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ELECTRIC HOIST

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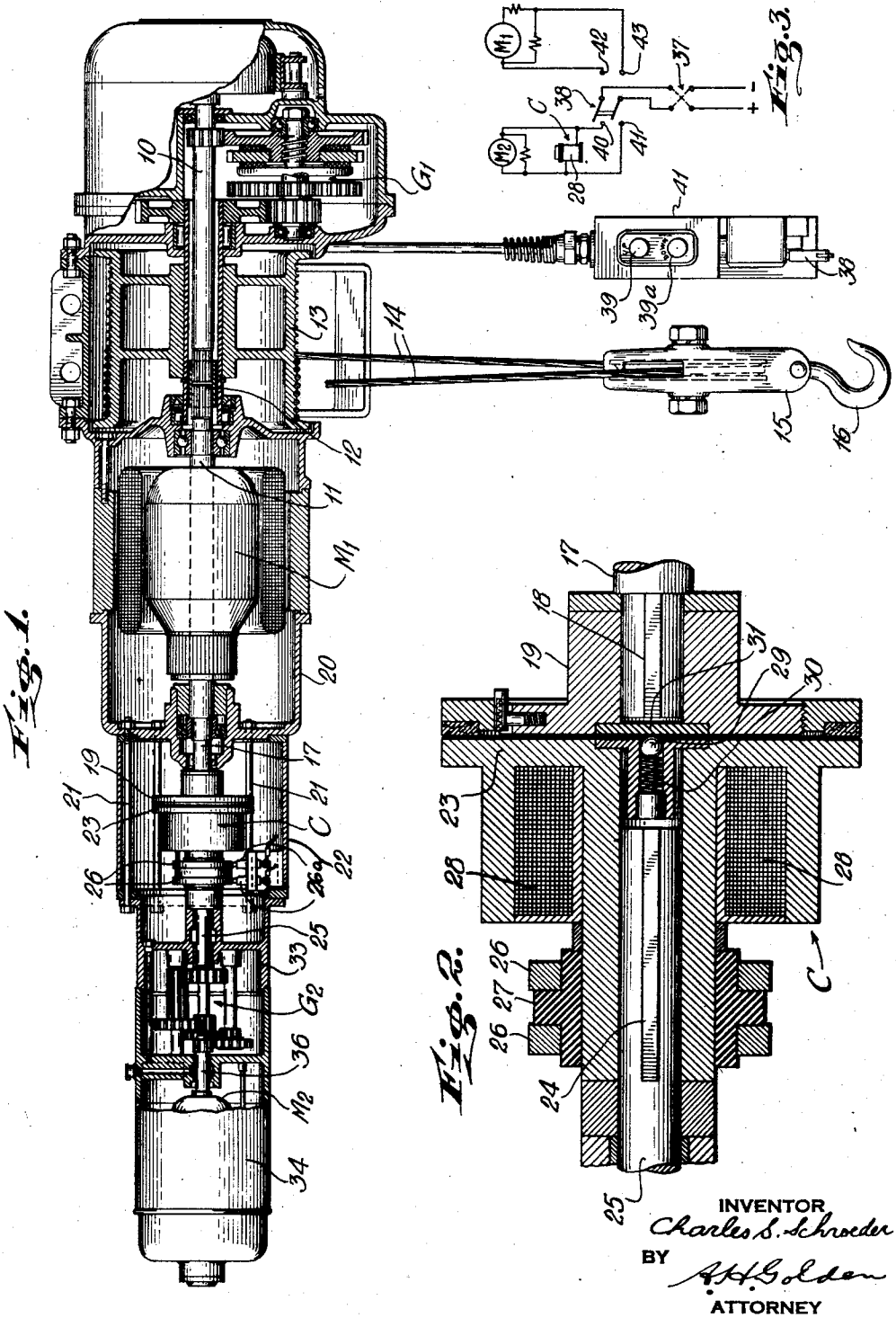


Fig. 1.

Fig. 2.

Fig. 3.

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ELECTRIC HOIST

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4 Claims. (Cl. 254—168)

This invention relates to an electric hoist, and more particularly to an electric hoist of the type in which the rotation of a drum is adapted to wind or unwind a cable from which the load is suspended.

In hoists of this class, it is customary to utilize an electric motor, which through a series of gears, rotates the drum, as is well understood by those skilled in the art. Moreover, hoists of the particular class are equipped with motors of a size and power adapted to lift and lower the loads at speeds which are generally approved for industrial use. Many times it becomes necessary to elevate or lower the load to a predetermined level. In such a case, it is readily appreciated that with hoists having a rather fast lifting speed, it becomes almost impossible to determine when to shut off the power to the motor so that the load will be moved to the particular level desired. Thus, it will be appreciated by those skilled in the art that when the power to the lifting motor is shut off, a certain time interval must elapse before the motor stops and the brake is applied. During this time interval, the load may move several inches. Therefore, it is very difficult for an operator to control the hoist motor for positioning the load as may be required, even when he resorts to "inching," a term which will be understood by those skilled in this art.

I have conceived and developed an improvement on a standard type of electric hoist, such as is disclosed in my patent application Serial No. 236,037, filed October 20, 1938, whereby I can readily combine with the structure of a standard hoist, means for operating the hoist at a speed which will facilitate the controlling of the load movement. It is a feature of my invention that I utilize a second and smaller motor which is adapted to drive the usual main motor of the hoist, and through that main motor, to drive the hoist gearing and the drum connected to that gearing. As a further feature of my invention, the second motor is adapted to drive the first motor through a second set of gearing whereby to reduce considerably the ultimate speed of movement of the hoist drum. As a matter of fact, in the preferred form which my invention takes, the small second motor drives the large motor at one-twenty-fourth its own speed. As a further feature of my invention, the main hoist motor is so arranged that it is not itself power actuated in any way when the second or smaller motor is driving the hoist, the first motor then functioning merely as a connecting unit between the second motor and its gearing, and the gearing driven by the said first motor.

It is a further feature of my invention that I connect the second motor and its gearing to the first motor through an electromagnetically controlled clutch, the mechanism being so arranged that the clutch is energized at the same time that the second motor is energized, whereby to connect to the first motor, the second motor and its gearing. When the first motor, or the main motor of the hoist is energized, it is a preferred feature of my invention that the second motor and the electromagnetic clutch be deenergized so that the first motor will operate freely of the second motor, its gearing, and the magnetic clutch, and to actuate the hoisting drum through the first set of gearing only, as though there were not present, a second motor.

I have thus described generally the operation of my invention in order that my detailed description of a particular form thereof may be better understood. Naturally, those skilled in the art will readily perceive the advantages of my contribution to the art, and will appreciate that the said contribution may be embodied in many forms other than that particular form shown in the drawing and described hereinafter.

Referring now to the drawing, Fig. 1 is a partial vertical section of my hoist showing the parts thereof. Fig. 2 is an enlarged section through the magnetically operated clutch. Fig. 3 is a schematic view of the electric wiring for controlling the operation of the several parts of my hoist.

Referring now more particularly to the drawing, the main portion of my hoist is constructed exactly as is set forth in my application supra, and for that reason I shall not describe this portion of my invention in detail. Suffice it to say that this main portion includes a motor M—1 of the type in which the field may be connected in series or parallel, the shaft 11 of the motor being adapted to drive through a splined coupling 12, a further shaft 10, which in turn drives a suitable set of gearing G—1, which in turn is in driving relation to a hoist drum 13. Rotation of the hoist drum 13 winds and unwinds the cable 14 for lifting a load supported by the said cable through the intermediary of the block 15 and its hook 16. As is set forth in my application referred to above, rotation of the motor M—1 in one direction or the other effects the rotation of the hoist drum in one direction or the other, to elevate or lower the load on the hook 16, the shutting off of the power to the motor M—1 effecting simultaneously

the application of a suitable brake mechanism for stopping the rotation of the hoist drum 13.

For carrying out the purposes of my invention that I have already described generally, I extend the left hand end 11 of the shaft of motor M—1, as designated by the reference numeral 17, so that there may be keyed to this shaft extension, as at 18, the driven portion 19 of an electromagnetically operated clutch C. In itself, this clutch is of a type well known in the art, and per se does not form a part of my invention. Any type of electrically controlled clutch might conceivably function just as well as does the particular form of clutch shown in detail in Fig. 2.

For housing and supporting the end 17 of the shaft 11, I utilize a casing portion 20 formed as an adaptor of the main casing of the motor M—1 and suitably bolted thereto by means which are not illustrated here. Secured as by a series of bolts 21 to the casing portion 20, is a casing 22 in which the clutch C is housed, as is best seen in Fig. 1. The driving portion of this clutch is designated by reference numeral 23, and is keyed at 24 to a shaft 25. Rotatable with the driving portion 23 are collector rings 26 suitably insulated as at 27 for receiving current from a pair of brushes 28a mounted on the casing 22, it being understood that this current will be supplied to the coil 28 of the electromagnetically operated clutch for suitably coupling the driving portion 23 to the driven portion 19 in a manner which is well understood by those skilled in the art. It may be well to note that when the clutch C is deenergized, the ball 29 carried on the driving portion 23, is spring pressed through the spring 30 against a plate 31 of the driven portion 19 for maintaining the portions 19 and 23 separated, and with a minimum of friction therebetween.

A second set of gearings G—2 is housed within a casing 33 bolted to the casing 22, and to which in turn is bolted the casing 34 of a second motor M—2. The shaft 25, to which is keyed the driving portion 23 of the magnetic clutch, is driven through the intermediary of the gearing G—2, by the shaft 36 of the motor M—2.

From the description which has been given, it will be readily appreciated that when the magnetic clutch C is energized, the driving portion 23 thereof is secured to the driven portion 19, and if the motor M—2 is at the same time energized, the motor will through the second set of gearing G—2 and through the said clutch C, rotate the motor M—1 and the first set of gearing G—1 for rotating the lifting drum 13. This rotation will be at a speed which will be determined by the speed of the motor M—2 and the gearing G—2. Naturally, it is arranged that the motor M—2 will be energized at the same time that the magnetic clutch C is energized, and that while the motor M—2 and the clutch are so energized, the motor M—1 will be deenergized. Reversely, when the motor M—1 is energized, the magnetic clutch and the secondary motor are deenergized, all as will be appreciated.

In order that the electric control of the motors M—1 and M—2 and the magnetic clutch may be better understood, I shall refer now to Fig. 3 in which I show schematically the electric circuits in which the motors M—1 and M—2 and the various other parts are located. The source of current, designated by plus and minus signs, is connected through the reversing switch 37 to the switch 38. The reversing switch 37 is operated in a manner well known in the art by buttons 39 and 39a, best shown in Fig. 1, on a controller handle 41 extending from the hoist, whereby the direction of the load movement is controlled. The switch 38, the handle portion of which is also shown in Fig. 1, is used to connect the power source to the binding posts 40, 41 or binding posts 42, 43. If connected to binding posts 40, 41, the secondary motor M—2 and the coil 28 of the magnetic clutch C are energized so that the hoist may be operated by the second motor M—2 at a very slow speed, and for the purpose indicated. On the other hand, when the switch 38 is thrown into engagement with the binding posts 42, 43, the large motor M—1 will be energized for operating the hoist drum at the usual commercially required speeds.

I now claim:

1. In a hoist of the class described, a hoisting member, a motor for driving said hoisting member, a set of gears intermediate said motor and hoisting member and through which said motor drives said hoisting member, a second motor in axial alignment with said first motor, a second set of gears driven by said second motor, a clutch positioned between said second set of gears and said first motor, the driven portion of said clutch being formed, in effect, as an extension of the shaft of said first motor, while the driving portion of said clutch is, in effect, an extension of the final gear of said second set of gears, means for actuating said clutch, electric circuits for said motors, and control means for effecting the actuation of said clutch by said means and the simultaneous energizing of the circuit of said second motor whereby said second motor is energized to drive said second set of gears as said clutch connects said first motor to said second set of gears, whereupon said second motor rotates the hoisting member through the intermediary of said first motor and said first set of gears and while said first motor remains de-energized.

2. In a hoist of the class described, a hoisting member, a motor for driving said hoisting member, a set of gears intermediate said motor and hoisting member and through which said motor drives said hoisting member, a second motor in axial alignment with said first motor, a second set of gears driven by said second motor, a casing secured between said motors in which said gears are mounted, a clutch positioned between said second set of gears and said first motor, the driven portion of said clutch being formed, in effect, as an extension of the shaft of said first motor, while the driving portion of said clutch is, in effect, an extension of the final gear of said second set of gears, means for actuating said clutch, electric circuits for said motors, and control means for effecting the actuation of said clutch by said means and the simultaneous energizing of the circuit of said second motor whereby said second motor is energized to drive said second set of gears as said clutch connects said first motor to said second set of gears, whereupon said second motor rotates the hoisting member through the intermediary of said first motor and said first set of gears and while said first motor remains de-energized.

3. In a hoist of the class described, a hoisting member, a motor for driving said hoisting member, a set of gears intermediate said motor and hoisting member and through which said motor drives said hoisting member, a second motor in axial alignment with said first motor, a second set of gears driven by said second motor, a casing secured between said motors in which said gears are mounted, an electromagnetic clutch posi-

tioned between said second set of gears and said first motor, the driven portion of said clutch being formed, in effect, as an extension of the shaft of said first motor while the driving portion of said clutch is, in effect, an extension of the final gear of said second set of gears, electric circuits for said motors and clutch, means for closing simultaneously the electric circuits through said second motor and said clutch while opening the circuit through said first motor whereby said second motor drives said hoisting member through the intermediary of said second set of gears, said clutch, said first motor and said first set of gears.

4. In a hoist of the class described, a hoisting member, a motor for driving said hoisting member, a set of gears intermediate said motor and hoisting member and through which said motor drives said hoisting member, a second motor in axial alignment with said first motor, a second set of gears driven by said second motor, a casing secured between said motors in which said gears are mounted, an electro-magnetic clutch positioned between said second set of gears and said first motor, the driven portion of said clutch being formed, in effect, as an extension of the shaft of said first motor while the driving portion of said clutch is, in effect, an extension of the final gear of said second set of gears, electric circuits for said motor and clutch, means for closing simultaneously the electric circuits through said second motor and said clutch while opening the circuit through said first motor whereby said second motor drives said hoisting member through the intermediary of said second set of gears, said clutch, said first motor and said first of gears, said means being adapted also for opening the circuit through said clutch and second motor while closing the circuit through said first motor, whereby said first motor will drive said hoisting member free of said second motor and said second set of gears.

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