March 22, 1932. G. ROGER, JR 1,850,692

ELECTRICAL CONTROL OF MOVABLE KNIVES EMPLOYED IN PILE CUTTING MACHINES

Filed March 9, 1931 3 Sheets-Sheet 1

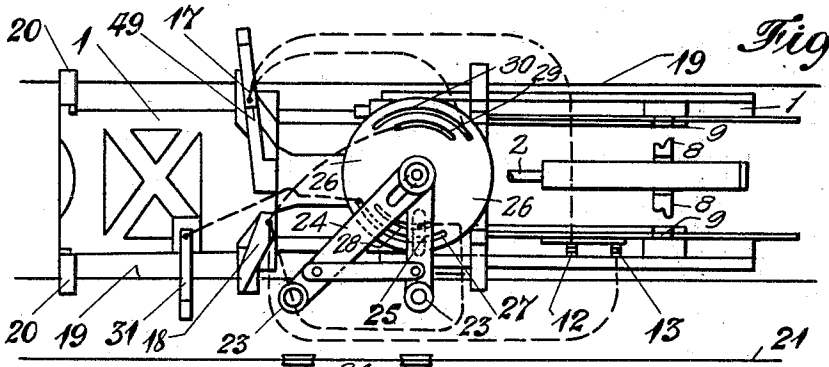


Fig. 1.

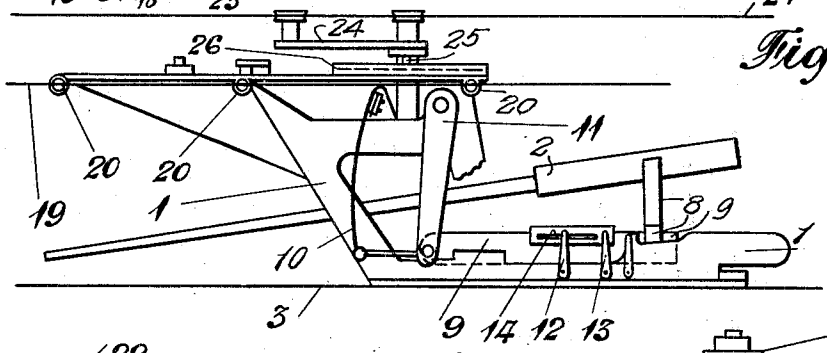


Fig. 2.

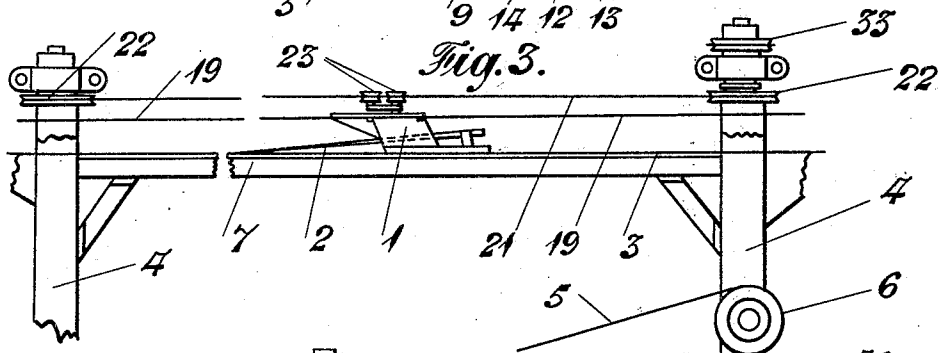


Fig. 3.

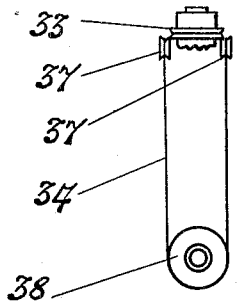


Fig. 4.

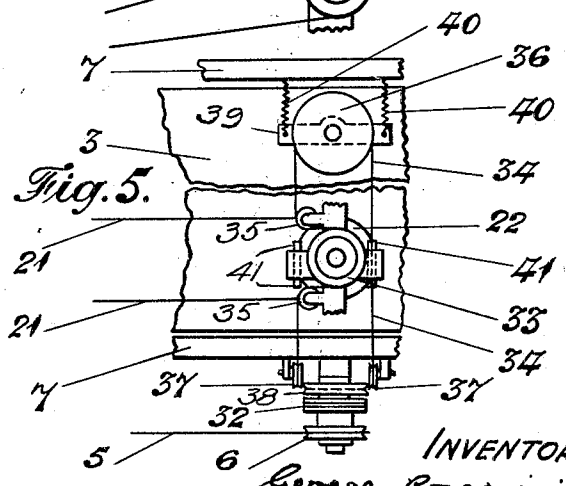


Fig. 5.

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Filed March 9, 1931 3 Sheets-Sheet 2

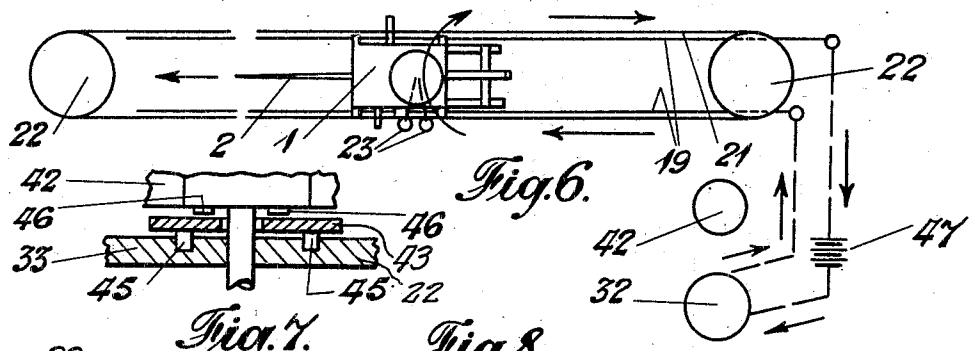


Fig.6.

Fig.7.

Fig.8.

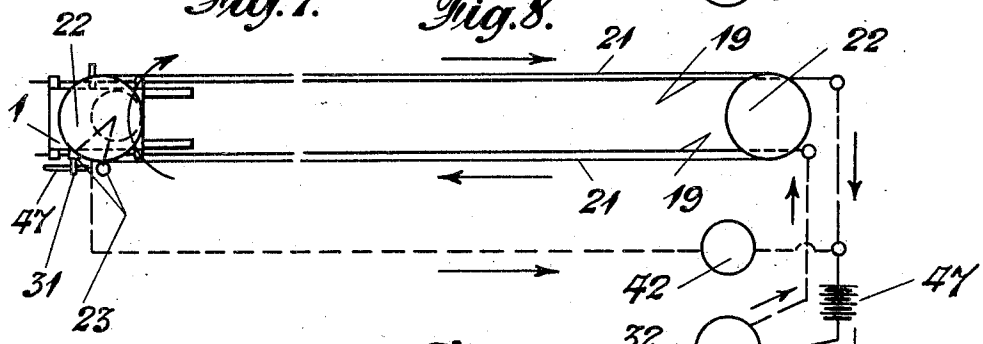


Fig.9.

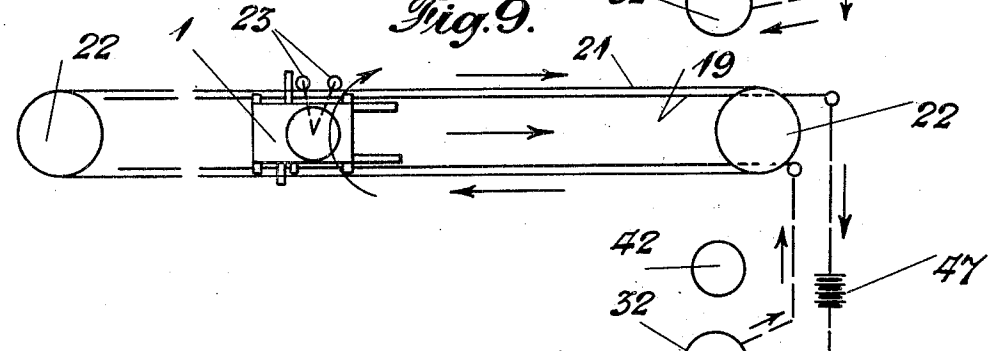
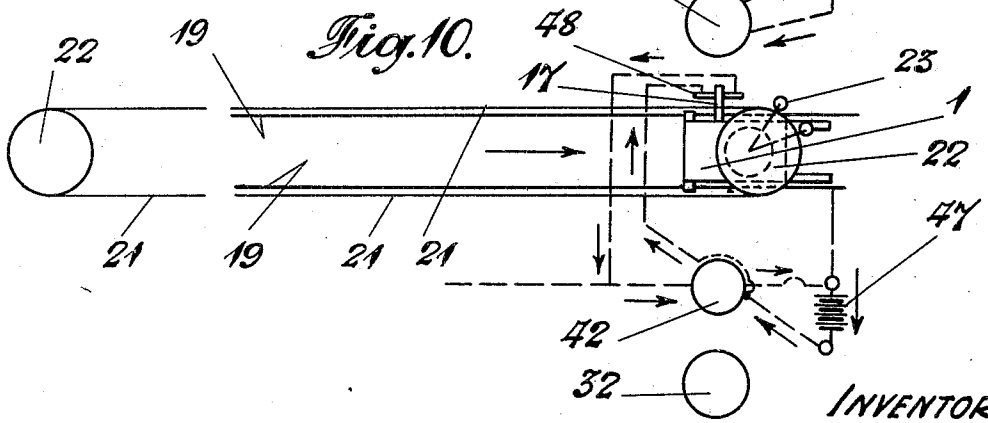


Fig.10.



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March 22, 1932. G. ROGER, JR 1,850,692

ELECTRICAL CONTROL OF MOVABLE KNIVES EMPLOYED IN PILE CUTTING MACHINES

Filed March 9, 1931 3 Sheets-Sheet 3

Fig. 11.

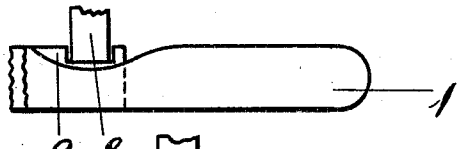


Fig. 12.

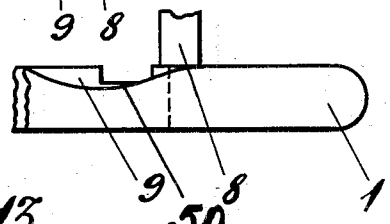


Fig. 13.

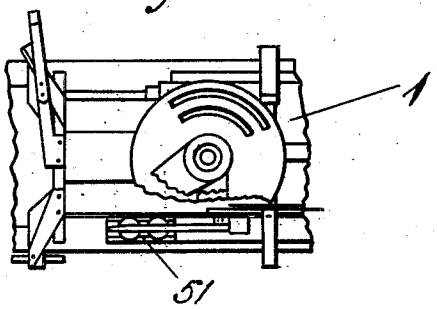


Fig. 14.

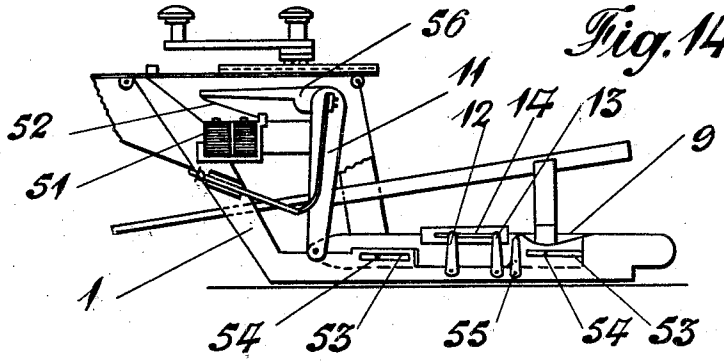
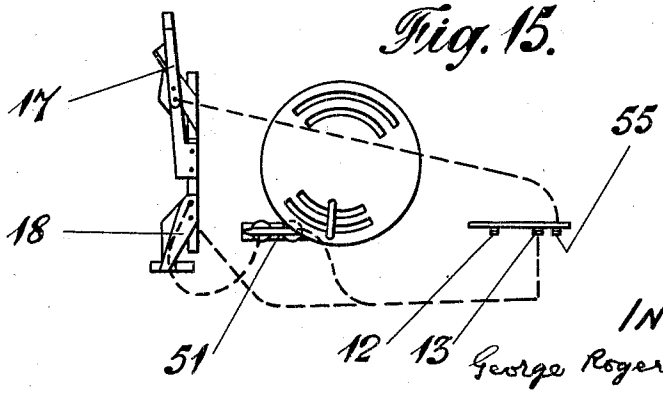


Fig. 15.



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Patented Mar. 22, 1932 1,850,692

UNITED STATES PATENT OFFICE

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ELECTRICAL CONTROL OF MOVABLE KNIVES EMPLOYED IN PILE CUTTING MACHINES

Application filed March 9, 1931, Serial No. 521,272, and in Great Britain November 11, 1930.

The invention relates to machines employed for cutting the pile of weft pile fabrics with cutting knives which move along a length of the cloth operated upon for the purpose named, said cloth being stationary for the time being.

The cutting knife employed may be of a known class, or such as the kind wherein the knife or attached rest is held in a slide or slides, which is or are capable of being longitudinally moved either forwardly or backwardly independently of the knife carriage itself, and upon which the slide or slides is or are mounted.

Such knife carriage requires to be provided with guides when employed in a machine known as the "cord and pulley" type, or that in which a continuous flexible cord or the like passes round revoluble end pulleys, the extremities of said cord being attached to the carriage and operated to pull the same along. The object of our invention primarily is to make said carriage guides (preferably in the form of bronze wire), part of the circuit for electrical current and whereby the operations of the knife carriage and of the machine involved may be electrically controlled as herein described.

In this manner the knife carriage is always capable of being in circuit, so to speak, with a source of electricity, during normal working of the machine, and at any position of travel of the knife.

According to the invention, the current of electricity for driving the carriage is stopped when the knife aforesaid runs out of a race of pile being cut, or alternatively, pierces the cloth, or otherwise acts improperly. In addition, the carriage is automatically reduced in speed or braked when the knife carriage reaches the outward end of its travel, and the current is cut off and the braking action applied on return of the knife carriage to its starting position, or that position at which the knife and guide are made to enter a fresh race of pile. This end or position is what is usually called the "setting-in" end.

With reference to the accompanying drawings, illustrating forms and applications of the invention, Fig. 1 is a plan view, and Fig. 2 is a side view of the carriage of the type named, and provided with means according to said invention. In these figures, portions of the cutting knife, with rest, are shown.

Fig. 3 shows on a reduced scale a portion of a machine frame, with a carriage and knife situated between extremes thereof, above the surface of the cloth indicated. Fig. 4 is a detail having reference to Fig. 5, the latter figure being a plan view of an end part of Fig. 3 above the same. Said Fig. 4 is however in elevation at right angles to Fig. 5. Fig. 7 shows on an enlarged scale a part of mechanism relating to the braking operation of the machine. The remaining figures are on a scale similar to that employed for Figs. 3, 4 and 5. Of these remaining figures, Fig. 6 is a plan view of the parts concerned, showing diagrammatically only so much of the wiring therein involved, and when the carriage with the knife is travelling between the machine extremes indicated, whilst cutting. Fig. 8 is a similar view showing the wiring involved when the carriage is at the outer extreme of its travel.

Fig. 9 is a similar view showing the wiring involved when the carriage is returning to the "setting-in" position, and the knife is not then cutting.

Fig. 10 is also a similar view when the carriage has returned to the starting position or "setting-in" end, the wiring requisite being also included.

Figs. 11 and 12 are portions of Fig. 2 for different positions and on a larger scale.

Fig. 13 is a portion of Fig. 1 with an adaptation thereto. Fig. 14 is a portion slightly modified of Fig. 2 showing said adaptation. Fig. 15 is a portion of Fig. 1 but with wiring thereon in relation to the adaptation above referred to.

The carriage is shown at 1, the knife at 2 and the cloth at 3. In Fig. 3 the end parts of the machine or frame are indicated partly at 4, and the drive for the said machine originates at a source of power, such as an electric motor (not shown) in connection with which is a band 5 passing around a pulley or wheel 6.

The cloth 3 is assumed to be stretched be-

tween end rollers (not indicated) and mounted in suitable brackets or bearings beyond the positions of the parts 4 herein named.

Means for supporting the cloth between the side frames shown at 7 may be provided according to custom or necessity. Referring more particularly to Figs. 1 and 2, the knife 2 is provided with the usual cross bar or rest 8, the latter supported in a slot indicated within a pair of slides 9, one on each side of the knife. The slides are capable of moving independently of the carriage 1, in a horizontal or longitudinal direction, or of being pushed back should the pressure at the knife in said direction be sufficient to overcome the spring resistance provided. In Fig. 14 slots 53 in frame 1 and pins 54 working therein on slide 9 are indicated. In Fig. 2 this spring device is shown at 10 fixed at an upper end to the carriage and connected to the end of a lever 11, the latter pivoted on the carriage aforesaid. The lever 11 is assumed to be pivoted to one of the slides 9, and so that after both slides are pushed back due to resistance at the knife the spring resistance 10 operates to return the slides to the position shown.

A pair of electrical contacts are shown respectively at 12 and 13 (Fig. 2 particularly) attached to the carriage, but insulated therefrom. A metal strip on one of the slides 9 for making contact therewith is indicated at 14. For the position shown in Fig. 2 said strip is only in contact with member 12, but when the carriage is moving forward and the knife actually cutting, the resistance is sufficient to force back the slides 9 until contact takes place between the parts 12 and 13 and the plate 14.

In Fig. 1 broken lines therein indicate various wiring arrangements in diagram form only, the necessary insulations being assumed to exist. Contact 12 is in wire connection with a projecting contact 17, and contact 13 is in wire connection with another projecting contact 18 on the opposite side of the carriage.

Guide wires for the carriage and forming part of the electric circuit are indicated at 19 passing through insulatory bearings on the carriage at 20. But the said wires 19 are in electrical connection with parts 17 and 18. A part of the cord which pulls the carriage along is shown at 21, and, as seen in Figs. 3, 6, 8, 9 and 10, said cord passes around the revoluble pulleys 22 one at each end of the machine or frame.

According to the invention, the carriage is provided with pulleys 23 to which are attached the ends of the cord 21 thereat, such as by passing said cord to the pulleys 23 in knotted or other form. These pulleys are mounted on the ends of arms indicated, the latter linked together. The upper arm 24 is slotted from the centre outwards, and the lower arm has a contact surface below at 25 capable of bearing against curved contact plates recessed in the surface of a circular plate 26. Said contacts are marked respectively 27, 28, 29 and 30. In Fig. 1, the contact 25 is shown bridging across and connecting plates 27 and 28.

Said latter plates are assumed to be insulated from the plate 26. Plate 27 is connected by wire to another projecting part 31 from the carriage. Plate 28 is connected by wire to part 18. Plate 29 is also connected by wire to part 18 aforesaid, and plate 30 is connected by wire to part 17. The member 17 is provided in hinged or resilient form, the lifting of which will cause it to be lifted away from guide wire 19.

The driving pulley 6 in Figs. 3 and 5 is assumed to be mounted on a shaft disconnected from another shaft in line therewith of the machine. Between the two shafts is an electrical clutch merely indicated at 32 provided with frictional plates capable of being pressed together for driving purposes in any well known manner common to electric clutches, but controlled as hereinafter described.

It will be seen that the pulleys 22 for the driving cord of the carriage are in overhung form, to enable the carriage 1 to pass below the same at extremes of travel.

The drive for these pulleys is therefor situated above the level of said pulleys 22, or in Figs. 3 and 5, a driving pulley 33 on a shaft carrying one of the pulleys 22 is connected by cord or flexible member 34 to a pulley 38 by passing around guide pulleys 35, and also guide pulleys 37 so as to take a downward course in the latter case for so engaging pulley 38. At the far and opposite side of the frame the pulley 36 is revolubly mounted for carrying the cord 34, but this last named pulley is mounted on a member or bar 39 connected by springs to the frame 7, said springs being indicated at 40. The yielding of the springs will slacken the cord 34, and so retard the drive.

The pulleys 22 and parts concerned can be moved laterally across the width of the cloth without disengaging the driving means illustrated. A frame carrying pulley 33 is partly indicated in Fig. 5 which is capable of being moved by and along cross screw shafts passing therethrough, said shaft ends being indicated at 41 in Fig. 3. In this way the pulleys are adapted to carry the cord 21 across the width of the cloth race by race as requisite.

In the movable mount for the parts last described, is provided a braking device (see more particularly Fig. 7). That is to say, the casing therefor at 42 contains solenoidal members projecting therefrom at 46 and capable when excited, of attracting an annular plate 43 loosely mounted about the shaft carrying the driving wheel 33. (See Fig. 7.)

This plate 43 has projections thereon taking into holes in the wheel 22, said projections being marked 45. A loose fit between the latter and the holes named obtains, so that when the plate 43 is held by the ends of the solenoids 46, the wheel 22 is naturally braked.

Referring to Figs. 7 to 10 inclusive, the electrical conditions are herein described, on the assumption that the circles 32 and 42 represent respectively in diagram form the clutch and the brake before-named and that the broken lines indicate wiring in diagram form also. In all cases, a battery is shown at 47, and which in the present example is assumed to form the means for operating the brake and also for operating the clutch referred to.

In Fig. 6 the carriage 1 is assumed to be travelling outwards from the setting-in end (on the right) and is cutting the pile of cloth on which the said carriage rides.

The circuit established through the carriage is indicated by external arrow lines. Internal arrow lines indicate directions of carriage travel. As to the carriage, reference to Fig. 1 will show that if the pulleys 23 are on the side indicated in Fig. 6 then the circuit through the carriage is by the near guide wire 19, to terminal in part 18, thence to contact 13, through plate 14, contact 12 to contact 17, and so to guide wire 19 on the opposite side. In this way the current passes through the contacts on the slide 9 since the knife when cutting is pushed sufficiently to make contact possible in manner stated. The other connections or wires are so many dead ends for the period named.

If however improper cutting takes place, or the resistance on the knife reduces too much, or on the other hand increases too much, then disconnection at the slide takes place, and the clutch 32 comes out of gear as a result of the broken circuit.

In Fig. 8 the carriage has about reached the extreme of travel at the far end from the setting-in end. Only braking is here desirable to reduce the speed of travel of the cord 21, but not sufficient to stop the same to allow the pulleys 23 to pass around the pulley 22 with greater ease. The contact 31 on the carriage here makes contact with a projecting contact 47 from the frame of the machine, the said contact being connected by wire to the brake as indicated, thus putting the latter in circuit and energizing the solenoids 46. By reason of current passing through the carriage via the means already stated, the drive continues to act. In Fig. 9 the carriage is returning, and as the knife is not now cutting or is pulled out of the race of pile and also is being pulled backwards over the cloth the contacts 13 and 14 are disconnected.

In this instance, the pulleys 23 are at the opposite side of the carriage to that previously shown, so that plates 29 and 30 of Fig. 1 are connected by contact 25, and the current passes via terminal in part 18, to plate 29, plate 30, contact 17 and thence to guide wire 19.

In Fig. 10 the carriage is required to be stopped, previous to a new setting-in of the knife, for a new race of pile to be cut. At about such time part 17 comes against a contact 48 projecting from the frame of the machine and shaped to raise contact 17 to break contact with wire 19, the contact named being on a hinge at 49 (Fig. 1). By this breaking of the main circuit the clutch 32 is put out of action. At the same time, the contacting of part 17 with part 48 enables the wiring shown in said Fig. 10 to be connected in manner indicated and thus allow the current to operate for acting upon the brake as required.

The arm on the upper side of the pair carrying the pulleys 23 is slotted to allow of the same passing around the pulleys 22, since the centres of turn of said arms and said pulleys 22 do not coincide, and the movement of the upper arm named is thus accommodated accordingly by said slot, or is free to move in the direction of its length.

In Fig. 10 although a system is shown whereby the mere contact of member 17 is sufficient without the current passing across the carriage (an extra lead being provided as indicated) the current could so pass across thes carriage via the near guide wire by a wire to the same from battery 47, thence to member 18, contacts 29, 30 and 17.

The braking means illustrated is merely by way of example, as electric brakes are well known.

Referring to Figs. 11 and 12, the former figure shows the relative positions of the knife rest 8, slide 9 and adjacent part of the carriage frame 1, before the knife experiences any abnormal resistance during cutting operations. The latter figure shows the conditions when said abnormal resistance pushes the slide back until a curved edge marked 50 and over which the rest 8 projects in frame 1, lifts the rest 8 out of the slot for it in slide 9, and so allows the knife to be released. In Fig. 12 the slide 9 has partly returned from its maximum position.

In those cases where the spring 10 may tend to move the slide 9 in the reverse direction before the knife is properly clear, it is convenient (see Figs. 13 to 15) to mount an electro-magnet 51 on the carriage 1 above which is a resilient armature 52 connected to an arm 56, the latter attached to and movable with the arm 11. When the slide 9 moves back, the armature 52 is caused to connect the two poles shown of the magnet 51, and the electric current passes around the coils of the latter for example, via the near guide wire 19,

contact 18 and the shunt wiring shown to terminal 17, and to the other guide wire.

The spring 10 eventually breaks this circuit.

The additional contact provided at 55 only makes connection with strip 14 when the slide 9 is pushed back about to the position of Fig. 8, at which time contact between 12 and 14 is broken.

I claim:—

1. For electrically controlling the operations of a moving knife in a pile cutting machine, of the cord and pulley type, and of the kind employing a knife carriage with longitudinally movable slides for supporting said knife or rest thereof, electric guide wires on both sides of the knife carriage in electrical connection across the carriage with a source of electricity, a speed-retarding device and a power-driven clutch for the machine drive, backwardly movable slides whereby the electric circuit is broken under excess of resistance at the knife, the speed-retarding device is brought into action, the drive de-clutched and the knife released, an electrical contact on the carriage and a corresponding electrical contact on the frame of the machine, whereby the speed retarding device is operated alone when the carriage reaches approximately the outermost part of its travel, and a movable electrical contact on the carriage and a shaped and corresponding electrical contact on the frame of the machine, whereby both the speed-retarding device and the clutch are operated for stopping the carriage at the "setting in" end.

2. For electrically controlling the operations of a moving knife in a pile cutting machine of the cord-and-pulley type, and of the kind employing a knife carriage with longitudinally movable slides for supporting said knife or rest thereof, electric guide wires on both sides of the knife carriage in electric connection across the carriage with a source of electricity, a speed-retarding device and a power-driven clutch for the machine drive, arms connected to the cord pulling the carriage, pivoted on the latter, electrical contacts and wiring for said carriage in connection with the arms aforesaid, whereby an electric circuit is completed across said carriage from one guide-wire to the other on the opposite side of the carriage, backwardly movable and spring resisted knife-carrying slides whereby under excess of resistance at the knife the electric circuit across the carriage is broken, the knife released, the speed-retarding device and the clutch operated for stopping the machine, an electrical contact on the carriage and a corresponding electrical contact on the frame of the machine, whereby the speed-retarding device is operated alone when the carriage approximately reaches the outermost part of its travel, and a movable electrical contact on the carriage and a shaped and corresponding electrical contact on the frame of the machine whereby both the speed-retarding device and the clutch are operated for stopping the carriage when the latter reaches the "setting-in" end of its travel as herein set forth.

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