April 27, 1965 J. KHACHIGIAN 3,179,965

DRILLING AND THREADING ATTACHMENT

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Fig. 1.

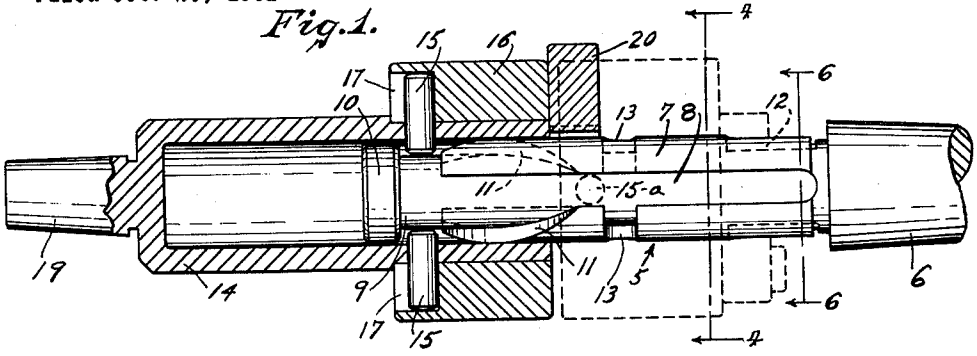


Fig. 2.

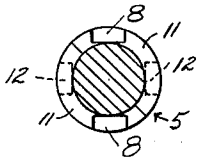


Fig. 3.

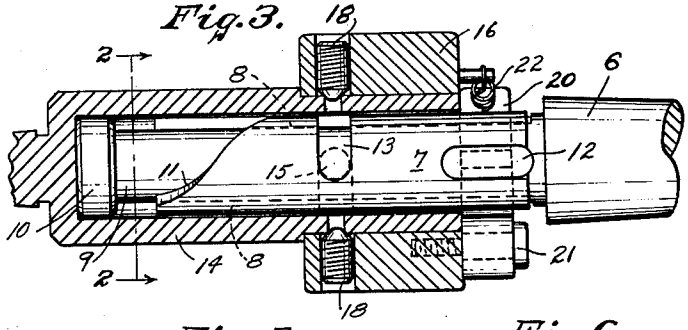


Fig. 4.

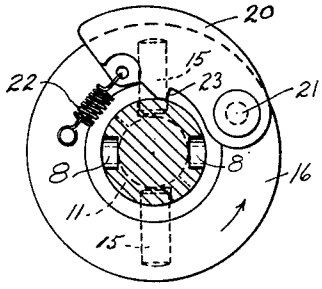


Fig. 5.

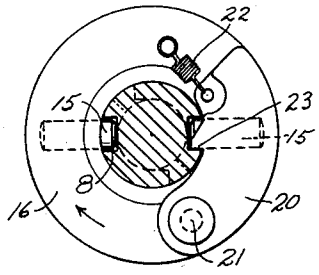


Fig. 6.

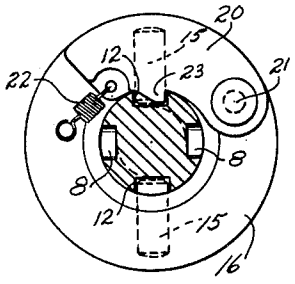
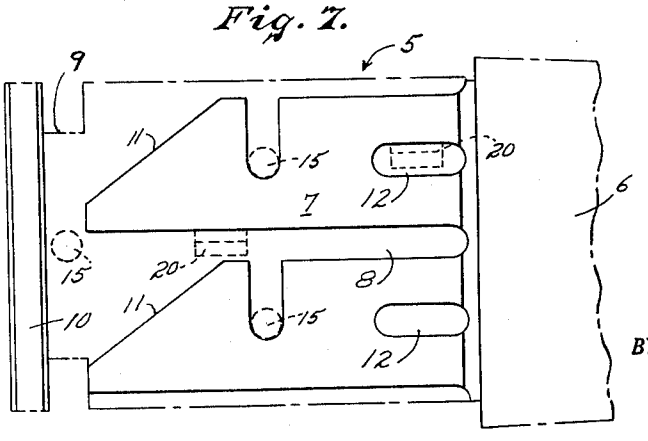


Fig. 7.



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DRILLING AND THREADING ATTACHMENT

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Fig. 8.

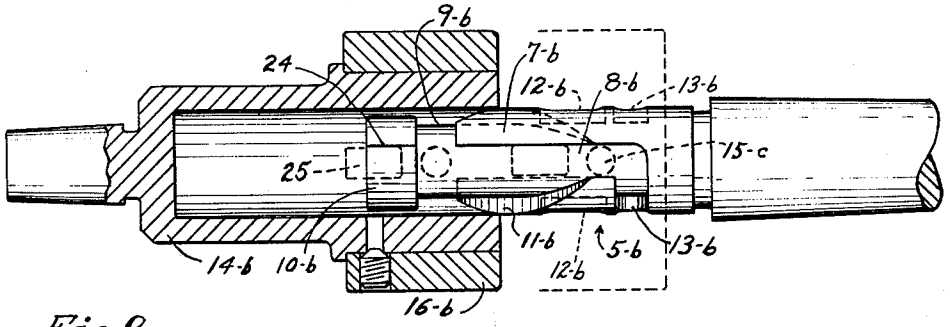


Fig. 9.

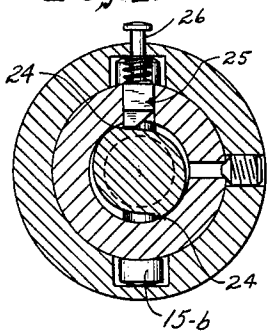


Fig. 10.

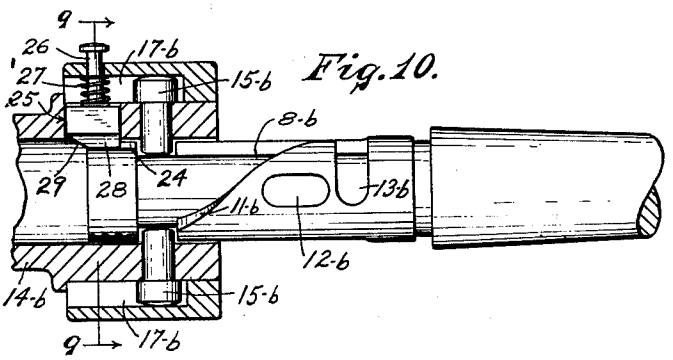


Fig. 11.

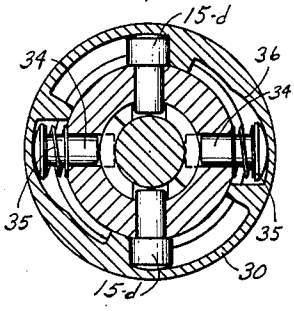


Fig. 12.

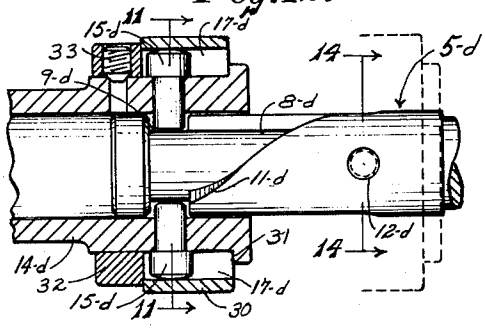


Fig. 13.

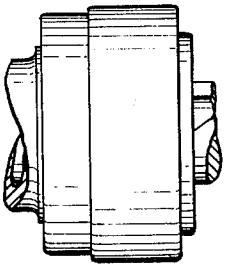


Fig. 14.

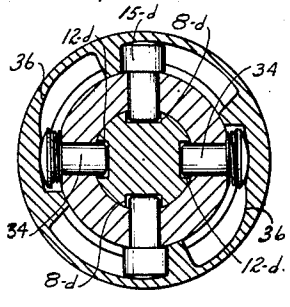
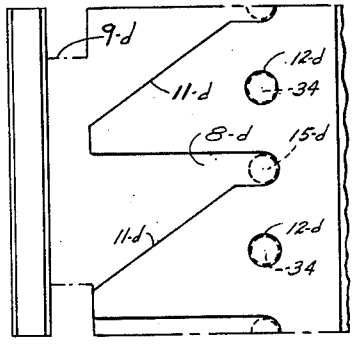


Fig. 15.



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3,179,965

DRILLING AND THREADING ATTACHMENT

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9 Claims. (Cl. 10—129)

This invention relates to a drilling and threading attachment for lathes and the like, and more particularly to a device for use in lathes and similar machines for holding a drill, tap or die for drilling or threading a workpiece.

The present invention provides certain improvements in the device disclosed and described in my co-pending application Serial No. 686,175, filed September 25, 1957, U.S. Letters Patent No. 3,011,185, issued December 5, 1961, which improvements facilitate the operation and use thereof.

It is a primary object of the present invention to provide certain novel improvements in the drilling and threading attachment described in my said co-pending application in order to obviate the requirement of manually adjusting the carrier member thereof with respect to its spindle as heretofore required to remove the tap from a workpiece in threading operations.

It is a further object of the present invention to provide a highly efficient, smoothly operating drilling and threading attachment for lathes and the like which is of simple construction, is convenient to use and is economical to manufacture.

It is a still further object of the present invention to provide certain novel improvements in drilling and threading attachments to increase the operational efficiency thereof by minimizing the amount of manual adjustment required in the operation thereof.

It is a still further object of the present invention to provide a drilling and threading attachment capable of rapid separation of the tool from the work, following an operation thereon.

It is another object of the present invention to provide a drilling and threading attachment which requires no preliminary training or experience in the operation thereof.

Further objects and advantages of this invention will be more clearly understood from the following description and the accompanying drawings in which:

FIG. 1 is a plan view, partly in central vertical section, of a device embodying the present invention.

FIG. 2 is a sectional end view of the spindle of said device taken on line 2—2 of FIG. 3.

FIG. 3 is a view similar to FIG. 1 but showing the carrier member of the device in retracted position on the spindle.

FIG. 4 is a sectional end view taken on line 4—4 of FIG. 1.

FIG. 5 is a sectional end view taken along substantially the same line as FIG. 4 but showing the operation of the device when the carrier member is rotated in reverse direction.

FIG. 6 is a sectional end view taken on line 6—6 of FIG. 1 and showing the position of the parts when the carrier member is retracted upon the spindle and locked thereto for drilling operations.

FIG. 7 is a diagrammatic view illustrating the peripheral surface of said spindle laid flat.

FIG. 8 is a plan view, partly in central vertical section showing a modified form of my invention.

FIG. 9 is a sectional end view of said modified form on line 9—9 of FIG. 10.

FIG. 10 is a fragmentary elevational view, partly in central vertical section, of the device of FIG. 8.

FIG. 11 is a sectional end view of a further modified form of my invention, taken on line 11—11 of FIG. 12.

FIG. 12 is a fragmentary elevational view, partly in central vertical section, of said further modified form of my invention.

FIG. 13 is a fragmentary elevational view of the device of FIG. 12.

FIG. 14 is a sectional end view, on line 14—14 of FIG. 12, with the carrier member positioned as shown in broken lines and locked to the spindle for a drilling operation.

FIG. 15 is a diagrammatic view illustrating the peripheral surface of the spindle of the device of FIG. 12 laid flat.

As illustrated in the drawings, the numeral 5 denotes a spindle having a tapered shank 6 with a body portion 7 extending therefrom. The said body portion is formed to provide elongated, longitudinal grooves 8—8 in diametrically opposed sides thereof terminating at the forward end thereof in an annular groove 9 adjacent to a head portion 10 at the forward end of the body 7. The forward portions of the opposite sides of the grooves 8—8 (the lower side of the front groove and the upper side of the rear groove in FIG. 1) are helical, as shown at 11—11, and lead toward the head end of the spindle for a purpose to be hereinafter described.

In the form of my invention shown in FIGS. 1 through 7, diametrically opposed, longitudinal, locking grooves 12—12 are also provided intermediate the said grooves 8—8 as shown in FIG. 2. Circumferential receiving grooves 13—13 extend perpendicularly from said grooves 8—8 and terminate in alignment with the lower edges of the grooves 12—12.

A carrier member 14, in the form of a sleeve, is slidably and rotatably mounted on the body portion of the spindle and has a pair of diametrically opposed pins 15—15 projecting radially through the walls thereof which are adapted to be received by the grooves in said body portion. Said pins are retained in operative position in the carrier member 14 by means of a collar 16 having notches 17—17, as best shown in FIG. 1, to receive the outer ends thereof. Set screws 18—18, shown in FIG. 3, secure said collar to the carrier member. At the forward end of said carrier member, there is provided a tapered, axial projection 19 which extends forwardly therefrom and is adapted to receive a conventional chuck or die holder.

In accordance with the objects of this invention, the carrier 14 is provided with a suitable pawl 20 which is pivotally mounted upon the carrier member at 21 and biased in the direction of the spindle 5 by a spring 22 to urge a detent 23 on said pawl inwardly toward the spindle 5. As shown in FIGS. 4, 5 and 6, the detent 23 is aligned longitudinally with one of the pins 15—15 and will be urged into one of the longitudinal grooves 8—8 or 12—12 in said spindle, as shown in FIGS. 5 and 6, when the pins 15—15 are positioned in alignment therewith.

My improved device may be used with equal convenience and efficiency in the spindle of a drill press as well as in the spindle or tail stock of a lathe. When used in the tail stock of a lathe, the shank 6 of the spindle 5 is inserted thereinto and a conventional chuck (not shown) is mounted upon the projection 19.

When it is desired to perform a drilling operation in a workpiece, a drill bit is mounted in the chuck and the carrier member 14 is manually moved rearwardly upon the body portion 7 of the spindle 5 to the limit of its travel wherein said carrier member is prevented from further rearward movement by the head portion 10 of said spindle. With the carrier member so positioned, the pins 15—15, located in the grooves 8—8, are aligned with the circumferential grooves 13—13. By rotating the said carrier

member 90° in a counter-clockwise direction upon the spindle 5 when viewed from FIGS. 4 through 6 into the position shown in FIGS. 3 and 6, the pins 15—15 pass into the grooves 13—13 and abut the ends thereof, and the detent 23, rotated into alignment with a locking groove 12, is urged into engagement therewith by the spring 22. In this position the carrier member 14 is prevented from rotating relatively to the spindle 5 by engagement of the pins 15—15 with the ends of the grooves 13—13 and engagement of the detent 23 with the side of the said locking groove 12 as in FIG. 6. Axial movement of the carrier on the spindle is prevented by the engagement of the pins 15—15 with the sides of the grooves 13—13. To complete the drilling operation, the tail stock of the lathe may be advanced or retracted relatively to the workpiece for advancing or withdrawing the drill bit in the conventional manner.

To thread the hole in the workpiece, the drill bit is moved from the chuck and replaced by a suitable tap, and the carrier member 14 is unlocked from the spindle 5 by manually pivoting the pawl 20 against the tension of the spring 22, into the position shown in FIG. 4, to disengage the detent 23 from the side of the groove 12 whereby the said carrier member may be rotated in a clockwise direction to return the pins 15—15 into the grooves 8—8, with the said detent also being urged into one of said diametrically opposed grooves 8—8.

The carrier is axially adjusted on the spindle to position the pins 15—15 in the grooves 8—8 as indicated in dotted lines at 15–*a* in FIG. 1, and the tail stock is advanced to the workpiece until the end of the tap is flush with the end of the hole therein. When the tail stock is locked in this position, the tap is started into the hole in the rotating workpiece by manually pushing the carrier member axially on the spindle in the direction of the workpiece until the tap starts to cut.

As the tap threads into the hole, the carrier member 14 will be pulled endwise on the spindle and will also tend to rotate in the same direction as the workpiece. This will thrust the pins 15—15 against the helical surfaces 11—11 of the grooves 8—8 and cause the carrier member to be forced forwardly on the spindle 5 and thereby greatly reduce the objectionable pull on the tap resulting from the friction between the pins 15—15 and the sides of the grooves 8—8 if such grooves were straight.

When the hole in the workpiece is threaded for the full predetermined distance, the pins 15—15 will ride off the forward end of said helical surfaces 11—11 into the annular groove 9, whereupon the carrier member 14 will rotate freely with the workpiece and the threading operation is completed.

To withdraw the tap, the workpiece is merely rotated in the opposite, or clockwise, direction, as viewed in FIG. 5, causing the detent 23 to be urged into engagement with the straight side of one of the grooves 8—8 opposite the helical side thereof and to axially slide therealong retaining said carrier member against rotation with the workpiece and guiding the pins 15—15 into said grooves for engagement with the straight sides thereof. As the tap moves axially out of the threaded hole, the carrier member will be guided for axial movement along the spindle by engagement of the pins 15—15 with the straight sides of the grooves 8—8.

It will be noted that with the improved form of my invention when the rotation of the workpiece is reversed to withdraw the tap therefrom it is not necessary to move the spindle forwardly by operation of the tail stock until the pins 15—15 engage the straight sides of the grooves 8—8. By merely reversing the direction of rotation of the workpiece, the detent 23 engages the straight side of one of the grooves 8—8 and both the carrier member and tap are prevented from rotating relatively to the spindle. The pins 15—15 are guided into the grooves 8—8 and the carrier is moved axially along the spindle as the tap is withdrawn from the threaded hole.

In the modified form of my invention shown in FIGS. 8 to 10, the spindle 5–*b* is formed to provide elongated, longitudinal grooves 8–*b*—8–*b* in diametrically opposed sides thereof terminating at the forward end thereof in an annular groove 9–*b* adjacent to a head portion 10–*b* at the forward end of the body 7–*b*. The forward portions of the opposite sides of the grooves 8–*b*—8–*b* are helical, as at 11–*b*—11–*b*, and as in the form of my invention shown in FIGS. 1 through 7. The said grooves 8–*b*—8–*b* terminate at the rear end thereof in circumferential receiving grooves 13–*b*—13–*b* which extend perpendicularly therefrom and terminate in alignment with the lower edges of diametrically opposed, longitudinal locking grooves 12–*b*—12–*b* spaced intermediate the grooves 8–*b*—8–*b*. The said head portion 10–*b* of the spindle 5–*b* is formed with diametrically opposed, longitudinal teeth 24—24 longitudinally aligned with said grooves 8–*b*—8–*b*, as shown in FIGS. 9 and 10.

The carrier member 14–*b* has a pair of diametrically opposed pins 15–*b*—15–*b* projecting radially through the wall thereof adapted to be received by the grooves 8–*b*—8–*b*. A collar 16–*b* is mounted upon said carrier member to retain said pins in operative position and is provided with notches 17–*b*—17–*b* to receive the outer ends of said pins.

A slidable pawl 25 is mounted for radial movement in said carrier member 14–*b* in longitudinal alignment with one of said pins 15–*b*, and is formed with a stem 26 extending radially outwardly therefrom as shown in FIG. 9. A spring 27 surrounds said stem and biases the pawl radially inwardly towards the spindle 5–*b*. The said pawl is formed with bevelled portions at 28 and 29 for a purpose to be hereinafter described.

To use the modified form of my improved device shown in FIGS. 8 through 10 in a drilling operation, it is merely necessary to manually slide the carrier member 14–*b* rearwardly upon the spindle with the said pins 15–*b*—15–*b* engaging the straight sides of the grooves 8–*b*—8–*b*, to the limit of its travel wherein the said pins engage the ends of the grooves 8–*b*—8–*b*. By rotating the carrier member in a clockwise direction as viewed from FIG. 9, the pins 15–*b*—15–*b* enter the receiving grooves 13–*b*—13–*b*, and the pawl 25 will be lifted out of the respective groove 8–*b* against the bias of the spring 27 by the bevel portion 28. As the said pins engage the ends of the receiving grooves 13–*b*—13–*b*, the said pawl will be rotated into alignment with a locking groove 12–*b* and urged thereinto by the said spring 27. In this position the carrier member is prevented from rotating relatively to the spindle by engagement of the pins 15–*b*—15–*b* with the ends of the grooves 13–*b*—13–*b* and by engagement of the pawl 25 with the side of a groove 12–*b*. Axial movement of the carrier with respect to the spindle is prevented by engagement of the pins 15–*b*—15–*b* with the sides of the grooves 13–*b*—13–*b*.

When the drilling operation is completed and it is desired to unlock the carrier member, the pawl 25 is manually withdrawn from the locking groove 12–*b* by pulling radially outwardly on the stem 26 and rotating the carrier member in a counter-clockwise direction with respect to FIG. 9.

To thread a hole in a workpiece, the threading operation itself is completed with my modified form shown in FIGS. 8 through 10 in much the same manner as with the form of my device disclosed in FIGS. 1 through 7. However, as the carrier is drawn forwardly on the spindle by the tap, the bevel portion 29 lifts the pawl 25 onto the annular surface of the head portion 10–*b* against the bias of the spring 27 as the pins 15–*b*—15–*b* ride off the forward end of the helical surfaces 11–*b*—11–*b* and into the annular groove 9–*b* as shown in FIGS. 9 and 10 wherein the said pawl and carrier will rotate freely in a clockwise direction over the teeth 24—24 with the pins 15–*b*—15*b* in the annular groove 9–*b*.

To withdraw the tap, the workpiece is rotated in the

opposite, or counter-clockwise direction, causing the straight side of the pawl to engage one of the teeth **24** as shown in FIG. 9, retaining said carrier member against rotation with the workpiece and aligning the pins **15**–*b*—**15**–*b* with the grooves **8**–*b*—**8**–*b*. As the tap is withdrawn, the pawl **25** guides the carrier member rearwardly until the pins **15**–*b*—**15**–*b* enter the grooves **8**–*b*—**8**–*b* when said pawl will slide off the head portion **10**–*b* and enter a groove **8**–*b*. When the pins **15**–*b*—**15**–*b* reach the position indicated in dotted lines at **15**–*c* as in FIG. 8, the tap is fully withdrawn from the threaded hole and the threading operation is completed.

In the further modified form of my invention shown in FIGS. 11 through 15, the spindle **5**–*d* is formed to provide elongated, longitudinal grooves **8**–*d*—**8**–*d* in diametrically opposed sides thereof having helical side portions **11**–*d*—**11**–*d*, as in the forms of my invention disclosed in FIGS. 1 through 10. Diametrically opposed locking recesses **12**–*d*—**12**–*d* are provided intermediate said grooves **8**–*d*—**8**–*d* and are circumferentially aligned with the ends thereof as shown in FIG. 15.

The carrier member **14**–*d* is provided with diametrically opposed pins **15**–*d*—**15**–*d* projecting radially through the wall thereof and adapted to be received by the grooves **8**–*d*—**8**–*d* in the spindle **5**–*d*. A collar **30** is rotatably mounted upon said carrier member and has notches **17**–*d*—**17**–*d* formed therein to receive the outer ends of the pins **15**–*d*—**15**–*d*. The said collar **30** abuts an annular flange **31** formed on the said carrier member **14**–*d* and a locking ring **32** retains said collar **30** against said flange for rotational movement upon said carrier member, as shown in FIG. 12. Said ring is secured to the carrier member by means of a locking screw **33**.

Diametrically opposed locking pins **34**—**34** are slidably mounted in the carrier member **14**–*d* intermediate the pins **15**–*d*—**15**–*d* and circumferentially aligned therewith. Said pins **34**—**34** are adapted to extend radially through said carrier member and into the said locking recesses **12**–*d*—**12**–*d* when positioned in register therewith. Springs **35**—**35** are provided for normally biasing said locking pins **34**—**34** outwardly of the said recesses, as shown in FIG. 11, in a retracted, inactive position. The retaining collar **30** is provided with diametrically opposed cam surfaces **36**—**36** formed internally therein and adapted for engagement with said pins **34**—**34** for a purpose to be later defined.

To use the further modified form of my invention shown in FIGS. 11 through 15 for drilling operations, the carrier member is moved rearwardly on the spindle in the same manner as with the other forms of my improved device as herein described for the full extent of its travel wherein the pins **15**–*d*—**15**–*d* engage the ends of the grooves **8**–*d*—**8**–*d*. In this position of the carrier on the spindle, the pins **34**—**34** will be in register with the locking recesses **12**–*d*—**12**–*d*, as shown in FIG. 12 in broken lines. By rotating the collar **30** in a clockwise direction as viewed from FIG. 11, the cam surfaces **36**—**36** will urge the said locking pins **34**—**34** radially inwardly into said aligned locking recesses, as shown in FIG. 14, to thereby lock the carrier member to the spindle for rotation therewith and also to prevent relative axial movement therebetween. To release the carrier member from its locked position on the spindle, the collar **30** is rotated in the opposite direction to the position shown in FIG. 11, permitting the springs **35**—**35** to withdraw the said pins **34**—**34** from the locking recesses.

If desired, the said modified form of my invention shown in FIGS. 11 through 15 may be provided with the teeth **24**—**24** and the pawl **25** of the form of my attachment shown in FIGS. 8 through 10, for automatically guiding the pins **15**–*d*—**15**–*d* into the grooves **8**–*d*—**8**–*d* when the rotation of the workpiece is reversed for withdrawing a tap therefrom during a threading operation as previously described.

While I have shown and described certain preferred

embodiments of my improved drilling and threading attachment, it will be understood that modifications and changes may be made without departing from the function and scope thereof, as will be clear to those skilled in the art.

I claim:

1. In an attachment of the character described, a spindle including a body portion having in its peripheral surface a longitudinal groove and an annular groove at the forward end of said longitudinal groove communicating therewith, a carrier member axially slidable and rotatable on said body portion over said grooves, a pin projecting from said carrier member and movable in said grooves, said longitudinal groove having a spiralled side portion leading to said annular groove and engageable by said pin to cause forward axial movement of said carrier member in response to a rotational force applied thereto in a direction to urge said pin against said spiralled side portion, said pin being adapted to pass from said spiralled side portion into said annular groove to release said carrier member for free rotation relatively to said spindle in the direction of said force, and means carried by said attachment and operable upon the application of a rotational force to said carrier member in the opposite direction for non-rotatably and slidably connecting said carrier member to said spindle in a position wherein said pin is disposed in alignment with said longitudinal groove to permit rearward sliding movement of said carrier member on said body portion.

2. An attachment as set forth in claim 1 wherein said longitudinal groove is formed with a straight side opposite said spiralled side and said connecting means include a pawl pivotally mounted on said carrier member and engageable with said straight side.

3. An attachment as set forth in claim 1 wherein said spindle has a head portion adjacent to the said annular groove and said connecting means include a pawl slidably mounted on said carrier member in alignment with said pin and an abutment on said head portion slidably engageable by said pawl for aligning said pin with said longitudinal groove when said carrier member is urged to rotate in said opposite direction relatively to the spindle.

4. An attachment as set forth in claim 1 wherein said connecting means include a pawl movably mounted on said carrier member, and abutment means on said body portion engageable by said pawl.

5. In an attachment as set forth in claim 4, the improvement comprising: separate abutment means on said body portion selectively engageable by said pawl and said pin for locking said carrier member thereto.

6. The subject matter set forth in claim 5 wherein said separate abutment means include a receiving groove in said body portion for receiving said pin to prevent axial movement of said carrier member relatively to said spindle, and a locking recess in said body portion engageable by said pawl to prevent rotation of said carrier relatively to said spindle.

7. In an attachment of the character described, a spindle including a body portion, a carrier member axially slidable and rotatable on said body portion and means for locking said carrier member to said body portion to prevent movement of said carrier member relative to said spindle including a projection extending radially from said carrier member, a locking member carried by said carrier member for movement between locking and unlocking positions and separate abutment means on said body portion selectively engageable by said projection and said locking member for locking said carrier member to said spindle.

8. The subject matter set forth in claim 7 wherein said separate abutment means include a lateral receiving groove in the body portion adapted to receive said projection, the engagement of the projection with the lateral groove preventing relative axial movement between the carrier member and the body portion and the engagement of the projection with the end of the lateral groove pre-

venting relative rotational movement in one direction between the carrier member and the body portion, and a locking recess engageable by the locking member to prevent relative rotational movement between the carrier member and the body portion in an opposite direction.

9. In an attachment of the character described, a spindle having a body portion formed with at least one longitudinal groove therein and an annular groove at the forward end of the longitudinal groove communicating therewith, a carrier member supported on the body portion for axial and rotary movement relatively thereto, a projection extending from the carrier member and selectively engageable with the walls of said grooves, said longitudinal groove having one side wall spiraled towards the annular groove engageable by said projection to urge the carrier member forwardly in response to a rotational force applied thereto in a direction to urge said projection against the spiral side wall, said projection being adapted to pass from said spiral side wall into said annular groove to permit unrestricted relative rotary movement between the carrier member and the body portion to prevent further forward axial movement of the carrier member relative to the body portion, the improvement comprising: means carried by said attachment operatable upon the application of a rotational force in an opposite direction to the carrier member for nonrotatably and slideably connecting the carrier member to the body portion for axial sliding movement relatively thereto in a rearward direction; said means comprising an abutment extending from said body portion, a pawl carried by the carrier member and which is engageable with said abutment upon rotation of the carrier member in said opposite direction, a head portion formed on said body portion forwardly of the annular groove, and an axially extending abutment on said head portion engageable by said pawl to position said projection in alignment with said longitudinal groove to permit sliding movement of the carrier member on the body portion.

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