A typical construction, showing a yieldable knob catch in cooperation with a spindle and door knob which employs a spindle cap which is interposed between the outside end of the spindle and the inside face of the knob, has been disclosed in Patent No. 3,196,644.

Among the objects of the invention is to provide a new and improved means for closing clearances between moving parts in the mounting of a handful on a spindle so that there is no feeling of looseness remaining when the handful is manipulated.

Another object of the invention is to provide a new and improved means for yieldably holding a spindle cap in snug engagement with the handful, the yieldable means being particularly simple and entirely concealed within the construction and, at the same time, to press a knob catch into firm engagement with the handful and the spindle, thereby to minimize any looseness.

With these and other objects in view, the invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a longitudinal sectional view of one form of the invention.

FIGURE 2 is a cross-sectional view on the line 2-2 of FIGURE 1.

FIGURE 3 is a longitudinal sectional view of another form of the invention.

FIGURE 4 is a cross-sectional view on the line 4-4 of FIGURE 5.

FIGURE 5 is a longitudinal sectional view of still another form of the invention with a different type of spring.

FIGURE 6 is a cross-sectional view on the line 6-6 of FIGURE 5.

FIGURE 7 is a longitudinal view of the application of the spring of FIGURE 5 to a different combination of parts.

In an embodiment of the invention chosen for the purpose of illustration, there is shown a fragment of door 10 in which is mounted a bearing 11 comprising part of a substantially conventional lock mechanism (not shown) which is mounted in the door 10. A rossette 12 is shown overlying the door 10, the rossette 12 being held in place by employment of a collar 13 which is in threaded engagement with the bearing 11. A tubular spindle 14 is rotatably mounted within the bearing 11 and is normally in operative engagement with the latch unit (not shown), and is a means used for manipulating the latch unit.

A handle 15, here having the form of a door knob, has an outer hand engaging portion 16 and a neck 17. The hand engaging portion 16 encompasses an outer free end 18 of the tubular spindle 14, and the neck 17 is in concentric relationship with the tubular spindle 14 but, in the embodiment shown, spaced from it by the thickness of the bearing 11.

To hold the knob in nonrotatable engagement on the tubular spindle 14, use is made of a knob catch 19 which extends through two diametrically aligned openings 20 in the wall of the tubular spindle 14 and through an aligned opening 21 in the neck 17. An arcuate leaf spring 22 partially surrounds the outer wall of the tubular spindle 14 and bears against a shoulder 23 of the knob catch 19, whereby to urge the knob catch 19 outwardly into its position of engagement, from which it can be depressed by a simple tool such as a screwdriver.

A spindle cap 25 has a pocket 26 therein, and an annular shoulder 27 which overlies the outer free end 18 of the tubular spindle 14. A blind recess 28 on an inside surface 29 of the hand engaging portion 16 accommodates a complementary projection 30 on the spindle cap 25. In the form of the invention of FIGURES 1 and 2, a coiled spring 31 is located inside of the tubular spindle 14 with its outer end bearing against an inside surface 32 of the spindle cap 25 and having its other end pressing against the outer face of the knob catch 19.

Arranged in this fashion, the coiled spring 31 performs a double function, namely, that of pressing the spindle cap 25 into snug engagement with the hand engaging portion 16, either at the bottom of the blind recess 28 or by having a shoulder 33 press against the inside surface 29 and, at the same time, that of urging the face on the opposite side of the knob catch 19 into engagement with the adjacent side of the aligned opening 21 in the neck 17 and the adjacent side of the openings 20 of the tubular spindle 14, so that there is an engagement which is free of end-play. Accordingly, the coiled spring 31 thereby serves to inhibit any rattling which might be occasioned by an otherwise necessary looseness due to clearances between the parts affected.

In the form of invention of FIGURES 3 and 4, a handful in the form of a knob 35 having the customary neck 36 is provided with a hole 37 through the face of the knob 35. An opening 38 in the neck 36 accommodates the customary knob catch 19. In this form of device, a spindle cap 39 has a passage 40 therethrough in axial alignment with the hole 37. A flange 41 fits inside of the hole 37, and a shoulder 42 is adapted to bear against an inside face 43 of the knob 35. An oppositely facing shoulder 44 is adapted to face a free end 45 of the tubular spindle 14. In this instance, an end edge 46 of a skirt 47 on the spindle cap 39 serves as a keeper for a spring 48. The opposite end of the spring 48 bears against a ring 49 which, in turn, presses against the adjacent face of the knob cap 19. In this form, the spring 48, extending as it does around the exterior of the tubular spindle 14, is larger in diameter and, instead of bearing directly against the knob catch 19, bears against the ring 49 which distributes the pressure of the spring 48 evenly on opposite ends of the knob catch 19, as shown. The spring 48, although slightly shorter than the coiled spring 31 of FIGURE 1, can be made sufficiently strong to force the spindle cap 39 into engagement with the knob 35 in one
direction and force the knob catch 19 in an opposite di-
rection, so that it bears snugly against the adjacent side of
the opening 38 in the neck 56 and against the adjacent side
of opening 20 in the cylinder housing 21. By hav-
ing the spring 48 on the outside of the tubular spindle
14, all room is left within a bore 50 of the tubular spindle
14 to accommodate a button-actuated or key-actuated
mechanism (not shown).

In the form of invention of FIGURES 5, 6 and 7, a
slightly different form of spring is employed and adapted
to cooperate with spindle caps 55, as shown in FIGURE
5, and 55', as shown in FIGURE 7, of slightly different
configuration.

In FIGURE 5, a knob 56 having a neck 57 is adapted
to be nonrotatably attached to the spindle 14 by the knob
catch 19, in the same manner as has been described in
connection with FIGURES 1 through 4, inclusive. In a
face 58 of the knob 56 is a hole 59 which accommo-
dates the spindle cap 55. In this instance, the spindle cap
55 has a cutout 60 to accommodate a pin tumbler cham-
ber 61 being an extension of a cylinder housing 62 which
accommodates a conventional key-actuated mechanism
and which is inserted into and substantially fills the outer
end of the spindle 14. A suitable slot 63 is provided for
the pin tumbler chamber 61, an inner end 64 of which
abuts an end 65 of the slot 63. An aperture 66 in the
spindle cap 55 accommodates a cylinder plug head 67.

In this instance, a specially constructed, substantially
annular spring 70, with a cutout 71 on one side, is re-
ceived in a recess 72 of the spindle cap 55 with a rela-
tively snug fit, providing a frictional engagement be-
tween the outside perimeter of the spring 70 and the wall
of the recess 72, thus keeping the spring 70 from falling out
during assembly. The spring 70 has a somewhat undulant
shape, such that inwardly projecting, raised portions 73
bear against an end edge 74 of the spindle 14 and out-
wardly directed raised portions 75 bear against a bot-
tom 76 of the recess 72.

The spring 70, acting as described in an endwise or
axial direction, outwardly against the spindle cap 55 and
inwardly against the edge 74 of the spindle 14, serves to
impress the spindle cap 55 snugly against the inside wall
of the knob face 58. The pressure thus created tends also
to move the knob 56 and its neck 57 outwardly relative
to the spindle 14, and this action draws the neck 57 of
the knob 56 endwise against the knob catch 19, making
that engagement also snug in an endwise direction. Simul-
taneously, this action also transfers from the knob catch
19 to the spindle 14, thereby also making a snug engage-
ment for those parts.

In the form of invention of FIGURE 7, the cylinder
housing 62 and related parts forming a key-actuated
mechanism as described in connection with FIGURE 5
is omitted, and there is substituted in its place a turn
button 80, the turn button 80 being secured in a substan-
tially conventional manner to a turn shaft 81 which sub-
stantially fills the interior of the spindle 14. The same
spring 70 is usable in this form of device, wherein raised
portions 73 bear against the edge 74 of the spindle
14 and oppositely directed raised portions 75 bear out-
wardly against a bottom 76 of a recess 72' in the spindle
cap 55. Action of the spring 70 is somewhat more clearly
discernible in FIGURE 6, wherein the movement of the
spring 70 outwardly against the spindle cap 55' causes it
to bear against the inside of the end face 58 of the knob,
which in turn moves the knob 56 and the neck 57 out-
wardly whereby to bring an inside edge of a hole 82 in
the neck 57 into engagement with the knob catch 19,
which movement in turn transfers to the knob catch 19
and hence outwardly against the spindle 14. This move-
ment is countered by the raised portions 73 of the spring
70 bearing against the edge 74 of the spindle 14.

By having an annular spring of the general configura-
tion of the spring 70 provided as described, the entire
central portion of the spindle 14 can be left clear for any
mechanism which might need to be contained within it or
extend through it. At the same time, the spring bears
actively, directly and indirectly, against the parts of the
device which need to be urged into snug relationship.

Where there is no need to keep the interior of the
spindle 14 clear, the form of invention shown in FIGURES
1 and 2 is suitable. Where there is a need to keep the in-
terior of the spindle 14 clear, the form of invention of
FIGURES 3 and 4 is more suitable. This form, like the
form of FIGURES 5, 6, and 7, leaves the inside of the
spindle 14 clear. The form of invention of FIGURES 5
and 6 is especially valuable where there needs to be some
projection, such as the pin tumbler chamber, projecting
beyond the outside circumference of the spindle.

While the invention has herein been shown and de-
scribed in what are conceived to be practical and effec-
tive embodiments, it is recognized that departures may be
made therefrom within the scope of the invention, which
is not to be limited to the details disclosed herein, but is
to embrace any and all equivalent devices.

Having described the invention, what is claimed as new
in support of Letters Patent is:

1. In a door lock a spindle member, a handhold mem-
ber having a hollow neck thereon encircling said spindle
member, a spindle cap element between said members
and formed with a bearing surface engaging said handhold
member, means forming aligned openings respectively in
said spindle member and said neck, said spindle member
including a knob catch extending through said openings
and holding said handhold member in nonrotatable
engagement with said spindle member, and yeldable means
acting between said knob catch and another portion of
said spindle member yieldably holding said knob catch in
genengagement with said neck and an expansion spring act-
ing in an axial direction between said spindle cap ele-
ment and said spindle member, whereby to snugly main-
tain said cap element in engagement with said handhold
member.

2. A device as claimed in claim 1, including a recess in
said handhold, said spindle cap element extending into
said recess and over said spindle, said spindle cap ele-
ment being in engagement with said handhold.

3. A device as claimed in claim 1, wherein said spring
is located between said spindle member and said spindle
cap element in a position acting at one end thereof against
said spindle cap element and at the other end thereof against
said spindle member, whereby to resiliently urge said
spindle cap element against said handhold member and
to resiliently urge said handhold member axially
against said means for holding said handhold member in
said nonrotatable engagement with said spindle member.

4. A device as claimed in claim 1, wherein a portion
of said spindle cap element engages a recess which is a
blind hold on the inside of said handhold member.

5. A device as claimed in claim 1, wherein said spin-
dle cap element and an inside portion of said handhold
member both have openings therethrough in alignment
with the interior of said spindle assembly.

6. A device as claimed in claim 1 wherein the expan-
sion spring is an accurately extending spring located
between an end edge of said spindle member and an
inside surface of said cap element.

7. A device as claimed in claim 1 wherein said cap ele-
ment has an annular skirt encircling an outer end portion
of said spindle member, said expansion spring compris-
ing a coiled spring acting between said catch and said
cap element.

8. A device as claimed in claim 1 wherein said cap ele-
ment has an annular skirt encircling an outer end portion
of said spindle member, said expansion spring compris-
ing a coiled spring acting between said spindle member
and said skirt.
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