A lock module for locking a tool to a tool holder

A lock module for locking a tool to a tool holder, the lock module comprising a body; at least one wing projecting laterally from a side of the body and lying on a first plane for engagement to the tool holder; at least one lock member slidably supported in the body, the lock member being actuable to extend from the body in a direction substantially orthogonal to the first plane to a lock position for engagement to the tool holder; and an abutment member supported in the body to move between a first position and a second position, the abutment member being in abutting engagement with the lock member wherein movement of the abutment member to the second position extends the at least one lock member to the lock position.
Description

Technical Field

[0001] This disclosure relates to the field of workstations for assembly production. In particular, this disclosure relates to locking of tools for setting up of workstations for assembly production.

Background

[0002] A workstation may comprise a tool to be connected and locked to a tool holder. The locking of a tool to a tool holder in a secure manner is critical for the preparation of a workstation for assembly production. The positioning of the tool relative to the tool holder and other tools is also essential for proper production operations. The relative position of the tools may need to be accurately monitored down to the order of millimetres.

[0003] Assembly production may include a series of workstations arranged in an assembly row. In the production of blister packages, there may be tools that are specific for each type of blister package. In order to produce different blister packages some tools may need to be replaced with the tools having the required specification. The time required to replace tools has a direct impact on the overall production times. There are a variety of methods for locking a tool to a tool holder. Overall production times may be reduced if a tool can be replaced with minimal effort and time.

[0004] EP2292409 discloses a tool holder to which a tool may be attached. The tool holder has three stop surfaces lying in three planes that are perpendicular to each other and a lock pin that can be lowered into the base body of the tool holder and extended from it. The lock pin can be introduced into a receptacle in the tool and comprises a slanted active contact surface defining a fourth plane. At extension of the lock pin, a force component is exerted toward each of the three stop surfaces to lock the tool.

[0005] The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of the prior art system.

Brief Summary of the Invention

[0006] In a first aspect, the present disclosure describes a lock module for locking a tool to a tool holder. The lock module comprises a body. At least one wing projects laterally from a side of the body and lies on a first plane for engagement to the tool holder. At least one lock member is slidably supported in the body and the lock member is actuable to extend from the body in a direction substantially orthogonal to the first plane to a lock position for engagement to the tool holder. An abutment member is supported in the body to move between a first position and a second position, the abutment member being in abutting engagement with the lock member wherein movement of the abutment member to the second position extends the at least one lock member to the lock position.

Detailed Description

[0007] The foregoing and other features and advantages of the present disclosure will be more fully understood from the following description of various embodiments, when read together with the accompanying drawings, in which:

Fig. 1 is a side view of a tool comprising the lock module according to the present disclosure;
Fig. 2 is a sectional view of the tool of Fig. 1 through the line II-II;
Fig. 3 is an isometric view of the lock module according to the present disclosure;
Fig. 4 is a plan view of the lock module according to the present disclosure;
Fig. 5 is a sectional view of the lock module of Fig. 4 through the line V-V;
Fig. 6 is a sectional view of an abutment member and a lock member through line VI-VI according to the present disclosure.

[0008] This disclosure generally relates to a lock module 14 for locking a tool 10 to a tool holder. This disclosure also relates to a tool 10 comprising the lock module 14.

[0009] With reference to Fig. 1, a tool 10 may comprise a tool module 12 and a lock module 14. The tool module 12 may be coupled to the lock module 14. The tool module 12 and the lock module 14 may be coupled through a mechanical connection.

[0010] The tool 10 may be attached to a tool holder through the lock module 14 for setting up a workstation. The tool 10 may be assembled through insertion of the lock module 14 into a tool holder. The tool 10 may be locked to a tool holder by the lock module 14 after insertion thereof into the tool holder. The tool holder may have guides for receiving the lock module 14.

[0011] In an embodiment, the tool 10 may be used in production operations in the pharmaceutical industry. The tool 10 may be used in the production of blister packages.

[0012] Fig. 2 illustrates a sectional view of the tool 10. Lock module 14 may be coupled to the tool module 12 through bolts 11. The coupling points may be positioned at opposite ends of the lock module 14. The lock module 14 may form the base plate of the tool 10. Lock module 14 may have a form and dimensions that are suitable for coupling to the tool module 12.

[0013] Fig. 3 illustrates an isometric view of the lock module 14. The lock module 14 may comprise a body 16. Body 16 may be suitably adapted for supporting tool 10. The body 16 may have coupling portions 24 posi-
tioned at opposite ends of the lock module 14. The coupling portions may have a contact surface 25 onto which corresponding portions of the tool module 12 may be supported. Each coupling portion 24 may have an aperture 26 through which the shank of bolt 11 may project and extend into the corresponding coupling portions of the tool module 12. The head of the bolts 11 may be retained in cavities which are in the coupling portions 24 and in communication with the apertures 26.

[0014] The body 16 may have a stop portion 28 at an end of the lock module 14. The stop portion 28 may extend from one of the coupling portions 24. In an embodiment, the body 16 may be provided with a pair of stop portions 28 projecting from opposite sides of the coupling portion 24. The stop portions 28 may extend in a direction substantially perpendicular to the longitudinal axis of the body 16. The stop portions 28 may limit the insertion of the lock module 14 into the corresponding tool holder provided with guides that abut against the stop portions 28.

[0015] The lock module 12 may have a wing 18. The wing 18 may project laterally from a side 17 of body 16 to form a shoulder 19. The wing 18 may project in a direction substantially perpendicular to the longitudinal axis of the body 16. The wing 18 may be disposed such that shoulder 19 is spaced from the contact surfaces 25 of the coupling portions 24. The surface opposite the shoulder 19 may be planar with the surface of the body 16 opposite the contact surface 25.

[0016] The wing 18 may extend along the entire length of side 17 of body 16. In an embodiment, the wing may extend along a portion of side 17.

[0017] An end of wing 18 may be joined to the stop portion 28 such that shoulder 19 is perpendicular to the stop portion 28. The opposite end of wing 18 may have an insertion end 21. The insertion end 21 may be bevelled such that the shoulder 19 has a reduced surface area.

[0018] With reference to Fig. 4, the lock module 14 may have a pair of wings 18 projecting laterally from opposite sides 17 of body 16. The wings 18 may lie on a first plane. The longitudinal axis of body 16 may be parallel to the first plane.

[0019] With reference to Figs. 3 and 4, the lock module 14 may comprise plungers 34. The plungers may be positioned at side 17 of body 16. Plungers 34 may be disposed at the coupling portions 24 between the shoulder 19 and the contact surface 25. The plungers 34 may be accommodated within cavities in the body 16. Springs may be disposed in the cavities to provide a biasing force on the plungers 34 so that the plungers 34 are biased outwards from the cavities. The spring-loaded plungers 34 provide a biasing force exerted laterally from the body 16. The biasing force of the plungers 34 may be exerted on guides of the tool holder.

[0020] In an embodiment, the lock module 14 may comprise a pair of additional plungers on the opposite side 17 of the body 16. The additional plungers may be laterally aligned with the plungers 34. The biasing force of the additional plungers may be exerted on opposite guides of the tool holder.

[0021] The body 16 may have a housing portion 30 with a void 32. The housing portion 30 may be centrally positioned on the body 16. Void 32 may be suitably shaped and dimensioned to accommodate the means for actuating the lock mechanism of the lock module 14. The void 32 may be bounded by side walls and floor of the housing portion 30. The void 32 may be covered by a cover plate 31 which is bolted to the body 16.

[0022] The lock mechanism may further comprise an abutment member 20. The abutment member 20 may be movably supported in the body 16. The abutment member 20 may be supported so as to rotate relative to the body 16. The abutment member 20 may be plate-like. Opposite ends of abutment member 20 may be narrower relative to the central portion 41 thereof. At an end the abutment member 20 may have an aperture portion 40 joined to the central portion 41 and a base portion 42 joined to the central portion 41 at the opposite end.

[0023] Abutment member 20 may be supported by a hub 36. Hub 36 may project substantially perpendicular from the body 16 relative to the longitudinal axis thereof. Hub 36 may project substantially orthogonal to the first plane. Hub 36 may be a tubular projection of the floor of the housing portion 30 extending into the void 32.

[0024] The abutment member 20 may have a hole disposed at the central portion 41 through which the hub 36 may be connected. A bushing 38 may be positioned on the hub 36 and supported on the floor of the housing portion 30. Bushing 38 may be rotatably mounted to the hub 36. The abutment member 20 may be engaged to the bushing 38 in order to be rotatably supported about the hub 36. The abutment member 20 may be supported at the hub 36 so as to be parallel to the wing 18. The abutment member 20 may be supported at the hub 36 so as to lie in a second plane that is parallel to the first plane.

[0025] Abutment member 20 may rotate between a first position and a second position. Abutment member 20 may rotate along the second plane. The narrower apex portion 40 and base portion 42 relative to the central portion may facilitate the rotation of the abutment member 20 within the void 32.

[0026] Abutment member 20 may oscillate between a first position and a second position. Abutment member 20 may oscillate along the second plane. The narrower apex portion 40 and base portion 42 relative to the central portion may facilitate the oscillation of the abutment member 20 within the void 32.

[0027] The oscillation of abutment member 20 may be restricted by limit elements 44. Limit elements 44 may be disposed within the void 32 and around the abutment member 20. The limit elements 44 may be positioned in correspondence with the apex portion 40 and base portion 42. A pair of limit elements 44 may be positioned at opposite sides of the abutment member 20 and at the junction of the apex portion 40 and central portion 41. A
A pair of limit elements 44 may be positioned at opposite sides of the abutment member 20 and at the junction of the base portion 42 and central portion 41.

[0028] The limit elements 44 may be disposed radially from the hub 36. The limit elements 44 may be equidistant from the hub 36. At the first position abutment member 20 may contact a first set of diagonally opposite limit elements 44. At the second position abutment member 20 may contact a second set of diagonally opposite limit elements 44.

[0029] In an embodiment, the limit elements 44 may be pins mounted to the floor of the housing portion 30. The limit elements 44 may retain the cover plate 31 onto the housing portion 30. The limit elements 44 may be mounted so that the first and second planes are substantially perpendicular to the limit elements 44.

[0030] The abutment member 20 may be provided with grooves 45 into which the limit elements 44 may be accommodated. The grooves 45 may extend through and laterally into the abutment member 20.

[0031] Abutment member 20 may have a lever 46 which extends from the base portion 42. The lever 46 may extend from a segment of the base portion 42. The lever 46 may extend in a direction opposite to the apex portion 40 and along the second plane. The lever 46 may have a longitudinal axis oblique to the longitudinal axis of the abutment member 20.

[0032] In an embodiment, the lever 46 may be arched relative to the base portion 42 of the abutment member 20. The lever 46 may have an arcuate shape.

[0033] Lever 46 may have a portion contiguous with the base portion 42 of the abutment member 20. Opposite to the contiguous portion, lever 46 may have an abutment portion 50. The abutment portion 50 may have a rounded edge. Rounded edge may be extend in a direction along the second plane and perpendicular to the longitudinal axis of the abutment member 20.

[0034] With reference to Fig. 5, abutment member 20 may have a camming boss 52. In an embodiment, camming boss 52 may be formed by a cutaway of the abutment member 20.

[0035] Camming boss 52 may protrude from the abutment member 20 in a direction substantially perpendicular to the second plane. With the abutment member 20 mounted to the hub 36 the camming boss 52 may protrude in a direction towards the floor of the housing portion 30. The camming boss 52 may protrude in a direction towards the first plane.

[0036] With reference to Fig. 6, the camming boss 52 may have a camming surface 54 inclined relative to the abutment member 20. Camming surface 54 may be inclined relative to the surface from which the camming boss 52 protrudes. Camming surface 54 may be inclined relative to the second plane. Camming surface 54 may have an end contiguous with the abutment member 20 and a free end opposite. Camming surface 54 may substantially face towards the second position to which abutment member 20 may move.

[0037] The camming boss 52 may have a connection surface 56 inclined relative to the camming surface 54. Connection surface 56 may extend from the free end of the camming surface 54 into the abutment member 20. Connection surface 56 may be parallel relative to the surface from which the camming boss 52 protrudes.

[0038] In an embodiment, connection surface 56 may be inclined relative to the surface from which the camming boss 52 protrudes.

[0039] In an embodiment, the abutment member 20 may have a plurality of camming bosses 52. With the abutment member 20 mounted to the hub 36 the camming bosses 52 may be positioned radially from the hub 36. The camming bosses 52 may be disposed on the apex portion 40 and the base portion 42 of the abutment member 20.

[0040] The abutment member 20 may have three camming bosses. A first camming boss 52 may be positioned on the apex portion 40. The second and third camming bosses 52 may be positioned at the base portion 42. The second and third camming bosses 52 may be mutually spaced in correspondence with opposite sides of the base portion 42.

[0041] Oscillation of the abutment member 20 between the first and second positions effects a corresponding transition of the camming bosses 52. The camming bosses 52 may transit between two terminal points. The terminal points may correspond to the first and second positions of the abutment member 20. The transition path of the camming bosses 52 may be parallel to the first plane and to the second plane. The transition path of the camming bosses 52 may be shaped as arcs.

[0042] With reference to Fig. 5, the lock mechanism may comprise at least one lock member 23. The lock member 23 may be slidably supported in the body 16. The lock member 23 may be actuable to extend from the body 16. The lock member 23 may be moved to a lock position along a direction substantially orthogonal to the first plane. The lock member 23 may be moved in a direction away from the first plane. The lock member 23 may be moved in a direction away from the wings 18.

[0043] With the abutment member 20 mounted to the hub 36, the lock member 23 may be moved in a direction away from the second plane. The lock member 23 may be moved in a direction away from the abutment member 20.

[0044] The lock member 23 may have a rod portion 58 connected to a collar portion 62. A head portion 60 may be connected to the collar portion 62 opposite the rod portion 58. The collar portion 62 may be interposed between the head portion 62 and the rod portion 58.

[0045] The collar portion 62 may have a cross-section that is greater than the cross-section of the head portion 60. The rod portion 58 may have a smaller cross-section relative to the collar portion 62. In an embodiment, the collar 62 may have a diameter greater than the diameter of the head portion 60. The rod portion 58 may have a smaller diameter relative to the collar portion 62.
With reference to Fig. 6, the head portion 60 may have a contact surface 64 for engaging camming surface 54. Contact surface 64 may be formed on head portion 62 opposite to the collar portion 62. Contact surface 64 may be inclined relative to the longitudinal axis of the lock member 23. Contact surface 64 may be inclined relative to the second plane. The angle of inclination of the contact surface 64 relative to the second plane may be the same as the angle of inclination of the camming surface 54 relative to the second plane. Contact surface 64 may substantially face towards the first position of the abutment member 20.

Body 16 may be adapted to accommodate the lock member 23. Body 16 may have a hole 65 in the floor of housing portion 30. The hole 65 may have a recess 66 and a channel 70.

The recess 66 may be adapted to accommodate the collar portion 62 of the lock member 23. The collar portion 62 may slidably move in the recess 66. A biasing element 68 may be disposed in the recess 66 between the collar portion 62 and the floor of the recess 66. The biasing element 68 may encircle the rod portion 58. In an embodiment, the biasing element 68 may be a coil spring.

The biasing element 68 may exert a biasing force on the collar portion 62 to push the lock member 23 towards the floor of the housing portion 30. The biasing element 68 may exert a biasing force on the collar portion 62 to push the lock member 23 towards the abutment member 20. The biasing element 68 may urge the lock member 23 into a retracted position relative to body 16.

The channel 70 may be connected to the recess 66. The channel 70 may have an opening at the recess 66 and an opening on the body 16 for communication to the exterior of the body 16. The channel 70 may be adapted to accommodate the rod portion 58 of the lock member 23. The rod portion 58 may slidably move in the channel 70.

With the lock member 23 in the fully retracted position an abutment end 59 of the rod portion 58 does not protrude beyond the channel 70. The abutment end 59 may be flush with the surface of body 16. With the lock member 23 in the fully extended position the abutment end 59 of the rod portion 58 may protrude beyond the channel 70. The abutment end 59 may protrude beyond the surface of the body 16 at the lock position of the lock member 23.

The movement of the abutment member 20 from the first position to the second position along the second plane may push the lock member 23 away from the second plane and the camming surface 54 may be forced against the contact surface 64. The movements of the abutment member 20 and the lock member 23 are indicated by the arrows in Fig. 6.

As camming surface 54 is forced against the contact surface 64 the surfaces 54, 64 may slide relative to each other so as to push the lock member 23 into the hole 65. The lock member 23 may move against the biasing force exerted by the biasing element 68 so as to compress the biasing element 68 within the recess 66.

The lock module 14 may comprise a plurality of lock members 23 each provided in respective hole 65. Each lock member 23 may have respective contact surface 64 to engage a respective camming surface 54 provided on the abutment member 20. The lock members 23 may be disposed radially from the hub 36 in correspondence with the camming bosses 52 of the abutment member 20.

In an embodiment, the lock module 14 may have three lock members 23. A first lock member 23 may be positioned in correspondence with the apex portion 40 of the abutment member 20. The second and third lock members 23 may be positioned in correspondence with the base portion 42 of the abutment member 20. The second and third lock members 23 may be mutually spaced in correspondence with opposite sides of the base portion 42.

The lock module 14 may comprise an actuation member 22 that is engaged to the abutment member 20. Actuation of the actuation member 22 may move the abutment member 20 from the first position to the second position.

The actuation member 22 may comprise a handle 76 connected to a threaded rod 74 through a connecting rod 72. The actuation member 22 may be connected to the lock module 14 through the threaded rod 74. The threaded rod 74 may be mounted to the housing portion 30.

The housing portion 30 may have a bracket element 80 to receive the threaded rod 74. The bracket element 80 may extend from the housing portion 30 in a direction perpendicular to the longitudinal axis of body 16 and away from the first plane. The bracket element 80 may be dimensioned greater than the side walls of the housing portion 30 so as to support the actuation member 22. Threaded rod 74 may be mounted such that the longitudinal axis of the actuation member 22 may be perpendicular to the longitudinal axis of the body 16. The longitudinal axis of the actuation member 22 may lie on the second plane of the abutment member 20.

The threaded rod 74 may extend through the bracket element 80 into the void 32. The threaded rod 74 may be in contact with the abutment member 20. Threaded rod 74 may be in contact with the lever 46 of the abutment member 20. Threaded rod 74 may be in contact with the abutment portion 50.

Threaded rod 74 may be held in the bracket element 80 so that the actuation member 22 may be movable relative to the body 16. Threaded rod 74 may be rotatable relative to the bracket element 80. The actuation member 22 may be actuated so as to rotate the threaded rod 74 relative to the bracket element 80.

The handle 76 may be manually actuated so as to move connecting rod 72 towards the bracket element 80 of the body 16. The movement of the connecting rod 72 may effect a rotation of the threaded rod 74 through
the bracket element 80 to abut the abutment portion 50. Continued actuation of the handle 76 may push the abutment member 20 from the first position to the second position.

[0062] The movement of the abutment member 20 from the second position to the first position may be effected by rotating the handle 76 so as to withdraw the connecting rod 72. The withdrawal of the connecting rod 72 may effect a counter rotation of the threaded rod 74 relative to the bracket element 80.

[0063] In an embodiment, the mechanism may be activated by rotation of the actuation member 22 relative to the body 16. The mechanism may be deactivated by rotation of the actuation member 22 in the opposite direction relative to the body 16.

[0064] The lock module 14 may comprise a mechanism to hold the actuation member 22 in the actuated position so as to retain the abutment member 20 at the second position. The mechanism may be activated by rotation of the actuation member 22 such that the actuation member 22 moves in a direction towards the body 16. The mechanism may be deactivated by rotation the actuation member 22 in an opposite direction such that the actuation member 22 moves in a direction away from the body 16.

[0065] In an embodiment, the actuation member 22 may be held in a position by the threaded rod 74 interacting with a complementary threaded portion in the bracket element 80. The holding mechanism is activated or deactivated by the screwing of the threaded rod 74 in the bracket element 80.

[0066] The lock module 14 may be operated as described in the foregoing description. The lock module 14 may be connected to the tool module 12 through mechanical connections. The tool 10 may be attached to a tool holder through the lock module 14.

[0067] The lock module 14 may firstly be inserted into a tool holder having at least one guide which connects with the at least one wing 18 of the lock module 14. In an embodiment, the tool holder may have two guides disposed on opposite sides to connect with wing 18. The lock module 14 may be inserted into the tool holder up to point of abutment of the stop portion 28 with the end of the guides of the tool holder.

[0068] After the lock module 14 is completely inserted into the tool holder actuation member 22 may be actuated so that the threaded rod 74 may push against the abutment member 20. The abutment member 20 may be moved from the first position to the second position along the second plane by the actuation member 22. The abutment member 20 may oscillate about the hub 36 from the first position to the second position.

[0069] As the abutment member 20 transits from first position to the second position the camming surface 54 of the camming boss 52 may push against the contact surface 64 of the lock member 23. The camming surface 54 may slide against the contact surface 64 to push the lock member 23 away from the second plane against the biasing force of the biasing element 68. The biasing element 68 may be compressed due to the movement of the lock member 23. The lock member 23 may be moved to the lock position at which rod portion 58 may be fully extended from the body 16 and the abutment end 59 may engage a surface of the tool holder.

[0070] The lock member 23 may exert a force against the surface of the tool holder so that the shoulder 19 of wings 18 are held against the guides of the tool holder. The force between the wings 18 and the guides may be equal and opposite to the force between the abutment end 59 and the tool holder.

[0071] In an embodiment, the abutment member 20 may slide against the contact surfaces 54 of the camming bosses 52 against the contact surfaces 64 of the lock members 23.

[0072] The tool 10 may be locked in the tool holder by the pressing action of the lock member 23 and the wings 18 against the surface and the guides, respectively, of the tool holder.

[0073] The lock members 23 may be held in the lock position by retaining the abutment member 20 at the second position through the holding mechanism. The actuation member 22 may be retained in the bracket element so as to hold the abutment member 20 at the second position.

[0074] The tool 10 may be detached from the tool holder by firstly actuating the actuation member 22 so as to be released from the holding mechanism. Without the actuation member 22 holding the abutment member 20 at the second position, the abutment member 20 may be free to return to the first position.

[0075] The biasing force of the biasing element 68 may force the lock member 23 to return from the lock position. The movement of the lock member 23 towards the second plane may force the contact surface 64 against the camming surface 54 so as to oscillate the abutment member 20 from the second position to the first position.

[0076] With the abutment member 20 at the first position and the lock member 23 returned to the original position, the tool 10 may be removed from the tool holder. The lock module 14 may be extracted from the tool holder.

[0077] The skilled person would appreciate that foregoing embodiments may be modified or combined to obtain the lock module 14 and the tool 10 comprising the lock module 14 of the present disclosure.

Industrial Applicability

[0078] This disclosure describes a lock module 14 for locking a tool 10 to a tool holder. The lock module 14 may enable the tool 10 to be efficiently attached to the tool holder. The lock module 14 enables the tool 10 to be effectively locked to the tool holder. The actuation of the actuation member 22 effects the extension of the lock member 23 to engage and abut the tool holder and to
push the wings 18 against the guides of the tool holder. The force exerted by lock member 23 on the tool holder and the wings 18 on the guides of the tool holder may lock the tool 10 to the tool holder. With the lock module 14, the tool 10 has the locking mechanism incorporated therein.

[0079] The plurality of lock members 23 are actuated through the actuation of the actuation member 22 acting on the abutment member 20. A single abutment member 20 is capable of effecting the extension of the plurality of lock members 23.

[0080] The plurality of lock members 23 enable the tool 10 to be stably locked with the tool holder. The lock members 23 may have a staggered arrangement. A lock member 23 may be offset relative to the other lock member 23.

[0081] Spring-loaded plungers 34 may exert a force orthogonal to the force exerted by the lock member 23 on the tool holder and the shoulder 19 on the guides of the tool holder.

[0082] Accordingly, this disclosure includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the disclosure unless otherwise indicated herein.

[0083] Where technical features mentioned in any claim are followed by references signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, neither the reference signs nor their absence have any limiting effect on the technical features as described above or on the scope of any claim elements.

[0084] One skilled in the art will realise the disclosure may be embodied in other specific forms without departing from the disclosure or essential characteristics thereof. The foregoing embodiments are therefore to be considered in all respects illustrative rather than limiting of the disclosure described herein. Scope of the invention is thus indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.

Claims

1. A lock module (14) for locking a tool (10) to a tool holder, the lock module (14) comprising:
   a body (16);
   at least one wing (18) projecting laterally from a side (17) of the body (16) and lying on a first plane;
   at least one lock member (23) slidably supported in the body (16), the lock member (23) being actuable to extend from the body (16) in a direction substantially orthogonal to the first plane,
   to a lock position; and
   an abutment member (20) supported in the body (16) to move between a first position and a second position, the abutment member (20) being in abutting engagement with the lock member (23) wherein movement of the abutment member (20) to the second position extends the at least one lock member (23) to the lock position.

2. The lock module (14) of claim 1 wherein the abutment member (20) is mounted to oscillate between the first and second positions along a second plane, the second plane being parallel to the first plane.

3. The lock module (14) of claim 2 wherein the abutment member (20) is mounted to a hub (36) projecting from body (16) in a direction substantially orthogonal to the first plane.

4. The lock module (14) of claim 1, 2 or 3 comprising a plurality of lock members (23).

5. The lock module (14) of claim 4 wherein the holding mechanism is actuated by lateral movement of the actuation member (22) relative to the body (16).

6. The lock module (14) of claim 4 or 5 wherein the abutment member (20) comprises a plurality of inclined camming surfaces (54) engaged to correspondingly inclined contact surfaces (64) of the lock members (23).

7. The lock module (14) of any one of preceding claims further comprising an actuation member (22) engaged to the abutment member (20) wherein actuation of the actuation member (22) moves the abutment member (20) from the first position to the second position.

8. The lock module (14) of claim 7 comprising a holding mechanism to hold the actuation member (22) in the actuated position so as to retain the abutment member (20) at the second position.

9. The lock module (14) of claim 8 wherein the holding mechanism is actuated by rotation of the actuation member (22) relative to the body (16).

10. The lock module (14) of claim 8 wherein the holding mechanism is actuated by lateral movement of the actuation member (22) relative to the body (16).

11. The lock module (14) of claim 7, 8, 9 or 10 wherein a lever (46) extends angularly from the abutment member (20) for engagement with the actuation member (22).

12. The lock module (14) of any one of preceding claims
further comprising at least one spring-loaded plunger (34) extending from a side of the body (16) in a direction parallel to the first plane and spaced from the wing (18).

13. The lock module (14) of any one of preceding claims further comprising limit elements (44) to restrict the movement of the abutment member (20).

14. The lock module (14) of any one of preceding claims wherein a second one wing (18) projects laterally from the opposite side (17) of the body (16) and lying on a first plane;

15. A tool (10) comprising the lock module (14) of any one of preceding claims.
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<td>DE 33 31 676 A1 (KLOECKNER WERKE AG [DE]) 28 March 1985 (1985-03-28) * figures 1-3 * * page 4, paragraph 6 - page 5, paragraph 2 * ----</td>
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The present search report has been drawn up for all claims.

Place of search: Munich
Date of completion of the search: 9 October 2012
Examiner: Schneider, Dominik
ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO. EP 12 16 9628

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on 09-10-2012. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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For more details about this annex: see Official Journal of the European Patent Office, No. 12/82
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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