Oct. 24, 1967 W. E. SWAGER 3,348,632

CLIMBING DEVICE

Filed Feb. 16, 1965 3 Sheets-Sheet 1

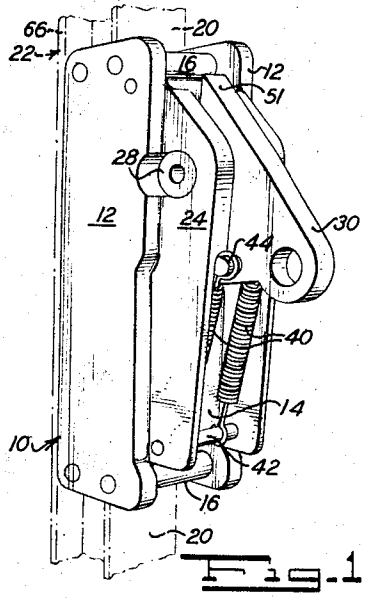

Fig. 1

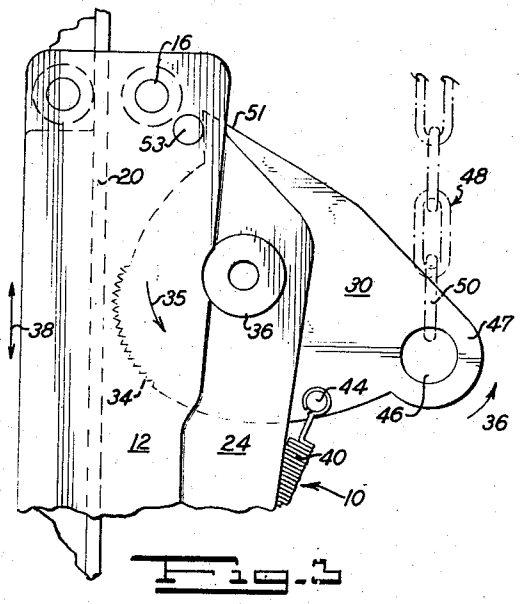

Fig. 3

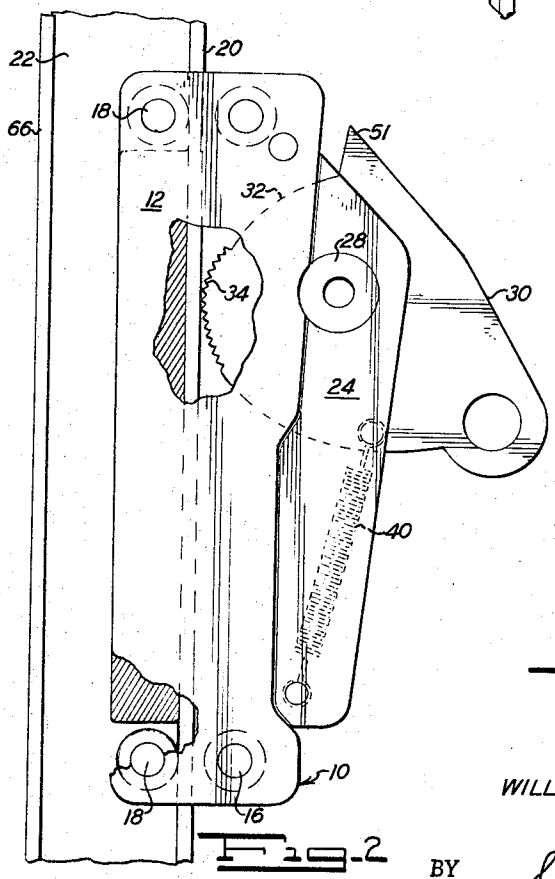

Fig. 2

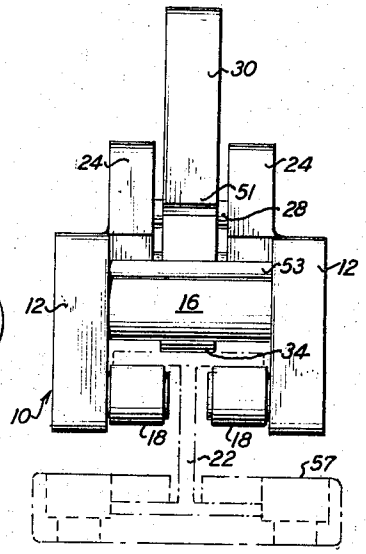

Fig. 4

INVENTOR

WILLIAM E. SWAGER

BY Sol B. Wiggs

ATTORNEY

Oct. 24, 1967 W. E. SWAGER 3,348,632

CLIMBING DEVICE

Filed Feb. 16, 1965 3 Sheets-Sheet 2

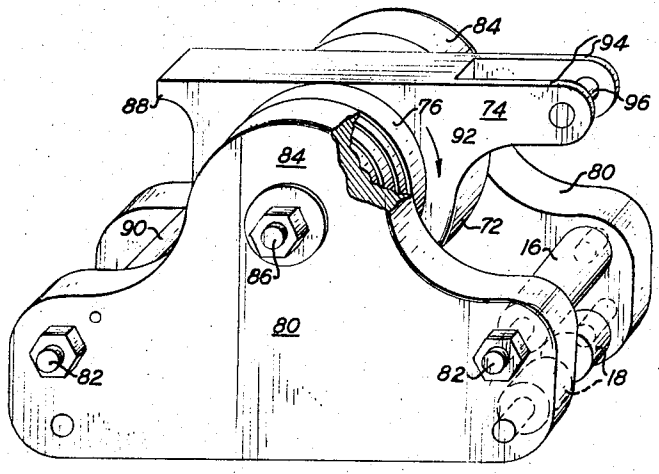

Fig. 4

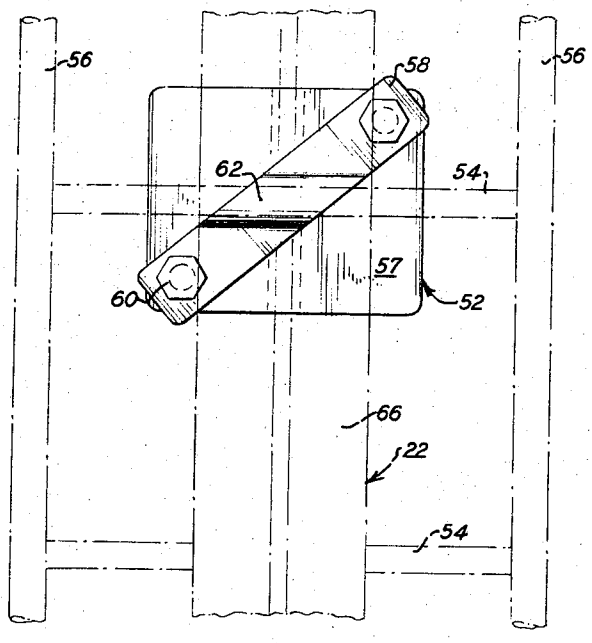

Fig. 5

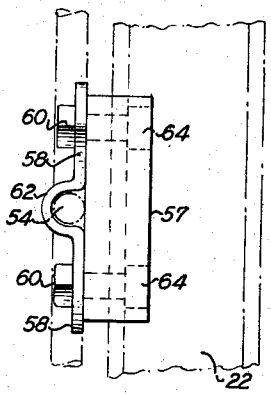

Fig. 6

INVENTOR
WILLIAM E. SWAGER
BY
Sol B. Wager
ATTORNEY

Oct. 24, 1967 W. E. SWAGER 3,348,632

CLIMBING DEVICE

Filed Feb. 16, 1965 3 Sheets-Sheet 3

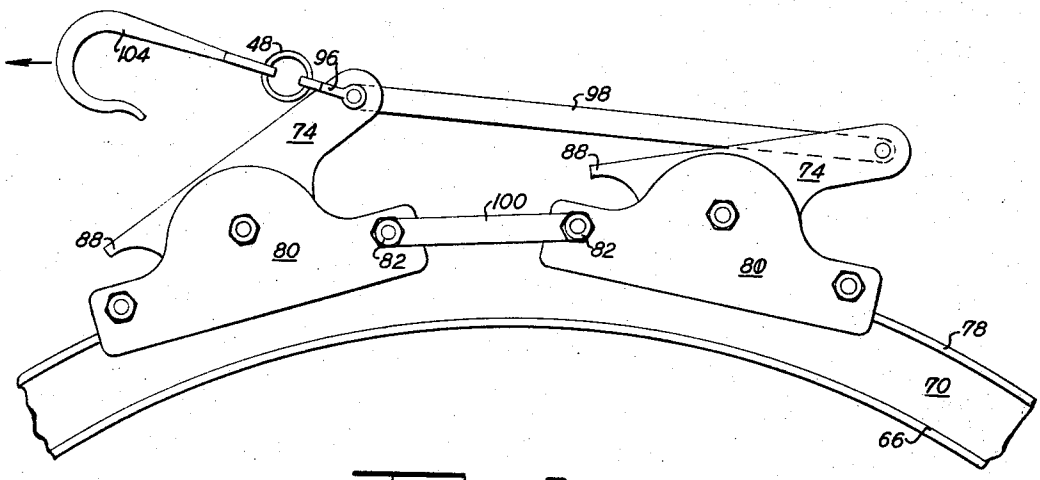

Fig. 9

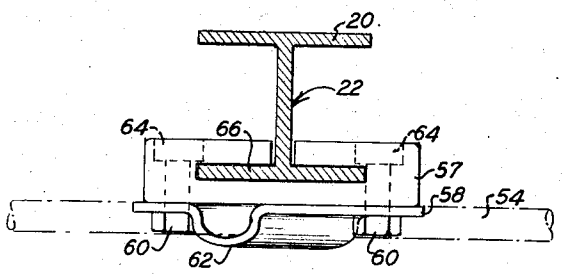

Fig. 7

INVENTOR

WILLIAM E. SWAGER

BY Sol B Wiczyk

ATTORNEY

United States Patent Office 3,348,632
Patented Oct. 24, 1967

3,348,632

CLIMBING DEVICE

William E. Swager, R.R. 2, Fremont, Ind. 46737

Filed Feb. 16, 1965, Ser. No. 433,145
5 Claims. (Cl. 182—230)

This invention relates to a climbing aid comprising an H-rail and a safety mechanism vertically slidable thereon and secured to the body of a climber upon a wall, ladder or the like; for instance, a tower having a ladder with rungs thereon for use by the climber in ascending the wall.

More particularly the invention is directed to a novel combination of a safety fastener and an H-rail to which the fastener is adapted for latching cooperatively to a flange as a supporting beam, or alternately to slide vertically or to latch thereto in latching and unlatched conditions of the mechanism, cooperative with the movement of the climber ascending or descending.

The invention further includes means for further securing an H-beam as a track for sliding support of a safety latching means, to a wall ladder, whereby a conventional ladder means may be used to demountably support an H-beam on the flange of which a safety gripping means may ride and be slided vertically as a safety device for a climber mounting the ladder.

The invention includes means for gripping a curved ladder and H-rail, including a safety device slidably mounted upon its curved flange thus to support and provide safety to a climber upon an arcuately shaped ladder; for instance, a ladder secured to the curved surface of a spherical container or the like.

The invention is further described with reference to the drawings in which:

FIG. 1 shows a perspective view of the gripping means as it is mounted on an H-rail;

FIG. 2 is a side elevation of the H-rail and safety device thereon in a clamped position;

FIG. 3 is a fragmentary view of the clamping means in unlocked or unclamped position;

FIG. 4 is a top view through the H-rail with the safety device in clamped position thereon;

FIG. 5 illustrates a clamping means in front elevation for securing an H-rail to a rung of a ladder;

FIG. 6 is an end view thereof in side elevation;

FIG. 7 is a plan view of the clamping means securing a section of the H-rail to a rung of the ladder;

FIG. 8 is a perspective view of a modification of the safety clamp; and

FIG. 9 illustrates two safety clamps latched together in tandem for use on an arcuate H-rail.

Referring to the drawings, wherein like numbers represent like parts in the several views, the safety clamping device comprises a carriage **10** having parallel vertical side rails **12** integrally secured together by a web **14**, which terminates short of opposite ends to accommodate upper roller **16** and the lower rollers **18**. The vertical side rails **12** and connecting web **14** by the construction described are suitably formed integrally in a single casting. The lower rollers **18** are split to allow the web of the H-rail to pass between them. Upper rollers **16** are spaced with respect to lower rollers **18** to receive and slidably engage one flange **20** of an H-rail **22** for firm sliding movement of the carriage therealong with only sufficient clearance to avoid binding so that the carriage rolls smoothly and firmly on the flange **20**.

The inner wall of the side rails **12** are integrally joined to a pair of protective side shields **24** which are bored at **26** to receive a pivot pin **28** which is supported at both ends in the parallel shields, thus to provide a pivot shaft upon which a locking arm **30** having an eccentrically

disposed edge **34** is pivotally mounted upon the pivot **28** normal to the surface of the flange **20** for radial movement for locking and unlocking engagement with the flange **20**, as will appear. The lock shaft **30** comprises a thick plate-like member carrying several teeth **34** or gripping elements eccentrically disposed thereon with respect to the pivot pin **28**. The lower portion thereof, **32**, is arcuate and has tooth-like serrations **34** which grip the rail **20** in the lower position of FIG. 2, the serrations in contact with the rail **20** locking firmly thereon. As shown in FIGS. 3 and 4, the teeth **34** are wide and grip the flat surface of the flange **20** in firm eccentric locking engagement in the lower engaging position of FIG. 2.

FIG. 3 exhibits the same serrations **34** lifted from engagement with the flange **20** by pivotal movement of the plate **30** about pivot **28** in the direction of the arrow **36** which, by eccentric or cam motion disengages the teeth **34** from the surface of the flange **20** allowing free sliding movement of the carriage **10** in free vertical movement up or down upon the H-rail **22** in either direction of the arrows **38**. A pair of tension springs **40** each have one end fastened about a pin **42** and the other end about a pin **44**, which together resiliently bias the plate **30** with the teeth **34** into locking engagement of the locking cam with the surface of the flange **20**.

Thus the device in normal position of the locking arm **30** biased by springs **40** engages and locks the carriage **10** to the surface of the flange **20** against movement in any direction. The plate **30** has an eccentric or angular supported lever or corner extension of its upper edge **47** which is bored at **46** to receive an end link **50** of a chain or cable **48**, the other end being attached to the belt of a climber using the safety device. The climber pulls upon chain **48** forcing the plate **30** thereby to rotate on its pivot **28** in the direction of the arrows **35** and **36**, withdrawing the teeth **34** out of engagement with the surface of the flange **20** so that the device is unlocked and free to move up or down upon the H-rail with the movement of the climber, unlocking the device as he pulls the chain, and automatically relocking as he releases the tension of the chain, the springs **40** biasing the plate **30** into locked engagement. Thus the cam-like rotary motion provides locking engagement of the plate **30** and teeth thereon **34** with the flange surface and in reverse rotation manual disengagement of the locking teeth with the flange surface by pulling upon the chain **48**.

To avoid extreme distension of the springs **40**, the after end of the cam surface at **51** is extended to form a shoulder which will ultimately bear against and engage the pin **53** as a stop, preventing further upward movement. Thus, the shoulder **51** bearing against stop **53** is the disengaged position of the cam surface and teeth **34** with the flange **20**. If the climber stops or falls, however, the release of upward tension upon chain **48** allows the plate **30** to lock automatically by rotary bias under tension of the springs **40** of the teeth **34** upon the flange **20**.

The protective shields **24** in addition to support of the pivot pin **26** therebetween, and the locking arm or plate **30** for rotation thereon, by its extended walls along a large portion of the length of the carriage, protectively enclose the springs **40** to avoid snagging of rope or chain elements **48** with the safety device. In this manner the device is rugged and continuously operative as a safety lock free to move only when the climber applies positive tension releasing the lock, automatically relocking when the climber relaxes the tension thereon.

The device as described thus far has the further advantage that quite free, non-binding sliding movement is available to the long carriage by being mounted upon a comparatively wide rail gripped by free rotating rollers

spaced for easy clearance of the rail flange therebetween. Moreover, very strong firm and immediate gripping is provided by the preferred wide serrated edge of the thick plate **30** pivoted in cam movement to engage a wide portion of such rail. While, as shown, the width of serrations correspond to the thickness of the plate **30**, they may be made as wide as the distance which shields **24** are separated for greater; that is, longer toothed, gripping effect upon the H-rail surface.

As shown in FIGS. 5, 6 and 7, the rail **22** may be clamped by one or more, sometimes several, suitable clamping means **52** to one or more rungs **54** of a ladder having side rails **56**. The clamping means **52** preferably comprises an outer plate **57** having a cross strap **58** bolted by fasteners such as bolts and nuts **60** from diagonal corners of the plate to each opposite end of the strap. The center of the strap **58** is arcuately bent at **62** to diagonally fit over a ladder rung **54** and firmly grip the same by the fastening bolts and nuts **60**, securing the rung between the strap **58** and plate **56**. In this manner the inner side of the plate and strap secure the H-rail to a rung of the ladder as in FIGS. 5 and 6. The heads of bolts **60**, as shown in FIGS. 6 and 7, are counter-sunk at **64**. The plate **52** has a T-groove or channel cut longitudinally to accommodate the opposite flange **66** of the H-rail **22** in sliding fit. However, when the bolts **60** are tightly fastened in the counter-sunk portion **64** of the clamping plate **57**, the head of the bolt will grip the edge of the H-rail flange **66** as shown in FIG. 7 and secure the same tightly within the plate **57** and in turn by the strap **58** to the rung **54** of the ladder. It will be seen that by merely loosening the bolts **60** without completely removing the fastening plate and strip from the ladder rung, the flange **66** will be freed sufficiently to allow vertical sliding movement of the H-rail to a changed position.

In a modified form illustrated in FIGS. 8 and 9, a safety gripping device is provided which is suitable for operation upon a curved rail shown somewhat exaggerated in the arcuate rail **70** of FIG. 9. The curved H-rail **70** is disposed horizontally, but usually it will be disposed relatively vertically on the curved shape of a spherical storage tank ladder or the like. The modified form of safety gripping device shown has the carriage considerably shorter with respect to the spacing of the forward and after rollers **16** and **18**. The cam surface **72** of the locking arm **74**, moreover, is spaced to engage a convex surface of the H-rail arcuately curved upwardly toward the cam surface **34**, the lower position of the cam surface **34** being biased into rotary movement by a spring **76** bearing the teeth **34** downwardly against the arcuate flange surface **78**. The spacing of the before and after rollers **16** and **18** are, therefore, such as to accommodate the specific curvature of the H-rail to allow locking engagement therewith. Moreover, to accommodate the stubby construction necessary for operation upon a curved H-rail, a coil spring **76** is mounted on each side of locking arm **74**, biasing the cam portion **32** and teeth **34** against the curved surface of the arcuate flange **78**.

Suitable stops (not shown) secure the springs **76** to the stubby side rails **80** comprising the carriage. The side rails **80** are spaced by bolts **82** on which the rollers **16** are rotatably mounted to complete spacing of the side rails and provide a channel for rotation of the locking arm or shaft **74** therebetween. Each side rail has a raised boss **84** at the center through which is mounted a pivot shaft **86** passing through opposite side rails securing and supporting the lock shaft **74** for pivotal movement thereon. The upper after end **88** of the locking arm **74** forms a stop which engages a pin **90** stopping the rotary movement of the locking arm **74** in unlocked position. In normal operation, however, the springs **76** will bias the pivotal movement of the locking arm **74** in the direction of the arrow **92** into locking engagement with the arcuate surface of the flange **78**. The lower cam surface **32** of the locking arm **74** similarly carries serrations (teeth

which are not shown) which grip the curved flange surface **78** in the same manner as described above for FIGS. 2, 3 and 4. The opposed forward end of the locking arm is divided or forked into an elongated yoke comprising two arms **94** connected by a pin **96** about which a cross bar **98** adapted to yoke or tie together a pair of such safety locking means is mounted. The pair of safety locking elements are pivotally yoked together by the bar **98** as shown in FIG. 9, the yoke bar **98** being correspondingly bored to receive both pins **96** at each end. A second pair of cross bars, links **100** are faastened at the lower end of the contiguous side rails through bolts **82**.

Thus in the assembly of FIG. 9 the carriages are linked together by cross bars **100** for sliding movement as a unit and the bars **98** link their corresponding pair of locking arms **74** together for simultaneous locking and unlocking movement in a rotary direction of both locking arms **74**. The upper or left-hand lock shaft has several chain links **48** attached through the yoke **96** which terminates in a hook **104** adapted to hook to the belt of a climber using the tandem linked pair of safety devices.

Thus in operation upon an arcuate rail **70** it has a pair of stubby safety carriages linked together and mounted thereon. They are operated to have double clamping effect by being yoked together and unlatched by being attached to the climber's belt by chains. As the climber climbs up an arcuate surface such as a ladder on a large spherical container to which the rail **70** is secured, as shown in FIGS. 5, 6 and 7, a double safety locking effect is provided in the tandem linked locking devices.

Certain modifications will occur to those skilled in the art and, accordingly, it is intended that the description herein be regarded as illustrative and not limiting except as defined in the claims hereof.

I claim:

1. In a safety locking device, the combination of a sliding locking carriage having a set of rollers spaced longitudinally at upper and lower ends and counter rollers parallel to and cooperative with said first set of rollers to receive in sliding engagement between said rollers a wide flat flange of a supporting rail, with said first set of rollers slidably engaging the flange on an inner surface and the second set of rollers on an outer opposite surface, the clearance between both sets of rollers corresponding substantially to the thickness of said flange for easy sliding rolling movement of said carriage upon said flange when engaged and supported by said rollers, a pivotally mounted locking arm in said carriage for pivotal movement in a plane normal to the said outer surface of said flange, said arm having a wide serrated flange gripping end having a series of gripping teeth extending from side to side thereof eccentrically disposed with respect to said pivot for eccentric movement of said end, to grippingly engage the outer surface of said flange by bearing eccentrically upon and thereby safely gripping a wide surface area of said flange in the pivotal movement of said locking arm, and resilient spring means mounted in substantial tension between said arm and said carriage, biasing said arm into firm teeth engaging, locking grip to the outer surface of said flange, stop means on said carriage positioned to intercept an inner end of said arm and stop rotary movement of said arm when moving against said spring tension, said arm having an opposite end extending outward from said carriage as a lever and for eccentric tooth gripping disengagement from the outer flange surface upon opposite movement of said lever by a user of said device.

2. The safety device of claim **1** wherein the supporting beam is an arcuately curved H-rail and the rollers of said carriage and locking arm therein are spaced to slidingly receive and bear substantially across the entire width and against the outer surface of a curved flange of said curved H-rail in sliding movement thereon, both in locked and unlocked engagement with the said locking arm.

3. The safety device of claim **3** comprising a pair of safety locking devices each mounted in tandem upon the

arcuately shaped H-rail, both safety devices being secured together by yoke arms, said yoke arms consisting of lower yoke arms securing the pair of carriages together for combined sliding movement thereof in tandem, and another yoke arm securing both locking arms together for combined pivotal locking movement of both locking arms of the pair upon the arcuate flange of said H-rail.

4. In a safety device the combination of a pair of locking devices each having a carriage mounted in tandem, roller means at each end of a carriage for supporting and securing said carriage in sliding movement upon a flange of an arcuately curved H-rail, a locking arm in each carriage mounted upon a pivot within the carriage for pivotal movement normal to the surface of said flange, said rollers and locking arm in each carriage being spaced to slidingly receive and bear a substantially wide distance against the curved outer surface of said flange in sliding movement thereon, each locking arm comprising a thick plate having a series of wide gripping teeth upon an edge thereof eccentrically disposed with respect to said pivot and spaced therefrom to bear upon and grip a wide surface area of said flange in its pivotal movement, resilient spring means biasing each arm into locking engagement with the surface of said flange, both of said locking arms being secured together by yoke arms consisting of lower yoke arms securing the pair of carriages together for combined sliding movement thereof in tandem and another yoke arm securing both locking arms together for combined pivotal locking movement of both locking arms upon the arcuate flange of said H-rail.

5. A safety device comprising a pair of locking devices supported together in tandem upon the flange of an arcuately shaped H-rail, each having a slidable carriage slidably fastened to said rail, a locking arm pivotally mounted in each carriage having a serrated end adapted to bear in pivotal locking engagement against the exposed surface of the outer flange of said H-rail, resilient spring means biasing each locking arm into locking engagement with the surface of said flange, both of said locking arms being secured together at their outer ends by a yoke arm and means for fastening both of said carriages together in sliding engagement upon said flange.

References Cited

UNITED STATES PATENTS

1,576,210	3/1926	Nickson	182—5
1,676,272	7/1928	McEwen	189—36
1,927,469	9/1933	Plumpton	182—8
2,280,361	4/1942	Ackerman	189—36
2,538,904	1/1951	Herod	182—8
2,616,609	11/1952	Herod	182—8
3,100,033	8/1963	Hanson	189—36

FOREIGN PATENTS

1,336,836	7/1929	France.
539,544	9/1941	Great Britain.

REINALDO P. MACHADO, *Primary Examiner.*