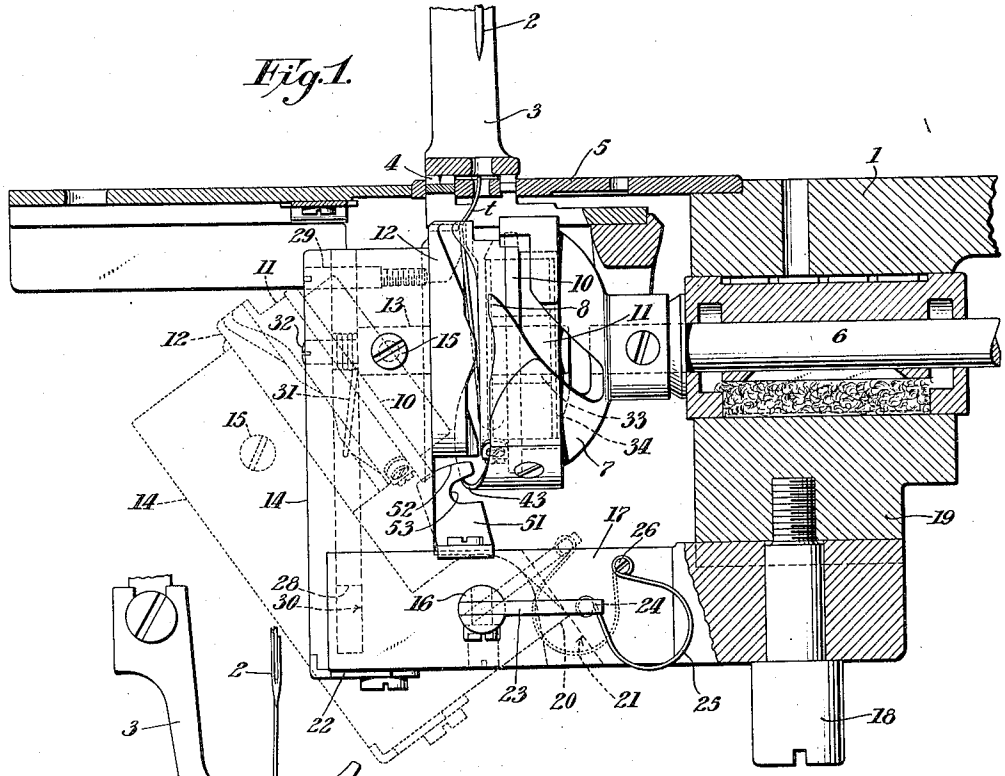
Dec. 30, 1930. M. HEMLEB 1,786,944

LOCK STITCH SEWING MACHINE

Filed Nov. 30, 1928 2 Sheets-Sheet 1

Fig. 1.



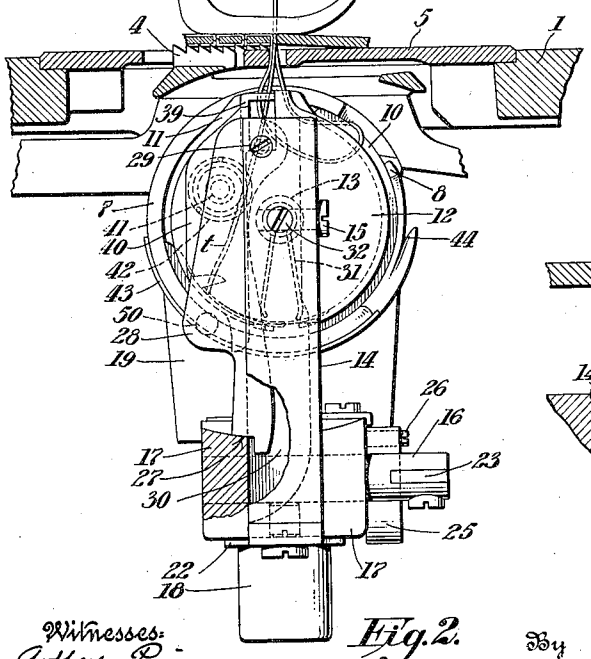


Fig. 2.

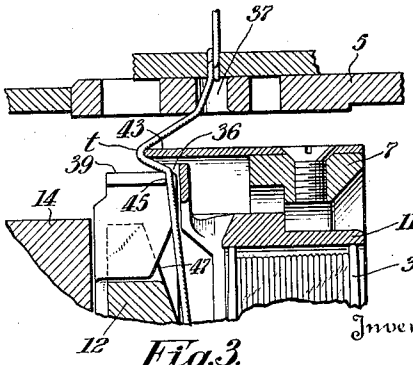


Fig. 3.

Witnesses:
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LOCK STITCH SEWING MACHINE

Filed Nov. 30, 1928 2 Sheets-Sheet 2

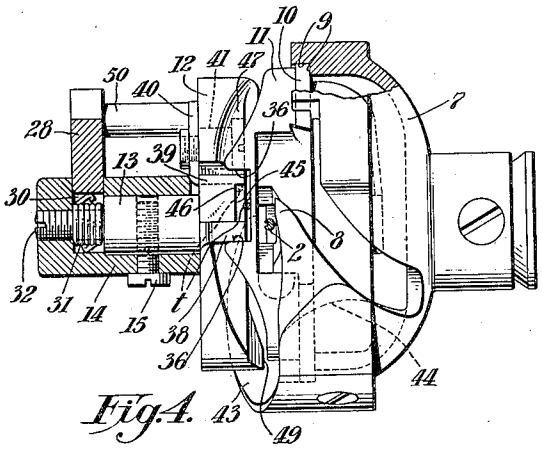


Fig. 4.

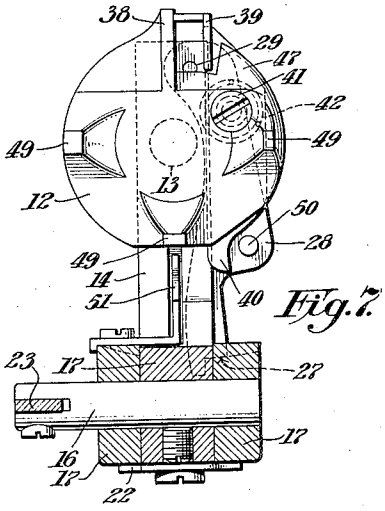


Fig. 7.

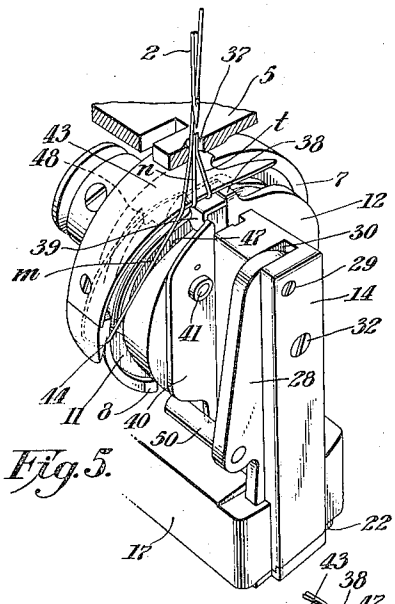


Fig. 5.

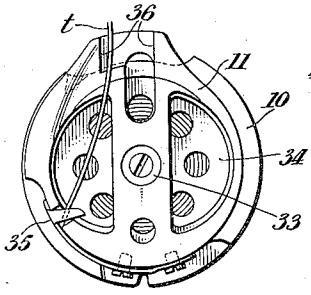


Fig. 8.

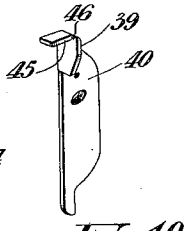


Fig. 10.

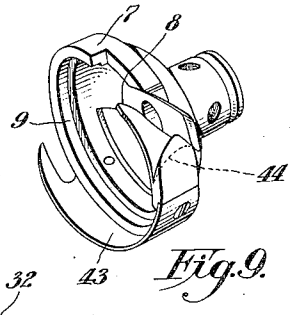


Fig. 9.

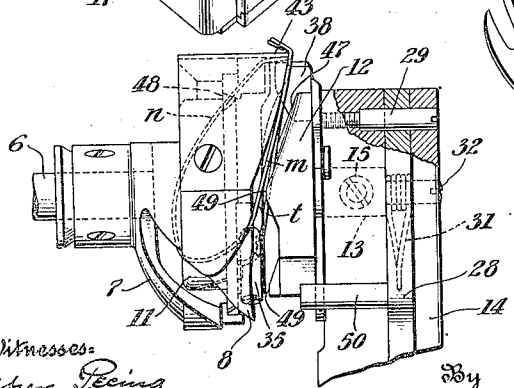


Fig. 6.

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Patented Dec. 30, 1930 1,786,944

UNITED STATES PATENT OFFICE

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LOCK-STITCH SEWING MACHINE

Application filed November 30, 1928. Serial No. 322,603.

This invention relates to lock-stitch sewing machines, more particularly of the rotary-hook type having an open-sided raceway for the bobbin-case, and has for an object to improve sewing conditions in a machine of this type, by as far as possible removing impediments to the free passage of the needle-loop about the bobbin-case and without resorting to complications incident to the employment of mechanical means for opening a passage for the needle-loop.

A further object of the invention is to provide the machine with bobbin-thread pull-off means which is uniformly reliable in operation.

A further object of the invention is to provide a machine of the type in question with bobbin-thread pull-off means, without sacrifice of easy threading characteristics of the under-thread mechanism.

According to the present improvement there is used a cup-shaped rotary hook having an open-sided raceway for the bobbin-case, which latter is prevented from falling out of operative position in the hook by means of a bobbin-case retainer in engagement with the outer face of the bobbin-case. With the exception of the usual interengaging tongue-and-notch rotation-restraining means on the bobbin-case and its retainer, there is a free space between the two for the passage of the outer limb of the needle-loop. The weight of the bobbin-case, when in sewing position, is supported by the hook and no mechanical bobbin-case lifter is needed to open a needle-loop passage-way between the bobbin-case and its retainer.

The cup-shaped rotary hook member is preferably provided at its rim with a pull-off flange, the path of which overhangs and is closely adjacent the rotation-restraining tongue on the bobbin-case retainer, which tongue loosely enters a notch in the bobbin-case. The bobbin-thread is led from the usual tension-device on the bobbin-case upwardly through the rotation-restraining notch in the bobbin-case and across the inner end of the rotation-restraining tongue, to the needle-hole in the throat-plate. It is thus held under control or guided at a point closely below the top of the circular path of the pull-off flange. To prevent the pull-off flange from driving the bobbin-thread out of the rotation-restraining notch in the bobbin-case, the rotation-restraining tongue is formed in its end with a recess affording a pocket which retains control of the bobbin-thread while it is being deflected or bent by the pull-off flange. As the top of this pocket is close to the path of the pull-off flange, it follows that the latter bends the bobbin-thread at a rather sharp acute angle during the pull-off action and pulls off a maximum amount of bobbin-thread for a minimum width or overhang of the pull-off flange.

After the rotary hook seizes the needle-loop and has executed about one-quarter or one-third of its loop-casting rotation, the pull-off flange in passing the needle-loop forces the outer limb of the needle-loop outwardly from the face of the bobbin-case, with the result that the outer limb of the needle-loop starts across the face of the bobbin-case at a distance outwardly from such face. This result is of no particular consequence in the case of a closed-raceway hook, since the bobbin-case of a closed-raceway hook is entirely supported by the closed raceway and there is nothing in engagement with the outer face of the bobbin-case to prevent free passage of the outer limb of the needle-loop across such face at a distance outwardly from the latter.

In the case of an open-sided raceway hook, however, a bobbin-case retainer engaging the outer face of the bobbin-case is used to hold the latter in the hook-raceway. It thus becomes a desideratum in providing such a machine with a bobbin-thread pull-off, to take care not to impede the passage of the outer limb of the needle-loop across the face of the bobbin-case and between the latter and the bobbin-case retainer. In the present instance the condition is met by providing the bobbin-case retainer with an inclined portion or face acting to catch the outer limb of the needle-loop and guide it between the bobbin-case and bobbin-case retainer, in the loop-casting operation. It is preferred to increase the effectiveness of the pull-off

flange, as above proposed, and thus enable it to be reduced in width with a consequent reduction in the amount that such flange must expand the needle-loop and with a reduction in the distance that the outer limb of the needle-loop is forced outwardly from the face of the bobbin-case in crossing such face; making it easier to shape the bobbin-case retainer to catch and guide the outer limb of the needle-loop without harsh engagement therewith.

In the accompanying drawings, Fig. 1 is a side elevation, partly in section, of the stitching mechanism of a sewing machine embodying the invention. Fig. 2 is a view from the left of Fig. 1. Fig. 3 is a fragmentary vertical sectional view at the stitching point, transversely of the line of feed. Fig. 4 is a plan view of the rotary hook and under-thread mechanism. Fig. 5 is a perspective view of the same, showing the needle-loop being drawn out. Fig. 6 is a side elevation of the parts in the position shown in Fig. 5. Fig. 7 is an inner face view of the bobbin-case retainer. Fig. 8 is an outer face view of the bobbin-case. Fig. 9 is a perspective view of the rotary hook, and Fig. 10 is a perspective view of the movable bobbin-case gripper-jaw.

According to the preferred embodiment of the invention illustrated, 1 represents the bed of a sewing machine having a reciprocating needle 2, presser-foot 3, feed-dog 4 and throat-plate 5, all of common form. Journaled below the bed is the rotary hook-shaft 6 driven in any suitable manner so as to make two rotations to one complete reciprocation of the needle 2. Fixed to the shaft 6 is the rotary hook having a cup-shaped body 7 formed with the hook-beak 8 and the internal open-sided raceway 9 which receives the bearing rib 10 of the bobbin-case 11 held in working position in the hook by the bobbin-case retainer-head 12. The retainer-head 12 has a pin-shank 13 fixed in the upstanding retainer-arm 14 by the screw 15. The retainer-arm 14 has fixed to it a pivot-shaft 16 which is journaled in the bifurcated end of the horizontal bracket 17 secured by the screw 18 to the bed-lug 19. The pivotal mounting of the retainer 14 enables it to be swung outwardly to dotted-line position, Fig. 1, for removal of the bobbin-case 11 from the hook-raceway.

The toe 20 on the retainer-arm 14, striking the inner end-wall 21 of the slot in the arm 17 which receives the arm 14, limits the outward motion of the retainer-arm 14. The plate 22, screwed to the lower end of the retainer-arm 14 and extending laterally under the bifurcations of the arm 17, limits the inward motion of the retainer arm 14 to its full-line position, Fig. 1. The pivot-shaft 16 has fixed in one end an arm 23 carrying a pin 24 embraced by one looped end of a bow-spring 25 the other looped end of which embraces the screw-pin 26 fixed to the bracket 17. The arm 23 is so positioned that in its movement between its extreme positions, shown in full and dotted lines, Fig. 1, it crosses a line connecting the center of the shaft 16 and screw 26 and hence functions to yieldingly urge the retainer-arm 14 to either extreme position.

The retainer-arm 14 is locked in its inner or upright position by engagement of the shoulder 27 at the lower end of the latch 28 with the bracket 17; the latch being pivoted at 29 in a slot 30 in the retainer-arm 14. A spring 31 coiled about the screw 32 and disposed in the slot 30 bears against the latch 28 and urges it outwardly to latching position. By manually pressing the latch 28 inwardly, the shoulder 27 is moved entirely within the slot 30 and the retainer-arm 14 is unlocked so that it can be moved to dotted line position, Fig. 1 for removal of the bobbin-case 11 from the hook 7. The bobbin-case 11 is formed with the usual central arbor 33 on which the bobbin 34 is journaled.

The bobbin-thread *t* is led from the bobbin 34 under the usual tension-spring 35 and upwardly across the outer face of the bobbin-case 11 and through the rotation-restraining notch 36 to the needle-hole 37 in the throat-plate 5.

The rotation-restraining notch 36 in the bobbin-case is entered by a rotation-restraining tongue on the bobbin-case retainer 12, said tongue being in the form of relatively separable gripper-jaws 38, 39. The jaw 38 is formed integral with the retainer-head 12 while the jaw 39 is formed at the upper end of a lever 40 carrying the fulcrum-screw 41 journaled in the retainer-head 12. A spring 42 surrounding the screw 41 within a cavity in the head 12 urges the lever 40 in a direction to move the jaw 39 into engagement with the jaw 38, as shown in Figs. 4 and 7; the construction being substantially the same as that disclosed in Fig. 7 of the U. S. patent to Hemleb No. 1,548,464 of Aug. 4, 1925.

For pulling off the bobbin-thread *t* there is secured to the hook-body 7 a pull-off flange 43 operating in a cylindrical path overhanging the retainer-head 12, as shown in Figs. 1 and 4. This flange begins just back of the throat 44 of the hook, Fig. 9, and terminates at a distance somewhat greater than 180° from the hook-beak 8, Fig. 2. The rotation-restraining tongue 38, 39 is formed at its inner end with a notch 45, disposed below and close to the path of the pull-off flange 43. In the embodiment illustrated, the notch 45 is formed entirely in the movable jaw-member 39 of the rotation-restraining tongue and constitutes a pocket into the corner 46 of which the bobbin-thread *t* is deflected by the pull-off flange 43. The pocket or notch 45, in catching the bobbin-thread,

prevents such thread from being driven out of the rotation-restraining notch 36 in the thread-case, by the pull-off flange 43. This pocket 45 also guides or confines the bobbin-thread closely below the pull-off flange 43, causing the latter to bend the bobbin-thread at an acute angle, Fig. 3, between the pocket and the needle-hole, thus pulling off the desired amount of bobbin-thread with a flange 43 of minimum width or overhang.

It is characteristic of a bobbin-thread pull-off flange of this character that it engages and deflects outwardly from the hook-body both limbs of the needle-loop being drawn out by the throat 44 of the hook. This has the effect of enlarging the needle-loop. A minimum enlargement of the needle-loop is desirable as less needle-thread take-up action is required and there is less reeving of the needle-thread through the eye of the needle. A minimum outward deflection of the needle-loop, and particularly the outer limb of the needle-loop, is desirable in the present instance, since the outer limb of the needle-loop must be passed between the outer face of the thread-case 11 and the adjacent face of the retainer-head 12.

It will be understood that this problem is not encountered in the case of a closed raceway-hook, for the reason that the bobbin-case is held in place by the closed raceway and there is nothing in engagement with the outer face of the bobbin-case which would interfere with the free passage of the outer limb of the needle-loop across the face of the bobbin-case, no matter how far outwardly of the thread-case the needle-loop may be deflected by the pull-off flange.

In the present instance the retainer-head 12 is cut away to form an inclined face 47, Figs. 5 and 6, to catch the outer limb *m* of the needle-loop and guide it between the bobbin-case 11 and retainer-head 12. The inner limb *n* of the needle-loop is caught and held as usual by the stationary hook 48 on the thread-case while the throat 44 spreads the loop and passes it about the bobbin-case.

The face of the retainer-head 12 is formed below the rotation-restraining tongue 38, 39 with separated raised contact faces 49 of small area which engage the bobbin-case 11 and hold it separated from the main face of the retainer-head 12, thus facilitating free passage of the limb *m* of the needle-loop between the bobbin-case and retainer-head. The contact faces 49 are connected by gently sloped surfaces to the plane of the main face of the head 12.

The latch-lever 28 carries a pin 50 which, when the latch-lever is pressed inwardly to release the retainer-arm 14, engages and moves inwardly the lower end of the lever 40 carrying the movable gripper-jaw 39, thus relatively spreading the jaws 38, 39 into gripping engagement with the side walls of the rotation-restraining notch 36 in the thread-case. Hence, when the retainer-arm 14 is moved to dotted line position, Fig. 1, the gripper-jaws 38, 39 withdraw the bobbin-case 11 from the hook-body 7. A bobbin-case support 51 is secured to the bracket 17 and has its upper end 52 curved concentrically with the axis of the fulcrum-shaft 16. When the gripper-jaws 38, 39 are released, in the dotted line position of the parts, Fig. 1, the bobbin-case 11 rests upon the support 51 and is guided by the latter during the movement of the bobbin-case into working position in the hook-body; it being unnecessary to operate the gripper jaws in this inward movement. The support 51 is cut away at 53 to clear the pull-off flange 43.

When renewing the lower thread supply, it is merely necessary to draw the bobbin-thread in the usual manner under the tension spring 35 and permit it to hang free. When the first needle-loop is cast about the bobbin-case it gathers in the bobbin-thread end and automatically draws it upwardly into the rotation-restraining notch 36 and through the needle-hole in the throat plate.

Having thus set forth the nature of the invention, what I claim herein is:

1. In a sewing machine, in combination, a reciprocating needle, a cup-shaped rotary hook having an open-sided raceway, a bobbin-case in said raceway, a bobbin-case retainer movable from sewing position adjacent said hook to open position more remote therefrom, manually operated seizing means on said retainer for removing the bobbin-case from the hook when the bobbin-case retainer is shifted to open position, and a stationary rest mounted in a fixed position to engage and support the bobbin-case on the opened retainer after the bobbin-case is removed from the hook and released by said seizing means, said rest being out of engagement with the bobbin-case when the latter is in working position in said hook.

2. In a sewing machine, a reciprocating needle, a rotary hook having an open-sided raceway, a bobbin-case in said raceway, a bobbin-case retainer, a pull-off flange on said rotary hook, and a bobbin-case support mounted below and independent of said retainer, said support being cut away below its upper end to clear said pull-off flange.

3. In a sewing machine, a reciprocating needle, a rotary hook having an open-sided raceway, a bobbin-case disposed in said raceway and formed with a rotation-restraining notch, a shiftable bobbin-case retainer having a rotation-restraining tongue entering said notch, said tongue being constituted by relatively expansible gripper-jaws adapted to seize the bobbin-case and remove it from the hook when the bobbin-case retainer is shifted, and a stationary bobbin-case supporting rest mounted independently of said shiftable retainer in position to engage and support the

bobbin-case on the opened retainer when the bobbin-case is removed from the hook and released by said gripper-jaws, said rest being out of engagement with the bobbin-case when the latter is in working position in said hook.

4. In a sewing machine, a reciprocating needle, a rotary hook having a cup-shaped body formed with an open-sided raceway and making two rotations for each reciprocation of said needle, a bobbin-case in said raceway, a bobbin-case retainer engaging the outer face of said bobbin-case, and a bobbin-thread pull-off flange on said rotary hook body, said pull-off flange being so positioned circularly of the hook body as to engage and deflect outwardly the limbs of the needle-loop while the latter is being distended by the hook, said retainer being shaped to engage the deflected outer limb of the needle-loop between the throat of the hook and the pull-off flange and guide such limb between said retainer and bobbin-case.

5. In a sewing machine, a reciprocating needle, a rotary hook having a cup-shaped body formed with an open-sided raceway and making two rotations for each reciprocation of said needle, a bobbin-case in said raceway, a bobbin-case retainer engaging the outer face of said bobbin-case, and a bobbin-thread pull-off on said rotary hook body, said retainer having an inclined face adapted to catch the outer limb of the needle-loop between the throat of the hook and the pull-off flange and guide such limb between the bobbin-case and bobbin-case retainer.

6. In a sewing machine, a reciprocating needle, a rotary hook having a cup-shaped body formed with an open-sided raceway and making two rotations for each reciprocation of said needle, a bobbin-case in said raceway, a bobbin-case retainer having a face engaging the outer face of the bobbin-case and shiftable to permit removal of the bobbin-case from the open raceway in the hook-body, and a bobbin-thread pull-off flange on the hook-body operating in a circular path overhanging said retainer, the face of said retainer having a cut-away portion adapted to receive one limb of the needle-loop extending between the hook and pull-off flange and guide it between said retainer and said bobbin-case.

7. In a sewing machine, a reciprocating needle, a throat-plate, a rotary hook having a cup-shaped body formed with an open-sided raceway, a bobbin-case disposed in said raceway and formed with a rotation-restraining notch, a rotation-restraining element having a tongue entering said notch, said tongue being formed with a bobbin-thread pocket, and a bobbin-thread pull-off device carried by said rotary hook body and acting on the bobbin-thread between said pocket and the throat-plate.

8. In a sewing machine, a reciprocating needle, a rotary hook having a cup-shaped body formed with an open-sided raceway, a bobbin-case journaled in said raceway and formed with a rotation-restraining notch, a bobbin-case retainer engaging the outer face of said bobbin-case and having a rotation-restraining tongue entering said notch, said tongue having a bobbin-thread pocket, and a bobbin-thread pull-off flange on said rotary hook body acting to deflect the bobbin-thread into said pocket during the pull-off action.

In testimony whereof, I have signed my name to this specification.

MARTIN HEMLEB.