member 100.

Connector member 100 includes along and within its upper oblique face 101, an elongated slot generally designated by the numeral 102, as shown in FIG. 9. Slot 102 has a widened portion 103 to receive widened projection portion 95 of wedging member 90. Slot 102 also includes a narrowed portion 104 (FIG. 9) which engages narrowed projection portion 94 of wedging member 90.

This embodiment of the invention operates by the aforementioned generally linear sliding motion when compressive force is applied across the tool. The sliding action is accomplished by projection 93 sliding in slot 102 within the limits defined by upper stop 105 and lower stop 106. In the longitudinally aligned or traveling attitude, projection 93 abuts upper stop 105 and suspends connector member 100. When a sudden force from below exerts relative compressive movement of wedging member 90 and connector member 100, relative sliding movement is effected between the members, causing projection 93 to slide toward lower stop 106. Projection 93 never reaches lower stop 106, however, because connector member 100 and wedging member 90 contact the sides of pipe 50 to stop the relative sliding movement, as well as the ascent of the tool and any wire line apparatus suspended therefrom.

Thus, it can be seen that a sensitive and reliable apparatus is shown for ceasing the upward movement of a wire line assembly caused by a sudden surge of pressure or fluid flow inside the pipe. This description of the combination is to be construed as illustrative only, and alternate embodiments of the invention will be apparent to those skilled in the art in view of this description.

What is claimed is:

1. In a braking apparatus for use with a wire line tool in an annular opening, the combination comprising:
 - a wedging member having an oblique lower face;
 - a connector member having a generally mating upper face which is oblique to the longitudinal axis of said apparatus; means for supporting said wedging member within said annular opening for travel of said apparatus therethrough; and, means for coupling said wedging member and said connector member whereby relative convergent motion between said connector member and said wedging member wedges said wedging member between the side of said annular opening and said connector member by a sliding movement and generally in a direction defined by the intersection of said mating oblique faces of said members, said coupling means taking the form of a slotted elongated coupler slidably and rotatably engaged with lugs extending laterally through said wedging member and said connector member.
2. In a blow-up preventer for use with a wire line tool within a wellbore, the combination comprising:
 - a wedging member having a lower oblique face;
 - a connector member having a generally mating upper oblique face;
 - means for supporting said wedging member within said wellbore, whereby all parts of said apparatus are supported in longitudinal alignment, thereby facilitating axial travel of said apparatus through said wellbore; and, means for slidably joining said wedging member and said connector member, whereby relative sliding movement of said wedging member and said connector along said respective oblique faces thereof may be achieved when the rate of upward movement of said connector member exceeds the rate of upward movement of said wedging member, thereby wedging said wedging member between said connector member and the well tubing, said joining means including an elongated linking member having lugs projecting laterally generally from the ends thereof, said lugs being slidably and rotatably engaged by lateral longitudinal slots in at least one of said wedging member and said connector member.
3. In a blow-up preventer for use with a wire line tool within a wellbore, the combination comprising:
 - a wedging member having a lower oblique face;
 - a connector member having a generally mating upper oblique face;
 - means for supporting said wedging member within said wellbore, whereby all parts of said apparatus are supported in longitudinal alignment, thereby facilitating axial travel of said apparatus through said wellbore; and, means for slidably joining said wedging member and said connector member, whereby relative sliding move-

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ment of said wedging member and said connector member along said respective oblique faces thereof may be achieved when the rate of upward movement of said connector exceeds the rate of upward movement of said wedging member, thereby wedging said wedging member between said connector member and the well tubing, said joining means taking the form of a longitudinally slotted elongated coupler slidably and rotatably engaged by lugs lateral to said coupler within said wedging member and said connector member.

4. In a blow-up preventer for use with a wire line tool within a wellbore, the combination comprising:
 - a wedging member having a lower oblique face;
 - a connector member having a generally mating upper oblique face;
 - means for supporting said wedging member within said wellbore, whereby all parts of said apparatus are supported in

longitudinal alignment, thereby facilitating axial travel of said apparatus through said wellbore;
and, means for slidably joining said wedging member and said connector member, whereby relative sliding movement of said wedging member and said connector member along said respective oblique faces thereof may be achieved when the rate of upward movement of said connector member exceeds the rate of upward movement of said wedging member, thereby wedging said member between said connector and the well tubing, said joining means taking the form of a slot along said oblique face of one connector member and said wedging member having an inner widened portion and key means projecting from the other of said members, said key means having an outer widened portion for matable sliding engaging with said inwardly widened slot.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,602,306

Dated Aug. 31, 1971

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Granison T. Alexander, Jr.

Inventor's name ([72]) "Gramison" should be changed to read --Granison--

Column 1, line 66, after "form of" insert --a--

Column 2, line 71, after "such as" insert --a--

Column 6, line 9, after "wedging said" insert --wedging--

Signed and sealed this 14th day of March 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents