Oct. 17, 1933. A. B. BRADLEY ET AL 1,930,640

HYDRAULIC GRIPPER

Filed Nov. 21, 1931 2 Sheets-Sheet 1

Fig. 1.

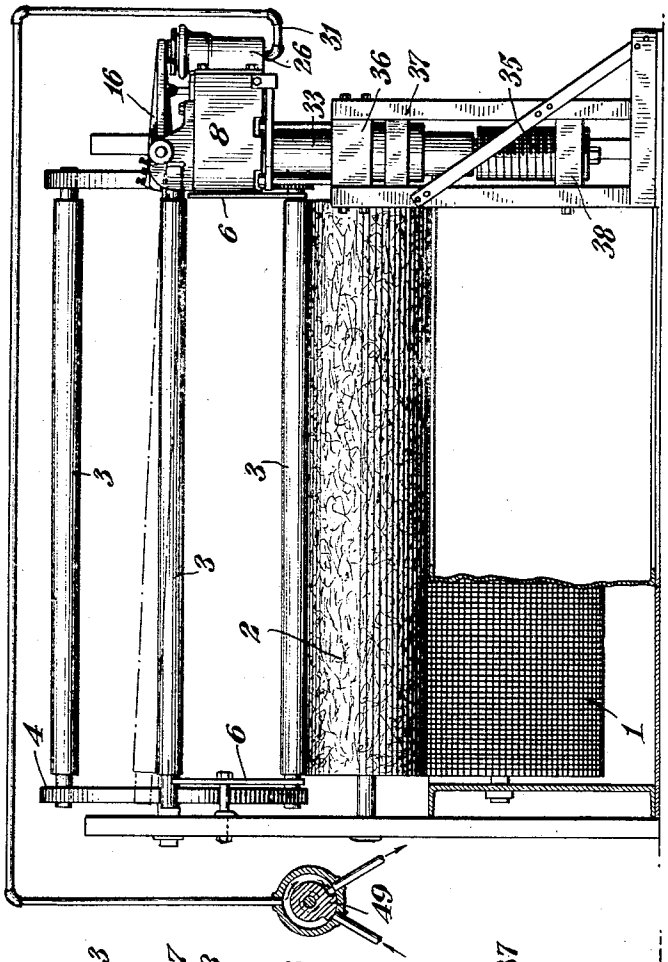
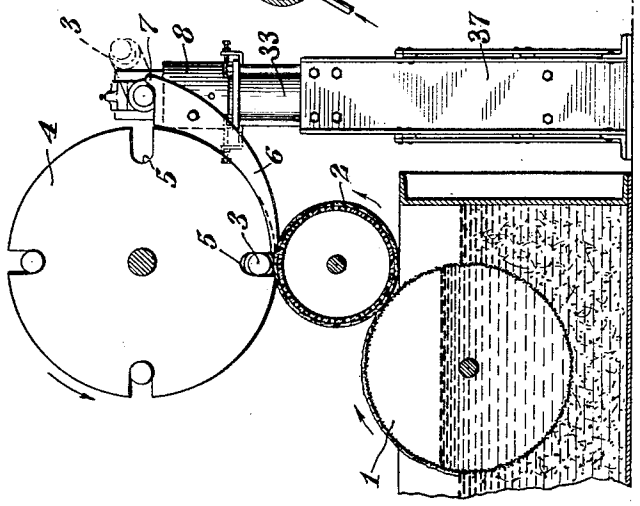


Fig. 2.



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Fig. 3.

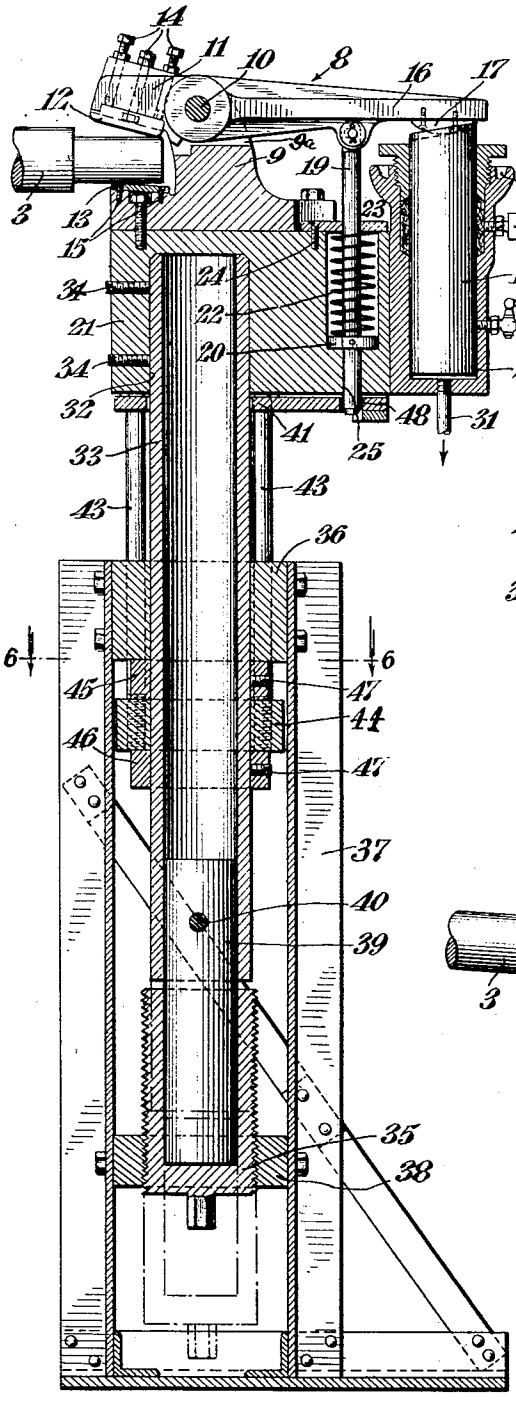


Fig. 1.

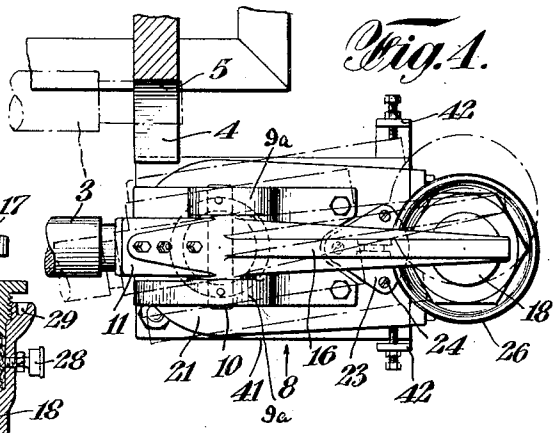


Fig. 6.

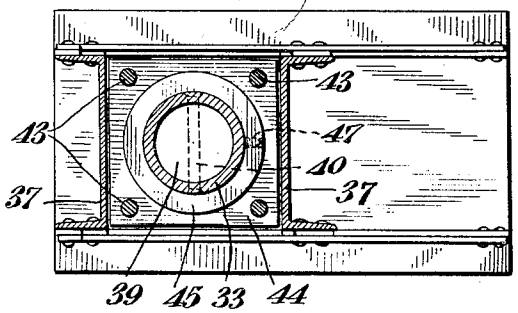
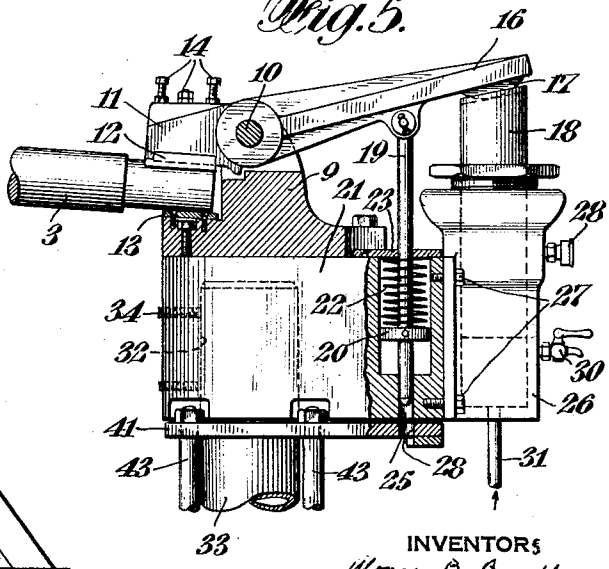


Fig. 5.



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HYDRAULIC GRIPPER

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Application November 21, 1931
Serial No. 576,600

10 Claims. (Cl. 214—1)

This invention relates to hydraulic operated jaws, more particularly to the operation of jaws for gripping shaft-like parts on one end and lifting the other end, and to a special way of rotatably mounting the apparatus.

Objects of the invention are, the provision of a construction which causes the closing of jaws by means of a hydraulic ram; the provision of jaw members which are adapted to grip heavy pieces and at the same time give them a tilting motion; the provision of a construction which allows the whole jaw apparatus, including its operating mechanism, to be revolved; the provision of means for adjusting the elevation of the jaws, including operating mechanism to suit the apparatus from which the jaws are fed; the provision of turntable-like means for revolving the jaw mechanism and other means for locking the turntable and preventing it from rotation at certain predetermined positions of the jaw members with respect to each other, and of the whole jaw mechanism with respect to its support structure.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims, and shown in the drawings, which by way of illustration show what we now consider to be a preferred embodiment of the invention.

In the drawings—

Figure 1 is a front view of the apparatus attached to a machine for making paper tubes.

Figure 2 is a cross-sectional view of the paper-roll making machine to which the hydraulic jaws are attached for the purpose of gripping the forming rolls around which the finished paper tube is located, and lifting the forming rolls.

Figure 3 is a front view of the upper jaw, and a cross-sectional view of the lower jaw, the operating mechanism, and the support.

Figure 4 is a top view of the apparatus.

Figure 5 is a front view of the upper jaw, and a cross-sectional view of the lower jaw, in closed position of the jaws.

Figure 6 is a cross-section of the supporting structure across lines 6—6 of Figure 3, looking in the direction of the arrows on Figure 3.

The operation of the paper-roll making machine as shown in Figures 1 and 2, is more clearly described in our copending application, filed November 21, 1931, Serial No. 576,599. The paper forming material is picked up by the mold roll 1, which is revolved by frictional engagement with the couch roll 2. The couch roll is rotated by means of a motor. On the couch roll 2 rests the forming roll 3 by its own weight and additional weights, which are not shown on the drawings. The forming roll 3 picks up the paper making material from couch roll 2 and gradually forms a paper tube around the forming roll. As soon as this tube has reached the desired thickness, the spider 4 is revolved one-quarter turn in the direction of the arrow. The forming roll 3 is held in the slots 5 of the spider by means of guides 6. After one-quarter turn, the forming roll 3 rolls out of the slot of the spider impelled by the centrifugal force which is obtained during the revolving motion. The roll then rests on one end on the upper part of guide 6 which is provided with a stop 7. On the other end, it rolls into the jaws of the lifting gripper 8. The gripping surfaces of the jaws are approximately parallel and inclined downwardly from their outer edges toward the vertical plane of the gripper pivot, and when the upper jaw is clamped onto the roll, the forming roll 3 is slightly tilted up on its free end, as shown by dotted lines in Figure 1.

Figures 3, 4 and 5 show the jaw mechanism 8 more clearly. The lower part 9 has two ear-like extensions 9a which act as bearings for the pin 10 upon which the upper jaw 11 is pivoted. The faces of the jaws are provided with exchangeable plates 12 and 13 of softer material than the forming roll 3, and held in position by bolts 14 and 15. The bolts 14, 15 can be tightened from above and are easily accessible. The upper jaw 11 has a lever-like extension 16. This extension has on its far end a projection 17 against which the hydraulic ram piston 18 abuts. The projection 17 is detachable and is preferably made of softer material than the hydraulic ram piston 18. The upper end of the piston 18 is inclined and has a diametric depression serving as a guide. This secures a more definite contact with the projection 17 and less wear on this projection. It will be noticed that the projection 17 is curved in such a way that whenever the piston 18 moves upward, there is no rubbing action on the projection 17, but the abutting parts roll over each other.

On lever 16 is pivoted a depending pin member 19 which carries a stop collar 20. This collar moves in a cylindrical chamber of the supporting arm 21 of the gripper. In this chamber, on pin 19 above the collar 20, a spring 22 is supported. The cylindrical chamber is closed by a plate 23 secured in place by screws 24. The plate 23 has an opening just sufficient to allow free movement of the pin 19. It is obvious that the spring 22 forces, by engagement with plate 23 and collar 20, the lever 16 downward and the projection 17 onto

the piston 18. The pin 19 extends beyond the collar 20 lower down through a hole 25 in the supporting arm 21, which is just large enough to allow free movement of the pin. The pin projects at its lowermost position, that is when the jaws are fully open, below the arm 21. The purpose of this projection will be described later.

The hydraulic cylinder 26 is bolted onto the arm 21 by bolts 27. The upper end of the cylinder is provided with a soft packing which can be greased from the grease cup 28. Any leakage through this packing will be collected in the annular channel 29 which is arranged on the upper part of the cylinder 26. The cylinder can be drained by means of a drain cock 30. The power fluid enters the cylinder at the bottom through pipe 31.

The arm 21 has a cylindrical opening 32 whereby it is seated on the top of hollow shaft 33, to which it is securely held by lock screws 34.

The shaft 33 supports the whole of the jaw mechanism including the hydraulic operating mechanism. Its lower end holds a cylindrical pivot pin 39 which is secured to the shaft by one or more cross pins 40. The pin 39 extends into the step bearing 35. The shaft rotates in and is axially guided by bearing 36 which is rigidly mounted on a support structure 37. The thrust bearing member 35 can be screwed up and down in the nut-like part 38 which is rigidly mounted on the support structure 37. By turning the step-bearing piece 35, it will be raised or lowered, and with it the shaft and the jaws. This raising or lowering of the jaws is necessary whenever the diameter of the paper tube-forming roll is changed or the thickness of the wall of the paper tube. In such cases, the center line of the spider will also be raised or lowered and the elevation of the lifting jaws must be adjusted so that the forming rolls roll easily into the jaws.

The purpose of the shaft is to allow a rotation of the whole jaw mechanism. Whenever the forming roll is gripped by the jaws, the free end of the roll must be turned away from the paper-roll making machine in order to obtain free access and to enable the operator to take the paper tube from the forming roll. This movement, however, must be limited. This is done by the provision of a plate 41 which is provided with adjustable stops 42, which are more clearly shown in Figure 4. This plate is secured by means of nuts on the upper end of four columns 43. These columns extend down through the bearing member 36 and are screwed into a square block 44 which is loose with respect to the shaft 33. This block 44 is arranged in between two collars 45 and 46 which are rigidly secured to the shaft 33 by means of lock screws 47. It will be understood that by this arrangement, the shaft 33 will take the stop plate 41 with it in its upward and downward movements. While a rotatable movement of the jaw mechanism is possible, the plate 41 cannot rotate but only move up or down.

It is desirable that the whole jaw mechanism be secured in a position so that the center line of the jaws and lever is parallel to the center line of the spider and forming rolls, as long as the jaws are open waiting for the next forming roll. This is accomplished by a hole 48 in the stop plate 41 into which the pin 19 projects whenever the jaws are open and the center line of the jaws is parallel to the forming rolls. As soon as the piston 18 moves upward and the jaws are closed and the forming roll 30 gripped and tilted upward, the pin 19 is withdrawn from the hole 48 and the apparatus is free for swinging out the forming roll 3.

The hydraulic ram 18 is operated by means of a three-way valve 49 (Figure 1) which is preferably arranged on the left side of the paper-roll making machine. The position of the valve shown in Figure 1 is the open position, whereby the admission of power fluid to the cylinder is interrupted, while the power fluid can easily run out of the cylinder. This is the case when the jaws are opened. The tension of the spring 22 is sufficient to force the ram downward and to force the power fluid out of the cylinder. The location of the valve 49 on the left-hand side of the paper-roll making machine is of importance. On this same side, next to valve 49, is located the four-way valve which operates the mechanism for operating the spider which supports the forming rolls. The operator stands on this side of the machine and can negotiate both valves with one hand. For swinging out the forming roll, taking off the finished paper roll and swinging back the forming roll and rolling it back into the respective slot on the spider, the operator has to stand in the same place.

We claim:—

1. A jaw mechanism for gripping and holding heavy work pieces, a jaw, a base structure for supporting said jaw, another jaw rotatably mounted on the first-mentioned jaw, a stationary support structure for supporting said base structure, connecting means between said support structure and said base structure, said connecting means allowing a rotating movement of the base structure with respect to said stationary support structure, adjusting means between said connecting means and the stationary support structure for varying the position of said base structure with respect to said support structure, and a stop plate provided with adjustable stops for limiting the movement of the base structure.

2. A jaw mechanism for gripping and holding heavy work pieces, a jaw, a base structure for supporting said jaw, another jaw member movably mounted on the first-mentioned jaw, a stationary support structure for supporting said base structure, and connecting means between said support structure and said base structure, said connecting means allowing movement of the base structure with respect to said support structure, a locking member extending from one of the jaw members, and an aperture on the stationary support structure for receiving said locking member and preventing movement of the jaw mechanism with respect to the stationary support structure at certain positions of the jaw mechanism.

3. A jaw mechanism for gripping and holding heavy work pieces, a jaw, a base structure for supporting said jaw, another jaw rotatably mounted on the first-mentioned jaw, a stationary support structure for supporting said base structure, connecting means between said support structure and said base structure, said connecting means allowing a rotating movement of the base structure with respect to said stationary support structure, adjusting means between said connecting means and the stationary support structure for varying the position of said base structure with respect to said support structure, a stop plate provided with adjustable stops for limiting the movement of the base structure, and means cooperating with said connecting means and said stop plate to allow the stop plate to partake of the variation of the positions of the base structure with respect to the support structure.

4. In a jaw mechanism having two jaw members, a base structure, one of said jaw members being mounted on said base structure, the other jaw member having a lever-like extension, a hydraulic operated piston abutting with said lever-like extension at its outer end, said outer end being provided with a curved attachment, said curved attachment abutting with the hydraulic piston, the part of the piston abutting with the lever being provided with a surface of such shape to secure a rolling of said curved attachment over the piston surface and prevent a rubbing action.

5. In a gripping mechanism of the character described, the combination with a rotatable base structure supporting a gripper jaw, of a cooperating gripper jaw pivotally mounted upon said base jaw, power means upon said base structure for operating said pivotally mounted gripper jaw, and means operated by said pivoted gripper jaw for locking said base structure against rotation.

6. In a gripping mechanism of the character described, the combination with a support, a gripper base structure rotatably mounted upon said support, and a gripper jaw upon said base structure of a cooperating gripper jaw pivotally mounted upon said base jaw, an operating lever projecting from said pivoted jaw, power means mounted upon said base structure in operative relation to said lever, and a locking pin connected with said lever adapted to engage said support to prevent rotation of said gripper base structure upon said support.

7. In a mechanism of the character described, the combination with a support, a gripper base rotatably mounted upon said support, and gripper jaw members carried by said base, of locking means between said gripper base and said support, and means under the control of one of said jaw members for operating said locking means.

8. In a mechanism of the character described, the combination with a support having a stop plate, a gripper base rotatably mounted upon said support adjacent to said stop plate, and gripper jaw members mounted upon said gripper base, said stop plate and gripper base having registering holes for the reception of a locking pin, of a locking pin connected with one of said jaw members operating in said registering holes.

9. In a mechanism of the character described, the combination with a support having a stop plate, a gripper base rotatably mounted upon said support adjacent to said stop plate, and relatively fixed and movable gripper jaw members mounted upon said gripper base, said stop plate and gripper base having registering holes for the reception of a locking pin, of a locking pin operating in said registering holes and connected with the movable jaw member to lock the gripper base to the support when the movable jaw member is in open position, and vice versa.

10. In a mechanism of the character described, the combination of a gripper base carrying a jaw, with a second gripper jaw pivotally mounted upon said base in operative relation to said base jaw, the gripping surfaces of said jaws being approximately parallel and inclined downwardly from their outer edges toward the vertical plane of the gripper pivot when the jaws are in gripping position, whereby a gripped work-piece will be tilted upwardly in the gripper.

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