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2,621,534

GRAB DRIVING MOTIONS

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3 Sheets-Sheet 1

Fig. 1.

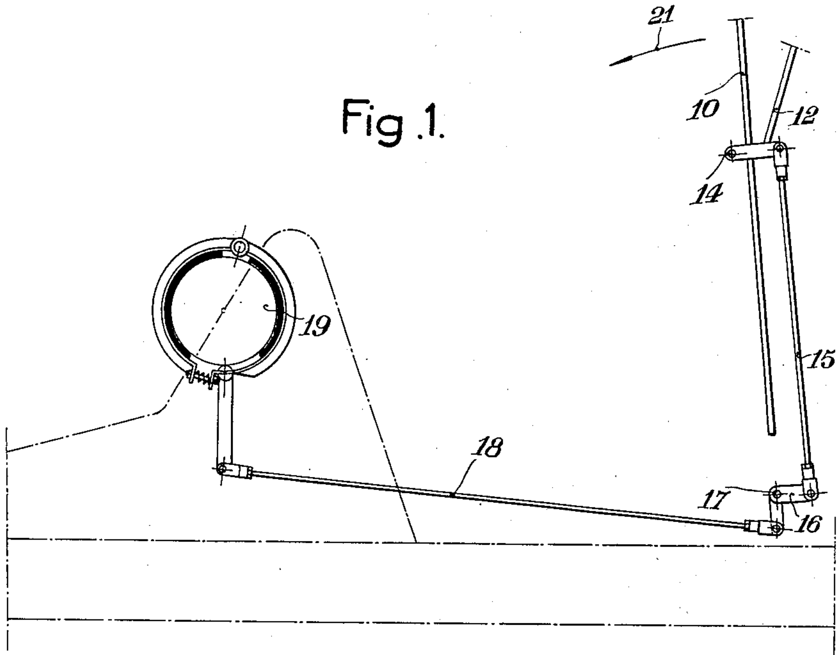

Fig. 2.

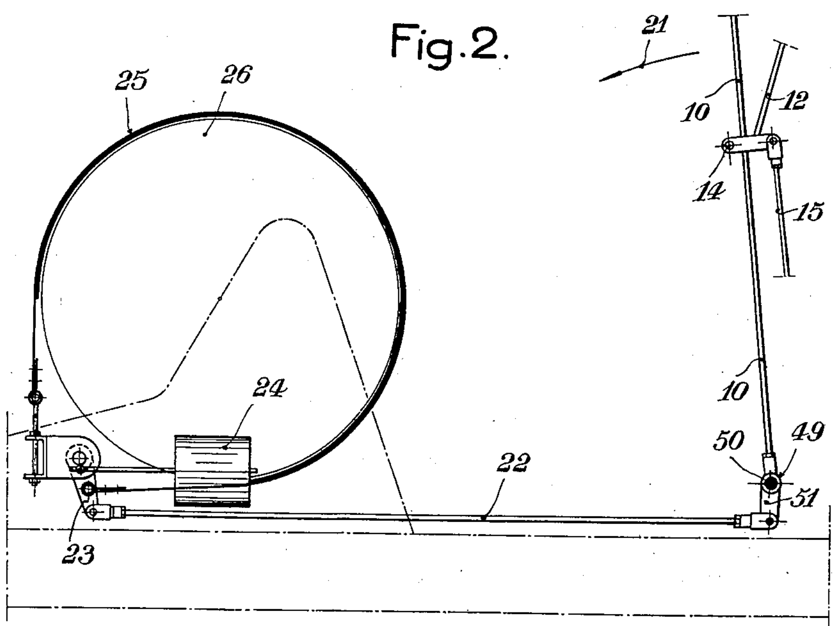

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Fig. 3.

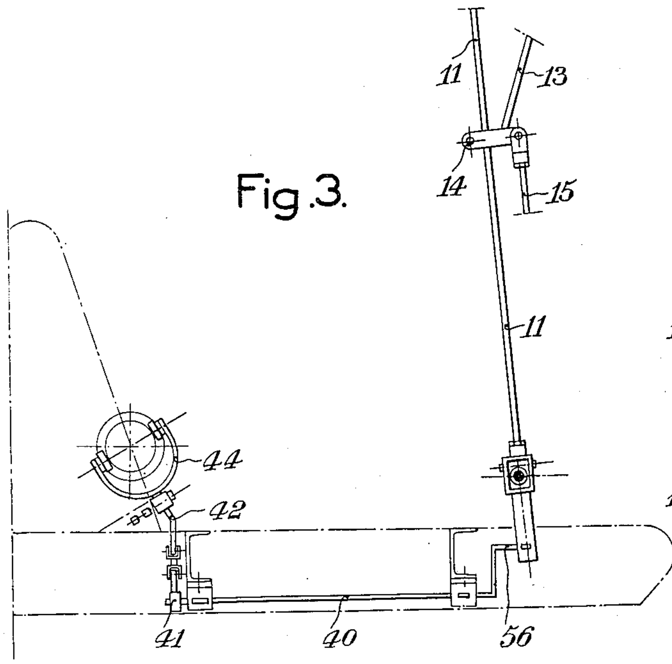

Fig. 7.

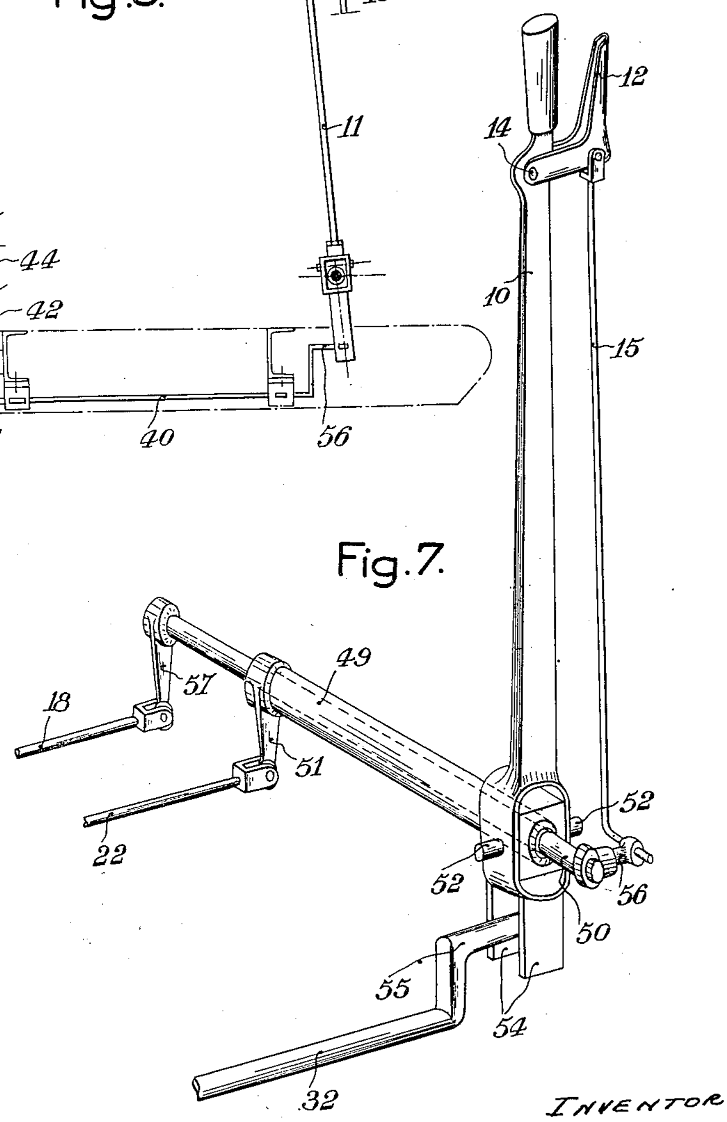

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Fig. 4.

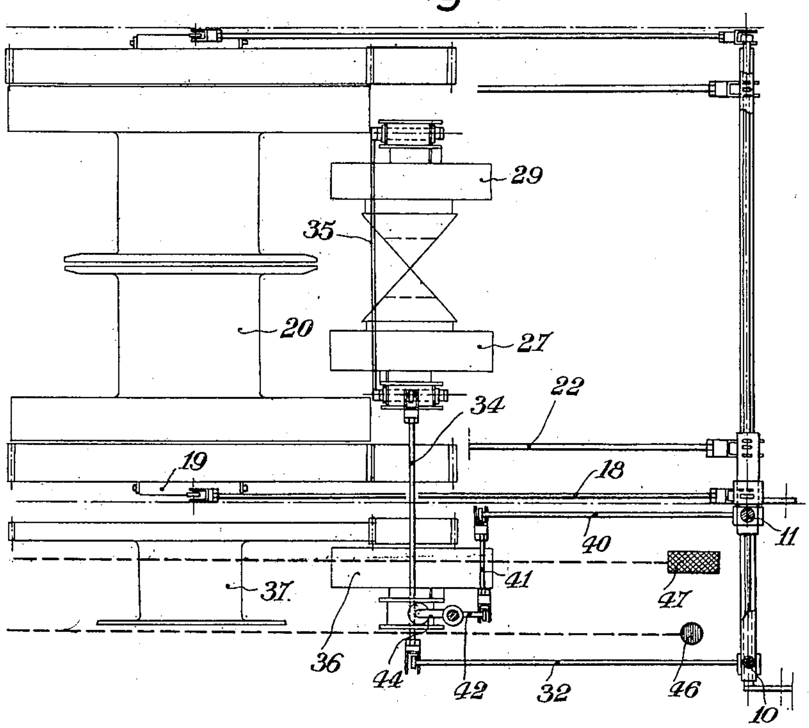


Fig. 5.

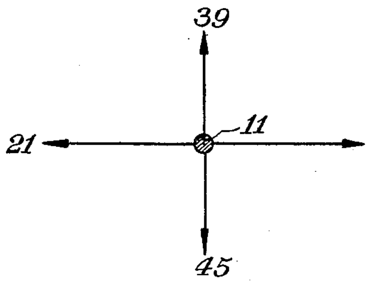
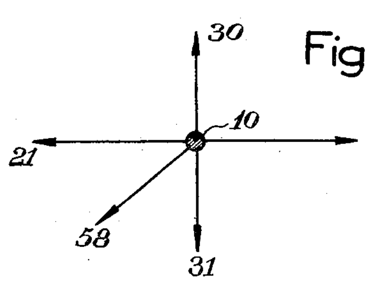


Fig. 6.



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GRAB DRIVING MOTIONS

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2 Claims. (Cl. 74—471)

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Considerable skill is required from the operator of a grab who must perform eight or ten manipulations within a very short time for the accomplishment of all the movements involved by the operation of the machine.

On existing grabs, these movements are controlled by means of a greater or less number of levers (however always more than two) and of three or four pedals. Since the operator is unable to actuate more than two levers and two pedals at one time, he is compelled to release some lever or pedal when he wants to actuate some other, which results in the discontinuation of certain movements although the possibility of effecting several manipulations simultaneously and the whole of them in rapid and uninterrupted succession would be desirable in order to secure maximum efficiency.

Usually, grabs are equipped with the following mechanisms controlled by hand or by foot: three winches operatable simultaneously or separately and associated each with its own clutch and its own brake, adapted to lift and lower the loads and to adjust the slope of the boom; a pair of clutches adapted to turn the whole machine frame to the right or the left, bucket-opening means and means to throw the engine out of gear.

The present invention has for its object a grab control gear all the parts of which can be actuated simultaneously or separately as desired with the aid of one single pair of levers and one single pair of pedals, each lever being provided with a movable handle.

The driving motion according to the invention is characterized thereby that it comprises control levers which are displaceable in all directions owing to the provision of a 2-directional joint complemented each with a movable handle, either lever controlling two movements separately or simultaneously depending on which way said lever is displaced, a third movement moreover being controlled with the aid of the movable handle.

The whole driving motion can thus be controlled with the aid of one pair of such levers provided with a movable handle as just described and of one pair of pedals.

A preferred embodiment of the invention will now be described for the purpose of exemplification and by no means of limitation, reference being had to the appended drawing in which:

Figure 1 is an elevational view which diagrammatically shows the control of the load-lifting winch clutch by means of the movable handle of a lever.

Figure 2 is an elevational view which diagrammatically shows the control of a load-lifting winch brake by means of a lever.

Figure 3 is an elevational view which diagrammatically shows the control of one of the frame-swinging clutches.

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Figure 4 is a plan view which diagrammatically shows the driving motion as a whole.

Figures 5 and 6 diagrammatically show in which directions the hand levers must be displaced for the control of the various movements of the grab.

Figure 7 is a perspective view of a control lever together with its movable handle and the related connecting rods.

The driving motion comprises a pair of similar levers **10**, **11** which the operator actuates with either hand; each lever comprises a movable handle **12**, **13** pivoted at **14** to the said lever **10** or **11**; each movable handle through the medium of a rod **15** actuates a bell-crank lever diagrammatically shown at **16**; the bell-crank levers **16** are pivoted at **17** coaxial with the related lever **10** or **11**; each of them actuates a rod **18** controlling the clutch **19** of a load-lifting winch **20**. Through the medium of the said bell-crank levers **16**, the movable handles **12** or **13** are capable of actuating the clutches **19** irrespective of the position of the lever **10** or **11** since the pivot **17** of the bell-crank lever **16** is collinear with the pivot of the lever **10** or **11** pertaining to the movable handle considered.

As the lever **10** is swung in the direction shown by the arrow **21**, it pulls the rod **22** which through the medium of a lever **23** lifts a weight **24** and at the same time looses the brake **25** wrapped about the drum **26**. As the lever **10** is swung back to its initial position, the brake band is tightened by the action of the weight **24** and of the lever **23**.

By pulling the lever **10** against the direction shown by the arrow **21**, the brake band **25** is pressed more tightly against the drum **26** and the braking action is increased.

The pair of clutches **27**, **29** pertaining to the mechanism by which the frame is rotated in either direction are actuated by swinging the lever **10** in the direction of the arrows **30**, **31** respectively, the action being transmitted through a rock shaft **32** to rods **34**, **35**.

The clutch **36**, which controls the action of the pinion which drives the winch **37** adapted to vary the inclination of the grab boom is actuated by moving the lever **11** transversally in the direction shown by the arrows **39**; the lever **11** actuates the clutch **36** through the medium of the rock shaft **40**, the lever arms **41**, **42** and the fork **44**. The grab bucket is opened by moving the same lever **11** transversally in the direction shown by the arrow **45**.

Finally, the driving motion comprises a pair of pedals **46**, **47** which respectively control the grab engine throttle and the engine clutch.

The perspective view shown in Fig. 7 illustrates a preferred arrangement of the levers **10**, **11** and their connections with the various transmission members. For instance, the lever **10** is arranged to swing together with the sleeve **49** about the shaft 50 and thereby to actuate the rod 22 of the brake 25 through the medium of the arm 51 rigid with the sleeve 49; moreover, the lever 10 is mounted to swing transversally about the trunnions 52 rigid with the sleeve 49, which results in a shifting of the fork 54 and a swinging of the crank 55 of the crankshaft 32 by which the clutches 27 and 29 controlling the rotation of the grab frame in the horizontal plane are actuated. The bell-crank lever 16 illustrated in the diagrammatical Fig. 1 consists of the arm 56 rigid with the shaft 50, said shaft 50 and the arm 57 which likewise is rigid with the latter and to which the rod 18 that actuates the clutch 19 of the load-lifting winch 20 is pivoted.

The levers 10 and 11 may be mounted on ball-and-socket joints; anyhow, they are displaceable in any direction intermediate between those which are indicated in the diagrammatical Figs. 5 and 6.

For instance, the operator of the grab moves the lever 10 in a direction 58 intermediate between those shown by the arrows 21 and 31; in this case he pulls the lever 10 with one hand in the said direction 58, which results in releasing the brake 25 and rotating the grab frame through the medium of the clutch 29; by simultaneously pushing the handle 12 on lever 10 with the same hand he can throw in the clutch 19 of the winch 20.

Consequently, the operator is enabled with his two hands to simultaneously control six movements, or any one, or two, or three, or four, or five of them. With his two feet he can actuate the two pedals 46, 47 which respectively control the throttle and the clutch of the engine.

The preceding description clearly shows how the operation of a grab provided with a driving motion according to the invention can be controlled easily, rapidly and accurately. The possibility afforded by such a driving motion of availing of an eighth simultaneous control of the engine throttle is particularly advantageous.

What I claim is:

1. In a mechanical assembly the operation of which requires the actuation of five different controls, comprising two pairs of controls, each pair having at least one control the actuation of which is required during each phase of the operation of said mechanical assembly, and a fifth control adapted to be actuated independently of said two pairs of controls, a steering system adapted to permit the accomplishment of the whole range of steering operations by means of a single handle having associated therewith a hand-lever adapted to be actuated together with said handle by one of the opeartor's hands constantly engaging said handle, said steering system comprising a rotatably mounted shaft having two arms rigid therewith and a tubular shaft rotatably mounted on and coaxial with said shaft, another arm rigid with said tubular shaft, a lever mounted for universal swivel motion about a fixed point on the common axis of said shaft and said tubular shaft, the latter being so operatively connected with said lever as to be rotated thereby whenever said lever is moved in a plane at right angles to said common axis, a handle on the free end of said lever, a fork-shaped extension on said lever opposite said handle, said hand-lever registering with said handle and being pivotally mounted on said lever, a connecting link pivotally mounted by one end on said hand-lever and by its other end on one of said shaft arms, a second connecting link pivotally mounted on the free end of said tubular shaft arm and adapted, upon angular displacement of said lever in a plane at right angles to said common axis, to actuate in one direction one control of the first pair of controls, and in the other direction the other control of the same pair, a rod mounted for rotation about its axis having a cranked end the crank-pin of which is engaged in between the two arms of said fork-shaped extension of said lever for actuation thereby, said rod being in turn adapted, upon angular displacement of said lever in a plane passing through said common axis, to actuate in one direction one control of the other pair of controls, and in the other direction the other control of the same pair, and a third connecting link pivotally mounted on the free end of the other arm of said shaft, adapted to actuate said fifth control when said hand-lever is moved towards said handle.

2. In a mechanical assembly the operation of which requires the actuation of five different controls, comprising two pairs of controls, each pair having at least one control the actuation of which is required during each phase of the operation of said mechanical assembly, and a fifth control adapted to be operated independently of said two pairs of controls, a steering system adapted to permit the accomplishment of the whole range of steering operations by means of a single handle having associated therewith a hand-lever adapted to be actuated together with said handle by one of the operator's hands constantly engaging said handle, said steering system comprising a rotatably mounted shaft having two arms rigid therewith and a tubular shaft rotatably mounted on, and coaxially to, said shaft, another arm rigid with said tubular shaft, a pair of trunnions on said tubular shaft at right angles to the common axis of said shaft and said tubular shaft, a lever formed at one end with a handle and at the other end with a strap mounted on said trunnions and formed in turn, on the side opposite to said handle, with two extensions constituting a fork, said hand-lever registering with said handle and being pivotally mounted on said lever, a connecting link pivotally mounted on the free end of the arm rigid with said tubular shaft and adapted, upon angular displacement of said lever in a plane at right angles to said common axis, to actuate in one direction one control of the first pair of controls and in the other direction the other control of the same pair, a rotatably mounted rod having a cranked end the crank-pin of which is engaged in between the arms of said fork for actuation thereby, said rod being adapted, upon angular displacement of said lever in a plane passing through said common axis, to actuate in one direction one control of the second pair of controls, and in the other direction the other control of the same pair, and another connecting link pivotally mounted on the free end of the other arm of said shaft, adapted to actuate said fifth control when said hand-lever is moved towards said handle.

LOUIS RENÉ MARTIN.

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