This invention relates to a drive for devices treating movable lengths of materials and refers more particularly to a drive for apparatus with roller guides for treating movable lengths of textiles.

Apparatus of this type often consists of a system of partly driven and partly non-driven guiding rollers in alternating, zigzag or spiral arrangements. Usually the guiding rollers do not exert any special effects upon the lengths of materials which they guide. Roller squeezing devices belong to another type of treating machinery with roller guiding. In these devices the guided lengths are small, but the exerted forces and, consequently, the driving forces are very high. All these treating machines present the same problem, namely, as to how to adapt the operation of the drives of all types for the guiding rollers and the treating rollers to the contractions or extensions of the lengths of the treated materials, which practically always take place, so as to prevent excessive tensions in the case of contractions and to prevent loose running and the formation of folds in the case of extensions. This problem exists in connection with the movement of goods in so-called storing machines, as well as in connection with the guiding of goods in combinations of treating machines of various types.

Many different devices exist in prior art for the purpose of solving this problem. In high quality treating processes, particularly for the refining of textiles, each of the individual machine aggregates and each part of the individual aggregate is provided with a separate drive and these drives are actuated with respect to their tensioning effect and their speed by feeler devices testing changes in tension and length of the material. The cost of such installation is considerable.

An advantageous solution was found in the use of elastic belts for driving guiding rollers or a certain number of guiding rollers. Changes in length of the material are then balanced by different extensions of the elastic belts. However, difficulties exist in the proper selection of the belts which can easily result in substantial errors, particularly in the case of varying operational requirements.

An object of the present invention is to eliminate drawbacks of prior art constructions.

Another object is the provision of a driving system which will make certain that a selected small tension of goods will be maintained for all operations.

Other objects will become apparent in the course of the following specification.

In the accomplishment of the objects of the present invention it was found desirable to create a drive for devices treating continuously moving wide lengths of materials which balances extensions or contractions of the material taking place during the treatements, by providing the treating devices with hydraulic drives which are all combined either jointly or in different groups and which are interconnected in series, whereby the regulation of the speeds of interconnected oil motors takes place by regulating the amount of flow of the hydraulic liquid through a bypass the effective cross-section of which is changed depending upon the shifting of the movable supported rollers around which the material moves. It was found advantageous to construct the operating rollers as rollers with a short stroke and it is possible to reduce the stroke to about 50 millimeters. In the case of large installations with greatly different outputs, it is possible to arrange in parallel several rows of oil motors operated in bypass, the guiding motors of each row being firmly interconnected. This firm connection can take place through a gear drive so as to adapt it to operational requirements, whereby the interconnected motors will be driven with different speeds.

For special requirements the oil motors can be constructed as regulating motors and a different speed regulation can be provided in addition to the bypass regulation.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing by way of example, preferred embodiments of the inventive idea.

In the drawings:

FIGURE 1 is a diagram showing an arrangement of different treating devices;
FIGURE 2 is a diagram illustrating the series connection of various drives;
FIGURE 3 is a diagram showing a parallel connection of several rows of drives;
FIGURE 4 is a diagrammatic illustration of the switching connections of a regulating motor.
FIGURE 5 illustrates diagrammatically the connection of oil motors with the installation shown in FIG. 1.

FIG. 1 shows an arrangement of various treating devices relatively to each other. A length of material 1 is withdrawn with uniform speed from a transporting wagon or a fixed preliminary treating device over an inlet trestle 2 by a driven inlet roller 11. The material passes through a wide washing section 3 where it is washed in counter-current, is squeezed in a squeezing section 5, then passes through a soaking section 6 and through another squeezing section 8, whereupon it reaches a winding link 9 and is wound upon an axle winder 10.

The various driving members are indicated by the numerals 11, 13, 15, 16, 18 and 20 in FIG. 1. The numeral 19 indicates the location of a synchronous motor which is particularly important for the purposes of the present invention. The operating rollers 12 are arranged between the individual treating locations. They maintain constant the tension of the material in that they have feelers which determine changes in length of the material and differences in speed of the treating devices, so that the driving speeds can be corrected by suitable regulating devices. The driving roller 14 has a roller for the inner diameter of the material wound upon the winder 20 so as to provide different speeds of rotation assuring constant speed of the winding of the material.

The drives can be connected in a number of different ways.

FIG. 2 shows a simplified connection of a drive of an installation with three driving locations. The regulating pump 21 is driven by a three-phase A.C. motor 22 with constant speed. The speed range of the treating installation is set by adjusting the output of the pump from zero to the maximum speed. The transmitted oil flows through the first oil motor without bypass action. In the illustrated construction this first oil motor is the driving motor 24. Behind this motor the flow of oil is divided. A quantitatively regulating valve 27 is actuated by a roller 12 and it provides a regulated bypass flow which affects the speed of the motor 25. The second motor 25 is operated in the same manner.

FIG. 3 illustrates diagrammatically an installation with five driving locations. It is assumed in this construction that the acceptable maximum pressure permits the series arrangement of only three motors. Thus it is necessary to divide the output of the pump into two parallel circuits.
However, in order to bring the amounts of oil in these two circuits into a certain relationship to each other, the motor 30 of the first circuit is coupled with a so-called synchronous motor 29 which is operated with any desired speed ratio by a suitable gear drive 17. The speed of the synchronous motor determines the amount of flow in the second circuit.

This arrangement has the substantial advantage that if the pressure drops in the two circuits are different, as may occur due to variable loads in the individual driving locations, the motor in the circuit with the smallest total pressure drop will provide a greater or a higher portion of the torque for the driving member 30, or in the case of large pressure differences one aggregate will operate as a motor and the other as a pump, so that the regulating pump 21 will have to operate only against average pressure.

Fig. 4 is a diagram of an axial winder. The required amount of pressure oil can be produced by its own pump aggregate 26, or the circulating oil can be withdrawn from a treating installation located in front of it. The driving motor 28 is constructed as a regulating motor which permits, when the oil flow is the same, as is provided by the constant speed of the front installation, to influence the speed through the driving roller 14 in accordance with the diameter of the winding. The driving roller 12 maintains constant the tension of the material between the winder and the front installation and it feels changes in length of the material being treated or differences in speed between the installation and the winder, so as to correct them through the regulating valve 27 in the bypass.

Fig. 5 illustrates diagrammatically the arrangement of motors in the installation of Fig. 1. A regulating pump 21 is driven by the three-phase A.C. motor 23 and sucks in oil from the container 23, the amount of oil which depends upon the desired speed of movement of the material, being transmitted into two parallel circuits. The correct ratio of the amounts of oil in the two circuits can be set by selecting the oil motors and by the gear drive. The first circuit includes besides the sucking section the driving motors 15 and 18, namely, the motors for the squeezing sections. They are actuated by rollers 12 through regulating valves in the bypass. In the second circuit oil is pressed initially through the regulating motor 20 of the axial winder, whereby the roller 12 balances through the bypass the changes in length and the differences in speed while the swinging member 14 compensates the differences in speed produced by the increased diameter of the winding material. The drive for the inlet roller 11 is located rearwardly, the roller 11 being regulated by a roller 12 located behind this drive. The drive 13 for the washing section is also located there; it is driven by a roller 12 which is located behind this section. The motor 19 which is located in front of all these parts serves, according to the present invention, as a regulator for the amount of oil and as a pressure balancing aggregate (motor-pump).

It is apparent that the examples described above have been given solely by way of illustration and not by way of limitation and that they are capable of many variations and modifications within the scope of the present invention. All such variations and modifications are to be included within the scope of the present invention.

What is claimed is:
1. A drive for devices treating movable lengths of materials, comprising in combination with a plurality of different sections differently treating a length of material passing through said sections, a plurality of rollers guiding said length of material through said sections and movable depending upon contractions or extensions of said material caused by treatments in said sections, a plurality of hydraulic drives in said sections, each of said drives comprising an oil motor and a bypass connected with said motor and with one of said rollers, the effective cross-section of said bypass being varied by the movement of said one roller to vary the flow of oil and thereby regulate the speed of said oil motor.
2. A drive in accordance with claim 1, wherein said hydraulic drives are interconnected in series.
3. A drive in accordance with claim 1, wherein said hydraulic drives are arranged in groups which are interconnected in series.
4. A drive in accordance with claim 1, wherein said rollers are short stroke rollers.
5. A drive in accordance with claim 1, wherein the oil motors are regulating motors.
6. A drive in accordance with claim 1, comprising additional direct speed regulating means for each oil motor.
7. A drive in accordance with claim 1, wherein said oil motors are arranged in rows and said rows are interconnected in parallel.
8. A drive in accordance with claim 7, having a driving motor in each row, said driving motors being firmly connected with each other.
9. A drive in accordance with claim 8, comprising gear drives interconnecting said driving motors.

References Cited

UNITED STATES PATENTS
2,441,308 5/1948 Bond.
3,278,100 10/1966 Hornerberger 226—118 X
FOREIGN PATENTS

ALLEN N. KNOWLES, Primary Examiner.
J. P. MULLINS, Assistant Examiner.