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BY A. P. C.

G. WIGGERMANN
WARPING MACHINE
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Serial No.
373,136
8 Sheets-Sheet 1

Fig. 2.

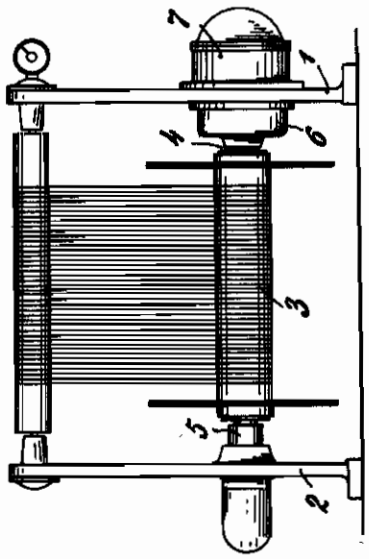


Fig. 4.

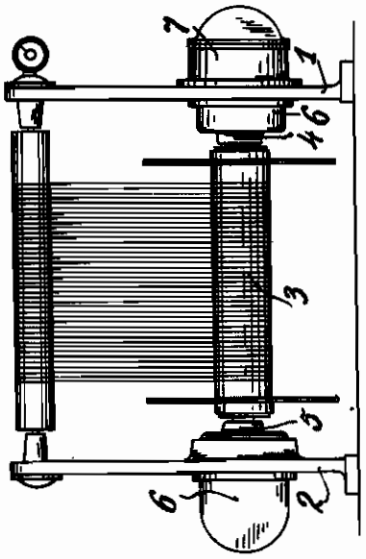


Fig. 1

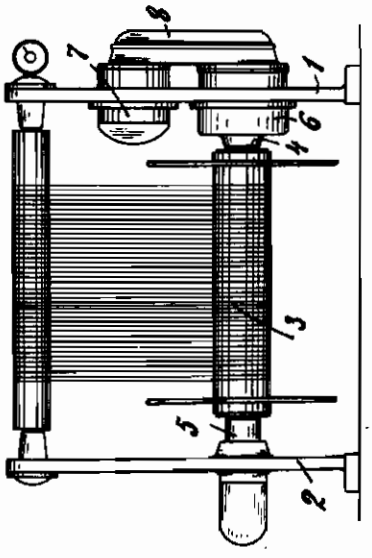
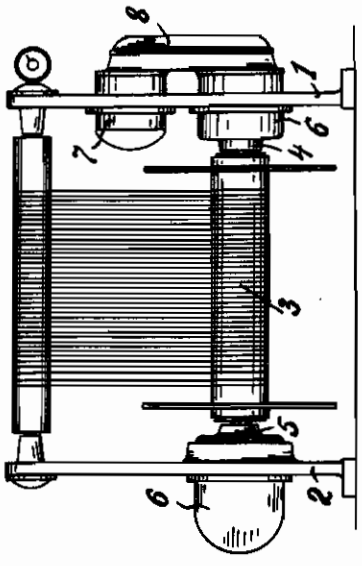


Fig. 3.



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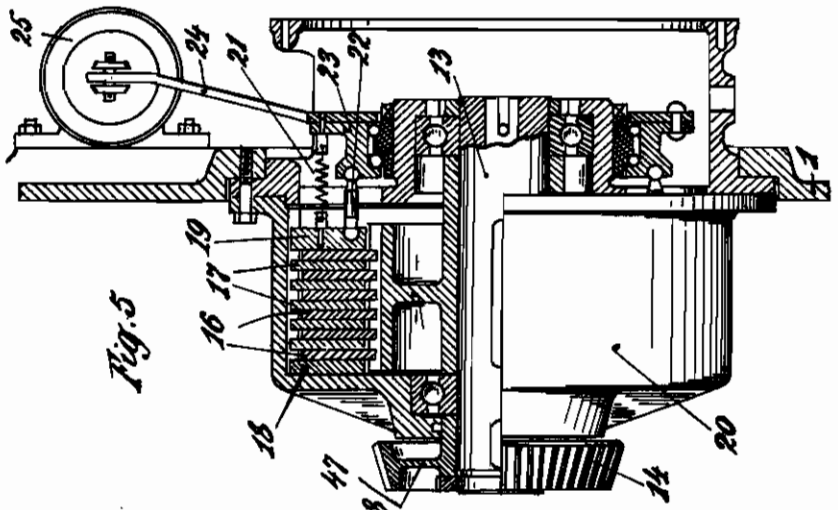

Fig. 5

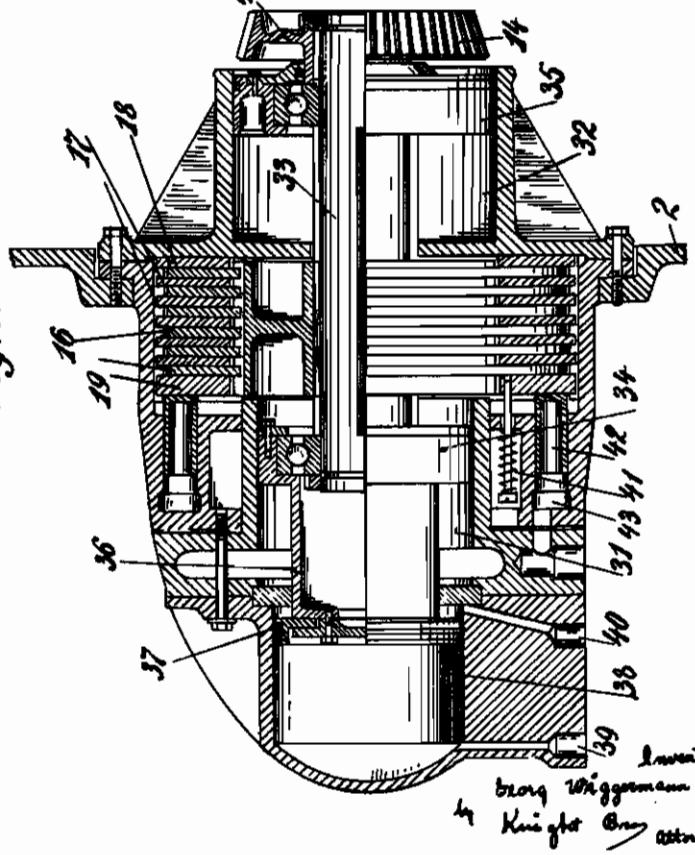

Fig. 6.

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Fig. 7.

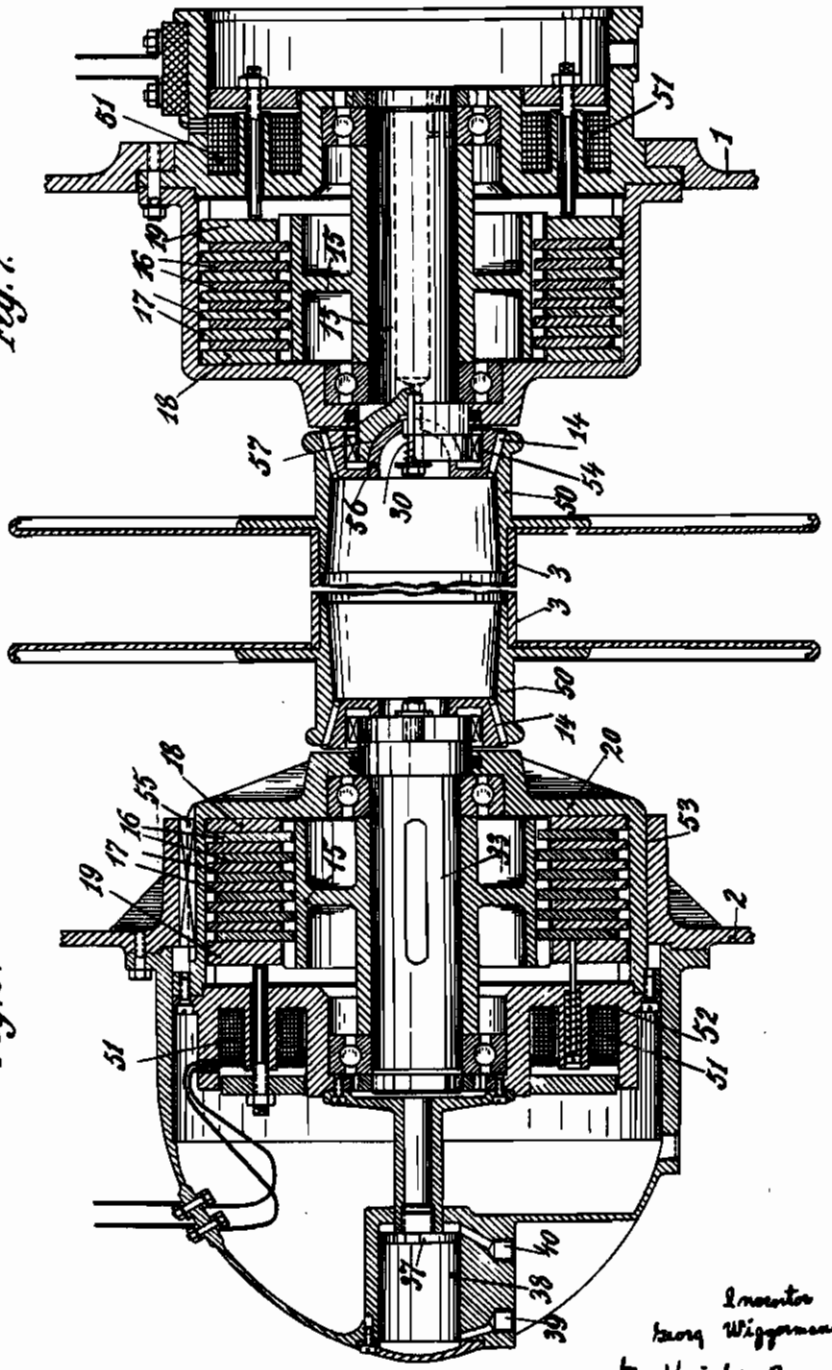

Fig. 8.

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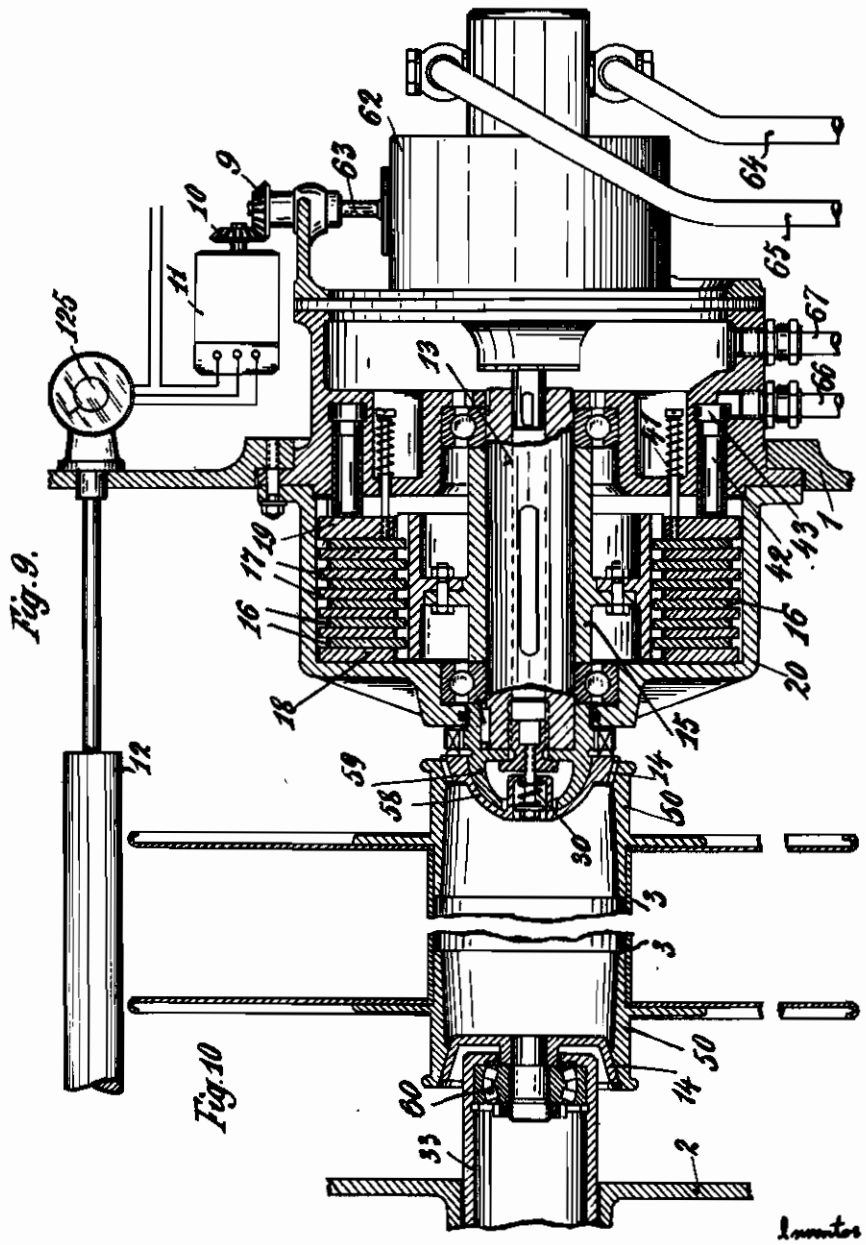

Fig. 9.

Fig. 10

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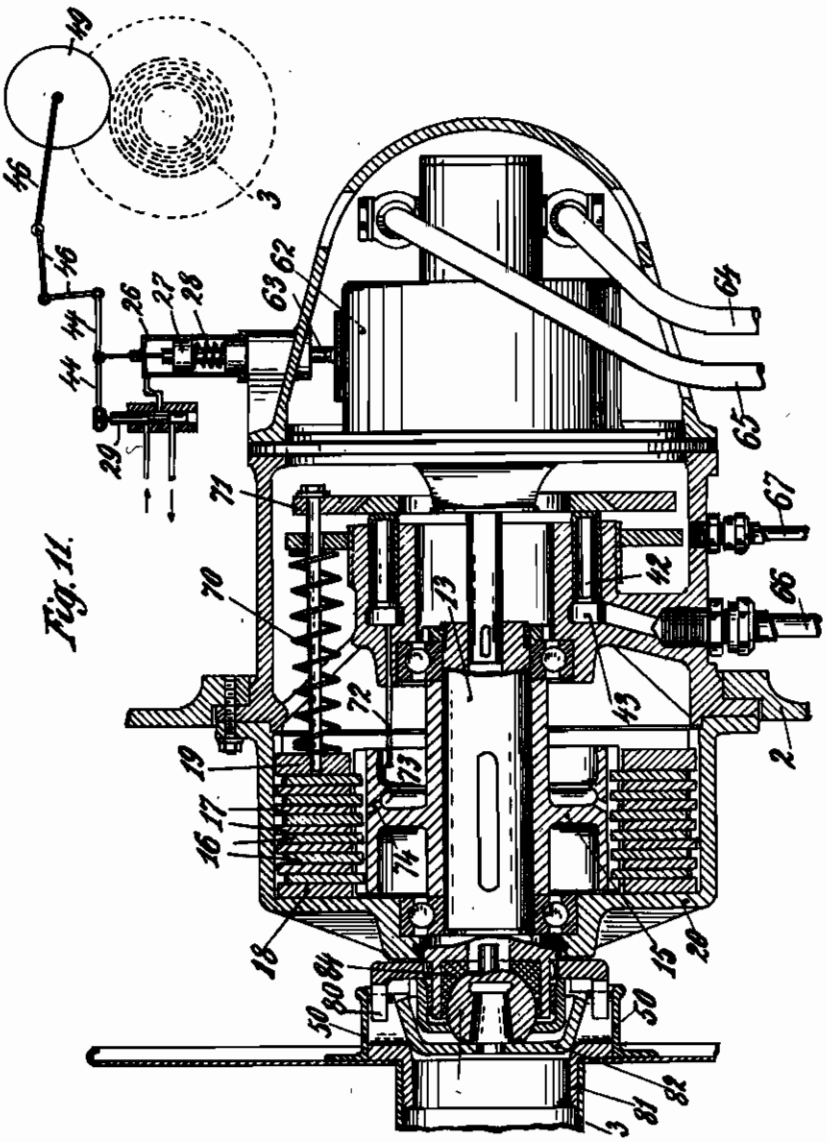

Fig. 11.

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Fig. 12.

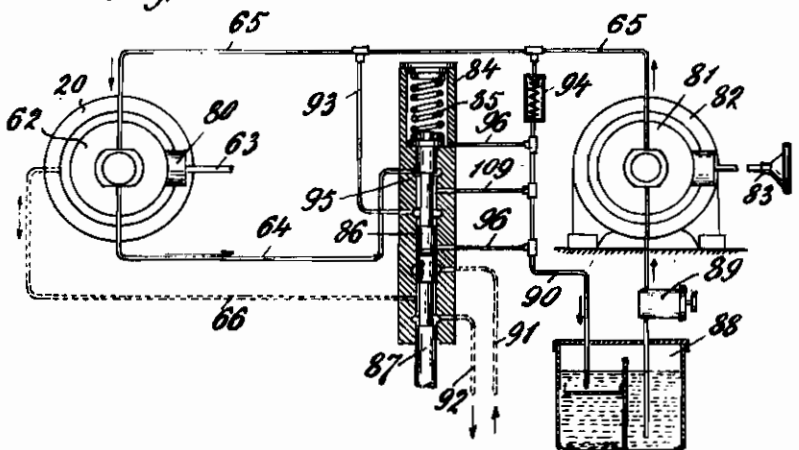

Fig. 13.

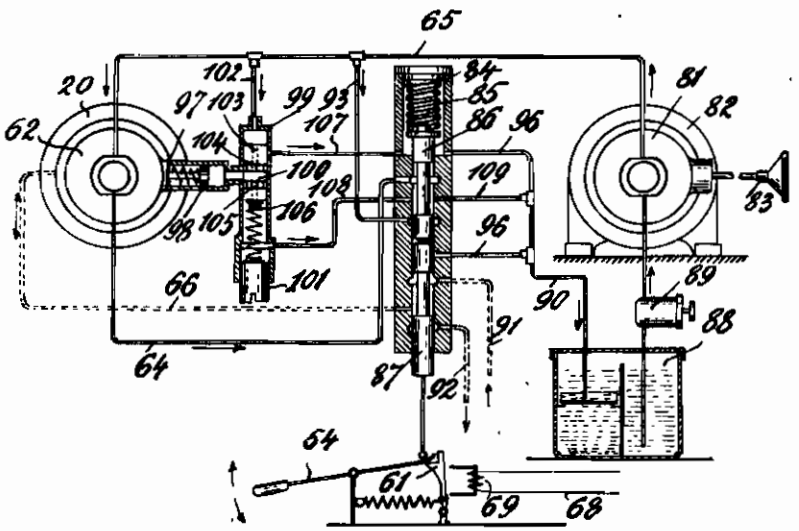

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Fig. 14.

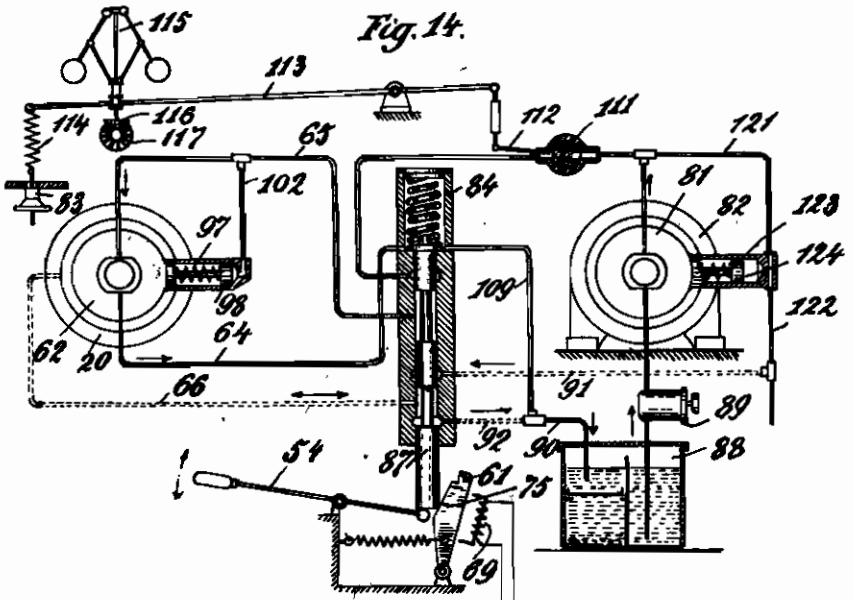

Fig. 15.

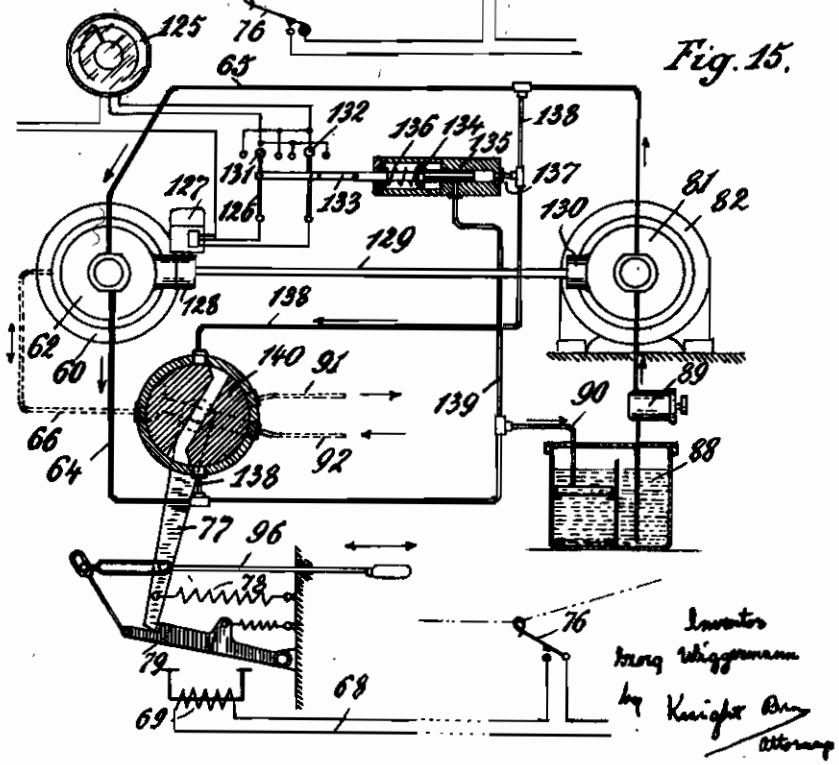

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Fig. 16.

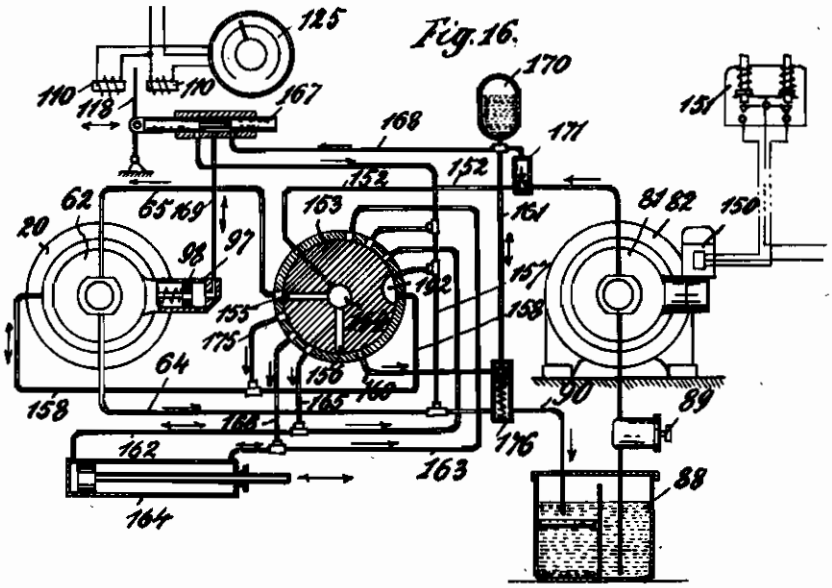
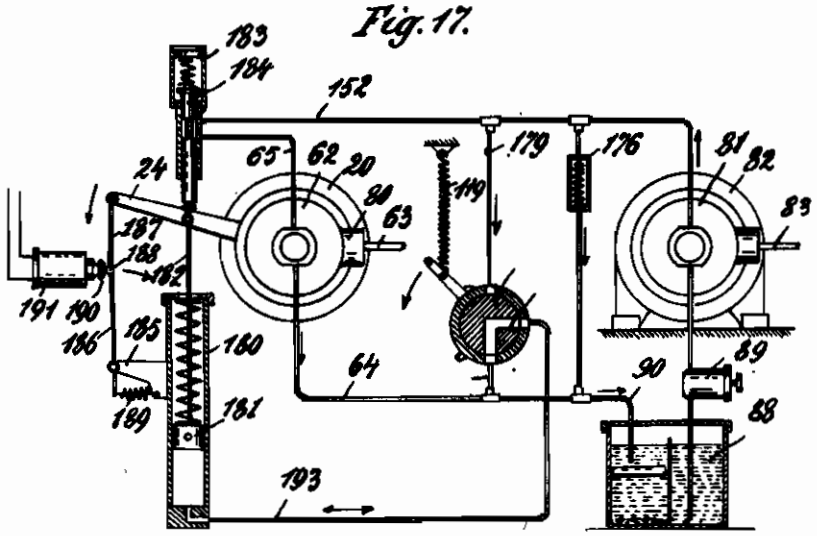


Fig. 17.



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ALIEN PROPERTY CUSTODIAN

WARPING MACHINE

Georg Wiggermann, Munchen-Gladbach, Germany; vested in the Alien Property Custodian

Application filed January 4, 1941

The invention relates to warping machines of that type, in which the yarn beam adapted to be braked, centred between adjustable bevel discs, is directly driven, and it has chiefly for its object to provide arrangements which make it possible to limit to a minimum the braking- and starting-times, notwithstanding the warping speeds increased as desired, without the necessity to put up with disturbances owing to high stressing of the machine itself and of the driving elements. This is attained according to the invention in that in the line of axis of the beam, secured by a toothed clutch against journal slip, a multi-disc brake of known type is arranged, and that the beam is driven by a motor actuated by a pressure medium. For the obtention of a particularly good and rapid braking effect multi-disc brakes may be provided one at each side of the beam. The bevel discs at the ends of the beam are preferably equipped themselves on their circumference with bevel teeth which mesh with corresponding teeth in the ends of the beam, in order to ensure a secure rotation and braking of the beam. The unavoidable swinging of the beam, whereby also the increase of speed is very much hindered, is met, according to the invention, in that the end-discs are yieldably connected with the shafts of the driving side and of the counter-holding head. As especially advantageous it has proved, to arrange the driving motor also in the axis line of the beam and to flange the same with this object in view on one of the brake casings.

The controlling of the multi-disc brakes can be effected with the aid of electromagnets, by mechanical means or with utilisation of the existing driving medium for the motor, in a similar manner as this driving medium can be used also for moving the counter-holding head and for lubricating and cooling the braking discs.

If, according to the invention, a hydraulic regulating gear, consisting of motor and pump, is used as drive for the beam, a regular acting upon the pump is provided according to the invention for the fundamental adjusting of the warping speed, and for maintaining equal circumferential speed of the beam, another regulator acting upon the motor is provided, which can be influenced by a feeler feeling off the beam diameter. After at the beginning of the warping proceeding the machine has been adjusted in accordance with the kind of the yarn to be worked, the further regulation is carried out automatically, so that the yarns are wound up with permanently equal speed. A control cylinder with piston may be arranged between the hydraulic motor and the pump and the piston may be controllable from the feeler arrangement of the warp creel, so that by shifting the piston the admission of the driving fluid to the motor is cut off and the warp beam brake engaged; a damming up by throttling of the driving medium flowing off from the motor can be caused at the same time with the cutting off of the motive fluid from the motor, in order to assist the braking effect. The same effect is evidently obtained also by controlling the piston by hand. Instead of influencing the regulator acting upon the motor by a feeler feeling off the beam diameter, a separate control cylinder with control piston may be provided which, when the pressure in the admission conduit to the motor is altered, responds to the regulator. This control cylinder may also be regulated and equipped with secondary conduits so that at greater alterations of pressure in the admission conduit a corresponding relieving occurs and no safety valve is necessary.

The two regulators coordinated the one to the pump and the other to the motor may be connected, according to the invention, the one with the other so that the flow of motive fluid and therewith the number of revolutions of the motor is watched by the cooperation of the two regulators. Hereby is attained that for instance the speed taken from the measuring cylinder can be used on the one hand directly for surveying the flow of motive fluid admitted to the motor, but on the other hand this regulation can be made directly dependent on the adjustment of the fundamental speed. It is, for instance, also possible to drive a centrifugal regulator directly from the measuring cylinder and to survey the motor at any adjusting of the fundamental speed.

Further, it is also possible to connect a regulator influencing the absorption capacity of the motor with the admission conduit for the motive fluid, whereby the starting is considerably accelerated. The driving flow conduit to the motor can also be conducted over the control cylinder arranged between pump and motor, so that this control cylinder directly liberates or shuts off the admission of the driving flow to the motor. In order that in this embodiment of the invention the driving medium can be used for the operation of the brakes and other moved elements of the warping machine, a third regulator is provided according to the invention between the conduit leading to the motor and the conduit leading to the other places of consumption, this third regulator acting upon the pump and preventing pressure fluctuations, which may occur

in the warping machine owing to the use of the driving fluid for other control proceedings.

The coupling of the two regulators controlling the one the pump and the other the motor may be effected according to the invention in that both regulators are under the controlling effect of an electromotor, which can be influenced from the measuring cylinder of the warping machine by means of a regulator of the contact number of revolutions, which regulator is adapted to be adjusted to different fundamental speeds. In this manner the whole warping proceeding is reliably surveyed or regulated automatically at any increase of the warping speed.

In order to shorten in this arrangement the starting time to a minimum, a polarity reverser is interposed between control motor and regulator for the number of revolutions of the contact, said polarity reverser being controlled by the action of a control piston responding to strong increase of pressure or drop of pressure in the driving flow conduit to the motor and liberates a discharge conduit at excessive increase of pressure.

According to the invention, a rotary slide adapted to be influenced by the warp stop motion is further provided for short-circuiting of the driving current when the warping machine is stopped and for controlling the braking current, which rotary slide short-circuits the driving current feed, when the machine is stopped and braked, and liberates simultaneously the braking current.

In order to attain in warping machines of the type in question an instantaneous relieving of the motor as soon as the same is cut off, and to utilize otherwise the pressure existing in the driving fluid conduit, the driving fluid conduit leading to the motor is arranged so that it can be directly switched over to the brake conduit when the motor is cut off, wherefrom results that then the pump acts directly upon the braking arrangement In order to ensure a rapid and nevertheless yieldable braking action, an air chamber may be interposed on the pressure conduit of the pump and in the braking conduit, said air chamber acting at the same time as safety valve and is introduced through a rotary slide controlled by the stop motion arrangement. Between the regulator of the motor and the air chamber connected by a check valve with the pressure conduit, a control slide may be arranged, which is controlled by the feeler-roller bearing against the beam or by a similar feeler of the warping machine. Hereby is attained, that in the air chamber exists always the highest pressure which can occur in the main conduit, so that any controlling proceedings can be released and carried through without influencing the conditions in the main conduit, and the starting times can be considerably shortened, for the reason that the high pressure of the air chamber alters in this sense the turning moment of the motor through the regulator.

The shock-free employment of the driving fluid, even when branched from the pressure conduit of the pump, makes it possible, to branch off also successively several control proceedings, in that the admission- and discharge-conduits of an additional control cylinder of the warping plant are connected to the rotary slide influencing the motor or the brake, so that the driving fluid, when the slide continues to rotate after the braking of the motor, can act upon the additional control cylinder for introducing any working proceedings occurring in warping machines. If an electric control is employed for the cutting off of the motor and for the brake, the switch lever of the brake is hingedly connected, according to the invention, with a slide controlling the driving flow and with a spring-controlled piston and secured against wrong-switching by a double articulated lever, on the articulation of which the switch relay influenced by the stop motion acts, so that at suppression of the safety clutch the switch lever is oscillated by the spring-controlled piston, the brake is applied, and at the same time the driving fluid admission to the motor is shut off by the slide.

Several embodiments of the invention are illustrated by way of example in the accompanying drawings, the parts equal in action having similar reference numerals.

Figs. 1 to 4 show diagrammatically different possibilities of the arrangement of brake and motor according to the invention,

Figs. 5 to 11 show several details, partly in vertical section, the right hand side or the left hand side of the beam being shown. Singly show:

Fig. 5 the control of the brake by a piston situated outside the casing,

Fig. 6 the control of the brake by means of a ring piston with axially shiftable centering disc,

Figs. 7 and 8 the control of the brake by means of built-in electromagnets with stationary and axially shiftable centering disc,

Fig. 9 shows the employment of a form of construction of a brake according to Fig. 6 with flanged-on motor,

Fig. 10 an axially shiftable counter-holding head without brake,

Fig. 11 a modified form of construction of Fig. 9,

Fig. 12 shows diagrammatically an arrangement, in which the regulator of the motor is influenced by an element of the warping machine which responds to alterations of the winding proceeding,

Fig. 13 shows a corresponding arrangement, in which the regulator of the motor is influenced by alterations in the pressure of the driving medium flowing to the motor,

Fig. 14 a modified form of construction of the regulator according to Fig. 12,

Fig. 15 another form of construction, in which the control of the regulators is effected with the aid of an electromotor,

Fig. 16 shows the branching off of the driving flow from the pressure conduit of the pump for the control of brakes and other parts of the warping plant to be controlled, and

Fig. 17 the control of a piston, acting upon the brake and the admission of the driving flow to the motor by the driving flow branched off from the pressure conduit of the pump. Figs. 12 to 17 are also purely diagrammatic, with the exception of some details.

Between the frame walls 1, 2, Figs. 1 to 4, the beam 3 is mounted by means of the holding heads 4, 5, after it has been brought, by a carriage or by one of the commonly used adjusting or lifting arrangements, with its axis approximately into the line of the axes of the journals. Hollow beam flanges, provided with corresponding inner teeth, serve for bringing the beam in line, said flanges, when the counter-holding head is axially shifted, bearing against centering discs having counter-teeth. The braking arrangements 6 are arranged on one side, as shown in Figs. 1 and 2, or on both sides of the beam 3, as shown in Figs. 3 and 4, in line with the axis of the beam. The motor 7 driven by flowing media is mounted in the ma-

chine frame so that as much space is saved as possible, as shown in Figs. 1 and 3, or flanged together with the braking device to a unit, as shown in Figs. 2 and 4. In the first mentioned instance the power transmission takes place through a mechanical connection arranged in the casing 8.

The shaft 13 of the driving block, as shown in Fig. 5, is therefore directly connected with the motor shaft or with a sprocket wheel or the like, whereas its other end carries a centering disc 14. A bush 15 is fixed on the shaft 13 which bush has a toothed wall engaging with the internal teeth of discs 16, said discs surrounding ring-shaped the bush 15. The discs 16 are separated the one from the other by discs 17 and limited on the outer side as regards their movement in axial direction by discs 18, 18. The discs 17, 18, 19 have outer teeth meshing with the inner teeth of a casing 20 and are thereby secured against being turned by the discs 16 or by the bush 15, but axially shiftable, as is usual in multi-disc brakes. The instantaneous braking of shaft 13 is effected by pressures uniformly distributed on the right hand side of ring 19 in opposition to the action of several pull springs 21 fixed on the circumference of ring 18. These pressures are produced, in the form of construction shown in Fig. 5, by means of oblique bolts 22 coupled at both ends, in that a disc 23 not axially shiftable is turned through the intermediary of a control rod 24 so that the bolts are oscillated in the same direction and their position relative to the driving axle approaches the parallel position, whereby the discs 19 and 23 are spread asunder. The movement of rod 24 is effected by means of flowing pressure media from the piston of a control cylinder 25.

In the counter-holding head shown in Fig. 6, cylindrical bores 31, 32 are provided, in which a secure guiding is given to the shaft 33 by means of sliding pistons 34, 35 when the shaft is axially shifted. The shaft 33 carries at the right hand end a centering disc 14 and at the other end on the correspondingly lengthened hub 36 of the piston 34 a control piston 37, which can be moved in its cylinder 38 by pressure media admitted through the conduits 39, 40. The braking movement of disc 19 is effected by a ring-shaped piston 42 of U-shaped cross-section open for the pressure medium, in opposition to the action of pull springs 41.

The hubs of the centering discs 14 are immovably mounted, as shown in Figs. 5 and 6, on the shafts 13 or 33. The wheel rims are, however, connected with the hubs by disc parts 47, 48 of less thickness or of special shape so that, when the circulation of the beam should not take place in line, the axis of the bevel wall of the centering discs, can incline relatively to the shafts 13 and 33. The teeth in the centering discs 14 and in the hubs of the beam prevent any slip, even when the beam is fully wound and the warping speed is greatest.

In the form of construction shown in Figs. 7 and 8 the lateral discs of beam 3 and their flanges 50 are shown, in order to illustrate their supporting on the centering discs 14; further a construction is selected which is conformable for both sides as regards the braking arrangement and the mounting of the centering discs. The pressures on the discs 19 are in this form of construction effected through magnet windings 51 in opposition to the action of springs 52 from the detector current of the warping creel. In the movement of the control piston 37 participates, besides the shaft 33, also the whole braking arrangement accommodated in the casing, which is encased accordingly by ground out bores of the frame 2 and of the capsule part 53, slidable wedges 55 preventing a turning of the casing 20.

The centering discs 14 are in this instance hingedly fixed on the front ends of the shafts 13 and 33 constructed as seats 57, whereas in the embodiment shown in Fig. 9 inversely the hub of the centering disc 14 is constructed as seat 58 and the shaft end as semi-sphere 59. In both instances the connection between the centering disc 14 and the shaft 13 respectively 33 is effected by a claw clutch, the flanges of which are crowned. Both centering discs are then held in their seat by a spring 30, in order that they cannot drop out when the beam is removed. In the brakeless counter-holding head as shown in Fig. 10 the centering disc 14 is mounted in the shaft 33 itself. The bearing 60 permits then, same as the articulated fixation by means of ball and seat, an easy yielding when the beam is not in line. The braking arrangement shown in Fig. 9 corresponds to the construction shown in Fig. 6 with the exception of the non-shiftability of shaft 13. However, the bush 15 is made in two parts for reasons of production and material. The toothed jacket may further be removed, without loosening of the wedge-connection with shaft 13.

On the casing 20 of brake 6 the casing 62 of the motor 7 is flanged in the forms of construction shown in Figs. 9 and 11, so that especially at corresponding encasing as in Fig. 11 a uniform encasing of all elements is produced. In the specification the brake will be hereinafter designated by 20 and the motor by 62. The adjusting of the number of revolutions or adjusting of the motor 62 is effected by a screw spindle 63 and bevel wheels 9, 10 from an electromotor 11, to which the control impulses are imparted from a contact tachometer 126 connected with the measuring roller 12. The pipes 64, 65 and 66 lead the actual driving medium to the motor and back again, this driving medium adapted to act also as pressure medium onto the ring piston 42 eventually through a corresponding branching and control at the moment at which the drive is cut out. If as driving medium a medium capable of lubricating is selected, the oil conduit 67 may also be connected to the pipe net for motor and brake.

The discs 16 and 17 may be pressed the one against the other also by spring force in order to obtain thus the braking effect as indicated in Fig. 11 by the spring 70 which presses against the disc 19. The ring-piston 42 effects then a lifting of the brake by pressure upon a disc. When oil or the like is employed as driving medium for the brake the oil pressure existing in the annular channel 43 may also be utilized for lubricating and cooling, particularly of the brake discs 16 to 19. In the form of construction shown in Fig. 11 some oil is sprayed through a small pipe 72 into a catching groove 73, whence the oil flows then to the discs through bores 74 in the jacket of the bush 15.

In this form of construction shown in Fig. 11 special means for preventing the slip and for centering the beam are provided. The hub 80 engages in teeth 80 clutchlike, whereas its centering is effected by means of a separate, conically turned out inner ring 81 on a bevel plate 82, which can turn through the intermediary of a ball 83 in a cup 84 of shaft 13.

In the form of construction shown in Fig. 11 the adjusting of the number of revolutions or the adjusting of the motor 62 by hydraulic drive is effected from a feeling device bearing against the beam. The control device is shown merely diagrammatically in Fig. 11 in the right hand upper portion without consideration for the real position of the separate parts and consists of a cylinder 26, in which a piston 27 moves which is mounted on spindle 63 which is smooth in this instance. A spring 28 tends to push the piston 27 in upward direction. For controlling the pressure medium, acting upon the other side of the piston and taken for instance from the drive circuit, serves a control piston 29, which moves in a cylinder 45 and is connected with one of the arms of a two-armed lever 44. The other arm of the two-armed lever 44 is connected through a rod 46 with the pressing-on cylinder 49 bearing against the beam 3. The pivot point of the two-armed lever 44 is on the lengthened spindle 63. At increasing thickness of the beam, pressure medium controlled by the piston 29 gets to behind the piston 27, said piston moves downward the spindle 63 and thereby increases the absorption capacity of the motor 62. The returning of piston 27 is effected by a spring 28 after the piston 27 has liberated the return conduit of the pressure medium.

The further embodiments of the invention, as they are diagrammatically illustrated in Figs. 12 to 17, relate to the driving of the beam of a warping machine; in this instance a hydraulic regulating gear is employed which consists of motor 62, shown in Figs. 9 and 11, and pump 81 which is built together with the electromotor 82 driving the same. In the form of construction shown in Fig. 12, a feeler influenced by the circumference of the warp beam acts for instance, as explained with reference to Fig. 11, onto the control rod 63 of the regulator 80 so that at increasing beam diameter the absorption capacity of the motor 62 is altered, so that the pressure of the driving fluid and therewith the circumferential speed of the beam remain constant.

The pump 81 of the hydraulic gear is flanged together with the electromotor 82 and can be adjusted through the control shaft 63 to any desired fundamental speed, for instance according to the kind of yarn.

For controlling the return flow of the driving medium and of the medium influencing the motor brake, i. e. gas, steam, air, or other liquid, a control cylinder 84 is provided, in which the control pistons 66, 67 can be brought into the driving position and maintained in the same in opposition to the pressure of a spring 85, as shown in Fig. 13. The means necessary herefore, which are merely diagrammatically indicated in Fig. 13, consist, for instance, of a hand lever 54, which being depressed lifts the pistons 86, 67 and stops the same in the driving position in cooperation with a resilient pawl 61. The pump 81 then sucks on the driving medium from the container 68 through a filter 88 and presses it through the conduit 65 to the motor 62. Thence the driving medium flows back, through the conduits 64, 109 and 80, to the reservoir 86, in which suitable mechanical cleaning means, such as sieve and overflow, are provided. A safety valve 94 acts against inadmissible overpressure in the conduit 65.

When a thread breaks, the circuit 88 is closed by the stop motion not shown, and thereby the electromagnet 69 is excited which attracts the pawl 61 and liberates the pistons 86, 87, so that these move, under the action of the spring 85, into the braking position shown in Fig. 12. The disengaging of pawl 61 may evidently also be effected by hand, in order to stop the machine. When the pistons 86, 87 are in this position, the driving medium flows, instead through the motor 82, through a conduit 83, branched from the motor, directly to the discharge 109, 80. At the same time with the liberating of conduit 83 by the piston 86, the piston 87 shuts off the condit 91, so that the pressure in the conduit 86 sinks instantaneously and the disc brake begins to act which is constructed as shown in Fig. 11.

The braking effect is assisted by the reflex of the driving medium in the conduit 64, as the discharge from the conduit 64 is braked by a throttling at 95.

In the form of construction shown in Fig. 13, the slowing of the revolving speed of the beam is effected according to the increasing diameter without any of the known control means which are influenced from an element of the warping machine, said elements responding to alterations of the winding proceeding. With this object in view, a separate control cylinder 99 is coordinated to the regulator constructed as control cylinder 87 with piston 98. In this control cylinder 99 a control piston 100 is mounted which is regulated to the normal position shown in Fig. 13 by the action of a spring and by means of an adjusting screw 101. The piston 100 has two grooves 104 and 105, which communicate each one towards the corresponding end of the piston, by central connections 103 and 106, with the corresponding portion of the cylinder 99. The control cylinder 99 is connected with the control cylinder 84 by conduits 102 and 108. This arrangement corresponds besides with that shown in Fig. 12. In both instances dripping conduits known per se and therefore not shown are provided for relieving the control cylinder 84.

The operation of the control shown in Fig. 13 is produced thereby that at increasing loading of the motor 62, owing to the increasing beam diameter, the pressure in the circuit 65 tends to rise. Hereby the pressure in the upper portion of the control cylinder 99 increases, so that the piston 109 is pressed somewhat downwards and an increase of pressure is thus produced in the cylinder 97 of the regulator and shifts the control piston 98 to the left in the example shown in the drawing, and thus increases, exactly as in the form of construction shown in Fig. 12, the absorption capacity of the motor, whereby the slowing of the revolving speed is caused. The piston 108 can also replace the safety valve 94, shown in Fig. 12, in that a conduit 107 is connected to the upper portion of the control cylinder 99, through which conduit the conduit 65 is relieved at strong increase of pressure in the conduit 65 and consequently at corresponding low position of the piston 100. An inadmissible increase of pressure can, however, occur in the present instance only when the regulating range of the cylinder 87 is exhausted by shifting the piston 98 into its extreme position, in the example shown towards the left.

At an abnormal relieving of the conduit 65, the piston 100 serves also for an equalisation, in that it instantaneously relieves the control cylinder 97 by means of groove 105 and control bore 106, when the pressure in the upper portion of the control cylinder 99 sinks to below the value adjusted by means of the set screw 101.

In the form of construction shown in Fig. 14,

a control cylinder 84 is also provided for controlling the return flow of the driving medium, in which control cylinder a control piston 86, 87 moves which, contrary to the arrangement shown in Figs. 12 and 13, consists only of one piece. The control piston 86, 87 is shown in Fig. 14 in the position which it assumes when the machine is at standstill. The transition into the driving position is effected by the same means as explained with reference to Fig. 13, only with the difference that the pawl 61 has an inclined face 75 and by lifting of the hand lever 54 is pushed aside and thus can liberate the piston 86, 87. The stop motion controlling the circuit 68 is illustrated diagrammatically and designated by 76. When the piston 86, 87 is in the driving position, the pump 81 sucks-on the driving medium from the container 88 through a filter 89 and forces it through the conduit 66 to the motor 62. Thence it flows through the conduits 64, 109 and 90 back to the reservoir 88.

The flowing medium used for controlling the brake is branched from the driving medium itself in that the admission conduit 91 is connected with a branch conduit 122 of the driving medium, and the discharge conduit 92 is connected to the general return conduit 90, so that therefore the brake 20 is influenced by the driving medium itself through the conduit 66, which means in the present instance that the brake is held in the relieved state.

A conduit 102 is branched from the conduit 66 and leads the pressure of the driving medium flowing through conduit 65 upon a piston 98 movable in the control cylinder 97 and influencing the absorption capacity of the motor 62.

The regulator 33 for adjusting the fundamental speed acts upon a spring 114, in that it puts this spring more or less under tension, so that the regulator 115, acting through a rod 112 upon a rotary slide 111 inserted in the conduit 65, assumes a stronger or less strong spread-position according to the adjusted fundamental speed. The regulator 115, in the example illustrated, is besides driven by a bevel wheel 117 mounted on the measuring cylinder of the warping machine and by a bevel wheel 116 mounted on the shaft of the regulator. According to the speed at which the warping is carried out at this moment, the measuring cylinder revolves more rapidly or more slowly, so that the regulator 115 lifts the rod 113 more or less in opposition to the regulated tension of the spring 114 and thereby regulates the quantity of the driving medium admitted to the pump through the conduit 65 according to the speed of the running threads. The shutting off of the admission of the driving medium to the motor 62 is further effected by the control piston 86 itself, in that the conduit 65 is accordingly conducted by means of the control cylinder 84.

The branching of driving medium for controlling the brake 20 has already been explained. The driving medium may, however, as already mentioned, evidently be used also for influencing other control proceedings. In the example illustrated, the conduit 122, from which the driving medium is conducted through the conduit 91 to the brake, may be connected with a control cylinder, not shown, which effects the centering of the beam, or with another, hydraulically actuated device which, for instance at the warping, moves to and fro the warping comb, as known per se. The result of such branching off of driving medium must, however, not exert a disturbing effect onto the driving medium pressure in the conduit 65. Another control cylinder 124 with control piston 123 is therefore, according to the invention, arranged between the conduit 122 and the conduit 121 leading to the conduit 65 for the driving medium, by which control cylinder the pump 81 is influenced, so that, independently on the pressure in the conduit 122, the pressure of the driving medium for the conduit 65 is maintained equal by altering the pump efficiency.

In the form of construction shown in Fig. 15, the arrangement of the conduits for the driving medium substantially corresponds to the arrangement shown in Fig. 12. As indicator for the warping speed the measuring cylinder of the warping arrangement is used in known manner and is connected, with this object in view, with a contact tachometer 125. The tachometer 125 influences, according to the fundamental speed adjusted, an electromotor 127 which acts upon the regulator 128 of the motor 62 and, through a shaft 129, at the same time upon the regulator 130 of the pump 81. The polarity of the electromotor may be reversed by oscillating the contacts 131, 132 in a manner usual for such switching proceedings. With this object in view the switch 126 is connected with a control piston 134 by means of a rod 133, said control piston being regulated in the cylinder 135 by means of a spring 136 to a certain position corresponding to the average driving medium pressure in the conduit 65. The driving medium pressure acts through the conduit 137, 138 upon the piston 134. The cylinder 135 is further connected by a conduit 139 with the return conduit 90. The engaging and disengaging of the motor 62 and thereby at the same time the engaging and disengaging of the brake is effected by means of a rotary slide 140 by which the conduit 138 can be connected with the return conduit 64 of the driving medium, and the conduit 92 or discharge conduit 91 for the braking medium can be connected with the brake conduit 66. The rotary slide 140 is in turn controlled by the machine switch or the stop motion arrangement of the warping creel.

This is effected, for instance, with the aid of a lever 77 fixed on a rotary slide 140, said lever controlled by a spring 78 and held in the driving position by a resilient pawl 79. The lever 77 can be oscillated into the locked position by means of a rod 96. As already described with reference to Figs. 13 and 14, the pawl 79 is also in this instance under the influence of an electromagnet 69, the circuit 68 of which is closed by the stop motion 76 when the thread breaks.

This just described arrangement operates as follows:

At the starting of the machine a strong increase of pressure is produced in the admission conduit 65 of the driving medium owing to the inertia of the beam which is at rest. This increase of pressure acts upon the piston 134, overcomes the counter-pressure of spring 136 and oscillates the switch 128 in the example shown towards the left. Hereby the polarity of the electromotor 127 is reversed, whereby then the highest starting turning moment is produced. With increasing number of revolutions of the beam the pressure in the conduit 65 sinks. The thread speed is, however, still slower than the fundamental speed, to which the contact-tachometer is adjusted. Owing to the decreasing pressure upon the piston 134 the switch 126 oscillates again under the action of spring 136 into its normal position. The motor 127, whose polarity has

been reversed, controls therefore again under the influence of the contact-tachometer 125 to "more rapid," until the adjusted fundamental speed is attained, and maintains this speed in that it gradually slows down the number of revolutions of the motor 62 and of the pump 81 according to the increasing diameter of the beam.

When a thread breaks or when the machine is stopped, the slide 140 is oscillated as has been above described, so that the conduit 136 and therewith the conduit 65 is directly connected with the conduit 64. The pressure of the driving medium sinks instantaneously. The piston 134 is thereby brought into the position which is shown in the drawing as the extreme right hand position and the polarity of the motor 127 is reversed in the same sense as in the extreme left hand position of the piston and thereby the gear is regulated during the standstill to the highest starting turning moment.

A too great pressure increase in the conduit 85 is prevented thereby, that the cylinder 135 is connected to the conduit 138, so that pressure relieving through the conduit 138 occurs when the piston 134 is shifted into the extremest possible position towards the left.

In the example shown, it is supposed, according to the form of construction shown in Fig. 11, that the ring piston influencing the disc brake holds the brake in detached position when there is pressure in the conduit 66. By simply exchanging the contact of the conduits 81 and 82 the rotary slide 140 may be used also for the inverse case, in which the ring piston is held out of action at the driving position by spring pressure, but brought into braking position for the braking action by the pressure of the braking medium.

The construction shown in Fig. 16 provides an electromotor 150 for influencing the pump 81, said electromotor being laid on the net by means of a push knob switch 151. The pump 81 sucks the driving medium from the container 88 through a filter 89 and presses it through the conduits 152, 65 to the motor 62, whence it can flow back to the reservoir 88 through the conduits 84 and 90.

The driving medium acts through the conduit 158 upon the ring piston of brake 26 in order to release this brake or to apply the same; the branching of the driving medium is effected by turning a slide 153, so that the bore 156 of this slide is connected with the mouth of the branch-conduit 176 of the conduit 158, whereas the mouth in the conduit 158 is shut off towards the rotary slide, as shown at the right hand side of the drawing. As at this turning of the slide at the same time bore 158 is connected with conduit 180, the driving medium communicates at the same time through the conduit 161 with an air chamber 170. By further turning of the rotary slide 153, which may be effected, besides from the stop motion arrangement, as shown in Fig. 15 relative to slide 140, also from any auxiliary device or from an element taking part in the warping proceeding, the bores of the rotary slide may be connected also with the conduits 182, 183 of any control cylinder 184, in that for instance the bore 156 comes into register with the connection of the conduit 165, whereby the mould-shaped recess 192 of slide 153 connects the conduit 183 with the conduit 157 or 98. In order to move back the piston in the cylinder 184 only a rotation is necessary, at which the driving medium is brought through the conduit 166 to the connected by the recess through the deeper one conduit 163, whereas the conduit 162 is then of the two connections with the conduit 157

In Fig. 16 the rotary slide 153 is shown in driving position. In this instance the driving medium flows from the pump 81 through the conduit 152, the central bore 154, the bore 156 and the conduit 65 to the motor and thence through the conduits 64 and 90 back to the reservoir 88. The brake conduit 168 is then relieved, as it is connected also with the conduit 64 through the mould-shaped recess 192 of the rotary slide 153 by the conduit 157.

The air chamber 178 is further connected by a check-valve 171 with the pressure conduit 152 of the pump and can act, through a control slide 167 and a conduit 168, upon the regulator 87, 88 of the motor 62 and correspondingly alter the absorption capacity of the motor.

The control of slide 187 and thereby of a winding speed which remains uniform is effected for instance by a contact-tachometer 125 from the measuring roll not shown. The control impulses are imparted by electromagnets 110 put under current by the contact-tachometer 125, between which electromagnets an oscillatable armature 118 is situated which is connected with slide 167. The air chamber is further connected by the conduit 161 with a safety valve 176 so that a limit is put to the pressure loading.

In the form of construction shown in Fig. 17 the control of the brake 20, just as shown in Fig. 5, is effected by a lever 24 which is hingedly connected with a rod 182. This rod 182 carries on its one end a piston 181 controlled by spring pressure and guided in the cylinder 180 and at its other end a control slide 184 guided in a corresponding guide 183. Through the control slide 184 the pressure conduit 152 of the pump can be opened or closed relative to the admission conduit 65 to the motor 62. The lever arm 24 is further hingedly connected to an articulated double lever 186, 187 fixed on an arm 185, the articulation point 188 of this double lever being pulled by the action of a light spring 189 against a switch-relay 190, 191 and held in the position shown. When a thread breaks, the double lever 186, 187 bends under the action of armature 190 which suddenly moves forward, to the right in the drawing, whereby the piston 181 under the action of its spring pulls downwards the lever 24 and thereby shuts off the driving current relative to the motor 62 and brings into effect the brake in the casing 20.

At the re-starting of the machine the rotary slide 153 is turned by hand or pedal by a quarter rotation in the direction of the arrow, whereby the bore 178 comes into communication with the conduit 179, so that now under the pressure of the driving flow branched from the conduit 152 by means of conduit 179 through the conduit 193, the piston 191 is again shifted upwards and thereby the conduit 152 connected with the motor conduit 65. This switching proceeding takes place in an extremely short time, so that the rotary slide 153 returns at once under the action of a spring 119 or the like into its initial position illustrated in the drawing, whereby the pressure in the cylinder 180 sinks or the oil can flow off through the conduits 193, 177 and 90.

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