ABSTRACT

The disclosure is broadly directed, in function, to an improved fastener-holding attachment whose purpose is to releasably integrate a fastener with its driving tool whereby the fastener becomes a rigid extension of the tool and may be driven without additional manual or other support.

This function is achieved through the use of gripping jaws sufficiently massive to insure their rigidity under all tool driving conditions in combination with jaw-closing camming means constantly biased toward a jaw-closing position which is irreversible in response to applied forces at the fastener.

The disclosure is specific, structurally, to the achievement of the foregoing through the use of a small profile attachment which requires only single-hand, single-finger manipulation to grip or release a fastener and, in a preferred embodiment, the incorporation of the foregoing into a removable, unit-handled attachment.

19 Claims, 15 Drawing Figures
FASTENER HOLDING ATTACHMENT

BACKGROUND OF THE INVENTION

Fastener-holding attachments applied to elongate fastener driving tools, such as screwdrivers, are commonly employed to position the fastener in driving relation to the tool where the fastener is to be driven in an inaccessible or relatively inaccessible location. Such attachments are not commonly employed where the fastener-driving location is readily accessible permitting manual support of the fastener during the driving operation for the reason that commercially available fastener-holding attachments are incapable of resisting the application of those lateral fastener-driving forces which are inevitably imparted by all but the most skilled artisans. Exemplary is the conventional screw-holding attachment consisting of a reciprocable sleeve mounted on a screwdriver shank and a pair of spring-steel fingers, spaced 180°, whose function is to engage the undersurface of a screw head and bias the same into driving engagement with the screwdriver bit. In the attempted use of such a fastener-holding attachment, the driving force must be applied to the fastener in pure compression or the screw simply pivots off the bit either by movement between the spring-steel fingers or by overriding the spring-steel bias if the resultant of lateral force application intersects the steel fingers. It is thus virtually impossible to make effective use of such commercial fastener attachments unless a pilot bore has been previously drilled. For this reason little attempt is made to employ such attachments except in truly inaccessible locations because, if the location is accessible, one hand must be used to steady the screw for initial workpiece penetration making redundant the use of the screw-holding attachment.

A detailed discussion of prior patented art relating to screw-holding attachments and their deficiencies particularly as regards ready manipulation of the attachment to grip and release a screw appears in applicant's prior U.S. Pat. No. 3,710,835 whose disclosure is herein incorporated by reference. While applicant's prior U.S. Pat. No. 3,710,835 introduced the concept of rigidly integrating the screw and screwdriver for use in most screw-driving applications, the particular construction of the same prohibits its use in those inaccessible locations where the use of a screw-holding attachment has always been required. Thus in the case of applicant's prior patent, the screw-holding attachment may only be released by two finger manipulation of the jaw-closing camming means at the bit end of the screwdriver. Accordingly, while applicant's prior patent opened up a range of use for accessible locations that was not previously practical, its inherent structure precludes its use in inaccessible locations. Furthermore, the exposed nature of the various biasing springs in applicant's prior patented structure is objectionable both from the standpoint of usage and esthetics; the former objection deriving from the normal storage area for screwdrivers where the springs become entangled with other tools.

A generally low-profile, sleeve-encased, screw-holding attachment is disclosed in U.S. Pat. No. 1,628,144, but the attainment of such low profile necessarily proscribes the achievement of a rigid integration of the screw and screwdriver for the reason that the finger manipulating mechanism inherently requires the light-gauge, sheet-metal-thickness stock therein described to retain the low profile. Thus the particular finger opening mechanism toward which U.S. Pat. No. 1,628,144 is directed employs relatively long finger elements fulcrummed intermediate their lengths and actuated, positively, to their open position by camming means at the upper end of the sleeve following a lost-motion movement prior to engagement of the respective cam surfaces. Such construction necessarily requires a relatively long lever arm between the fulcrum and cam surfaces which translates into magnified radial movement of the fastener-gripping arms at the ends thereof remote from the gripping ends. It is thus apparent that the use of other than a light gauge material would require the surrounding sleeve diameter to be appropriately increased to house the same. A far greater consequence of the light-gauge finger construction shown in U.S. Pat. No. 1,628,144 is that the fastener may simply pivot off the bit as a function of lateral-force application to the fastener. A further disadvantage in the latter prior patent that is overcome by the present invention is that in normal use the same the fastener-gripping fingers will always be opened to their greatest permissible extent which must, of necessity, be utilized to receive the largest screw to be employed thus rendering more difficult the insertion of smaller-headed screws.

A primary object of the invention is to combine the advantages of applicant's prior patented structure as regards rigid integration of fastener and driver with a low profile, single-finger actuating mechanism for opening and closing the jaws while avoiding the inherent disadvantages in prior structures directed to this latter end.

Functionally, the purpose is to place in the hands of carpenters, cabinet makers, et al. an attachment which will be advantageously used in both accessible and inaccessible locations as opposed to the prior use of such attachments for driving fasteners only in accessible locations.

SUMMARY OF THE INVENTION

A low-profile cylindrical sleeve is telescoped over the shank of an elongate driving tool in a radial movement relative thereto and houses the rear ends of a pair of rigid, fastener-gripping jaws which are fulcrummed for opening and closing movement immediately adjacent the rear ends thereof. The rear ends of the jaws are formed with cam surfaces coacting with jaw-opening cam means which continually bias the jaws toward an open position. The extent of jaw opening is positively limited at all positions of axial sleeve movement by camming means on the sleeve coacting with external cam surfaces on the jaws to define a jaw-opening control which is irreversible as a function of forces applied to the fastener but which is readily overridden by forward movement of the sleeve in opposition to the bias which constantly maintains the sleeve in position to oppose jaw-opening movement.

Stated functionally, upon forward movement of the sleeve against a resilient bias as may be performed with one finger, such as the thumb of the hand holding the tool, the jaws move both axially and radially of the tool with the radial movement of the same being a constant function of axial sleeve displacement with further radial movement of the jaws being positively limited as a function of the same sleeve movement so that for every position of the sleeve a fastener gripped thereby against
the driving end of the tool is positively gripped but may be readily released by forward sleeve movement against the aforesaid spring bias.

Inasmuch as the coating fulcrum surfaces between the jaws are immediately adjacent their rear ends the range of arcuate movement to be undergone thereby is relatively small thus permitting the use of jaws sufficiently massive to insure their rigidity while retaining the low-profile sleeve housing.

The greatest single advantage in the present attachment is its utter simplicity. Thus all the desired functions are achieved using basically nothing more than two jaws, two springs and a sleeve with the sleeve housing the entire assembly in low profile on the tool shank to present a compact, esthetically pleasing combination. Since the sleeve may be finger actuated to a jaw open position from its rear end a fastener may be readily released following a driving operation in an inaccessible location and, in a preferred embodiment, the attachment may be readily handled as a unit for ease of assembly with, and removal from, a tool. An important factor in the attainment of such simplicity is the novel use of a single spring to perform the dual functions of blasing the jaws toward an open position and, concomitantly, biasing the jaw-limiting cam means toward a jaw retaining or closing position. This eliminates the requirement for a third spring as in applicant's prior patent and permits of the more compact sleeve-encased structure.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a broken, isometric view of a preferred embodiment of the fastener-holding attachment assembled with a screwdriver;

FIG. 2 is a longitudinal section taken through the attachment of FIG. 1 showing the attachment in a nonuse condition;

FIG. 3 is a view similar to FIG. 2 illustrating the attachment with the jaws in an open, screw-receiving position;

FIG. 4 illustrates the screw-gripping position of the attachment following manual release of the sleeve from the position of FIG. 3;

FIGS. 5, 6 and 7 are cross-sectional views taken, respectively, along lines 5—5, 6—6 and 7—7 of FIG. 4;

FIG. 8 is a longitudinal section of a modified attachment illustrated in a nonuse condition;

FIGS. 9 and 10 are views similar to FIG. 8 illustrating the attachment in jaw-open and fastener-gripping positions, respectively;

FIG. 11 is an exploded side elevation of the fastener-gripping jaws illustrated in FIGS. 1—4;

FIG. 12 is a cross-sectional view taken along line 12—12 of FIG. 10;

FIG. 13 is a broken view, partly in elevation and partly in section, illustrating use of the fastener-holding attachment in combination with a nail-driving tool;

FIG. 14 is an enlarged view, partly in side elevation and partly in longitudinal section, of the fastener-holding attachment of FIG. 13; and

FIG. 15 is a cross-sectional view taken along line 15—15 of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 is illustrated a fastener-holding attachment 10 assembled with an elongate driving tool 12 compris-
lindrical camming surface 56 is irreversible with respect to jaw-opening forces applied at the forward ends of the jaws.

The rear end of attachment mounting sleeve 22 has secured thereto a threaded fitting 58 which terminates at its rear end in a smooth cam surface 60 interrupted by a plurality of longitudinal slots 62.

The foregoing completes the description of a unit handled fastener-gripping attachment which is assembled with screwdriver 12 by telescopic assembly of mounting sleeve 22 on tool shank 16 to the approximate position of FIG. 2. Releasable mounting means 64, which was previously assembled with shank 16, is thereafter threaded onto fitting 58 to anchor the attachment to the screwdriver by camming the slotted end of fitting 58 into wedging engagement with shank 16 via a coating camming surface 66 on releasable mounting means 64.

The operation of the attachment and the manner in which a screw may be readily held in, and released from, rigid integration with a screwdriver will be apparent from FIGS. 2-4. In FIG. 2, the attachment is shown in the nonuse condition wherein compression spring 38 reacts between tool shank 16, via releasable mounting means 64, fitting 58, sleeve 22 and abutment 34, and spring seats 36 to maintain jaws 20 in their rearwardmost position as defined by the engagement of jaw abutments 32 with end abutment 34. Sleeve 52 is resiliently biased to the rearward position of FIG. 2 by compression spring 46 reacting between the rearward ends of jaws 20 via washer 50 with the rearward extent of sleeve movement being limited by wedging engagement between the coating cam surfaces 28 and camming surfaces 56. It will be apparent that there is a constant jaw-opening bias applied to jaw-opening cam surfaces 48 by spring 46 which is limited by the coating cam surfaces 28 and camming surfaces 56. Thus, single spring 46 serves the concomitant dual function of biasing the jaws toward an open position and limiting the opening movement thereof as a function of the axial position of the sleeve.

When a screw is to be integrated with the screwdriver, the thumb or forefinger of the hand grasping handle 14 is employed to force sleeve 52 forwardly against the additive biases of springs 38 and 46. The effect is to induce a joint, differential forward movement of the jaws and sleeve which differential movement includes greater or lost-motion sleeve movement, taken up through spring 46, to move the camming surface 56 on sleeve 52 further outwardly along the inwardly tapered jaw cam surfaces 28 to the position of FIG. 3. Since spring 46 also exerts a jaw-opening movement via washer 50 and jaw-opening cam surfaces 48 which is now permitted by the outward movement of sleeve cam 56, the jaws open and a screw may be inserted as indicated in phantom lines in FIG. 3. The fact that there is a continual gradient of jaw-opening movement as a direct function of axial sleeve displacement is an important feature of the invention in that one hand, one-finger operation may be readily employed to open the jaws the precise amount to “feel” the proper placement and seating of the screw head on the bit and in recesses 26 before the sleeve is released to lock the screw in place. Following such screw placement the sleeve is released, spring 38 returns the jaws rearwardly for only that minute travel permitted by full seating of the screw slots on the bit while spring 46 returns the sleeve 52 rearwardly until such rearward movement is arrested by wedging engagement between jaw cam surfaces 28 and sleeve camming surface 56. Since the placement of the screw head 40 between jaws 20 radially displaces the forward jaw ends about pivot axis 44 the sleeve camming surface 56 is arrested in its rearward travel under the influence of spring 46 by wedging engagement with the jaw cam surfaces at a location forwardly of the normal nonuse position of the attachment as will be evident from a comparative inspection of FIGS. 2 and 4. More specifically, the axial location of the sleeve relative to the jaws in the fastener-gripping mode will always be a direct function of the diameter of screw head 40. Conversely, since the jaws are continually biased toward the open position at all sleeve locations the jaws may be opened the precise amount required to position or remove a fastener as a direct function of sleeve movement so that the same may be readily effected by single-finger movement with the tool-grasping hand.

With the screw fastener integrated with screwdriver 12 as illustrated in FIG. 4 one may actually hold the screwdriver by the handle and strike hammerlike blows with the exposed screw end without displacing the screw. Accordingly, it is apparent that one may make initial workpiece penetration without manually supporting the screw. Forceful, two-handed, compressive and rotative forces applied to the screwdriver handle result in workpiece penetration at a far greater rate than can be achieved by conventional one-handed penetration where the other hand is used to support the screw for commencing the screw driving operation.

Initial assembly of the attachment 10 is facilitated by forming the rear end of sleeve 52 with a screw-threaded, removable end wall 68 which, along with washer 50 and springs 38 and 46 are telescoped onto mounting sleeve 22 after which time fitting 58 is secured to sleeve 22 as by a weld 70 or the like. The separable jaws 20 are then positioned between washer 50 and spring 38 with their coating fulcrum surfaces 42 in bearing engagement and the rear end of sleeve 52 telescoped rearwardly over the jaws to the nonuse position of FIG. 2 whereupon sleeve end wall 68 is threaded into the end of the sleeve to complete the unit handled assembly which may then be assembled with a screwdriver through the intermediary of releasable mounting means 64 as already described without requiring any physical alteration of a conventional screwdriver.

The embodiment illustrated in FIGS. 8-10 and 12 differs from that of FIGS. 1-7 and 11 in that the removable mounting sleeve is eliminated thus permitting the establishment of a somewhat lower cylindrical profile but at the cost of the unit handled feature made possible by the use of such mounting sleeve.

The nonuse condition is illustrated in FIG. 8. In this embodiment a groove 72 is milled on screwdriver shank 74 to receive releasable mounting means herein disclosed in the form of a snap ring 76. Snap ring 76 performs the function of the abutment 34 in the first embodiment in transmitting the reaction of jaw-return compression spring 78 to tool shank 74 and limiting the rearward movement of jaws 80 to the position of FIG. 8. The jaws 80 are substantially identical to the jaws 20, previously described, in both function and structure except for the particular design of the jaw-opening cam surfaces 82 at the rearward ends thereof. Cam surfaces 82 are generally concave to coact with the convex cam
surface 84 formed at the forward end of an annular plastic plug 86 continually biased into jaw opening camming engagement with the jaws by compression spring 88. The manually manipulable sleeve 90 includes a rigid rear end wall 92 and a removable screw-threaded plastic fitting 94 received within the front end of sleeve 90. The removable plastic fitting 94 provides the cylindrical camming surface 96, similar to the previously described camming surface 56, to coat with jaw cam surfaces 98.

The manner of using the fastener-holding attachment 100 shown in FIGS. 8–10 and 12 is the same as described in connection with attachment 10 except that the particular square-cross-sectional shank 74 makes possible the attainment of one additional advantage when the attachment is mounted to the shank via snap ring 76 rather than a mounting sleeve. Through the use of a square-cross-sectional opening 102 in the end wall 92 of sleeve 90 it is possible to grasp the screwdriver by the handle with one hand and by the sleeve 90 with the other hand to impart additional driving torque to the tool.

In the assembly of attachment 100 with a screwdriver, sleeve 90 is first telescoped over the shank followed by spring 88 and plug 86. The jaws are then assembled with their coacting fulcrum bearing surfaces in bearing engagement with spring 78 and snap ring 76 positioned in recesses 106. This jaw assembly is then telescoped over the bit end of the screwdriver until the end abutments 108 of recesses 106 forcibly cam snap ring 76 into locking engagement with groove 72. The plastic fitting 94 is then threaded into the forward end of sleeve 90 to complete the assembly.

In FIGS. 13–15 is illustrated the use of a fastener-holding attachment 110 with an elongate impacting tool for driving a nail. The attachment 110 is substantially identical to the previously described attachment 10 except that the extreme forward ends of gripping jaws 112 are milled to provide opposed V slots 114, best shown in FIG. 15, to grip and center a nail shank.

The elongate tool shown in FIG. 13 comprises a rearward driving or impacting end 116 provided with a hand grip portion 118, an intermediate shank 120 and a forward driving end 122 terminating in a nail driving anvil 124.

Attachment 110 is assembled with shank 120 in the same manner as described for the assembly of attachment 10 with screwdriver 12. Forward movement of sleeve 126 opens jaws 112 for the insertion of a nail with the head 128 thereof received in jaw recesses 130 and the nail shank 132 centered and gripped by the opposed V slots 114. Following release of the sleeve, the nail is now integrated with the elongate impacting tool.

The driving end 116 of the impacting tool is telescopically received within the hollow handle 134 of a hammer 136 including a claw head 138 which is preferably of all-metal construction. The nail may be driven by grasping handle portion 118 in one hand and delivering repeated impacts to the tool by reciprocation of hammer 136 in the directions indicated by the double headed arrow 140. One great advantage of the use of the attachment for driving nails is that the shank may be made quite long to permit one to stand while driving a nail at a lower location. The rigid integration of the fastener and tool cannot be overstressed from the standpoint of functional utility since nails can be driven using the present invention without having to use one hand to hold the nail for initial penetration. Exemplary of the substantial advancement represented by the present invention is the nailing of quarter rounds into position adjacent a floor and wall. As anyone knows who has ever attempted this task it is a most formidable one. The quarter rounds are only made from hard woods and relatively long nails must be driven in at an angle against a convex outer surface while the person attempting such task must kneel, hold the nail and try to avoid striking his elbow on the wall while driving the nail. With the present invention, which can of course accept finishing nails, the installer can use an impacting tool which is several feet long. He can then stand holding the nail and tool at the desired angle to the quarter round and impact the top of the tool from a standing position by grasping hammer head 138 and reciprocating the same against the driving end 116 of the tool to quickly drive the nail. The advantage in forming the impacting tool in the form of the conventional hammer is obvious in that the same may be separately used in a conventional fashion.

It is, of course, obvious that the attachment herein disclosed may be used to drive fasteners other than those herein specifically illustrated. Exemplary is the use of such an attachment to convert a screwdriver into a wrench whereby, upon no further modification than an alteration of the arcuate fastener-head-engaging recesses to include flat-fastener-engaging surfaces, the attachment may be used to grip a nut or bolt.

I claim:

1. In combination with an elongate tool having a rearward driving end, a shank and a forward fastener-engaging end, a fastener-holding attachment telescoped on said shank; said fastener-holding attachment comprising jaw-control means and rigid, fastener gripping jaws concentrically mounted on said shank adjacent said fastener-engaging end for axial and radial movement relative thereto; the exterior and interior surfaces of said jaws including cam surfaces and fastener-engaging recesses, respectively, adjacent the forward gripping ends thereof and coacting fulcrum surfaces adjacent the rearward ends thereof; said jaw-control means comprising a sleeve mounted for limited axial movement between jaw-open and jaw-closed positions in outer telescoping relation to said jaws; said jaw-control means further including resiliently biased means coacting with said sleeve for constantly biasing the outer ends of said jaws radially outwardly about said coacting fulcrum surfaces and, concomitantly, positively limiting the radially outward movement of said jaws at all positions of axial sleeve movement to define a substantial jaw-opening gradient throughout the full range of axial sleeve movement; said resiliently biased means including biasing means for commonly opening said jaws and in cooperation with said sleeve limiting the radially outward movement thereof; and camming means carried by said sleeve for coacting engagement with the cam surfaces on said jaws providing the limit on the outward movement of said jaws.

2. The combination of claim 1 including cam surfaces on the rearward ends of said jaws; said resiliently biased means including jaw-opening cam means mounted within said sleeve for axial movement relative thereto; and said common biasing means interacting between said sleeve and said jaw-opening cam means for exerting a jaw-opening bias on said jaws and, concomitantly,
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exerting a jaw-closing bias on the camming means carried by said sleeve.

3. The combination of claim 2 wherein said common biasing means comprises a first compression spring interacting between said jaw-opening cam means and the rearward end of said sleeve.

4. The combination of claim 3 including releasable mounting means supporting said fastener-holding attachment on said elongate tool shank and limiting the rearward movement of the same; and a second compression spring interacting between said tool shank through said releasable mounting means, and the rearward portions of said jaws forwardly of said fulcrum surfaces biasing said jaws rearwardly against the opposed bias of said first compression spring.

5. The combination of claim 4 wherein one end of said sleeve comprises a removable end wall for permitting the removable, telescopic assembly of said sleeve with the remainder of said fastener-holding attachment.

6. The combination of claim 5 wherein said removable sleeve end is at the rearward end of said sleeve and in engagement with the rearward end of said first compression spring.

7. The combination of claim 6 wherein said fastener-holding attachment comprises a mounting sleeve removably secured to said shank by said releasable mounting means in inner spaced relation to said first named sleeve.

8. The combination of claim 5 wherein said removable sleeve end wall is at the forward end of said sleeve and comprises said camming means carried by said sleeve.

9. The combination of claim 8 wherein said tool shank comprises a polygonal cross section extending through a geometrically similar opening in the rear end wall of said sleeve whereby rotative driving torque may be imparted to said tool through said sleeve.

10. The combination of claim 8 wherein said releasable mounting means comprises a snap ring anchored to said shank.

11. The combination of claim 1 wherein said rearward driving end comprises an impact surface; and an impacting element adapted for reciprocal, telescopic movement on the driving end of said tool for impacting the same.

12. The combination of claim 11 wherein the forward fastener-engaging end of said tool comprises a flat surface for driving engagement with a nail head; and said fastener-engaging recesses in said jaws include arcuate recesses rearward of the extreme forward ends of said jaws for engaging a nail head and generally V-shaped recesses at the extreme forward ends of said jaws for engaging a nail shank.

13. The combination of claim 12 wherein said impacting element comprises a hammer, having a hollow handle telescoped over the rearward driving end of said elongate tool for impacting the same.

14. The fastener-holding attachment adapted to be mounted on the shank of an elongate tool having a forward fastener-engaging end and a rearward driving end, comprising: a sleeve adapted to be mounted on said shank in outer, spaced, concentric relation thereto; rigid fastener-gripping jaws having rearward ends telescopically received within said sleeve and forward fastener-engaging ends extending outwardly of said sleeve; the exterior and interior surfaces of said jaws including cam surfaces and fastener engaging recesses, respectively, adjacent the forward gripping ends thereof; said jaws including coating fulcrum surfaces adjacent the rearward ends thereof; jaw-closing camming means on the forward end of said sleeve; jaw opening camming means internally of said sleeve; biasing means commonly biasing said sleeve rearwardly of said jaws and moving said jaw-closing camming means on said sleeve into jaw-closing engagement with the cam surfaces on said jaws and, concomitantly, biasing said jaw-opening camming means into jaw opening engagement with jaw-opening cam surfaces on the rearward ends of said jaws; jaw-return biasing means mounted internal of said jaws and concentric with said common biasing means for biasing said jaws rearwardly in opposition to the bias of said common biasing means.

15. The attachment of claim 14 including releasable mounting means for mounting said fastener-holding attachment to the shank of an elongate tool.

16. The attachment of claim 15 wherein said common biasing means comprises a compression spring reacting between the rearward end of said sleeve and said jaw-opening cam means.

17. The attachment of claim 16 including a removable mounting sleeve in inner, spaced, telescopic relation to the first-named sleeve; said removable mounting sleeve being adapted for outer, telescopic engagement with a tool shank and including an end abutment at the forward end thereof; and said jaw-return biasing means comprising a compression spring reacting between said end abutment and a spring seat formed internal of said jaws and forward of said fulcrum surfaces.

18. The attachment of claim 16 wherein said sleeve comprises a polygonal opening in the rear end wall thereof for the telescopic receipt of a similarly configured tool shank whereby rotative torque may be applied to the tool shank via said sleeve.

19. The attachment of claim 16 wherein said gripping jaws include V-shaped slots intersecting said fastener-engaging recesses and extending forwardly thereof to the extreme forward ends of said jaws for gripping and centering a nail shank; and said fastener-engaging recesses including arcuate slots for gripping the periphery of a nail head in conjunction with the nail-shank gripping action.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.: 3,901,298
DATED: August 26, 1975
INVENTOR(S): JOHN B. EBY

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In column 2, line 36, "et al" should read --etc.--.
In column 2, line 38, "accessible" should read --inaccessible--.
In column 4, line 15, "recesses" should read --recessed--.
In column 10, line 2, "The" should read --A--.
In column 10, line 24, "internal" should read --internally--.
In column 10, line 42, "internal" should read --internally--.

Signed and Sealed this
sixth Day of January 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks