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(54) **BINDING TOOL, AND FIXING TOOL FOR BINDING AND BINDING BAND FOR THE SAME**

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(57) **ABSTRACT**

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To provide a binding tool which facilitates the insertion of an end part of a binding band into a fixing tool body without wasting the binding band.

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A binding too comprises a fixing tool for binding **11** having ratchet pawls **7** and **9** for allowing a binding band **5** to move in an opposite direction but preventing the binding band **5** from moving in the return direction, respectively on opposed inner faces of a cylindrical binding tool body **3**, and the binding band **5** which forms a loop by being inserted twice into an entrance of the fixing tool **11** from the same direction, wherein locking projections **25** are provided on both sides of the binding band **5** in proper pitches. An operating space of each of the ratchet pawls **7** and **9** are spaced out on entrance and exit sides of the fixing tool body **3**. Further, bank-shaped belts **21** are provided on both sides of the band body **5**.

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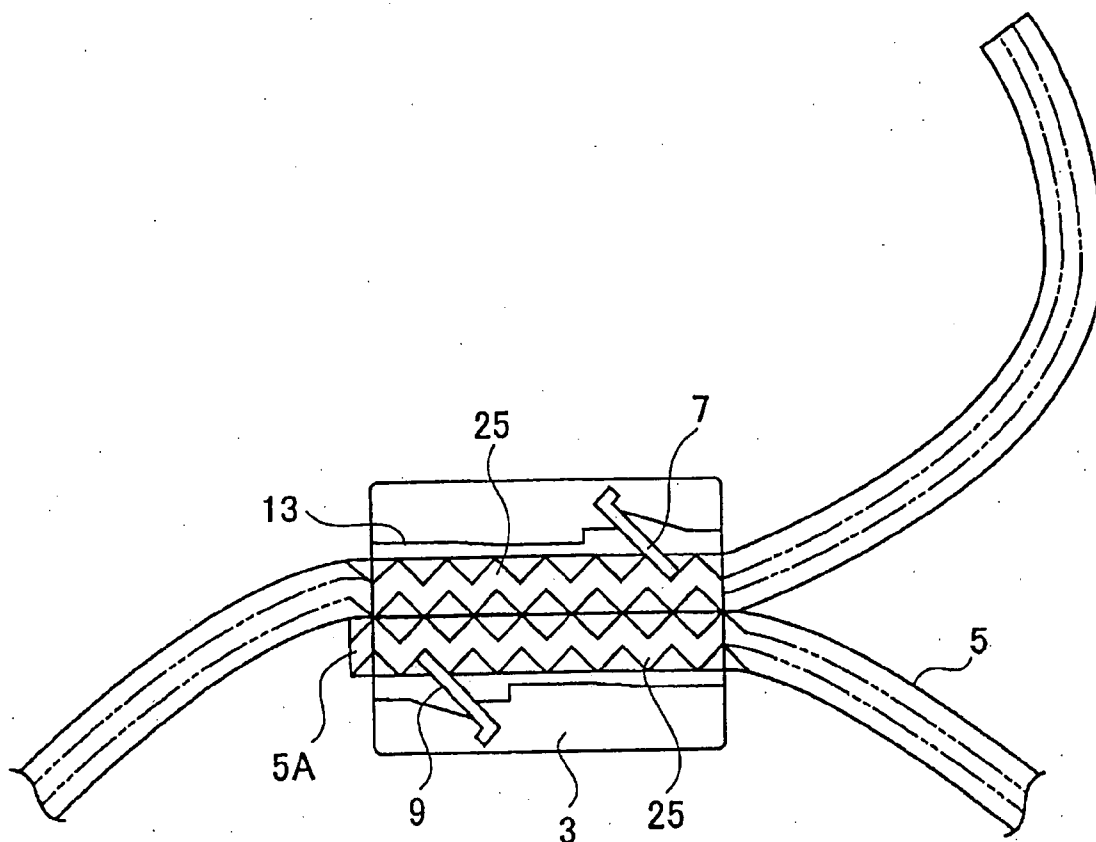


Fig. 1

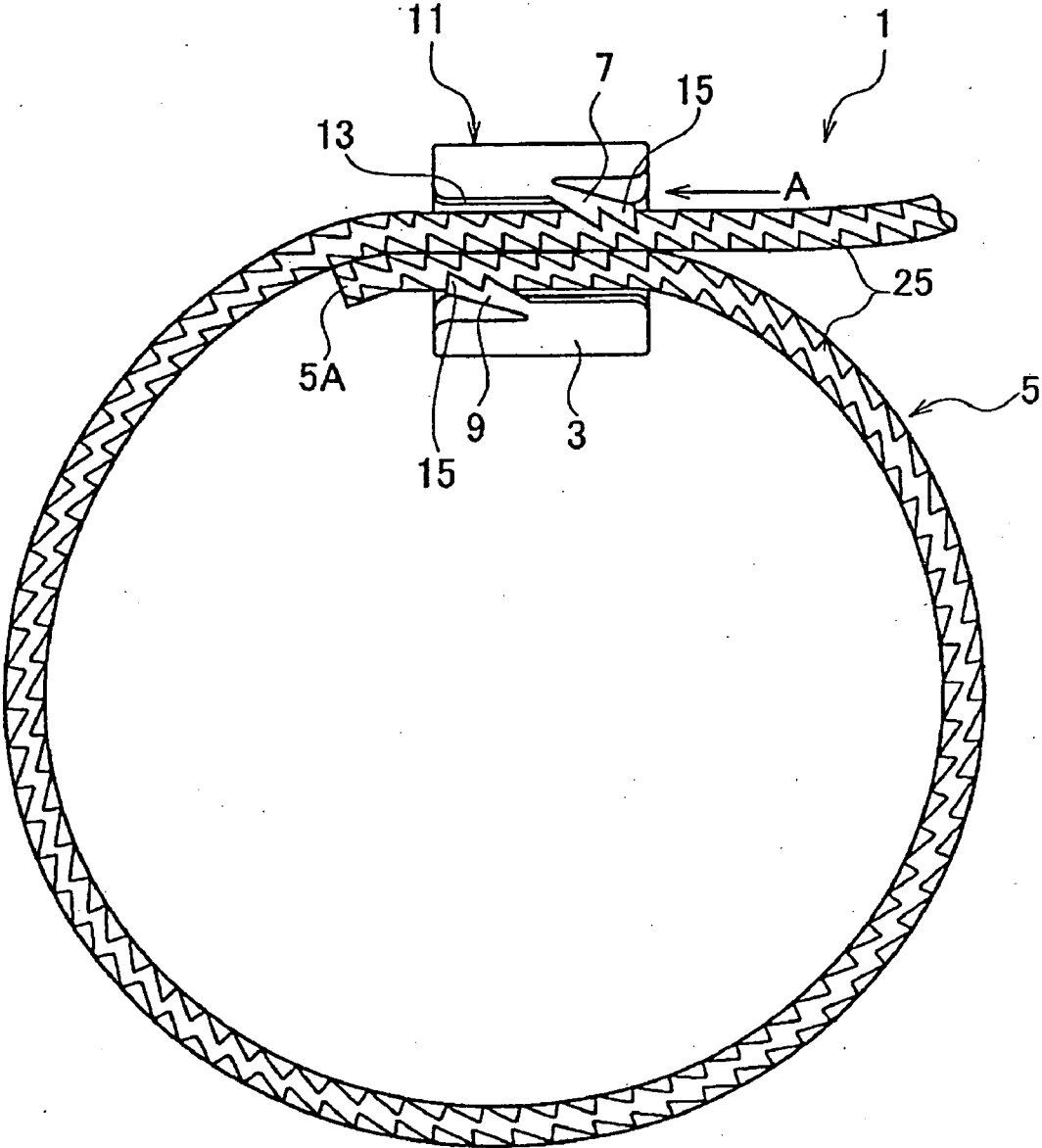


Fig. 2A

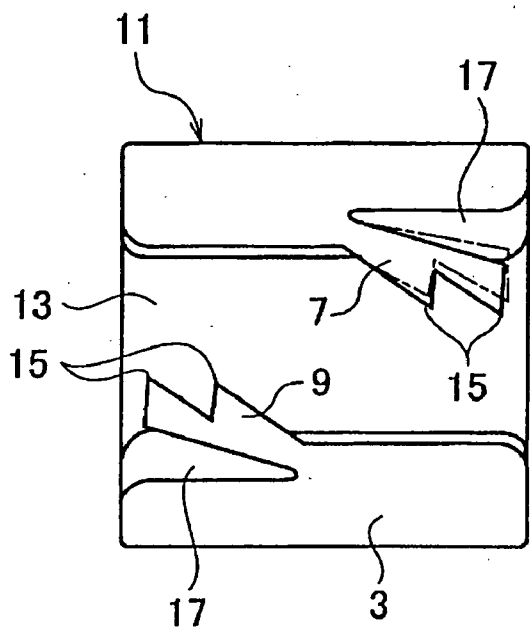


Fig. 2B

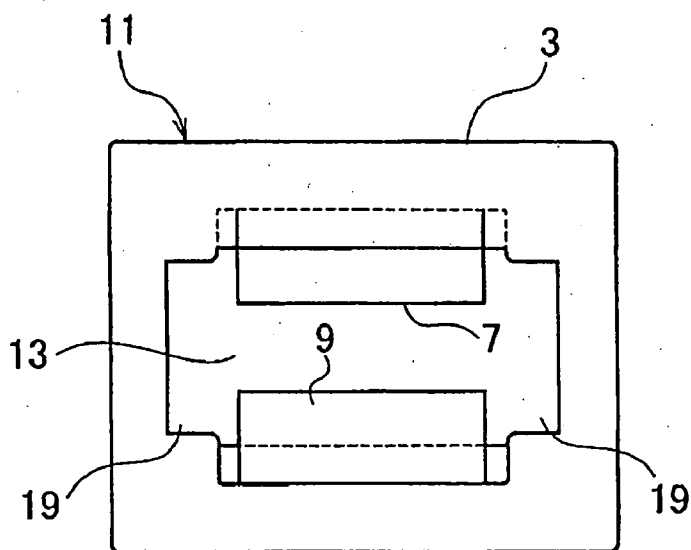


Fig. 3A

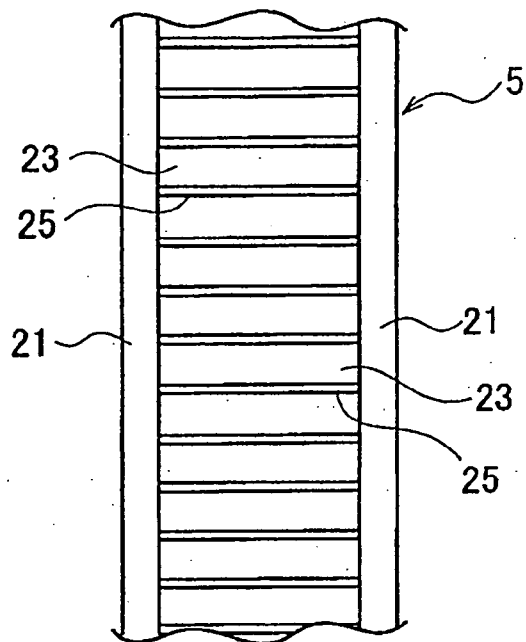


Fig. 3B

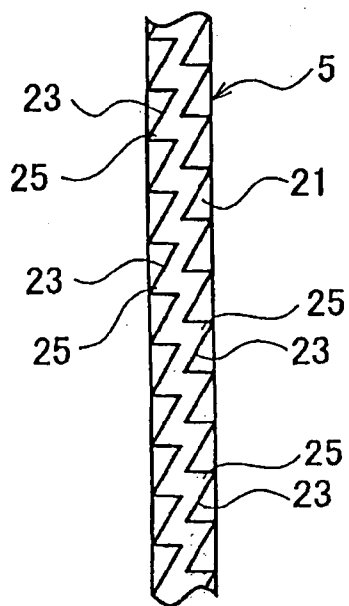


Fig. 4

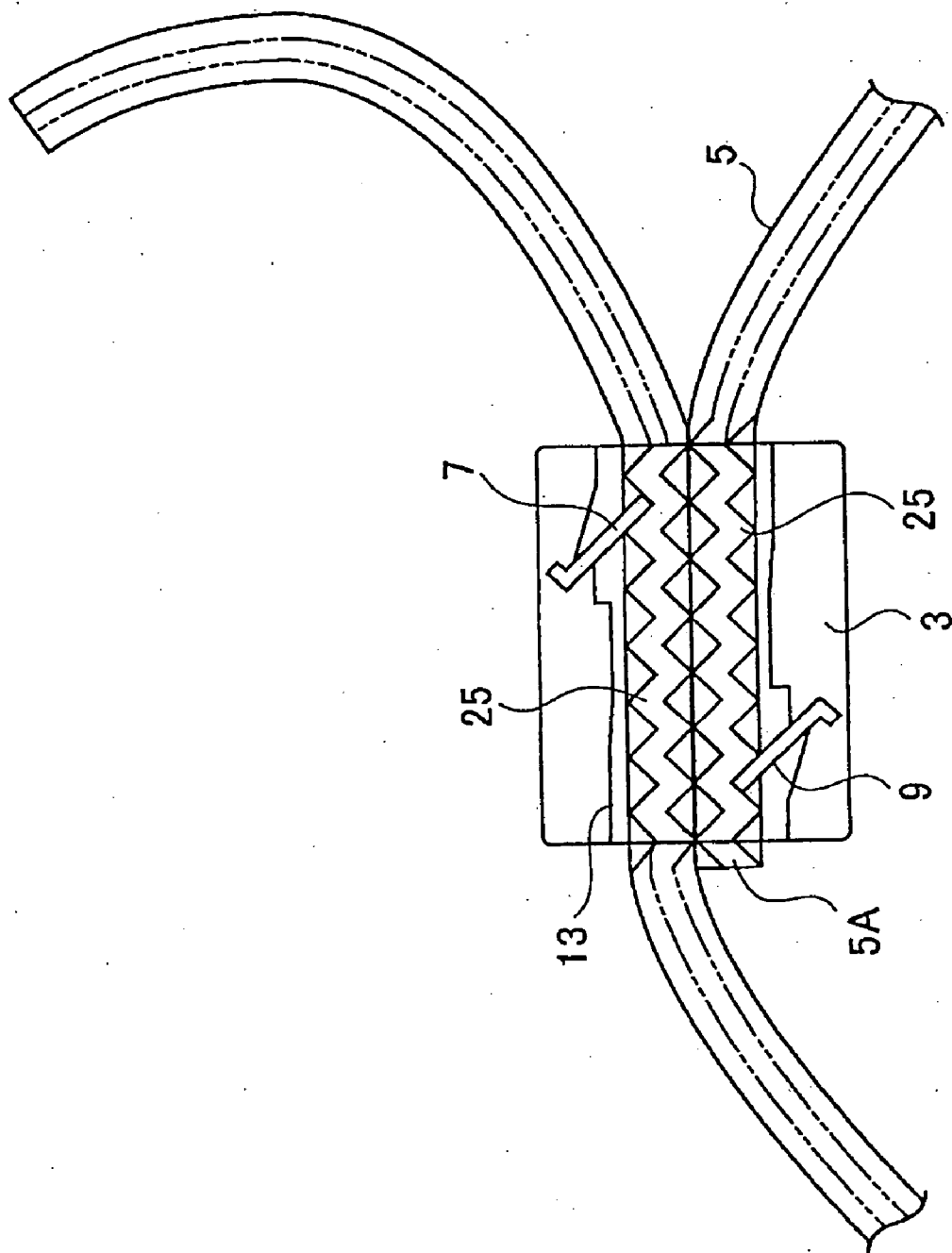
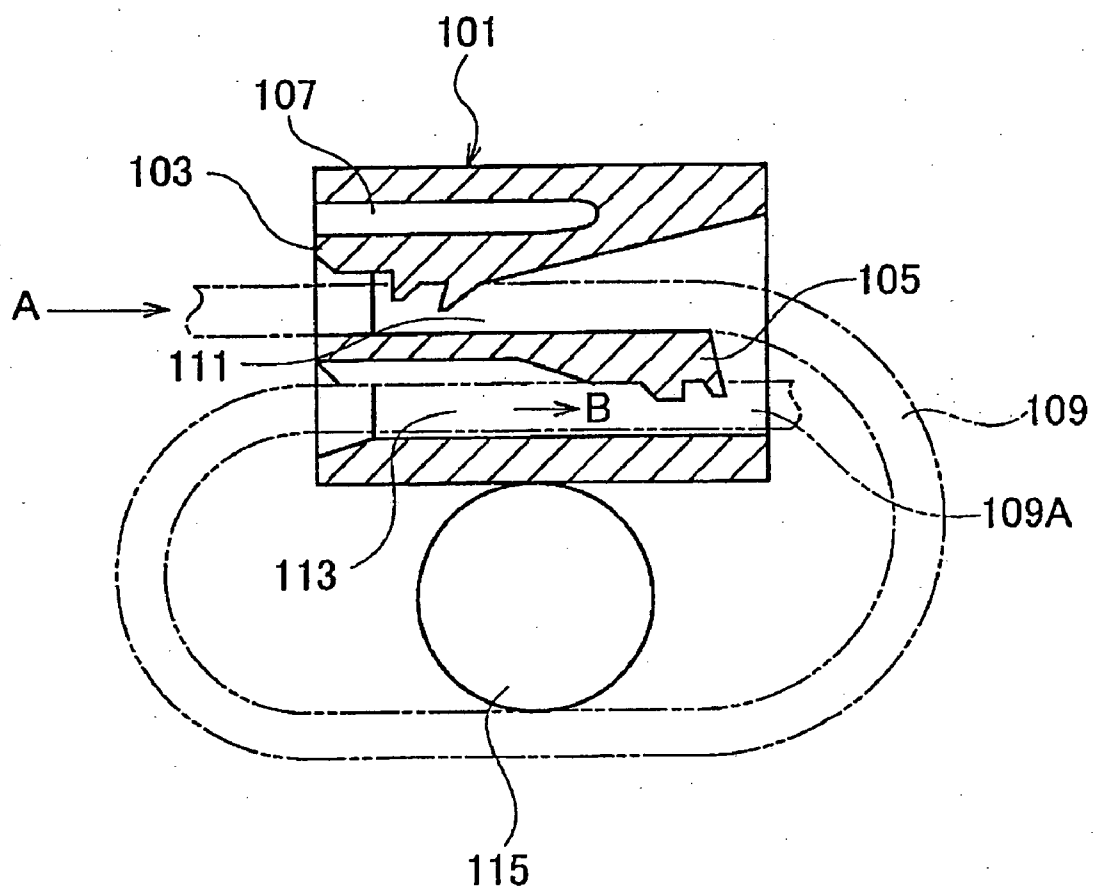


Fig. 5



BINDING TOOL, AND FIXING TOOL FOR BINDING AND BINDING BAND FOR THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a binding tool for binding various objects to be bound and a fixing tool for binding and a binding band used for the binding tool, and more specifically, to a binding tool which facilitates a binding operation and allows effective use of a binding band, and a fixing tool for binding and the binding band.

[0003] 2. Background of the Invention

[0004] As a conventional binding tool for binding an object to be bound, a structure in which an annular buckle part is integrally formed on one end side of a binding band, the other end side of the binding band is passed through the inside of the buckle part, and locking projections provided in the buckle part are locked in a locking recess or a locking hole provided in the above other end side is known.

[0005] In the binding tool having the above structure, a length of the binding band is restricted, and since an object to be bound is bound within an allowable range, when a circumferential length of the object to be bound is even slightly longer than the length of the binding band, the binding tool cannot accommodate the object. That is, there is a disadvantage in that an applicable scope of the intended object to be bound is restricted. In addition, when the circumferential length of the object to be bound is short, there is another disadvantage in that cutting and removing excessive portions on the other end side of the binding band greatly projected from the buckle part causes much waste.

[0006] Moreover, as a conventional binding tool, a structure having a separate binding band and a fixing tool is also known (for example, refer to Japanese Utility Model Laid-open Publication No. Hei 5-73387).

[0007] The structure of a binding tool as described in the above Patent Document 1 is a structure as shown in FIG. 5. That is, the inner part of a cylindrical fixing tool body **101** is provided with first and second flexible ratchet pawls **103** and **105** with courses of action in opposite directions. Further, a space part **107** allowing the first ratchet pawl **103** to bend is formed between the first ratchet pawl **103** and an upper wall part in the fixing tool body **101**, and a first path **111** for passing a binding band **109** is formed between the first and second ratchet pawls **103** and **105**. Furthermore, a second path **113** is formed between the second ratchet pawl **105** and a lower wall part of the fixing tool body **101**.

[0008] In the above structure, in order to form the binding band **109** in a loop to bind an object to be bound **115**, a top end side of the first ratchet pawl **103** is first lifted up by using an appropriate jig, and a vertical clearance of the first path **111** is spread. Then, the binding band **109** is formed in the loop by inserting an end part **109A** of the binding band **109** in the direction of an arrow A, and also passing the end part **109A** in the direction of an arrow B through the second path **113**.

[0009] In the above structure, the object to be bound **115** in the loop can be tightly fastened by pulling the binding band **109** formed in the loop in the opposite direction to the

arrow A. Moreover, the waste of the binding band **109** can be eliminated by cutting the binding band **109** outside the fixing tool body **101**.

[0010] However, in the above structure, it is necessary to lift up the end part of the first ratchet pawl **103** with the jig when the binding band **109** is passed through the fixing tool body **101** in the direction of the arrow A, and there is a problem in the case of achieving improvement of operability. Further, in the above structure, since the upper wall part of the fixing tool body **101**, the space part **107**, the first ratchet pawl **103**, the first path **111**, the second ratchet pawl **105**, the second path **113**, and the lower wall part of the fixing tool body overlap each other in a vertical direction, there is a disadvantage in that a vertical dimension of the entire structure of the fixing tool body **101** becomes large.

[0011] Furthermore, in the above structure, the second ratchet pawl **105** exists between the first path **111** and the second path **113** through which the binding band **109** is passed, and serves as a substantial partition. That is, since two layers of independent spaces and independent mechanisms are provided, the structure is complicated and also difficult to manufacture with a die or the like.

SUMMARY OF THE INVENTION

[0012] The present invention is made in view of the conventional problems as described above, and a fixing tool for binding according to the present invention is characterized by having ratchet pawls for allowing a band to move in an opposite direction but preventing the band from moving in the return direction, respectively, on opposite inner surfaces of a cylindrical fixing tool body.

[0013] In addition, in the above fixing tool for binding, an operating space of each of the ratchet pawls is characterized by being arranged on the entrance and exit sides of the fixing tool body.

[0014] Moreover, a binding band is characterized in that locking projections having inclined faces in one direction are provided in proper pitches on the front face of a band body, and locking projections with a course of action in an opposite direction to the above locking projections are provided in proper pitches on the rear face of the band body.

[0015] Furthermore, the binding band is characterized in that bank-shaped belts are provided on both sides of the band body.

[0016] Also, the present invention is characterized by comprising the fixing tool for binding having the ratchet pawls for allowing the binding band to move in the opposite direction but preventing the binding band from moving in the return direction, respectively on the opposed inner faces in the cylindrical fixing tool body, and the binding band which forms a loop by being inserted twice in the entrance of the fixing tool from the same direction, wherein the locking projections to be locked by the ratchet pawls are provided on both faces of the binding band in proper pitches.

[0017] Further, the present invention is characterized by comprising a fixing tool for binding having ratchet pawls made of metal for allowing a binding band to move in an opposite direction but preventing the binding band from moving in the return direction, respectively on opposed inner faces of a cylindrical fixing tool body, and the binding

band which forms a loop by being inserted twice in the entrance of the fixing tool from the same direction, wherein the ratchet pawls are configured to bite into the binding band.

[0018] According to the present invention, when an end part of the binding band is first passed through the fixing tool body, a clearance between the first and second ratchet pawls is large so that the binding band can be easily passed. And when the binding band is formed in a loop and the end part of the binding band is passed for the second time from the same direction, since the binding band overlaps, the first and second ratchet pawls are caused to be bent and the binding band can be easily passed through the fixing tool body.

[0019] Further, in a state in which the binding band is formed in a loop, the binding band is in a state in which the binding band is directly contacted and overlapped in the fixing tool body, and a height dimension of the entire structure of the fixing tool body can be controlled to a small value.

[0020] Other features and advantages of the present invention will be apparent from the following description when taken in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 is an illustrative drawing showing the entire structure of a binding tool related to an embodiment of the present invention, FIGS. 2A and 2B are illustrative drawings of a fixing tool for binding, FIGS. 3A and 3B are illustrative drawings of a binding band, FIG. 4 is an illustrative drawing of a binding tool related to a second embodiment, and FIG. 5 is an illustrative drawing of a conventional binding tool.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Referring to FIG. 1, a binding tool 1 related to the embodiment of the present invention is provided with a fixing tool for binding 11 having first and second ratchet pawls 7 and 9 for allowing a binding band 5 to move in an opposite direction but preventing the binding band 5 from moving in the return direction, respectively on opposed inner faces of a cylindrical fixing tool body 3.

[0023] The fixing tool body 3 in the fixing tool for binding 11 is formed in a cylindrical body provided with a quadrilateral through hole 13 as shown in FIGS. 2A and 2B, and the first and second ratchet pawls 7 and 9 are provided in a position of point symmetry on an entrance side and an exit side of the through hole 13. That is, the first and second ratchet pawls 7 and 9 are separately provided on the entrance and exit sides of the through hole 13 so that each operating space does not overlap. In addition, since the first and second ratchet pawls 7 and 9 are symmetrically formed, the entrance and the exit are not fixed in the through hole 13 in the fixing tool body 3, and if one side serves as the entrance, the other side serves as the exit.

[0024] The first and second ratchet pawls 7 and 9 are inclined so that the end part (free end part) is directed to the center side of the through hole 13, and locking pawls 15 which freely lock locking projections provided on the binding band 5 are formed on the internal faces of the ratchet

pawls 7 and 9, respectively. Further, recessed parts 17 into which each of the ratchet pawls 7 and 9 may enter are formed in the fixing tool body 3 corresponding to each of the ratchet pawls 7 and 9.

[0025] A height dimension of the through hole 13 in the fixing tool body 3 is formed in a slightly bigger dimension than a thickness dimension of the overlapped binding band 5, and belt guide parts 19 for guiding bank-shaped belts 21 provided on both sides of the binding band 5 are formed on both sides of the through hole 13, that is, on both sides of the first and second ratchet pawls 7 and 9.

[0026] The binding band 5 has a structure having bank-shaped belts 21 with smooth surfaces on both sides in a longitudinal direction, as shown in FIGS. 3A and 3B. These bank-shaped belts 21 are formed with thickness on both sides of the binding band 5 as if forming bank-shaped portions. Further, between the bank-shaped belts 21 on the surface of the binding band 5, locking projections 25 having inclined faces 23 in one direction are provided in proper pitches. Further, the locking projections 25 provided on the rear face of the binding band 5 in proper pitches are formed with a course of action in an opposite direction to the above locking projections 25 on the front face.

[0027] In the structure as described above, in order to form the binding band 5 in a loop for binding an object to be bound (not illustrated), an end part 5A of the binding band 5 is first passed through (first passage) in the direction of an arrow A in FIG. 1, to the through hole 13 of the fixing tool body 3. In this case, although the first ratchet pawl 7 is in a state of being projected into the through hole 13, since the binding band 5 is singlefold and the first and second ratchet pawls 7 and 9 are unevenly distributed on the entrance and exit sides of the through hole 13, the binding band 5 can be easily passed through without being locked by the locking pawls 15 of the first and second ratchet pawls 7 and 9.

[0028] Next, the binding band 5 is formed in a loop, and when the end part 5A of the binding band 5 is passed through the through hole 13 (second passage) in the fixing tool body 3 from the same direction, the locking projections 25 in the vicinity of the end part 5A are locked by the locking pawls 15 in the second ratchet pawl 9 and prevented from escaping.

[0029] As mentioned above, when the second passage of the end part 5A of the binding band 5 is performed through the through hole 13 of the fixing tool body 3, the binding band 5 is doubly overlapped in the through hole 13. In this case, since the portions of the thick bank-shaped belts 21 on both sides of the binding band 5 overlap in the belt guide portions 19 of the through hole 13, the locking projections 25 provided on both the front and rear faces of the binding band 5 do not interfere with each other. Therefore, the passage of the end part 5A through the through hole 13 can be also performed comparatively easily.

[0030] As described above, when the binding band 5 is doubly overlapped in the through hole 13 of the fixing tool body 3, the locking projections 25 provided on both the front and rear faces of the binding band 5 are in a state of being locked by the locking pawls 15 of the first and second ratchet pawls 7 and 9. In this state, when the binding band 5 is pulled in an opposite direction to the arrow A so that an object to be bound placed in the loop of the binding band 5

is tightly fastened, the first ratchet pawl 7 bends, and the locking projections 25 of the binding band 5 get over the locking pawls 15 of the first ratchet pawl 7 and are pulled out outside in every one pitch.

[0031] As mentioned above, when the binding band 5 is pulled in the opposite direction to the arrow A, the locking projections 25 in the vicinity of the end part 5A of the binding band 5 are in a state of being locked by the locking pawls 15 of the second ratchet pawl 9, and the end part 5A of the binding band 5 does not escape from the through hole 13 of the fixing tool body 3. Further, in a state in which the binding band 5 is pulled to tightly fasten the object to be bound, the locking pawls 15 of the first ratchet pawl 7 lock the locking projections 25 of the binding band 5 to prevent loosening. Therefore, after tight fastening of the object to be bound, the excessive portion of the binding band 5 can be cut.

[0032] As understood from the above description, according to the present embodiment, when the end part 5A of the binding band 5 is passed through the through hole 13 in the fixing tool body 3, the passage can be easily performed without receiving interference by the ratchet pawls on the entrance side. In addition, since the fixing tool body 3 has a structure having the ratchet pawls 7 and 9 respectively on the entrance and exit sides of the through hole 13 with a slightly bigger height dimension than the dimension of the binding band 5 doubly overlapped, the simplification of the entire structure can be achieved, and also the height dimension can be reduced.

[0033] FIG. 4 shows the second embodiment. In this second embodiment, the top parts of the locking projections 25 provided on both the front and rear faces of a binding band 5 are formed in a shape showing a substantially right angle, and first and second ratchet pawls 7 and 9 are made of a metal plate or the like, of which a base side is buried into a fixing tool body 3 and obliquely projected. Also in this case, the same effect as the above embodiment can be obtained.

[0034] Incidentally, when the first and second ratchet pawls 7 and 9 are made of metal and have a structure in which an end part has an edge formed in a proper shape, such as a saw blade or a knife edge, namely, an edge with a shape for easily biting into the binding band 5, the end parts of the ratchet pawls 7 and 9 bite into the binding band 5 when an object to be bound is tightly fastened to prevent loosening. Therefore, in this case, the locking projections 25 provided on both sides of the binding band 5 can be omitted and the binding band 5 can also be provided as a structure of a flat belt.

[0035] In addition, the ratchet pawls 7 and 9 are sufficient as long as they has a function for allowing the binding band

5 to move in one direction but preventing motion in the other direction (direction to be loosened).

[0036] As many apparently widely different embodiments and variations of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the present invention is not limited to the specific embodiments thereof described herein but rather only to the extent set forth in the following claims.

[0037] This application claims the benefit of Japanese Patent Application No. 2005-285157, filed on Sept. 29, 2005, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. A fixing tool for binding characterized by having ratchet pawls for allowing a band to move in an opposite direction but preventing the band from moving in the return direction, respectively on opposed inner faces of a cylindrical fixing tool body.

2. The fixing tool for binding according to claim 1, characterized in that an operating space of each of the ratchet pawls is arranged on entrance and exit sides of the fixing tool body.

3. A binding band characterized by having locking projections with inclined faces in one direction in proper pitches on the front face of a band body, and locking projections with a course of action in an opposite direction to the above locking projections in the proper pitches on the rear face of the band body.

4. The binding band according to claim 3, characterized by having bank-shaped bands on both sides of the band body.

5. A binding tool characterized by comprising a fixing tool for binding having ratchet pawls for allowing a binding band to move in an opposite direction but preventing the binding band from moving in the return direction, respectively on opposed inner faces of a cylindrical binding tool body, and the binding band which forms a loop by being inserted twice into an entrance of the fixing tool from the same direction, wherein locking projections to be locked by the ratchet pawls are provided on both sides of the binding band in proper pitches.

6. A binding tool characterized by comprising a fixing tool for binding having ratchet pawls made of metal for allowing a binding band to move in an opposite direction but preventing the binding band from moving in the return direction, respectively on opposed inner faces of a cylindrical binding tool body, and the binding band which forms a loop by being inserted twice into an entrance of the fixing tool from the same direction, wherein the ratchet pawls are configured to bite into the binding band.

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