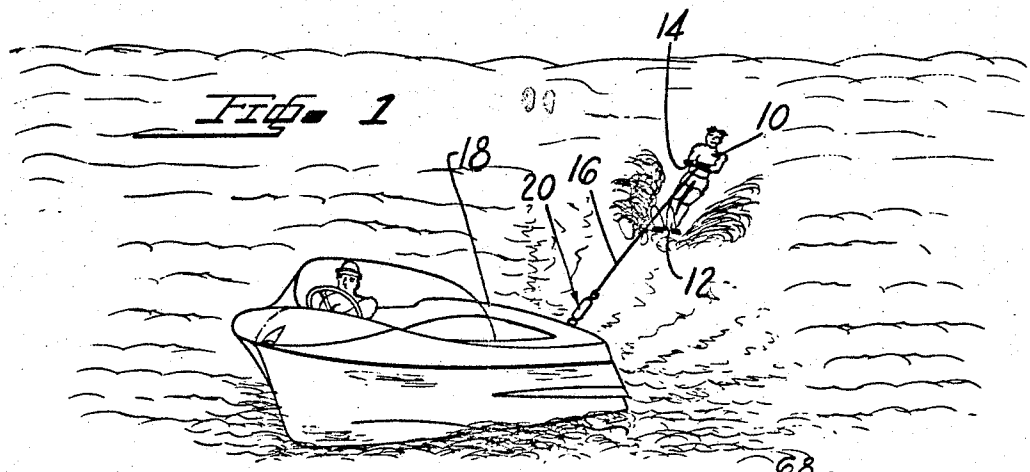
April 2, 1963 C. B. POST 3,083,992

DISCONNECT COUPLING

Filed May 3, 1961 2 Sheets-Sheet 1

Fig. 1



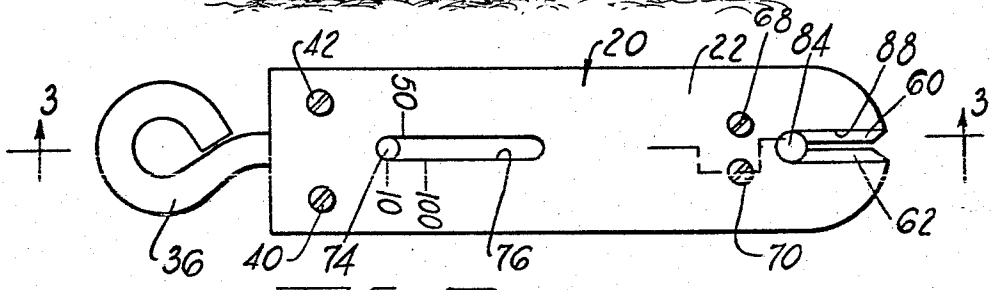


Fig. 2

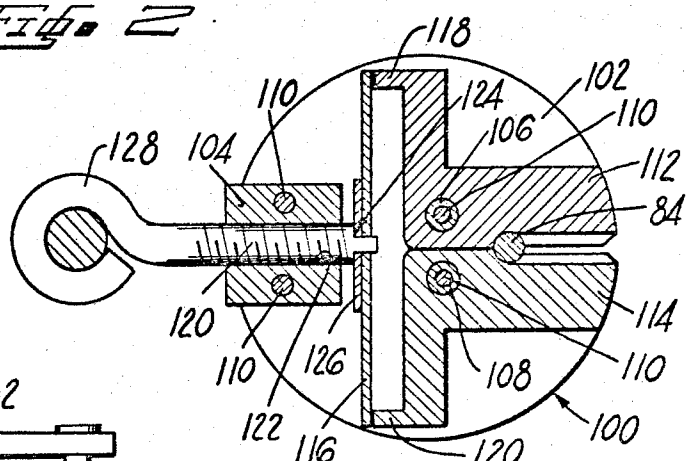


Fig. 7

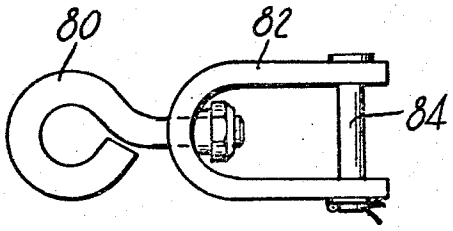


Fig. 8

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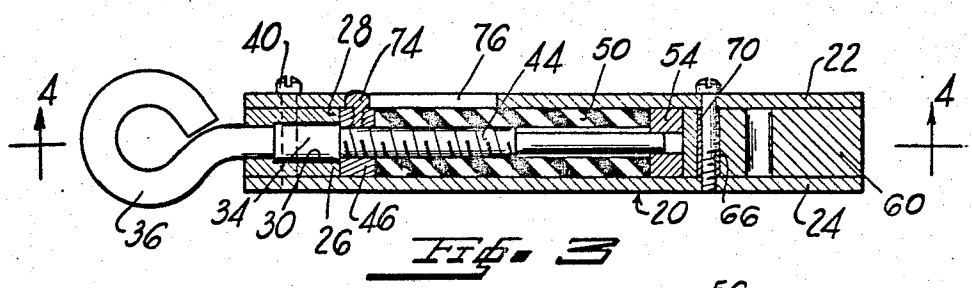

Fig. 3

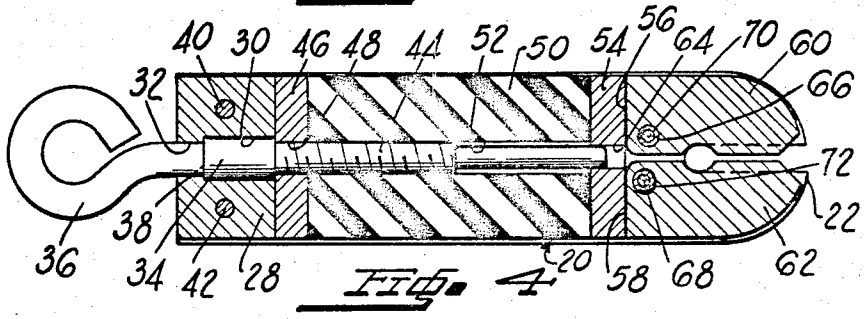

Fig. 4

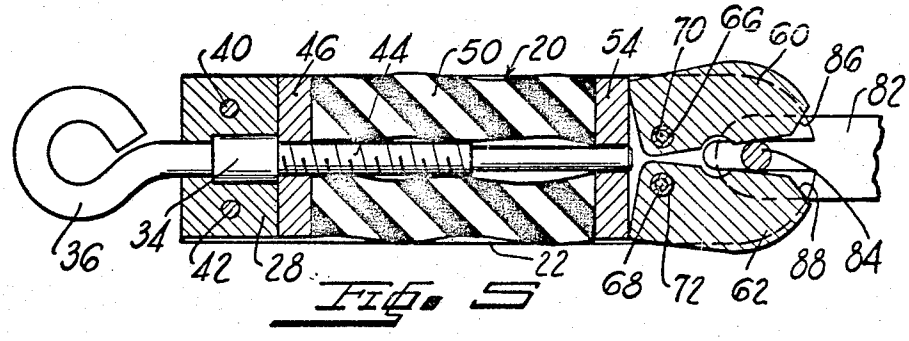

Fig. 5

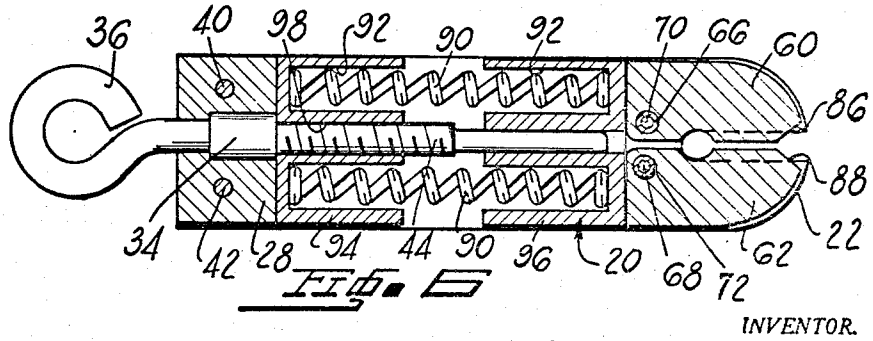

Fig. 6

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United States Patent Office 3,083,992 Patented Apr. 2, 1963

3,083,992

DISCONNECT COUPLING

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Filed May 3, 1961, Ser. No. 107,512
10 Claims. (Cl. 287—119)

This invention relates to a disconnect coupling which is used as part of a tow line in water skiing and the like.

Water skiing as a sport has become popular throughout the United States and enough experience is now accumulated to make evident the need for certain safety devices which are necessary for safeguarding the water skier. One desirable safety precaution is that means should be provided for disconnecting the water skier from the tow boat at some predetermined upper limit of tensile force on the tow line because, if the skier should lose his balance and become entangled in the tow line, the boat will continue to draw the skier submerged. Under these circumstances, it is practically impossible for the skier to surface and he has no opportunity to free himself from the entangling tow line. It frequently happens, where the driver of the boat is inexperienced, that the plight of the skier is not immediately apparent and so these circumstances can produce injury if not fatality.

Accordingly, I propose a disconnect coupling which forms a part of the skiing tow line and functions to break the tow line connection, releasing the skier from the boat at some predetermined tensile loading of the tow line and which occurs under the conditions previously described, i.e., the boat towing the skier while he is submerged and at cruising speeds of the boat.

An object of the present invention is to provide a simple, inexpensive disconnect coupling structure which is unaffected by water and other environmental conditions which are encountered during water skiing operations.

A further object of the invention is to provide a disconnect coupling which is adjustable to release the skier at a preselected tensile load of the tow line and having a convenient indicator which tells at what load the disconnect coupling is set for operation.

A further object of the invention is to provide a disconnect coupling which includes a resilient member which can be adjustably loaded to provide release of the coupling at a predetermined tensile load and which may be either in the form of a rubber-like solid block, a stack of coil springs or a leaf spring depending upon the design selected.

Another object of the invention is to provide a disconnect coupling which is structurally simplified so that various components are made to perform dual functions. For example, certain fastening devices which are used to hold the coupling structure together are also employed for pivotally mounting the locking jaws. The locking jaws in turn are loaded to a normally closed position by means of the resilient means.

Other objects and features of the invention will become apparent from a consideration of the following detailed description which proceeds with reference to the accompanying drawings, wherein:

FIGURE 1 illustrates a water skiing operation in isometric view, wherein the tow line includes a disconnect coupling embodying my invention;

FIGURE 2 is a side elevation view of the disconnect coupling constituting a first embodiment of my invention;

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken on line 4—4 of FIGURE 3;

FIGURE 5 is the same as FIGURE 4, but showing the jaws as they appear when moved to a releasing position;

FIGURE 6 is a sectional view of a further embodiment of the invention in which the rubber block in the previous embodiment is replaced by a plurality of coil springs;

FIGURE 7 is a further embodiment of my invention in which the sectional view is taken midway through the width or thickness of a disconnect coupling utilizing a leaf spring in place of the coil spring; and,

FIGURE 8 is a clevis which forms a connector between the coupling and tow line.

Referring now to FIGURE 1, the water skier 10 is pulled along the surface of the water and he planes over the surface of the water on the skis 12, his forward momentum being maintained by holding on to the handle 14 of tow line 16 which is fastened to the boat 18 through disconnect coupling 20.

The disconnect coupling 20 includes two plate-like members 22 and 24 which may be formed as stampings or the like and are spaced a predetermined distance apart by means of two complementary spacer blocks 26 and 28 each of which has a semi-circular cross section recess 30 and an opening 32 which closes one over the other. The recesses 30 form a pocket which receives an enlarged diameter portion 34 of a stem 36 which is bent at its one end into the form of a hook and includes a shoulder 38 which bears against a cooperative shoulder formed in spacer blocks 26 and 28 between recess 30 and opening 32.

The plates 22 and 24 are clamped together over the spacers 26 and 28 by means of threaded machine bolts 40 and 42 which pass through aligned openings in plate 22 and spacers 26, 28 and are screwed within threaded openings of plate 24.

The stem 36 has a threaded portion 44 which passes through a threaded opening 48 in compressor bar 46 so that when the stem 36 is rotated it will react against its shoulder 38 and cause the compressor bar 46 to advance toward the right from the position shown in FIGURE 4 thereby compressing a solid block 50 of rubber-like material which has an opening 52 through which the stem 44 extends.

The compression block 50 bears against a second bar 54 having a flat surface 56 which engages the opposed flat faces 58 of two jaws 60 and 62 which pivot from their normally closed positions shown in FIGURE 4 to the releasing position shown in FIGURE 5 by pushing the bar 54 rearwardly, there being an opening 64 which permits the bar to move backwardly relatively to the stem 36 for jaw opening movement.

The two jaws 60, 62 are moved pivotally about the bolts 66 and 68 which are received through bushings 70 and 72 extending through openings in the jaws 60, 62.

The bolts 66, 68 clamp the two plates 22 and 24 together the same as bolts 40 and 42 and the bushings 70, 72 fix the spaced relationship between the plates 22 and 24 which are spaced sufficiently apart to permit free pivotal movement of the jaws between the two plates. The bolts 66, 68 thus serve multiple functions in that they hold the plates 22, 24 together and a spaced distance apart, and they further provide pivotal mountings for the jaws 60, 62.

Since the jaws 60, 62 open against the resistance of resilient block 50, the point at which they will release depends upon the degree of loading of the resilient block 50, this being determined by the position of the compressor bar 46 on the stem 36. Should the compressor bar 46 be moved substantially closer to the bar 54, the greater degree of compression of resilient block 50 will effect greater resistance to opening of the jaws 60, 62 and therefore the coupling 20 will release at higher tensile

load. The degree of compression of the resilient block **50** is gauged by the location of stem head **74** which is fastened to compressor bar **46** by a threaded connection, press-fitting connection or the like, the stem head **74** being passed through a slot **76** in plate **22**. As shown in FIGURE 2, along the edges of slot **76** there are calibrated values 10, 50 and 100 which are intended to refer to a corresponding tensile load on tow line **16** forcing the jaws **60**, **62** to release. The values may be calibrated in pounds per square inch or any suitable load value desired.

The disconnect coupling **20** is secured to the boat through the hook end of its stem **36** (FIGURE 2) and is secured to the tow line **16** through a connector which includes an eyebolt **80** which is free to swivel on clevis **82**. Cross-pin **84** fastens to the jaws **60**, **62** by passing through slots **88** of the plates **22**, **24**. The cross-pin **84** is connected to the coupling **20** by fitting it transversely through the slots **88** and then passing it along the length of the slots **88**. The cross-pin **84** acts against cam faces **86** on the jaws **60**, **62** spreading the jaws apart and allowing the cross-pin **84** to move down the slots **88** until it bottoms therein and the jaws **60**, **62** then snap to their closed positions wherein complementary concave notches of the jaws **60**, **62** close over the cross-pin **84**. The disconnect coupling is now prepared for operation.

The tow line **16** then communicates a drawing force on the skier through the coupling **20** until the tension in tow line **16** is sufficient to pull the cross-pin **84** through the slots **88** by pivoting the jaws **60**, **62** to their releasing positions shown in FIGURE 5 against the resistance of resilient block **50**. As mentioned, the point at which the tension in tow line **16** is capable of spreading the jaws is determined by the degree of compression of block **50** and this is adjustable by operating the stem **36**. The tensile force in tow line **16** can be selected by screwing the stem until the head **74** is matched with a calibrated value along the edge of slot **76**.

The resilient block **50** can be substituted by a plurality of coil springs **90** which are received within recesses **92** of sleeves **94** and **96** and are compressed between said sleeves to control the release force for the jaws **60**, **62**. In all other respects, the invention structurally and functionally, is the same as the previous embodiment. The coupling is adjusted by rotating the stem **36** to move sleeve **94** toward the right from its position shown in FIGURE 6 through a threaded connection **98** with sleeve **94** and thereby controlling the degree of compression of springs **90**.

Referring next to the embodiment shown in FIGURE 7, wherein there is illustrated a further embodiment of the invention, a circular-shaped coupling **100**, includes two round, substantially flat disk members **102** (only one being shown) which are spaced apart by spacer blocks **104** and bushings **106**, **108**. Bolts **110** clamp the two disks **102** together over the spacer blocks **104**, and bushings **106**, **108** define the centers of pivotal movement for the jaws **112**, **114**, respectively. The two jaws have flanges **118**, **120** which bear against a leaf spring **116** which is loaded at its middle by means of a threaded stem **120** acting through shoulder **124** and washer **126** against the mid portion of the leaf spring **116** and determining by the position of the threaded stem **120** the degree of loading on the spring **116** and thus the degree of force closing the jaws **112**, **114**. The disconnect coupling **100** is thereby regulated to effect release at a predetermined, adjustable tensile load obtainable through threaded stem **120**, and the hook end **128** is fastened to the boat or other tow vehicle.

The cross-pin **84** is shown in its locked position in FIGURE 7 and thus the connector of which the cross-pin **84** is a part may be as shown in FIGURE 8 and secured through eyebolt **80** connecting to the tow line **16**.

An important feature of the present invention is that the coupling will release at substantially the same tension if the setting remains the same. Once the resiilent means is adjusted, the disconnect coupling will release the tow line at substantially the same tension of the tow line. It should be further noted that the disconnect coupling will not operate until both jaws are pivoted to a release position because the slot in the plates is obstructed sufficiently by one of the jaws to prevent movement of the cross-pin **84** through the slots of the plates. Because both jaws must be pivoted to release position, there is obtained greater utility from the resilient means which acts against both jaws and also a more consistent operation is obtained.

Although the present invention has been disclosed in connection with the few selected example embodiments, it will be understood that these are illustrative and are in no sense restrictive of the invention. It is maintained that such variations and revisions of the invention, as are reasonably to be expected on the part of those skilled in the art to meet individual design requirements, will be included within the scope of the following claims as equivalents of the invention.

What is claimed is:

1. A disconnect coupling forming a part of the tow connection for water skiing and the like comprising a hook having an integrally formed stepped diameter shoulder and a threaded stem, retaining means including a recess forming a thrust abutment with said shoulder and providing rotatable movement thereagainst, resilient means mounted within said retaining means, a threaded relatively movable compression member received on said stem and movable thereon to adjustably compress said resilient means, a bearing member at the end of said resilient means opposite said compression member, and two complementary jaws having cam faces forming a tow connection between said faces and pivot mountings about which said jaws are turned to normally closed position by the loaded compression member acting through said bearing member in engagement with said jaws, each of said jaws being arranged to open and release its tow connection against the resistance of said loaded adjustable resilient means to disconnect the tow connection at a predetermined tensile loading thereof.

2. A releasable connection for water ski tow line usage and the like, comprising two plate members having spacers therebetween providing a clearance between said plate members and fasteners for holding said members together, one of said spacers including a shoulder and an opening therein, a rotatable force transmitting means having a shoulder forming a thrust connection with the shoulder of said one spacer and a threaded portion extending through the space provided between said plate members, two clamping jaws mounted for pivotal movement between said plate members and having complementary recess portions which releasably secure therein a tow line fastener, means forming slots in said plates to provide passage of said tow line connection into locking relation with said jaws, resilient means located between said plates and biasing said jaws to a normally closed position, and a compression member having a threaded opening for receiving said threaded stem and displaceable thereby to adjustably compress said resilient means and effect a preselected loading force holding said jaws in their closed position and thereby determining their release force of said jaws on said fastener.

3. A disconnect coupling comprising two spaced rigid members forming a housing, means disposed within the housing and having an abutment therein, a threaded stem having an integrally constructed hook and passing through said means which provides rotatable movement therein and forms a thrust connection with said stem, two jaws also disposed within said housing and having complementary recesses providing a releasable hitch connection, means for pivotally mounting said jaws for their movement between open and closed positions, resilient means for biasing said jaws to a normally closed position, and a compression member adjustably movable by said stem to

effect compression of said resilient means and thereby determine the tensile load at which said jaws open to their release position.

4. A disconnect coupling comprising a housing having two spaced members and spacer means holding said members apart, fasteners passing through said spacer means for connecting the members and spacer means into a rigid structure, two jaws proportioned to fit between said spaced members and movable pivotally therebetween, one of said fasteners providing pivotal support for each of said jaws respectively, resilient means acting against said jaws to bias them to a normally closed position, means for loading said resilient means and thereby effecting the release point of said jaws, and means for adjustably moving said loading means and extending from said housing to provide an attachment for said coupling.

5. A disconnect coupling comprising a housing, two jaws having complementary portions adapted to form a releasable coupling connection, a resilient block of rubber-like material acting against said jaws to urge them to a normally closed position, a pressure member mounted for movement within said housing and bearing against said block of rubber-like material to effect compression thereof, means forming a reaction abutment within said housing, and threaded means acting through said reaction abutment and pressure member to effect loading of said resilient member and thereby establish the release force effecting opening of said jaws to disconnect said coupling.

6. A disconnect coupling comprising two spaced rigid members forming a housing structure, fastener means for clamping said members together, two oppositely pivoting jaws having complementary portions which provide a releasable tow connection and include oppositely extending flange portions fitted within said housing, a leaf spring bearing against said flange portions to urge said jaws to a normally closed position, means for loading said spring at the center thereof to effect a preselected spring force, and adjusting means acting through said loading means and comprising a threaded member having an extension projecting outwardly from said housing and including an integrally formed hitch connection.

7. A releasable connection for water ski tow line usage and the like, comprising two plate members having spacers therebetween providing a clearance between said plate members and fasteners for holding said members together, one of said spacers including a shoulder and an opening therein, a rotatable force transmitting means having a shoulder forming a thrust connection with the shoulder of said one spacer and a threaded portion extending through the space provided between said plate members, two clamping jaws mounted for pivotal movement between said plate members and having complementary recess portions which releasably secure therein a tow line fastener, means forming slots in said plates to provide passage of said tow line connection into locking relation with said jaws, resilient means located between said plates and biasing said jaws to a normally closed position, a compression member having a threaded opening for receiving said threaded stem and displaceable thereby to adjustably compress said resilient means and effect a preselected loading force holding said jaws in their closed position and thereby determining their release force of said jaws on said fastener, and means carried by said compression member and extending through a slot in one of said plate members having calibrated markings which indicate the degree of compression of said resilient means and thereby provide a calibrated value of tow line tension at which said jaws open to release position.

8. A releasable tow line for water skiing and the like, comprising two plate members forming a housing and having aligned slots at one end thereof, spacer means disposed between said plate members for holding them a predetermined distance apart, a plurality of fastening devices passing through said plates and spacer means for clamping said plates together, two jaws which are pivotally held by two of said fastening devices for pivotal movement between said plate members and include complementary recesses forming a hitch connection in the closed positions of said jaws, inclined cam faces at the forward ends of said jaws which are contacted by a hitch device proportioned to pass through said slots and acting against said faces to cam the jaws apart as it moves into locking position within said recesses, means forming an abutment on one of said spacers located remotely from said jaws, a threaded stem having a shoulder bearing against said abutment and extending outwardly from housing where it provides a hitch connection, a compression member including a threaded opening for receiving said stem which is held against movement and effects thereby longitudinal movement of the compression member responsively to turning of said stem, resilient rubber-like block fitted between said plates and compressed at one end by said compression member and a second abutment member interposed between the other end of said resilient block and jaws and including a guide opening therein for said stem, said jaws being pivoted to their open position by biasing said second abutment against the force of said resilient block which is adjustably loaded by the displacement of said compression member effected through said threaded stem.

9. A disconnect coupling, comprising two complementary jaws forming a locking connection therebetween to receive a force transmitting member therein, means forming pivots one for each of said jaws, abutment means for each of said jaws located to receive thrust at a point relative to said pivot means to bias said jaws together and provide a locking connection with its associated force transmitting member, resilient means effective against said abutment means to produce effort in a direction for maintaining a releasable connection, and adjustable means operatively associated with said resilient means to produce a controllable loading thereof whereby the release point of said connection is effectively determined by direction when it overcomes said resilient means.

10. A disconnect coupling, comprising two complementary jaws forming a locking connection therebetween to receive a force transmitting member therein, means forming pivots one for each of said jaws, abutment means for each of said jaws located to receive thrust at a point relative to said pivot means to bias said jaws together and provide a locking connection with its associated force transmitting member, resilient means bearing against said abutment means to produce effort in a direction for maintaining a releasable connection, and adjustable means for loading said resilient means to a preferred degree and to produce a controllable loading thereof whereby the release point of said connection is effectively determined by direction when it overcomes said resilient means.

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