

Feb. 5, 1952

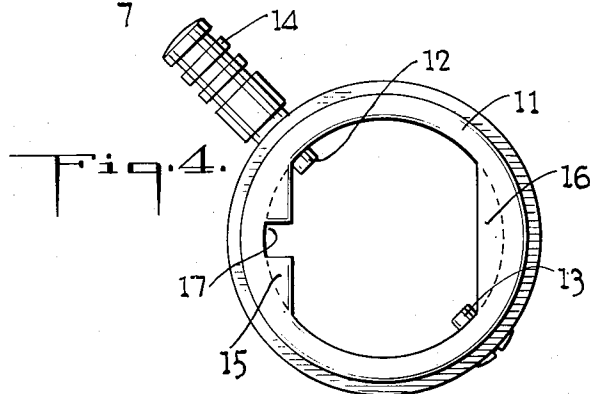
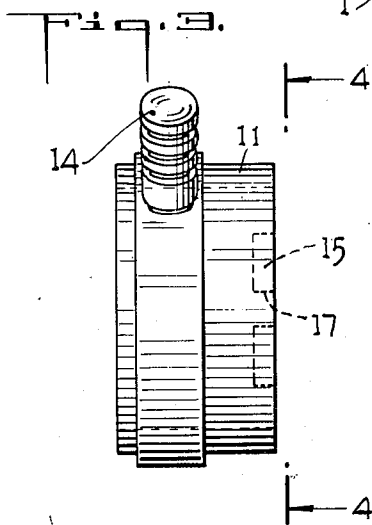
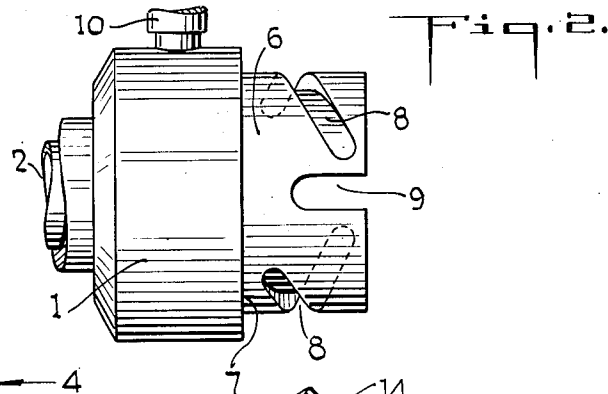
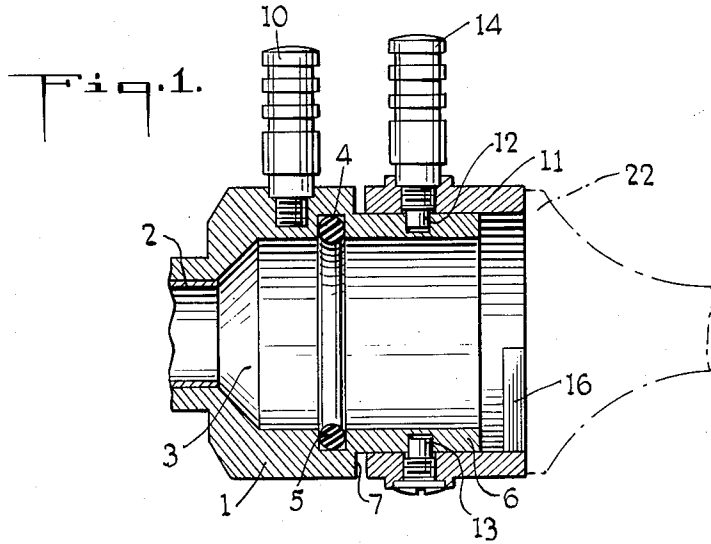
H. S. RUBENS ET AL

2,584,619

OBTURATOR LOCK FOR ENDOSCOPIC INSTRUMENT

Filed Nov. 4, 1949

2 SHEETS—SHEET 1



INVENTORS  
HARRY S. RUBENS  
IGNAZ SUWA

BY

*[Signature]*  
ATTORNEY

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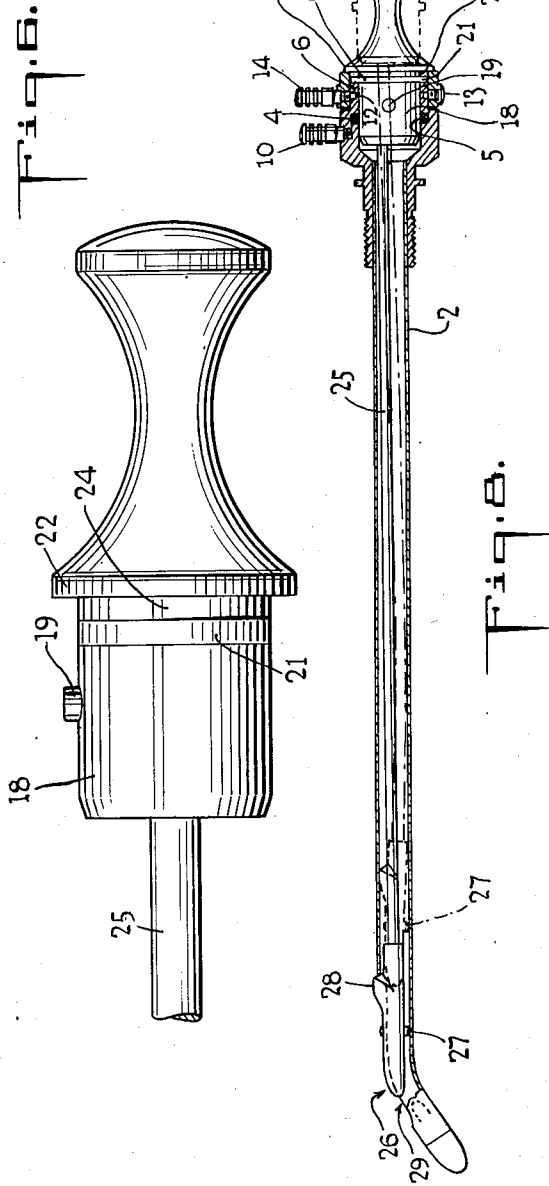
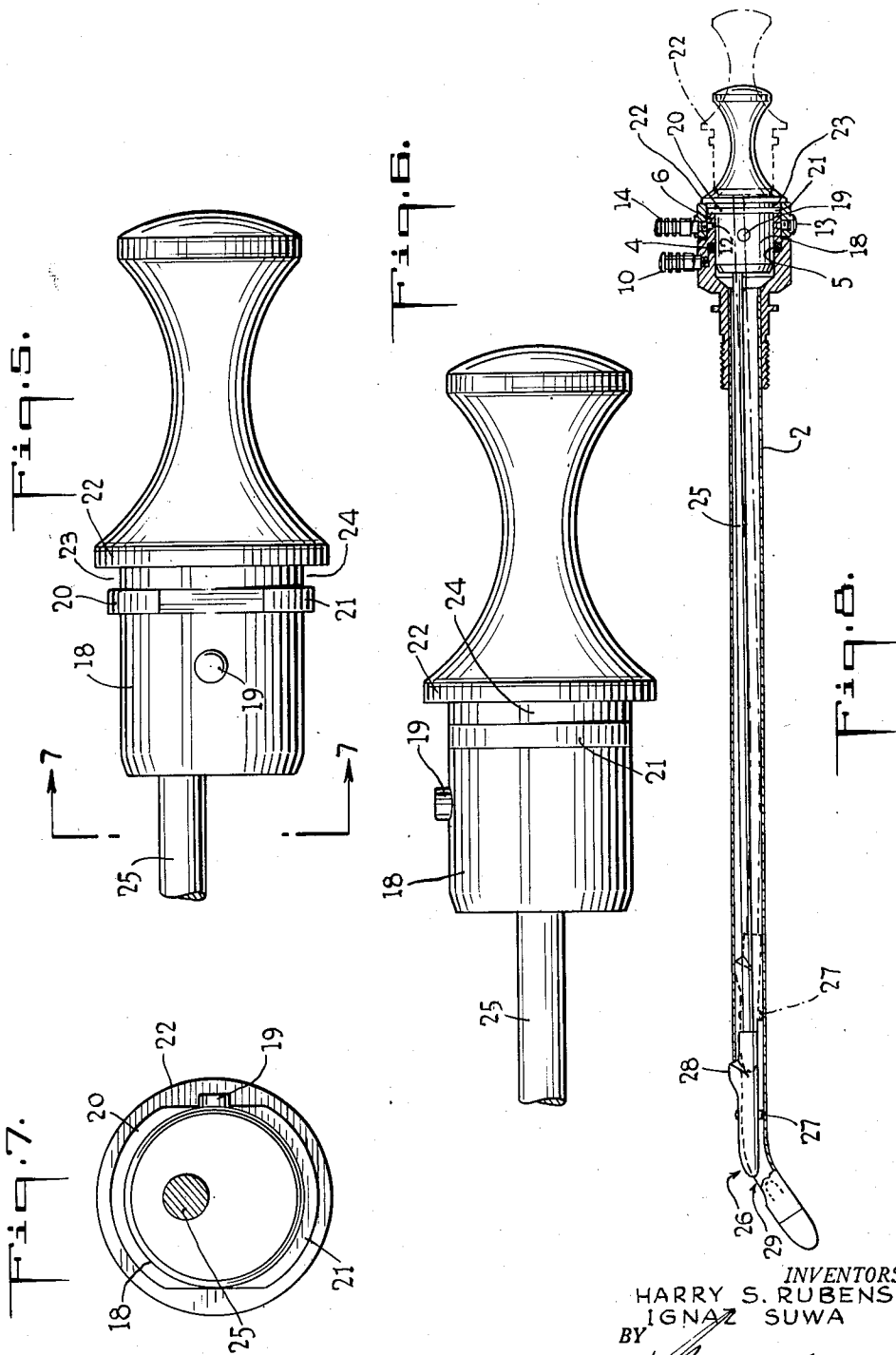
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# OBTURATOR LOCK FOR ENDOSCOPIC INSTRUMENT

Filed Nov. 4, 1949

2 SHEETS—SHEET 2



INVENTORS  
HARRY S. RUBENS  
IGNAZ SUWA  
BY

ATTORNEY

## UNITED STATES PATENT OFFICE

2,584,619

## OBTURATOR LOCK FOR ENDOSCOPIC INSTRUMENT

Harry S. Rubens, Manhasset, and Ignaz Suwa,  
Jackson Heights, N. Y., assignors to National  
Electric Instrument Co., Inc., Elmhurst, N. Y.,  
a corporation of New York

Application November 4, 1949, Serial No. 125,502

3 Claims. (Cl. 128—5)

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The present invention relates generally to improvements in an endoscopic instrument and more particularly to improvements in a lock and cooperating obturator therefor in cystoscopes or the like diagnostic and treating instruments.

The cystoscope comprises, for example, an outer sheath or tube adapted for insertion into a body cavity through an opening, natural or otherwise, whereby said body cavity is to be illuminated, examined and treated through a fenestral opening provided in said tube. The fenestral opening, prior to the insertion of the cystoscope into the body cavity or withdrawal therefrom, is substantially closed by means of an obturator so that the edges of the fenestrum do not cause injury during passage into or out of the body cavity.

After the tube has been inserted, the obturator is withdrawn and replaced by a telescopic optical system through which the body cavity is observed—under illumination produced by an incandescent lamp provided inside the tip of the outer cystoscope tube and which is adapted to illuminate through the fenestrum—while being treated, etc.

After the insertion of the cystoscope, e. g. into the bladder, it is advantageous to prevent any fluid leakage through the cystoscope lock whether the lock comprises a component, e. g. a lock plug, as an embodiment of the obturator or of the telescopic optical system. Some cystoscope locks heretofore known are disadvantageous in that they are not sufficiently leak-proof or are not easily disengageable. For example, in the case of a screw type lock, the lock action may be forced to prevent leakage and thereby provides a tightening of the lock components so that undesirable pressure, which adds to the discomfort of the patient, must be exerted to disengage the lock components. Other cystoscope locks are more satisfactory with respect to locking action, but are not sufficiently secured in locked position and the lock components are too easily disengaged or loosened, which results in leakage through said lock. Moreover, cystoscope locks heretofore known are not of sufficiently rugged construction to withstand long usage and maintain a secure leak-proof condition in locked position.

It is an object of the present invention to provide a leak-proof cystoscope lock. It is another object of the present invention to provide a cystoscope lock secure in locked position so that a cooperating obturator or telescopic system does not accidentally loosen or become disengaged

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from the desired locked position. It is a further object of the present invention to provide a cystoscope lock of rugged construction for long usage and maintenance of a secure leak-proof condition. It is a still further object of the present invention to provide a combination of a cystoscope lock and cooperating obturator adapted for obturating a fenestrum by means of the locking action of said cystoscope lock. Other objects and advantages of the present invention will become apparent from the description hereinafter following and the drawings forming part hereof, in which:

Figure 1 illustrates a sectional view of an assembled lock base and cooperating lock ring,

Figure 2 illustrates a side view of an unassembled lock base,

Figure 3 illustrates a side view of an unassembled lock ring,

Figure 4 illustrates a view of the lock ring along the lines 4—4 of Figure 3,

Figure 5 illustrates one side view of a lock plug as an embodiment of an obturator,

Figure 6 illustrates another side view of a lock plug as an embodiment of an obturator,

Figure 7 illustrates an end view of the lock plug along the lines 7—7 of Figure 5, and

Figure 8 illustrates an elevational view of an obturator positioned in a cystoscope tube shown in longitudinal section.

According to the present invention, the cystoscope lock comprises a lock body or lock base, a locking ring and a lock plug, which is a part of an obturator or of a telescopic system, and all said lock parts or components cooperate to form the cystoscope lock of the invention which is particularly advantageous for cystoscopes of the type described in my co-pending application Serial No. 43,097, filed August 7, 1948 now Patent No. 2,531,827. The lock is constructed to withstand long usage and contains novel features which insure excellent locking action, easy manipulation of an obturator, and maintains a locked position by frictional contact of large surfaces which prevent accidental disengagement or movement of the lock components. The combination of the said lock and the obturator is such that both cooperate in a novel manner to provide an obturation of the fenestrum simultaneously with the locking movement of said cystoscope lock.

Referring to Figure 1, the lock base 1 is positioned at one end of the cystoscope tube 2, and is constructed so that its inner surface forms a breech 3 for containing a lock plug hereinafter

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more particularly described. The breech 3 is provided with an annular groove 4 into which is fitted a sealing ring 5. The sealing ring 5 is constructed of a resilient material, e. g. rubber, etc., and fits loosely into the groove 4 due to its outer diameter being smaller than that of the groove. The inner diameter of the sealing ring is slightly smaller than the diameter of a lock plug or the diameter of said breech so that when the plug enters the breech a portion of the plug passes through the sealing ring thereby increasing the diameter of the sealing ring to fill the annular groove 4, thus forming a tight seal.

The outer surface of the lock base 1, e. g. a cylindrical lock base structure, particularly illustrated by Figure 2, is provided with a sleeve 6 integral therewith and reduced in overall diameter to provide an abutment 7. The sleeve 6 is provided with twin diametrically disposed grooves 8 on its outer surface, said grooves arranged to follow a helical traverse partly across the outer surface of the sleeve 6; and a slot 9 at least partly along the length of the sleeve and parallel with the axis of said sleeve. A lever guide 10 is positioned on top of the lock base preferably screwed partly through the thicker portion of the lock base 1 substantially near the abutment 7.

Figure 3 illustrates a side view of the lock ring 11 and Figure 4 illustrates an end view of the lock ring along the lines 4-4 of Figure 3. The lock ring is provided with a pair of drill holes, preferably threaded, diametrically opposite each other and formed completely through the wall of said lock ring so that a pair of guide pins 12 and 13 are secured to said drill holes in such manner that the pins project through the drill holes to a degree such that said guide pins cooperate with the grooves 8 of Figure 2 when the lock ring is positioned over the sleeve 6 as shown in Figure 1. The guide pin 12 is integral with the lever 14 so that when said pins cooperate with said grooves a movement of the lever 14 imparts rotary and axial motion to the lock ring 11. The lock ring 11 is also provided with a pair of diametrically opposite terminal segments 15 and 16 at one end thereof and one of said segments having a slot 17 positioned to coincide in alignment with the slot 9 of Figure 2 such as to provide an entrance gate for a lock plug pin hereinafter described. It is apparent from the drawings that the lock ring 11 with pins 12 and 13 removed fits over the sleeve 6 and the pins 12 and 13 are subsequently positioned to cooperate with the grooves 8 which secures the lock ring to the sleeve 6.

Figures 5, 6 and 7 illustrate the lock plug 18 as part of an obturator which is dimensioned to enter the breech 3 through the sleeve 6. The lock plug is provided with structures adapted to cooperate with the lock base and lock ring to secure said lock plug into locking position by a rotary interlocking movement of said lock ring. In order to accomplish this, the lock plug is provided with a projection or a plug pin 19, flange sections 20 and 21 and a terminal flange 22, said flange sections and said flange being longitudinally spaced to form arcuate grooves 23 and 24, said flange sections being provided with sides parallel to the segments 15 and 16 and perpendicular to the plug pin 19.

In assembling the lock, or placing the obturator in locked position, after the lock ring 11 has been positioned over the sleeve 6 as shown in Figure 1, the lock plug 18 is held so that the

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plug pin 19 passes through the slot 17 of the terminal segment 15 and enters the slot 9 of the sleeve 6. When the pin 19 enters the slot 9, the flange sections simultaneously pass into the ring 11 beyond the segments 15 and 16 until the flange 22 abuts against the end of the lock ring 11, as illustrated by broken lines in Figure 1, which aligns the segments 15 and 16 with the arcuate grooves 23 and 24.

Upon a rotary locking movement of the lever 14, the segments 15 and 16 engage the slots 23 and 24 respectively while the guide pins 12 and 13 in cooperation with the grooves 8 follow a helical path to cause the segments, which are in frictional interlocking contact with the flange sections 20 and 21, to advance the lock plug 18 into the breech 3. When the guide pins 12 and 13 are helically advanced in the direction of the abutment 7, the lock plug 18 is advanced laterally and non-rotatably so that a portion of the lock plug passes through the sealing ring 5 as hereinbefore described. The lateral non-rotatable movement of the lock plug, and consequently of the obturator, is provided for by the action of the plug pin 19 in cooperation with the sleeve slot 9. Just before the lever 14 is rotated sufficiently to align with the lever guide 10, the fingers of the hand exert a slight locking force on the lever 14 and simultaneously exert a force in the opposite direction upon the lever guide 10 so that the lock is secured frictionally without the possibility of causing the entire cystoscope to rotate and increase the patient's discomfort. Only a slight force is necessary to provide a secure locking action because of the mechanical advantage afforded by helical slots 8 and 9 and frictional contact of the segments 15 and 16 with the flange sections 20 and 21 which provide substantially large surfaces for said frictional contact and for prevention of accidental dislodgement of the lock plug 18 and consequent leakage.

It is apparent that only a full rotary motion in reverse of the fully rotary locking action will position the groove or gate slot for removal of the lock plug since the segments 15 and 16 are in interlocking contact with the flange sections 20 and 21 until the slot 17 is aligned with the slot 9 of the sleeve 6.

Figure 8 illustrates a complete cystoscope tube shown in longitudinal section and having an obturator according to the present invention positioned therein. The combination of the cystoscope lock hereinbefore described and the obturator is such that both cooperate in a novel manner to provide an obturation of the fenestrum simultaneously with the locking movement of said cystoscope lock. The obturator comprises a lock plug 18, a shaft 25 and a head 26. The obturator shaft 25 is secured to the lock plug 18 so that the axis of the lock plug and axis of the shaft do not coincide in alignment, e. g. the shaft is positioned out of center with respect to the end of the lock plug 18 or eccentrically located thereon in a manner particularly illustrated by Figures 5 and 7. The obturator head 26 is provided with a rounded projection or sled pin 27 which slides inside and on the lower portion of the cystoscope tube 2 during insertion and extraction of the obturator. The sled pin 27 is positioned forward of head projection 28 so that the obturator head 26 can slide through the cystoscope tube only at an angle as illustrated by broken lines in Figure 8. Since the obturator shaft is positioned off-center of the lock plug 18, it is to be understood that when the obturator

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is inserted into the cystoscope tube, the lock plug is not in alignment with the sleeve 6 and a lower portion of the lock plug remains substantially below the sleeve 6 and must be forced slightly upward to contact the entrance of the sleeve. This upward movement of the lock plug causes the obturator shaft to bend slightly near the obturator head as illustrated. Upon locking rotation of the lever 14, the obturator head 26 is moved into contact with the fenestrum 29 and the obturator shaft is thereby relieved of the bend near the head to allow the projection 28 to move upwardly slightly beyond the upper surface of the cystoscope tube at the fenestrum. The upward movement of the obturator projection 28 causes the obturator head to come into alignment with the cystoscope tube and is no longer at the angle hereinbefore described but substantially follows the contour of the fenestrum 29.

Therefore, it is apparent that the cystoscope lock of the invention and the combination of said cystoscope lock and cooperating obturator provide a leak-proof lock and a novel obturation of a fenestrum according to the several objects hereinbefore set forth.

The invention is not limited to the specific illustrations and description herein set forth as relating to cystoscopes, but may be construed to include, generally, improvements for endoscopic instruments falling within the true scope of the invention.

What we claim is:

1. In an endoscopic instrument including a tubular body, the combination of an obturator and locking means therefor, said locking means comprising a sleeved base structure mounted on one end of said tubular body and having a breech in communication with said end of said tubular body, the inner surface of said base structure forming said breech and containing an annular groove, a resilient sealing ring positioned in said breech and held therein by means of said annular groove, a locking ring mounted on the sleeve portion of said base structure by means of a guide pin cooperative with a helically arranged groove on the outer surface of said sleeve portion to impart a simultaneous rotary and axial movement to said locking ring, said obturator comprising a shaft, a head portion on one end of said shaft and a lock plug on the other end, said lock plug being insertable into said breech and having a diameter larger than the inner diameter of said sealing ring, said locking ring having on one end thereof a pair of diametrically opposed terminal segments, said lock plug having a terminal flange and longitudinally spaced therefrom, flange sections positioned on a rear portion of said plug to form arcuate grooves cooperative with said terminal segments to advance said lock plug into said breech partly

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through sealing ring thereby forming a leak-proof seal.

2. In an endoscopic instrument including a tubular body, a lock comprising in combination a sleeved base structure, a locking ring and a lock plug, said lock base structure being mounted on one end of said tubular body and having a breech formed therethrough in communication with said end of said tubular body, the inner surface of said sleeved base structure forming said breech and containing an annular groove, a resilient sealing ring positioned in said breech and held therein by means of said annular groove, the sleeved portion of said base structure containing a pair of diametrically disposed grooves arranged to follow a helical traverse partly across the outer surface of said sleeve portion, a slot partly along the length of the sleeved portion and parallel with the axis of said sleeve, a locking ring mounted on the sleeve portion of said base structure by means of guide pins cooperative with said grooves to impart a simultaneous rotary and axial movement to said locking ring, a lock plug insertable into said breech and having a diameter larger than the inner diameter of said sealing ring, said locking ring having on one end thereof a pair of diametrically opposed terminal segments, one of said segments being slotted, said lock plug having a terminal flange and longitudinally spaced therefrom, flange sections positioned on a rear portion of said plug, to form grooves cooperative with said terminal segments to advance said lock plug into said breech partly through said sealing ring, said lock plug having a projection insertable into said slot and advanceable therein upon a locking movement of said locking ring.

3. In an endoscopic instrument according to claim 1, an obturator comprising a shaft, a head means on one end of said shaft and a plug means on the other end of said shaft, said shaft being secured to said plug means eccentrically of the axis thereof, said head means having a projection on an upper rear portion thereof, a rounded projection on a bottom portion and positioned forward of said upper projection.

HARRY S. RUBENS.  
IGNAZ SUWA.

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