

April 10, 1962

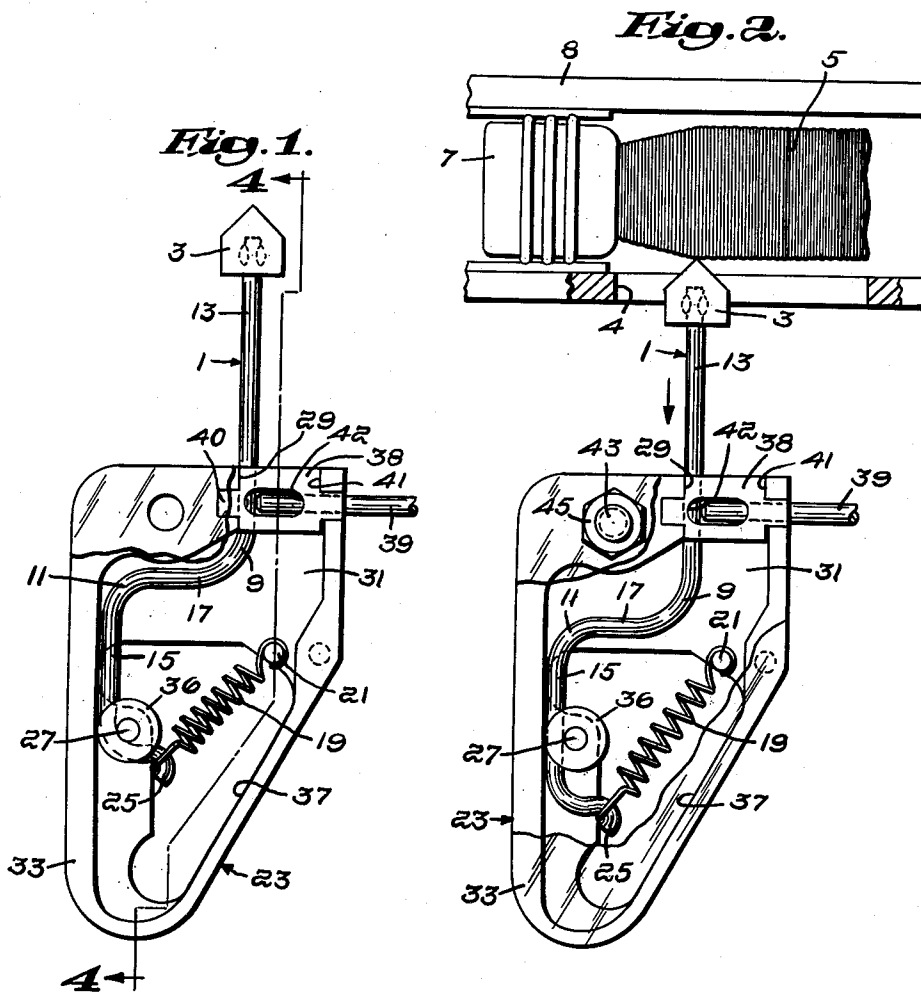
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3,028,883

FILLING FEELERS

Filed Feb. 2, 1960

2 Sheets-Sheet 1



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Fig. 3.

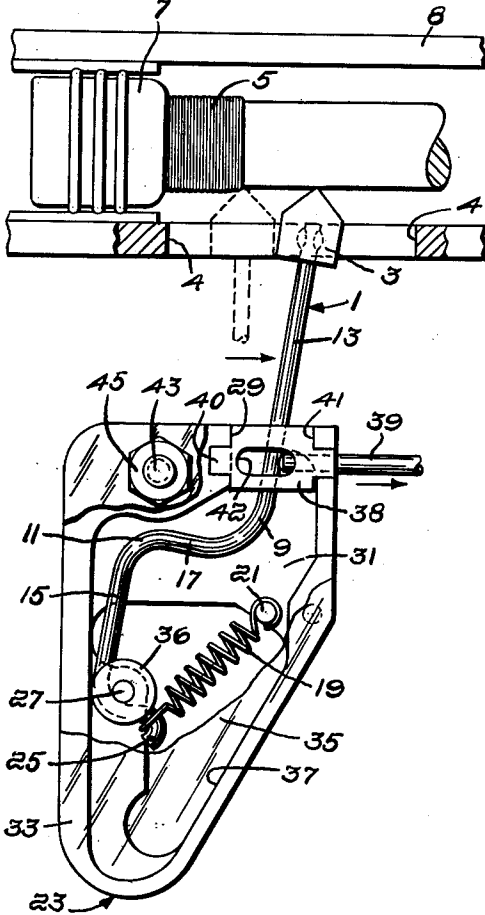


Fig. 4.

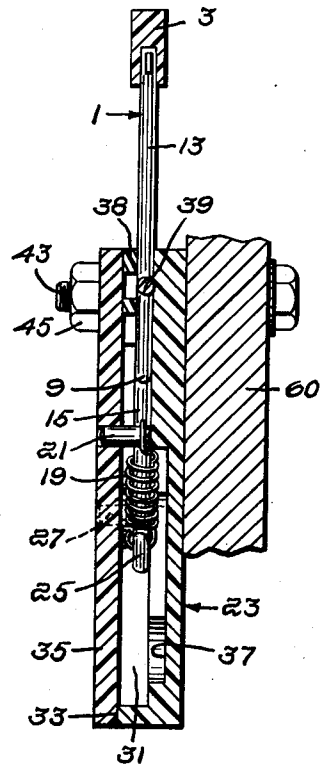
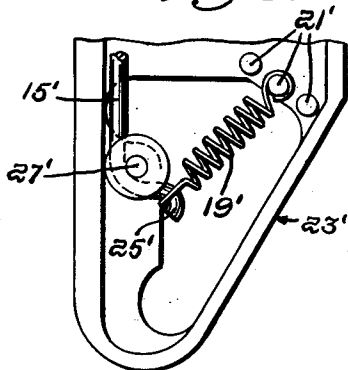


Fig. 5.



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FILLING FEELERS

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The present invention relates to filling feelers, which are the devices used in automatic filling-replenishing looms to cause the replenishing mechanism to replace the bobbin which has been working in the shuttle by a full bobbin, just before the yarn or filling on the working bobbin becomes exhausted, so that the end of the yarn will be outside the fabric and not left intermediate its width. These devices conventionally work by making contact with the wound mass of filling on the bobbin at every other beat of the lay, reacting to the reduction of diameter of the wound mass or to the absence of any windings and consequent engagement with the bare bobbin at the point of contact, by a change in their position or a movement which is transmitted to the replenishing mechanism to put the latter in action to expel the spent bobbin from the shuttle and put a fresh one in its place.

The invention is an improvement in filling feelers of the side-slipping type exemplified by Brown and Repass Patent No. 1,593,426 of 1926, widely used and commonly known as the "Midget" feeler. Basically, this feeler comprises an L-shaped member of stiff wire, on the longer rearwardly-extending leg of which is fixed a pointed or serrated tip to enter the shuttle and engage the windings on the bobbin therein as the lay brings the bobbin against it. The short leg or foot extends at right angles and floats or slides loosely in stationary guideways holding it in a horizontal plane, with a contracting coil spring hooked around the foot near its toe and pulling the toe yieldingly rearwardly against a stop at one side of the guideway, thus maintaining the feeler in its normal idle position with the long leg against one side of the guideway and at right angles to the bobbin. Though the spring supports the feeler yieldingly against the thrust of the bobbin at a point laterally offset from the line of such thrust, so that the feeler tip tends to swing to the side, the frictional engagement of the tip with the coils of yarn on the bobbin prevents the feeler from swinging sidewise until the unwinding of the yarn bares the bobbin or loosens the few remaining coils of filling at the point engaged by the feeler tip, letting the latter slip sidewise along the bobbin. This sidewise slipping movement of the tip and leg of the feeler is used to actuate a member which transmits the impulse to the replenishing mechanism which calls it into action.

The "Midget" feeler has been outstandingly successful in practical use. But it still leaves room for improvement in several respects.

The arrangement of the spring which presents the feeler to the bobbin and holds it against the bobbin during the feeling action is such that the feeler when in action is variably urged to slip sidewise by the spring itself, in addition to the tendency to slip sidewise purposely resulting from the offset relation of the tip with respect to its support by the spring. This two-fold urge occasionally results in premature side slipping and hence needless discarding of a bobbin containing a still adequate supply of filling. Such a bobbin is ejected from the shut-

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tle so forcibly that the yarn thereon is frequently damaged beyond further usefulness, through denting of the wound mass and jamming of the coils to an extent which prevents free unwinding, through fracture of the yarn in the case of filling made of synthetic fibers, through landing on the floor to become stained with oil or dirt, and through other disturbances, all resulting in its being discarded as waste. That is, the instant the feeler starts forward under the push of the wound mass of filling, and the toe of the feeler leaves the stop which holds the feeler at right angles to the bobbin, the spring, which previously acted to hold the feeler erect, begins to urge the feeler to slip sidewise, and this urge increases in direct proportion to the forward travel of the feeler and resulting increased resistance of the spring, applied in laterally offset relation. It is normally counteracted as noted by the frictional engagement of the tip with the windings on the bobbin, the increasing resistance of the spring pressing the tip the harder against the windings as the feeler is driven forward and the spring is stretched.

However, the greater the diameter of the windings, and hence the more abundant the supply of yarn at the point of contact of the tip therewith, and consequently the farther the feeler is pushed forward, the harder the tip tries to slip, which is exactly the opposite of what would be most desirable and leads to premature and unwanted slip, whenever the tip fails to get a good grip on the windings, which is the only force preventing slip.

This failure to grip, and resulting premature slip, is encouraged by the taper of the "traverse" or conical wind with which filling bobbins are wound; the profile of the wound mass engaged by the tip changes from cylindrical to conical as the yarn is unwound, tapering so as to slope or slant away from the feeler in the direction in which the tip is trying to slip.

A variety of forms of tips, and an assortment of springs of different degrees of tension, are offered and used with the Midget feeler, in the effort to attain certainty of action on different kinds of filling.

The problem of waste from this mal-functioning has of late become more acute. With the increase of loom speeds within the last few years from 160 or so picks per minute to around 200 or in some instances to 220 picks, all parts of the loom are subjected to increased vibration, which makes the tip more prone to vibrate, rebound, and slip on the windings and especially down the slope of the traverse, with a corresponding increase in the proportion of false doffs of usable bobbins.

A leading aim of the present invention is to overcome this drawback inherent in the Midget feeler, so as to minimize the occurrence of false indications of the need for filling replenishment, and thus to cut down the very considerable waste arising from such errors.

To this end, the present device comprises a side-slipping feeler in which the spring which enables it to make and keep contact with the bobbin and its supply of filling during the feeling action, opposes the side-slipping movement of the feeler throughout each feeling action from beginning to end. Further, this opposition to side-slip increases continuously in direct proportion to the distance the feeler is pushed forward. The urge to slip sidewise along the bobbin is supplied as heretofore by the off-setting of the point of reactance of the spring against the feeler with respect to the line of thrust applied to the feeler tip by the bobbin.

Thus the tendency of the feeler to slip sidewise is least

when it works against the full diameter of the wound mass and there remains plenty of filling for continued weaving, and greatest when the filling is nearly gone and the tip encounters the bare bobbin, the stage at which the spent bobbin needs to be replaced by a full one. The result is a greatly reduced proportion of premature filling changes and wasted filling.

The novel feeler device also exemplifies or contains a further safeguard against premature action. Thus, although it provides the necessary sliding action to enable the feeler to move forward idly under the push of a full bobbin, and the necessary swinging action to slip on a denuded bobbin and thus call the replenishing mechanism into action, the feeler cannot slide and swing simultaneously on the same feeling action. That is, if there is sufficient filling on the bobbin for continued weaving, its thickness causes the feeler to slide forward past the point at which it can swing and thus slip along the bobbin to cause replenishment; but when the bobbin is bare or substantially so at its point of engagement with the feeler, the feeler is not slid forward thereby and is left free to slip sidewise and call the change of filling.

From another aspect, the conventional feelers including the Midget are of all-metal construction, and consequently the parts wear quite rapidly at their mutual bearing surfaces. Lubricating these bearing surfaces is strictly avoided because of its resultant accumulation of lint and fly ever present in the locality of their operation. Hence frequent servicing and replacement of parts are required. To remedy this situation, the novel feeler uses synthetic material having an inherently low coefficient of friction obviating the need for applied lubricant for the stationary bearing surfaces. Examples of such suitable materials are nylon and Zytel, made by Dupont Corporation. Preferably all parts of the device except the feeler member and the spring will be made of such plastic material, as thus the guiding surfaces can be precisely located and formed as an integral part of the feeler body, with no need for machining, cheaply in quantity production by injection molding operations.

Long wear of the parts and long life of the device is thus attained.

Further, the use of a transparent plastic such as methyl methacrylate to form the cover, against which latter the moving parts make only a light contact, if at all, enables continuing observation and visual check on the operation and condition of the parts and of the occurrence of any lint fouling.

Other objects of the invention, and the manner of their attainment, are as will be made plain hereinafter.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which—

FIG. 1 is a plan view of the improved feeler device, with the feeler in its normal rearward presentation position, the cover being partly broken away.

FIG. 2 is a similar plan view of the device with the feeler engaged by the full-diameter wound mass carried by a bobbin, with the latter in its position of closest approach to the feeler.

FIG. 3 is a plan view similar to FIGS. 1 and 2 showing the feeler after it has slipped sidewise along the bare surface of a nearly empty bobbin.

FIG. 4 is a view in vertical section on line 4—4 of FIG. 1.

FIG. 5 is a fragmentary plan view of an alternative spring arrangement.

The improved structure comprises a feeler 1 of steel wire with a filling-engaging tip 3 of plastic or fiber molded or otherwise affixed rigidly thereon. This tip is of appropriate thickness to enter the usual feeler slot 4 in the shuttle 8 on the lay of an automatic loom, and as heretofore in certain instances has a right dihedral angle symmetrically disposed at its rearward end to provide a vertical edge or tooth for engagement in the turns of filling 5 wound on the bobbin 7 occupying the shuttle 8.

The feeler 1 is bent at 9 and 11 at equal but opposite obtuse angles to produce two parallelly disposed portions 13, 15, joined by an angularly disposed portion 17. The amount of offset of portion 15 from the portion 13 which latter is in line with the direction of thrust delivered to the tip 3 by the wound mass 5 as the lay beats up, is made substantial to provide a turning impulse, force or moment which alone and unassisted is adequate to insure side-slipping of the tip 3 when it encounters the bare bobbin 7, as in FIG. 3.

A contracting coil spring 19 is attached at one end by its diverted end-coils to a perch in the form of an integral stud 21 on a base 23 of molded plastic material. At its other end the diverted end-coils are looped around a hook 25 formed on the forward end of feeler 1. By reason of its oblique relation, at an angle of about 45° to the portion 13, the spring pulls the forward portion 15 of the feeler laterally against a fixed abutment forming a combined guide, pivot, and stop, herein in the form of a stud 27 formed integrally on the base 23, and likewise pulls it rearwardly until the rearward surface of hook 25 engages this stud 27. The force of the spring being thus applied to the feeler 1 forward and to the right of stud 27, it of course tends to rotate the feeler about stud 27 as a pivot, which brings the left-hand side of the portion 13 of the feeler against a guide surface 29 formed by a gap in the wall of a flat-bottomed recess 31, defined by the raised rim 33. This rim is slightly higher all around than the thickness of the wire of feeler 1, so that when a transparent cover 35 is applied the feeler can slide freely while supported on the horizontal bottom of recess 31, being guided between it and a nylon washer 36 on stud 27 which holds the feeler down to a void chafing the cover. Another nylon spacer 38 bridges the gap in the rear of wall 33 between the opposing surfaces 29 and 41 of the gap, having lateral extensions 40 let into the wall and an aperture 42 for observing the setting of the parts. The two bends 9, 11 at the ends of portion 17 give the feeler breadth enough to stay right side up. The feeler 1 does not in its normal idle movement engage in any way with the rim in the present embodiment, except at the guide surface 29 which holds the feeler in its erect presentation position.

A deeper recess 37 is formed in the floor of recess 31 for the reception of the spring 19 with clearance from all surfaces.

The working of the feeler is illustrated in FIGS. 2 and 3. When the windings 5 on bobbin 7 are thick enough to allow continued weaving, as in FIG. 2, the engagement of the pointed end of feeler tip 3 therewith tends to hold the feeler tip from slipping sidewise and the feeler from swinging clockwise about guide 27 as a pivot, in response to its offset relation to the resisting force applied by spring 19 to hook 25. The greater the diameter of the wound mass 5, and hence the farther the forward end with hook 25 thereon is pushed, the more powerful becomes the action of spring 19 in resisting the feeler's tendency to swing to the right and the tip's consequent urge to slip to the right along the wound mass 5. This is because of the increased tension in the spring and the increased length of the lever arm comprised by that part of portion 15 of the feeler lying between the bight of the hook 25 and the point of the feeler's contact with guide 27, both of which values increase in direct proportion to the distance the feeler is pushed forward by the filling 5. In brief, the tendency or urge of the feeler to slip sidewise is greatest in its rearmost position at the instant of contact with the bobbin, and thereafter diminishes as the feeler moves forward, becoming least at the end of its forward travel, the extent of which latter is determined by the diameter or thickness of the wound mass 5 and hence by the sufficiency of the amount of filling left on the bobbin. When the weaving has continued and the filling has been drawn off until the bobbin is left bare at the point where it makes contact with the feeler tip, or the few remaining turns

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about the bobbin at such point have been so loosened by the unwinding that they are no longer able to hold the tip from slipping sidewise, the feeler tip slips along the surface of the bobbin from the dotted-line position of first contact shown in FIG. 3 to its solid-line position therein. The gap in the rim 33 between guide surface 29 and the surface 41 of the other end of such rim provides for the consequent clockwise rotation of feeler 1 about guide 27 as shown.

This causes the portion 13 of the feeler to push the usual transmitter 39 to the right as indicated by the arrow, to call the replenishing mechanism (not shown) into action in this conventional or any preferred manner, as by closing an electrical circuit, and thus to cause a fresh bobbin to replace the spent bobbin 7 in the shuttle. The feeler has then fulfilled its purpose, with a minimum of tendency to act prematurely.

A further safeguard against premature and false indication of filling depletion is provided in the novel construction. The proximity of the left-hand wall of raised rim 33 to the path of travel of the portion 15 of feeler 1 makes it impossible for the feeler member to swing sidewise once the feeler starts forward and the hooked end 25 travels any material distance away from guide 27. That is, as soon as the lever arm defined between the bight of hook 25 and guide 27 attains any significant length, if the feeler tip then starts to slip the bend of portion 15 adjacent the hook 25 will engage the adjacent surface of rim 33 and prevent the feeler from swinging far enough to actuate the transmitter 39 and set the replenishing mechanism in action. So the feeler can only act to change the bobbin when at or very near its rearmost position. Thus if the thickness of the wound mass is sufficient to slide the feeler forward for even a part of its travel, but the feeler tip should get an insecure grip on the filling otherwise leading to subsequent slipping during the remainder of its travel, no false indication can occur. The feeler is thus prevented from simultaneously sliding and swinging.

Either of the two safeguards against premature side-slipping can be used independently in constructing a feeler device.

The feeler device is mounted on the usual stand 60, FIG. 4, on the loom breast-beam by a screw 43 put through the feeler stand from below and threaded into the base 23 of the feeler body, and extending freely through and above the cover 35 to receive a nut 45 which holds the cover on.

In the alternative form shown in FIG. 5, a single type and strength of spring 19' is made to serve in practically all situations, by providing a series of studs 21' arranged in an arc with respect to guide 27'. When either more or less responsive action of the feeler is desired, the anchorage of the spring is shifted accordingly from one stud 21' to another.

Because of the steadier action of the feeler, a single feeler tip of simple construction such as shown is adequate for use on practically all kinds of filling.

While I have illustrated and described certain forms in which the invention may be embodied, I am aware that many modifications may be made therein by any person skilled in the art, without departing from the scope of the invention as expressed in the claims. Therefore, I do not wish to be limited to the particular forms shown, or to the details of construction thereof, but what I do claim is:

1. A filling feeler device for automatic looms having in combination a side-slipping feeler, a fixed abutment forming a combined guide, pivot, and stop for the feeler, and a single spring engaging the feeler and acting at all times throughout the movement of the feeler to resist both bodily movement and side-slipping movement of the feeler.

2. A filling feeler device for automatic looms having in combination a feeler base, a fixed abutment thereon, a side-slipping feeler and a single spring engaging the feeler and holding the feeler ever against the abutment and opposing the side-slipping movement of the feeler throughout each feeling action.

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3. The combination according to claim 2 in which the spring's opposition to the side-slipping movement increases continuously in direct proportion to the distance the feeler is pushed forward.

4. A filling feeler device for automatic looms having in combination a side-slipping feeler, a base in which the feeler is adapted to slide forward and backward, an offset tip on the rear end of the feeler tending to make the latter swing sidewise when pushed by the filling, a spring tending at all times to make the feeler swing in the opposite direction to that described and acting on the front end of the feeler, and a fixed abutment defining a pivot on which the feeler swings.

5. A filling feeler device for automatic looms having in combination a side-slipping filling feeler adapted to be thrust forward by the filling and having its forward portion offset from the line of thrust of the filling, a stationary guide, a spring urging the forward portion toward the line of thrust and against the guide, the guide engaging the feeler ever rearward of the point of application of the spring's force thereto.

6. A filling feeler device for automatic looms having in combination a side-slipping filling feeler adapted to be thrust forward by the filling and having its forward portion offset from the line of thrust of the filling, a spring urging the forward portion toward the line of thrust, and a guide against which the spring urges the forward portion, the guide engaging the feeler member at a distance rearward of the point of application of the spring's force that increases in direct proportion to the forward travel of the feeler.

7. A filling feeler device for automatic looms having in combination a side-slipping filling feeler adapted to be thrust forward by the push of the filling, a guide at that side of the feeler that is toward the line of thrust exerted by the filling against the feeler, spring means urging the feeler against the guide and holding the feeler yieldingly rearward in presentation position, and fixed means to engage the forward portion of the feeler at the opposite side thereof from the guide and prevent the feeler from swinging about the guide except when in substantially its rearmost position.

8. A filling feeler device for automatic looms having in combination a side-slipping feeler, a base in which the feeler is mounted with capacity for sliding and swinging, fixed pivot means on which the feeler slides and swings, and means preventing simultaneous sliding and swinging of the feeler.

9. A filling feeler device for automatic looms having in combination a side-slipping feeler, a base in which the feeler is mounted for sliding movement under the forward thrust of the filling and for swinging movement, the feeler having a rearward end-portion for engagement with the filling and a forward end-portion offset from the line of thrust of the filling against the rearward end-portion, the forward end-portion being straight and extending parallel to the said line of thrust except when the feeler slips sidewise, a guide on the base located between the forward end-portion and the said line of thrust, and spring means urging the feeler rearwardly and laterally against the guide, the latter forming a pivot about which the feeler is adapted to swing sidewise.

10. The combination according to claim 9 in which means is provided to prevent swinging of the feeler member about the guide when the feeler slides forward.

11. A filling feeler device for automatic looms having in combination a filling feeler having an offset filling-engaging tip, guides respectively engaging opposite sides of the feeler when at rest, a spring resisting movement of the feeler under the forward thrust of the filling and urging the portion of the feeler that is forward of the guides in a direction toward the line of thrust of the filling.

12. A filling feeler device for automatic looms having in combination a filling feeler having an offset filling-engaging tip, guides for the feeler one of which provides a

pivot about which the feeler can swing laterally, and a spring continuously resisting all forward movement and lateral swing of the feeler under the forward push of the filling against the tip.

13. A filling feeler device for automatic looms having in combination a side-slipping feeler having a tip adapted to be engaged and thrust forward by the filling, a fixed abutment forming a combined guide, pivot, and stop for the feeler, and a single spring engaging the feeler and acting at all times throughout the movement of the feeler to resist both bodily movement and side-slipping move-

ment of the feeler, the tip being laterally offset from the abutment transversely of the line of thrust of the filling in the direction toward the point of engagement of the spring with the feeler.

References Cited in the file of this patent

UNITED STATES PATENTS

1,747,991	Simpson	Feb. 18, 1930
1,874,533	Hudson	Aug. 30, 1932
2,782,808	Laferte	Feb. 26, 1957