June 12, 1928. 1,673,237

F. GERDES

AUTOMATIC CRANE GRAB

Filed Dec. 2, 1926 4 Sheets-Sheet 1

Fig. 1.

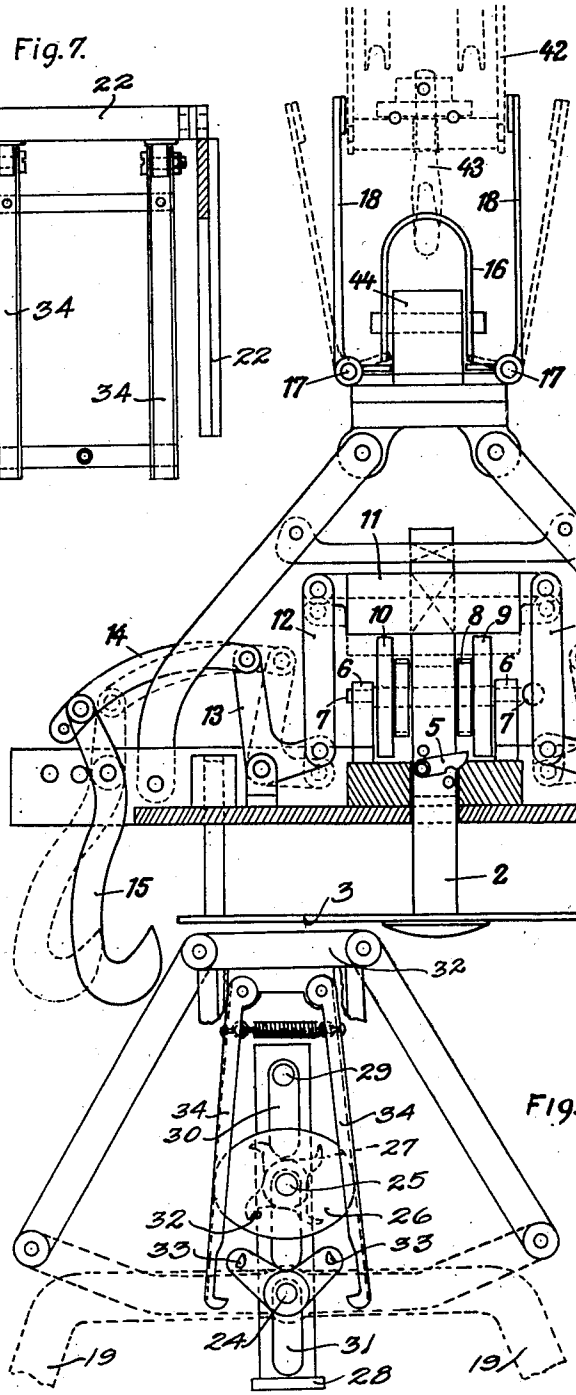


Fig. 6.

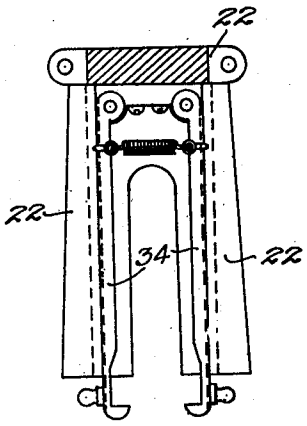


Fig. 7.

Fig. 8

Inventor:
Franz Gerdes.

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Fig. 2.

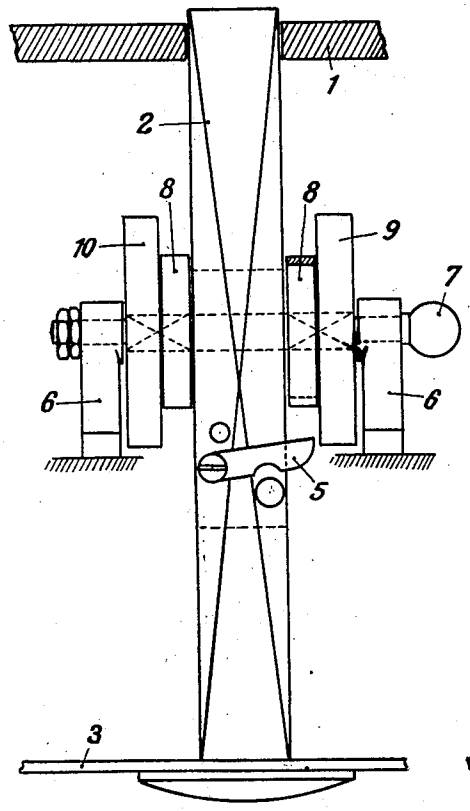
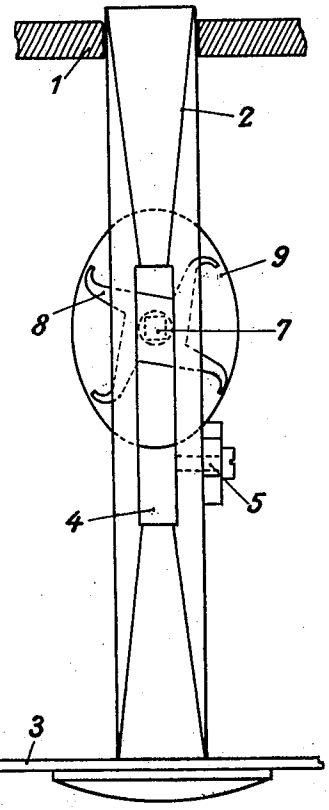


Fig. 3.



Inventor:
Franz Gerdes.

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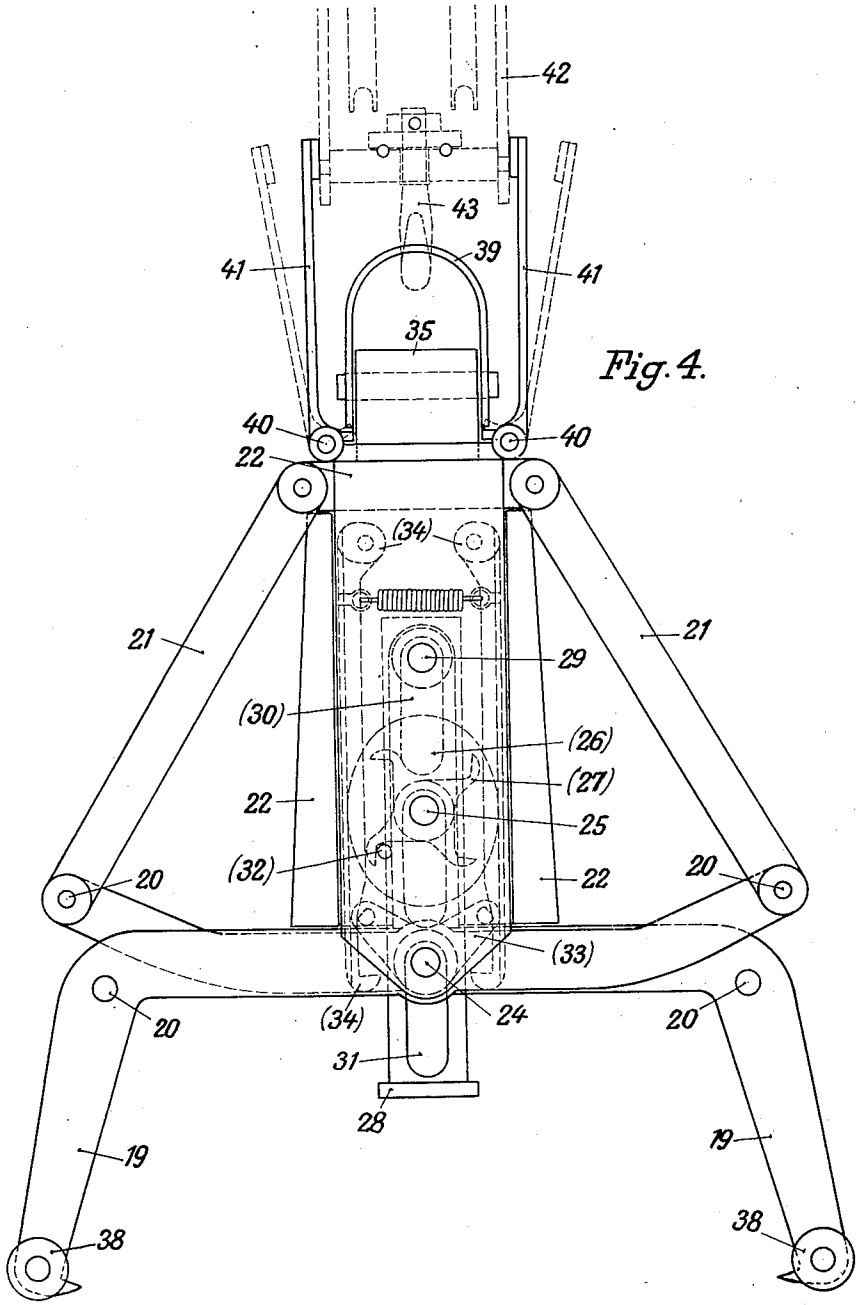


Fig. 4.

Inventor:
Franz Gerdes.

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F. GERDES

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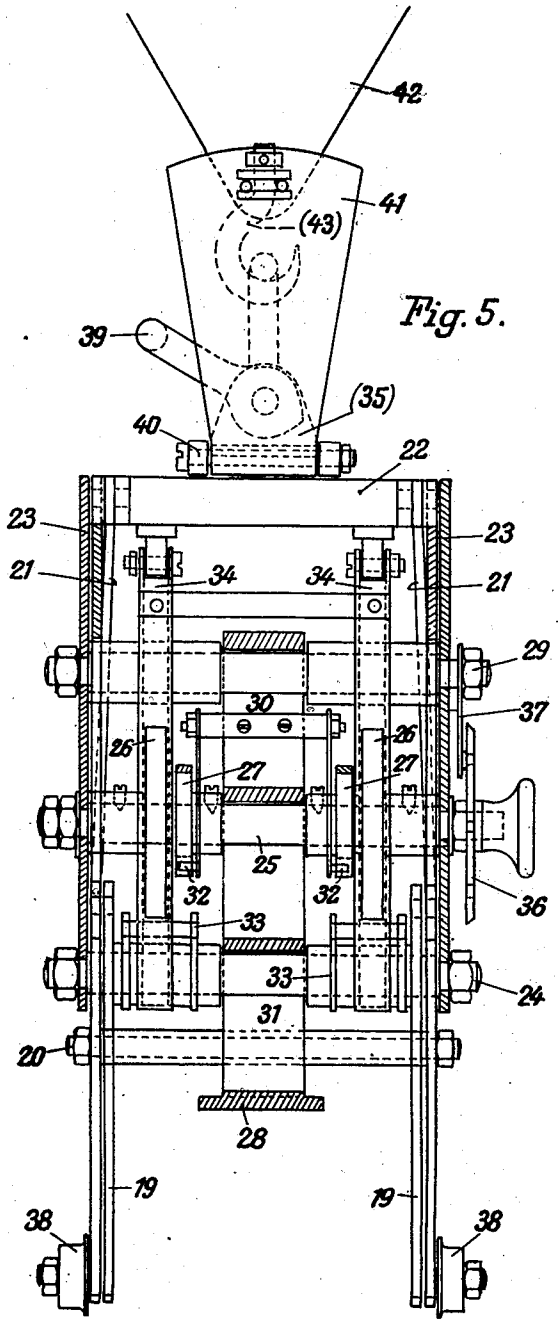


Fig. 5.

Inventor:
Franz Gerdes.

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UNITED STATES PATENT OFFICE.

FRANZ GERDES, OF ESSEN-RUHR, GERMANY.

AUTOMATIC CRANE GRAB.

Application filed December 2, 1926, Serial No. 152,261, and in Germany January 9, 1926.

The invention relates to an automatic crane grab or gripping device for use either on loads which are enclosed in a container or on single piece loads. Two constructional examples embodying a similar principle are illustrated by way of example in the drawings in which:—

Fig. 1 is an elevation, partly in section, illustrating one embodiment of the invention.

Fig. 2 is an enlarged detail elevation of the movable ram and its associated parts.

Fig. 3 is a side elevation of the construction shown in Fig. 2.

Fig. 4 is an enlarged elevation of a modification of the invention.

Fig. 5 is a vertical sectional view taken at right angles to Fig. 4.

Figs. 6 and 7 are respectively a side elevation and a front elevation of the slide and arresting levers carried therewith.

Fig. 8 is a detail elevation showing the arresting levers carried by the slide (Figs. 6 and 7) in their open position.

The grab in accordance with Figs. 1–3 lifts containers or any single piece loads which are capable of being gripped either underneath or by means of projections or otherwise. The grab or gripping device in accordance with Figs. 4–8 is of tong-like form.

It is true that semi-automatic tong-grabs are known in which the opening and locking of the arms of the tongs take place on depositing the tongs on the load to be lifted. With such tong-grabs, however, some additional assistance is necessary for the purpose of suspending and placing the load in them. In contra-distinction thereto the new gripping device in accordance with the present invention is entirely automatic and is characterized by its capability of standing, the central arrangement of the arm-lock and a separate locking device in its head. The new grab or gripping device is therefore suitable not only for work at places where the load is easily accessible but also as a so-called dipping grab for situations which are not in full view and are difficult of access by an attendant on account of heat, wet, steam, gas and the like. The extreme certainty with which the new grab meets the load is due to special precautionary means which almost entirely prevent the grab from swinging about its axis of suspension.

Referring to Figs. 1–3, of the drawings, the gripping device or grab consists essentially of a frame-like body portion 1 in the middle of which is carried an upwardly and downwardly movable ram 2 having a plate 3. The ram has a longitudinal slot 4 extending through it and is provided at the side with a pawl 5 for actuating the mechanism. The bearings 6 carry a shaft 7 which passes through the longitudinal slot 4 in the ram 2. A star wheel 8 and beside it a cam 9, for example of elliptical shape, are fixed on the shaft 7. Cams of other shapes the two diameters of which are of different length may also be employed, their object being to enable different distances apart to be obtained for reversing purposes. In order to avoid jamming a symmetrical elliptical cam 10 is also fitted on the opposite side of the ram 2. A bridge 11 guided by the ram 2 rests on the edges of the two elliptical cams and is connected by means of the levers 12, 13 and 14 to the grab-claws 15 fitted on the frame 1. At the head 44 of the frame or body portion 1 there is provided a suspension eye 16 which is laterally displaceable and in its position of rest lies approximately horizontal and of which the lower portions of the parts surrounding the bolt holes are curved out somewhat elliptically so that, when the eye 16 is upright, they press against the shorter arms of the angle levers 18 but, when the eye 16 is displaced, they allow the shorter arms of the levers 18 to fly upwards. These serve the purpose of automatically adjusting the closure cheeks which clamp the block 42 of the tackle of the crane in order that the grab suspended from the hook 43 cannot at any time rotate relatively to the block 42.

The method of operation of this form of construction of the invention is as follows—

At the beginning of the operation the operator of the crane slips the hook 43 of the crane into the suspension eye 16 and hoists, whereupon the two cheeks 18 close automatically and press closely against the pulley-block 42. Rotation of the gripping device about the axis of suspension is thereby avoided and a so-called semi-rigidity is obtained without any guides. After the grab has encountered the load and on being further lowered the ram 2 is pushed upwards into the frame 1. The pawl 5 rotates the star wheel 8 and with it the elliptical cams 9 and 10 about an angle of approximately

90°. During this movement the bridge 11 slides over the periphery of the elliptical cams until it is supported on their longer diameter and has closed the grab-claws 15 by means of the levers 12, 13 and 14, which takes place under the influence of the weight of the grab itself. While the load is being hoisted the ram 2 together with the plate 3 slides backwards into its former position and the pawl 5 travelling therewith places itself in a position in which it is ready to engage the next tooth of the star wheel 8. When the load is set down the grab is again lowered on to it. The ram 2 and the pawl 5 again rotate the elliptical cam about an angle of 90° so that the bridge 11 is lowered on to the shorter diameter of the ellipse and thereby allows the claws 15 to move outward. The centre in the frame 1 about which the latter rotate may be varied as desired as may be necessitated by the size of the load at the time. Further, the elliptical curve may be constructed as a closed guide so that the claws 15 are moved positively in both directions.

Referring now to Figs. 4–8, the gripping device or grab consists of two pairs of tong-like members 19 which are connected together by means of parallel, transverse bolts 20. The rods 21 connect from the levers 19 of the tongs to a slide 22 which is movable up and down. The mechanism is arranged between the side plates 23 which are connected by means of transverse bolts 24 and 29. The shaft 25 is journalled in the side plates 23 and carries two cams 26 which are connected with star wheels 27. In the middle of the grab is located the ram 28 which is guided by the transverse bolts 24 and 29 and by the shaft 25, for which purpose the ram 28 is provided with longitudinal slots 30 and 31. It is therefore movable upwards and downwards. The ram 28 carries a pawl 32 on either side for driving the star wheels 27. The transverse bolt 24 carries two arresting members 33 for the position of rest of the grab. Two arresting levers 34 which are hinged to the slide 22 and are formed as hooks at their lower ends rest against the cams 26. On the front of the grab (Fig. 5) there is fitted the adjustment disc 36 the object of which is to secure the mechanism of the cams against undesired movement with the aid of the leaf springs 37. A construction of the adjusting disc 36 as a kind of double indicator enables the position of rest or the gripping position of the grab to be easily recognized. Rollers or wheels 38 facilitate the forward movement of the grab along the ground or on rails. At the head 35 of the slide 22 there is fitted a displaceable suspension eye 39 and hinges 40 together with the closure cheeks 41.

The method of operation of this form of construction of the new gripping device is as follows—

At the beginning of the operation the mechanism must be in its position of rest which corresponds to that adjustment of the elliptical cams 26 in which their longer diameter is vertical. In this position the hooks at the lower ends of the arresting levers 34 engage the carrying bolt of the arresting member 33 for the purpose of lifting. The operator of the crane allows the hook 43 of the crane to slip into the suspension eye 39 and hoists. The cheeks 41 close against the block 42 and the hooks of the arresting levers 34 engage under the carrying bolt whereby the grab is held open. On lowering the grab on to the load to be gripped the ram 28 is pushed upwards and its pawl 32 rotates the star wheel 27 and the cams 26 through an angle of 90°. During this the arresting levers 34 are spread apart by the cams 26, the carrying bolts of the arresting members 33 are thereby freed and the position of rest is dissolved. The operator of the crane now hoists and the pair of jaws 19 closes and grips the load. During the lifting the ram 28 again slides downwards and the pawl 32 places itself in position to engage in front of the next tooth of the star-wheel 27. On setting down the load the grab is again completely set down on the load. The ram 28 and the pawl 32 again rotate the cams 26 about an angle of 90°, and the arresting levers 34 again support themselves against the shorter elliptical axes of the cams 26. The hooks of the arresting levers 34 again slide under the carrying bolts of the arresting member 33 so that the grab again returns to the position of rest. If, after the operation is complete, the grab is brought to its station, the closure cheeks 41 are opened by a side thrust on the suspension eye 39 and release the hook 43 of the crane so that it is free to be removed.

I claim:—

1. An automatic grab for cranes comprising a main body member, a pair of grab claws pivoted thereto, a ram slidably mounted on said body member, a pawl carried by said ram, a bridge linked between said claws, and means interposed between said bridge and body member and actuated by said pawl for controlling the operation of said claws.

2. An automatic grab for cranes comprising a main body member, a pair of grab claws pivoted thereto, a ram slidably mounted on said body member, a pawl pivoted on said ram, a bridge and link connection between said claws, and a cooperating star wheel and cam mechanism interposed between said bridge and body member for controlling the operation of said claws.

FRANZ GERDES.