June 9, 1931. J. E. OTT 1,809,566

GRIPPING DOG

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Fig. 1.

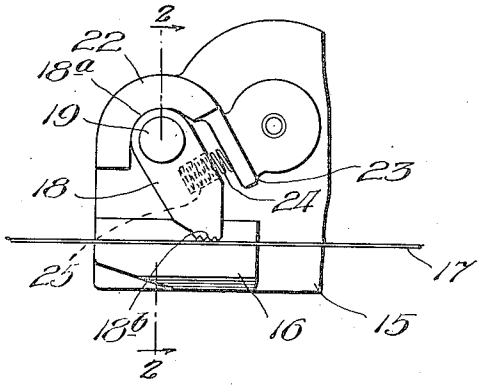


Fig. 2.

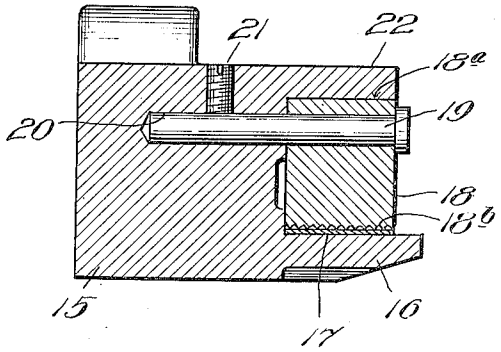
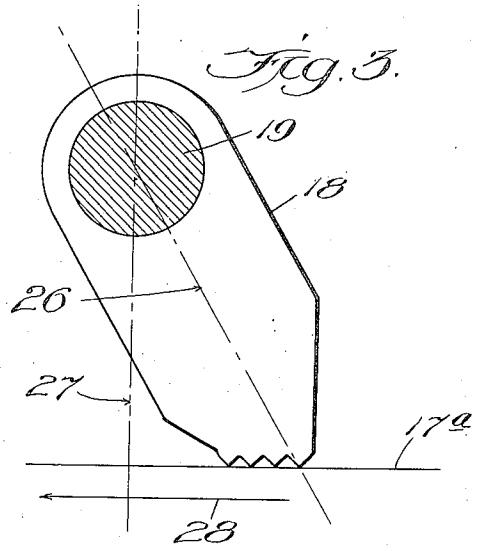


Fig. 3.



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Fig. 4.

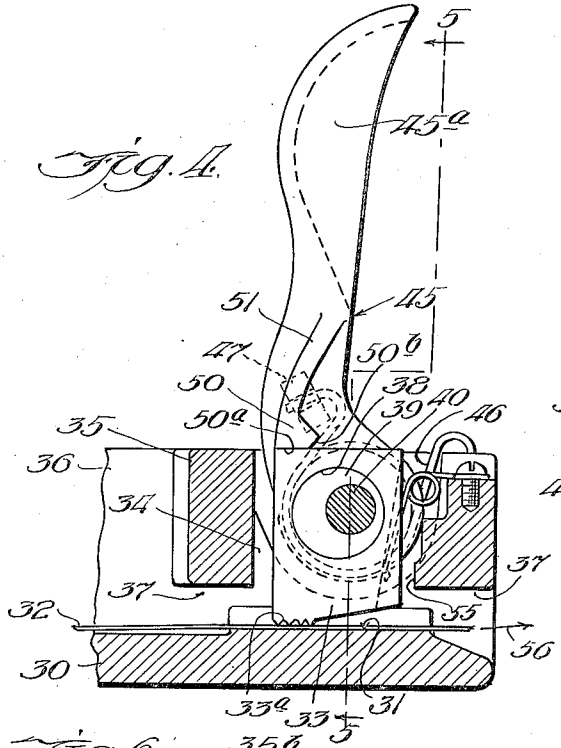


Fig. 5.

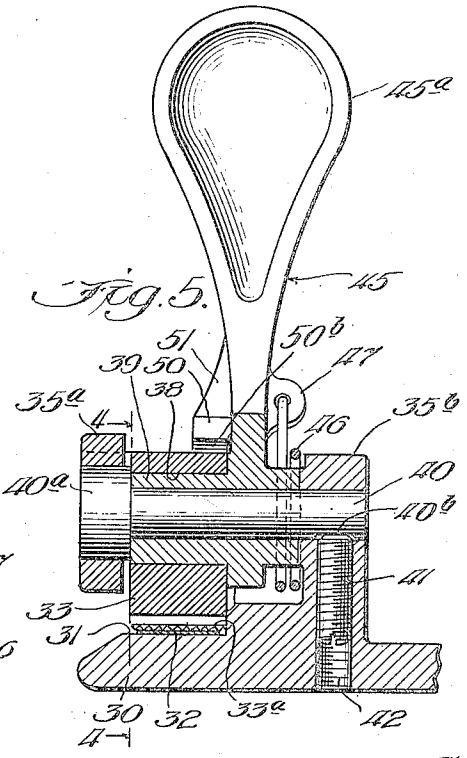


Fig. 6.

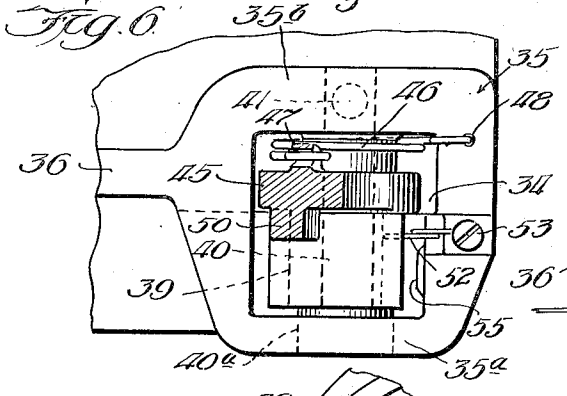


Fig. 8.

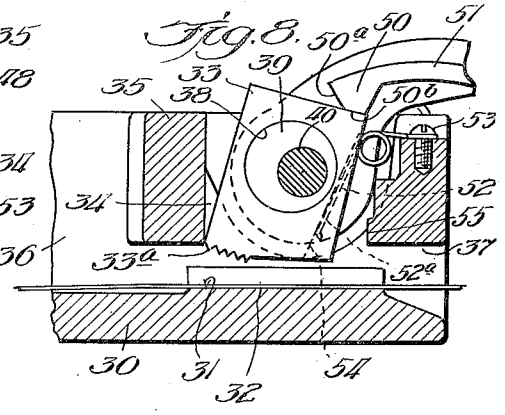
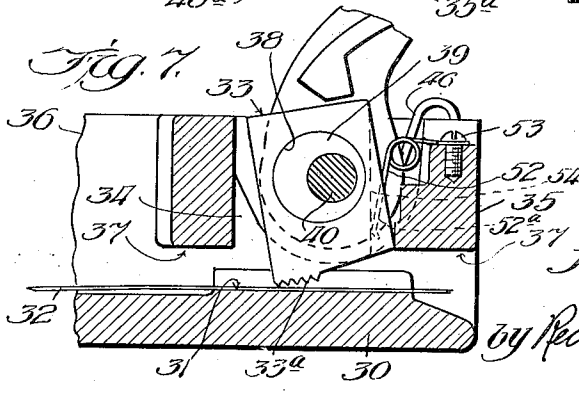


Fig. 7.



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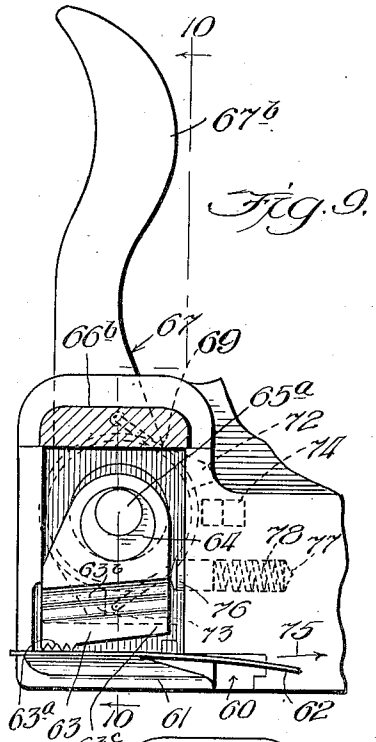


Fig. 9.

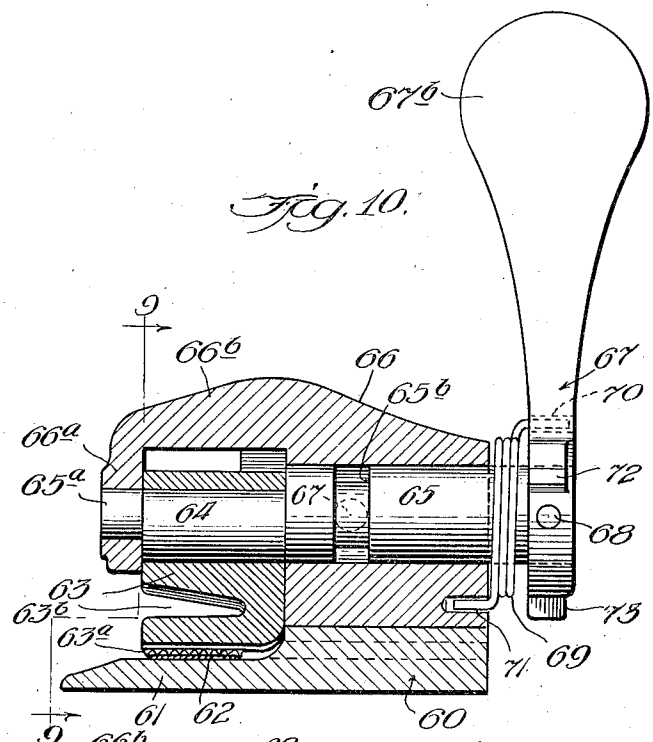


Fig. 10.

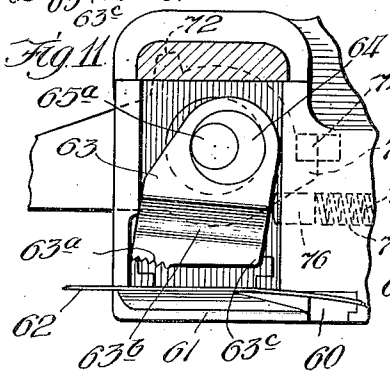


Fig. 11.

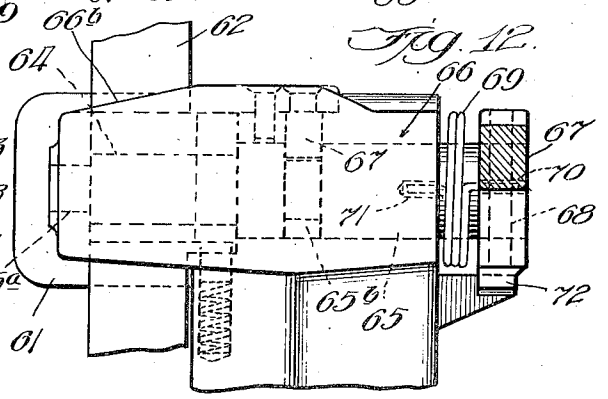


Fig. 12.

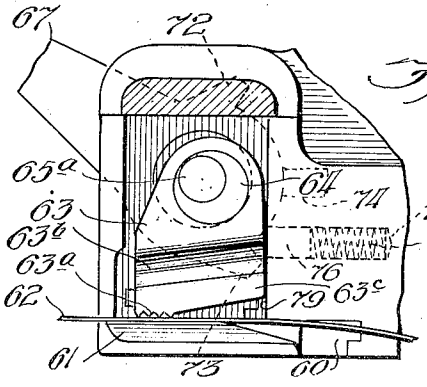


Fig. 13.

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UNITED STATES PATENT OFFICE

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GRIPPING DOG

Application filed May 10, 1928. Serial No. 276,564.

This invention relates to improvements in gripping dogs and its purpose is to provide a device adapted for use in gripping steel strap or wire or other binding material or the like for holding it in fixed position with respect to a fixed support or to a tool to be used in operating on the strap or other binding member. Heretofore, it has been the practice to use cams or threaded clamping members for securing straps and other binding members in place where desired, but these devices are unsatisfactory in many respects, particularly in that a screw threaded clamping device cannot be conveniently and quickly operated while a gripping cam tends to increase its grip on the strap when tension is exerted thereon, to such an extent that it cannot readily be released, whether or not the strap is under tension, when it is subsequently sought to release the strap from the holding device. The principal object of the present invention is to provide an improved gripping dog which is self-gripping and self-releasing so that it may be readily applied or released from a strap or other member to be gripped. A further object is to provide a gripping dog which automatically increases its grip on the strap or other binder as the tension on said strap or binder is increased and which permits the strap to be readily disengaged, without any manual manipulation of the gripping dog, when tension on the strap is released or when a pull is exerted thereon in the opposite direction. A further object of the invention is to provide a gripping dog which normally extends at an oblique angle to the surface of the member to be gripped and which is self-gripping and self-releasing when the angularity of the gripping member is maintained in predetermined limits. A further object is to provide a gripping dog in combination with means for elevating the dog away from the surface of the strap or binder when it is desired to release the strap. Another object is to provide a gripping dog in which the gripping member is elevated from the surface of the member being gripped, by the operation of a cam. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which three embodiments are illustrated. In the drawings,

Figure 1 shows a side elevation of one form of the improved gripping dog, illustrated as being embodied in a portion of a tool adapted to operate upon the strap;

Fig. 2 shows a vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 shows an enlarged front elevation of the gripping member, illustrating diagrammatically the preferred limits of angularity of the gripping member with respect to the surface being gripped;

Fig. 4 is a longitudinal sectional view taken on the line 4—4 of Fig. 5, showing a second form of gripping dog embodying the present invention;

Fig. 5 shows a transverse section taken on the line 5—5 of Fig. 4;

Fig. 6 shows a top plan view of the construction illustrated in Fig. 4 with a portion of the handle cut away;

Fig. 7 is a sectional view similar to that of Fig. 1, showing the position of the gripping member in a partially released position;

Fig. 8 is a sectional view similar to that of Fig. 4 showing the relative positions of the parts when the gripping member is fully released from engagement with the strap.

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 10, illustrating, chiefly in side elevation, a third form of gripping dog embodying the present invention;

Fig. 10 is a transverse sectional view taken on the line 10—10 of Fig. 9;

Fig. 11 is a sectional view similar to that of Fig. 9, showing the relative positions of the parts when the gripping member has been elevated out of engagement with the strap;

Fig. 12 shows a top plan view of the form of device illustrated in Figs. 9, 10 and 11; and

Fig. 13 is a sectional view similar to that of Fig. 9, showing the relative positions of the parts when the operating lever is in a half open position.

In the form of the invention illustrated in Figs. 1, 2 and 3, the invention is shown as being embodied in a tool having a frame 15 which is provided with a laterally projecting foot or flange 16 which serves as a gripping member adapted to engage the lower side of the steel strap 17 when the strap is placed in position thereon. The upper side of the strap is adapted to be engaged by a movable gripping member 18 which is pivotally mounted on a pin 19 engaging an aperture 20 formed in the frame 15 and secured in position by a set screw 21. The frame 15 is provided with an overhanging arcuate flange 22 which is concentric with the axis of the pin 19 and which is arranged to form a bearing for the upper curved surface 18^a of the gripping member 18. The overhanging flange 22 has an inclined downward extension 23 which engages one end of a coil spring 24 seated in a socket 25 formed in the gripping member 18. This spring tends normally to force the gripping member 18 downwardly so that the lower serrated gripping surface 18^b thereof is maintained in engagement with the strap 17. The gripping member might move to gripping position by gravity but the spring 24 is preferably employed. Referring to Figs. 1 and 3, it will be seen that the longitudinal axis 26 of the gripping member 18 is inclined with respect to the surface 17^a of the strap and with respect to a vertical line 27 passing downwardly through the axis of the pin 19 perpendicular to the upper surface 17^a of the strap. This inclination of the gripping member 18 is of importance in causing the gripping dog to have self-gripping and self-releasing functions. It will be apparent that a pull on the strap 17 in the direction indicated by the arrow 28 in Fig. 3 automatically increases the grip of the serrated surface 18^b on the strap and if it be desired to release the strap from the gripping member, it is merely necessary to release the tension and pull on the strap in a direction opposite to that indicated by the arrow 28. No matter what would be the tension exerted on the strap when it is being gripped by the member 18, the strap may be readily released due to the inclined position of the gripping member. In order that the gripping member may operate efficiently and retain a tight grip on the strap while permitting the ready release of the strap when desired, the gripping member 18 should preferably be so constructed that no part of the gripping surface 18^b will engage the strap 17 at the left of the vertical line 27 passing through the pivotal axis of the gripping member, and in such a way that at least a portion of the gripping surface 18^b will engage the upper surface of the strap at the left of the intersection with the strap of the line 26 passing through the pivotal axis of the gripping member and making an angle of sixty degrees with the upper surface of the strap, as viewed in Fig. 3. In the embodiment shown, the axis 26 of the gripping dog is coincident with a line making an angle of sixty degrees with the upper surface of the strap but it will be apparent that as the angle of the gripping dog with respect to the strap is decreased, there is a decrease in the gripping force exerted by a pull on the strap in the direction of the arrow 28, whereas if the longitudinal axis of the gripping dog be moved inwardly with respect to a line making an angle of sixty degrees with the strap there is an increase in the gripping force until, when a portion of the gripping surface extends toward the left beyond the line 27, as viewed in Fig. 3, there is a tendency for a binding action of the gripping member on the strap with a corresponding increased difficulty in the release of the strap. A strap stretching device embodying substantially such a gripping dog as shown in Figs. 1 and 2 is described and claimed in the co-pending application of Messrs. MacChesney, Norton and Ott, Serial No. 276,659, filed May 10, 1928.

In the form of the invention shown in Figs. 4, 5, 6, 7 and 8, the edges of the gripping dog described above are retained in combination with means for manually elevating the gripping dog away from the strap when the strap is to be released. This modified form of the invention may have various adaptations among which may be mentioned its application to a strap stretching device of the form described and claimed in the application of Messrs. MacChesney and Ott, Serial No. 149,306, filed November 19, 1926. This and the other forms of gripping dogs hereinafter described may be applied to other forms of strap stretching devices, welding devices, sheet drills or other machines or devices where it is desired to grip and hold a strip or sheet of metal or other material. Referring to Figs. 4 to 8, the device therein illustrated is shown as comprising a base plate 30 having a gripping surface 31 over which is passed a flat steel strap 32. This strap is adapted to be gripped and held against movement by means of the gripping member 33 having a serrated surface 33^a to coact with the upper surface of the strap 32. The gripping member 33 is located within a rectangular opening 34 formed in an enlarged boss or auxiliary frame 35 which is formed as an integral part of the base plate 30 and united with the web 36 extending longitudinally thereof. On the forward side of the web 36, the boss 35 is undercut or slotted as shown at 37 to permit the strap 32 to pass beneath the gripping member 33. The gripping member 33 is provided with a circular aperture 38 in which there is journaled an eccentric sleeve 39 and this eccentric sleeve is in turn journaled on a pin or axle 40. This pin has an enlarged head 40^a which fits within an aperture formed in

the front wall 35[a] of the boss 35 and the opposite extremity of the pin 40 fits within an aperture is formed within the rear wall 35[b] of the boss 35, as shown particularly in Fig. 5. The pin 40 is held against rotation by means of a set screw 41 which engages a threaded aperture 42 extending upwardly through the base plate 30 and the rear wall 35[b] of the boss 35. The end of the set screw engages the flat surface 40[b] of the pin 40 which is thus held against rotation, and the eccentric sleeve 39 is free to rotate thereon for the purpose of effecting movement of the gripping member 33 toward or from the upper surface of the strap 32, which is to be gripped between the member 33 and the base plate 30. The eccentric sleeve 39 has an operating handle 45 formed integrally therewith and extending upwardly therefrom, as shown in Fig. 4, when the strap is being gripped. The handle 45 has a curved broad extremity 45[a] for engagement by the hand of the operator when it is desired to push the handle downwardly from its upright position in order to release the strap.

The handle 45 is normally maintained in the upright position shown in Fig. 4 by means of a coil spring 46, which is wound around that portion of the sleeve 39 which lies between the hub of the arm 45 and the adjacent wall 35[b] of the boss 35. One end of this coil spring engages an aperture in a lug 47 formed in one side of the handle 45 and the other end of the spring is hooked into an aperture 48 which is formed in the top of the boss 35, as shown in Fig. 6.

When the operator wishes to insert the strap 32 beneath the gripping member 33 on the gripping surface 31, the handle or lever 45 is moved toward the right as viewed in Fig. 4, thereby elevating the gripping member 33 through the rotation of the cam or eccentric sleeve 39 and then, after the strap has been inserted, the release of the handle 45 will allow it to return to its normal upright position under the influence of the spring 46, thereby lowering the gripping member 33 to cause the flat gripping surface 33[a] to engage the upper surface of the strap. The handle 45 not only serves to rotate the cam or eccentric sleeve 39, but it also effects certain movements of the gripping member on the eccentric sleeve through the agency of a lug 50 which is formed on one side of the handle 45 at the end of a reinforcing rib 51. The lug 50 has a surface 50[a] which is adapted to engage the top surface of the gripping member 33 when the handle 45 is in its upright position, as shown in Fig. 4, thereby rocking the gripping member 33 about the eccentric 39 to cause the flat gripping surface 33[a] and its teeth to engage evenly with the top surface of the strap.

The lug 35 also has an angularly disposed surface 50[b] which, when the handle 45 reaches or approaches its lowermost position, shown in Fig. 8, contacts with the upper surface of the gripping member 33 adjacent the edge thereof opposite to the edge which is engaged by the surface 50[a] in Fig. 4, thereby tilting the gripping member 33 about the pin 40 and moving it to the position shown in Fig. 8. There is a normal tendency of the gripping member 33 to tilt to the position shown in Fig. 8 under the influence of a spring 52 which has one end secured by a screw 53 to the boss 35 and which has an intermediate coil terminating in an extremity 52[a] bearing on the inclined inner wall of a groove 54 formed in the side of the member 33. The wall of the rectangular aperture within the boss 35 has a projection 55 beneath the spring 52 for engagement with the lower corner of the gripping member 33 when the latter is tilted to the position shown in Fig. 7, thereby limiting the tilting movement of the gripping member in that direction.

In this form of the invention, instead of releasing the strap from the grip of the gripping member by reversing the direction of the pull on the strap, the gripping member 33 is released by elevating it from engagement with the strap 32 through the operation of the handle 45. This may be done while the strap 32 is under tension in a direction adapted to increase the grip of the member 33 on the strap. It will be observed that the serrated gripping surface 33[a] is disposed at one side of a vertical plane passing through the axis of the eccentric sleeve 39 so that the member 33 has the self-gripping function previously referred to and tends to increase its grip on the strap when tension is set up in the strap in the direction indicated by the arrow 56 in Fig. 4. Upon elevating the gripping member 33 by the operation of the handle 45, the serrated surface 33[a] tends to remain in contact with the strap and to move inwardly toward a vertical plane passing through the axis of the sleeve 39, due primarily to the pull on the strap in the direction of the arrow 56. If this tendency were not opposed, the gripping surface 33[a] would tend to assume a position beneath the pin 40 and thereby cause a binding action which would prevent the release of the strap, notwithstanding the elevation of the gripping member 33 from the gripping position shown in Fig. 4. This tilting tendency of the gripping member 33 due to the pull on the strap, is opposed by the action of the spring 52 which tends to maintain the gripping member in an upright position while it is being elevated by the rotation of the eccentric sleeve 39, and the extreme tilting of the member 33, in a counterclockwise direction as viewed in Fig. 4, is further overcome by the engagement of the lower edge of the gripping member with the projection 55, previously referred to. The gripping member 33 is thus prevented from tilting further than the position illustrated in Fig. 7, wherein the part of the serrated gripping surface

33[a] which engages the strap 32 is displaced toward the left, as viewed in that figure, from a plane passing through the vertical axis of the pin 40, so that the member 33 is elevated before any objectionable binding effect is established by the pull of the strap 33 in the direction of the arrow 56. After reaching the position shown in Fig. 7, the further operation of the handle 45 rotates the eccentric sleeve 39 and elevates the gripping member 33 to the position shown in Fig. 8. As the handle 45 approaches that position, the inclined face 50[b] on the lug 50 engages the top surface of the gripping member 33 and tilts it in a clockwise direction, as viewed in Fig. 8, so that the serrated gripping surface 33[a] is positively carried away from a position which would tend to cause an objectionable binding action if it were in engagement with the strap, and the parts are then in readiness to permit the gripping member 33 to engage the strap properly when it is again lowered. When this lowering of the gripping member is effected, it passes downwardly so that the flat serrated gripping surface 33[a] moves into proper engagement with the top surface of the strap to grip the strap throughout its width.

In Figs. 9, 10, 11, 12 and 13 of the drawings, there is illustrated a certain form of gripping dog construction which is, in many respects, similar to the second form of the invention described above except that the direction of rotation of the eccentric is reversed and other parts are arranged to permit the efficient operation of the gripping device when embodied in a machine wherein a compact relation of the parts is desired. In this form of the invention, the parts are carried by a base plate 60 having a laterally projecting foot or flange 61 which is adapted to serve as a gripping member to engage the lower side of the metal strap 62 when the latter is passed into position thereon as shown in Fig. 9. The upper side of the strap 62 is adapted to be engaged by the flat serrated gripping surface 63[a] formed on a gripping member 63 which is mounted for rotation on the eccentric 64 which is formed as a part of a shaft 65. This shaft is journaled in a block 66 which is carried by the base plate 60 and the reduced end portion 65[a] thereof, at the outer end of the eccentric 64, is journaled in a depending flange 66[a] which is carried by the overhanging arm 66[b] of the block 66. The shaft 65 is maintained against endwise movement in its bearings by means of a stud 67 which threadedly engages the wall of the block and which passes into an annular groove 65[b] formed in the shaft 65. This shaft projects from the rear side of the block 66 and has secured thereto a handle 67 provided with a broad curved portion 67[b] adapted to be engaged by the hand of the operator. The handle 67 is secured on the shaft 65 by a transverse pin 68 and is normally maintained in the upright position shown in Figs. 9 and 10, with a corresponding position of the shaft 65 and eccentric 64, by the action of a coil spring 69 which is wound about the shaft between the handle 67 and the block 66 with one end of the spring engaging an aperture 70 in the handle and with the other end engaging an aperture 71 in the block. The extent of angular movement of the handle 67 is limited by a pair of lugs 72 and 73 which are formed on the hub portion of the handle and which are adapted to engage a lug 74 projecting from the block 66 in the two limiting positions of the handle. This effects a corresponding limitation upon the movement in either direction of the eccentric 64 and this determines the extent to which the gripping member 63 may be raised and lowered by the operation of the eccentric. The serrated gripping surface 63[a] of the gripping member 63 is displaced laterally from a vertical plane passing through the axis of the shaft 65 so that the grip of the member 63 on the strap 62 automatically increases when tension is exerted on the strap in the direction indicated by the arrow 75 in Fig. 9. The gripping member 63 is provided in its outer side with a slot 63[b] to permit a superimposed layer of the strap to be passed therethrough when the device is embodied in a strap stretching device, for example, where the strap is rendered taut by the relative movement of two gripping devices in opposite directions with the ends of the strap overlapping. The gripping member 63 is restrained against a tilting movement in a counter-clockwise direction, as viewed in Fig. 9, by the action of a plunger 76 which is mounted in a bore 77 formed in the block 66 and which is engaged by a coil spring 78 mounted in the bore to force the plunger 76 against the face of the gripping member.

When the gripping member 63 of the device illustrated in Figs. 9 to 13, inclusive, is elevated, the handle 67 is moved towards the left as viewed in Figs. 9, 11 and 13, thus rocking the eccentric 64 in a counterclockwise direction which is the direction in which the pull is exerted by the strap 62 as shown by the arrow 75 in Fig. 9. Notwithstanding this movement of the eccentric in this direction, the gripping member 63 is prevented from tilting in this direction sufficiently to exert an objectionable binding effect upon the strap which would interfere with its release, due to the action of the plunger 76 and by the engagement of the part 63[c] of the gripping member with the vertical surface 79 formed at one edge of the recess in the block in which the gripping member 63 is partially located. When the handle 67 has been moved to the intermediate position shown in Fig. 13, the nose 63[c] of the gripping member engages the

surface 79 to prevent further tilting of the gripping member in a counterclockwise direction, as viewed in that figure, and upon further rotation of the handle 67 to the position shown in Fig. 11, the nose 63c rises upwardly on the surface 79 until the serrated gripping surface 63a is released from the strap, when the plunger 76 takes effect and tilts the gripping member in a clockwise direction to the position shown in Fig. 11.

Although three forms of the invention have been shown and described by way of illustration, it will be understood that it may be embodied in various other forms within the scope of the appended claims.

I claim:

1. A gripping dog comprising a frame member having a part to engage a strap to be gripped, a gripping member, a supporting member on which said gripping member is rotatably mounted, and means having an eccentric connection with said supporting member for effecting rotation thereof to move said gripping member toward and from said strap, said gripping member having a gripping surface in one plane located at one side of a plane passing through the axis of movement of said supporting member normal to the surface of said strap.

2. A gripping dog comprising a frame having a part provided with a surface to engage a strap, a gripping member mounted on said frame and having a gripping surface to engage said strap, a rotatable shaft having an eccentric part on which said gripping member is rotatably mounted, a handle for effecting rotation of said shaft, and means for limiting the movement of said handle.

3. A gripping dog comprising a frame provided with a part having a surface to engage a strap, a supporting member carried by said frame and having a part on which said gripping member is rotatably mounted, means for actuating said supporting member to move said gripping member away from said strap, and means for limiting the angular movement of said gripping member about said supporting member during said movement away from said strap.

4. A gripping dog comprising a frame having a part provided with a surface to engage a strap, a shaft rotatably mounted in said frame and having an eccentric part, a gripping member pivotally mounted on said eccentric part and having a gripping surface located at one side of a plane passing through the axis of said shaft normal to the surface of said part, and means tending normally to rotate said shaft to cause said gripping member to engage a strap seated on said part.

5. A gripping dog comprising a frame having a part provided with a surface to engage a strap, a shaft rotatably mounted in said frame and having an eccentric part, a gripping member pivotally mounted on said eccentric part and having a gripping surface located at one side of a plane passing through the axis of said shaft normal to the surface of said part, means tending normally to rotate said shaft in a direction adapted to cause said gripping member to engage said strap, and means tending normally to move said gripping member in a reverse direction when it is out of engagement with said strap.

6. A gripping dog comprising a frame having a part provided with a surface to engage a strap, a shaft rotatably mounted in said frame and having an eccentric part, a gripping member pivotally mounted on said eccentric part and having a gripping surface located at one side of a plane passing through the axis of said shaft normal to the surface of said part, means tending normally to rotate said shaft in a direction adapted to cause said gripping member to engage said strap, means tending normally to move said gripping member in a reverse direction when it is out of engagement with said strap, means for rotating said shaft to move said gripping member away from said strap, and means for limiting the pivotal movement of said gripping member about said eccentric part during the initial part of its movement away from said strap.

7. A gripping dog comprising a frame having a part to engage one side of a strap, a shaft journaled in said frame and having an eccentric part, a gripping member having a pivotal movement on said eccentric part and having a gripping surface located at one side of a plane passing through the axis of said shaft normal to the surface of said strap, means for rotating said shaft, means tending to tilt said gripping member upon said eccentric part when it is released from said strap, and means for limiting the tilting movement of said gripping member upon rotation of said eccentric part.

8. A gripping dog comprising a frame member having a part to engage a strap, a movable gripping member adapted to engage a strap seated on said part, an eccentric on which said gripping member is pivotally mounted, and means tending to effect a pivotal movement of said gripping member on said eccentric when said gripping member is released from said strap.

In testimony whereof, I have subscribed my name.

JOHN EKERN OTT.