This invention relates to belt conveyers and particularly to rollers which support the return run of the belt. Commonly the return rollers, as they are called, are cylindrical pulleys mounted on straight shafts and have no inherent training action to correct the usual tendency of the return run of the belt to creep to one side or the other.

The principal object of this invention is to make travel of the belt to one side react through the roller to produce a training effect on the belt.

Generally speaking, this is accomplished by mounting the return roller to swing about an axis in a vertical plane through the normal center line of the belt and preferably inclined in the direction of the return run of the belt. With such an arrangement the excess weight of the belt traveling to one side of the normal center line will tend to swing the corresponding end of the return roller forwardly and the opposite end backwardly, thus setting the roller askew in position to train the belt towards its normal position.

If the axis of the swinging movement for the roller is inclined forwardly, as is preferable, the end of the roller that is moved forward by the weight of the belt will also swing downward while the opposite end will swing upwardly as well as backwardly, and the roller as a whole will thus be inclined and skewed in a manner to train the belt to normal central position. As the belt approaches that position the relative weight on the opposite end portions of the roller will approach equality and the training tendency will diminish until it disappears with the return of the belt to its proper traveling position.

In practical use of such return rollers any movement of the belt to one side at once sets the roller for a corresponding training action to return the belt and in consequence the belt hardly deviates noticeably from its right line of travel on the return run.

Further objects and advantages of the invention will appear as the description is read in connection with the accompanying drawings, in which

Fig. 1 is a diagrammatic side elevation of a belt conveyor;

Fig. 2 is a fragmentary side elevation showing a return roller arrangement beneath a fragment of the main conveyor frame;

Fig. 3 is a transverse section through the return run of the belt and a longitudinal section through a return roller arrangement;

Fig. 4 is a plan view looking down from the line 4--4 in Fig. 4;

Fig. 5 is a longitudinal section through the central supporting bracket of the return roller mounting;

Fig. 6 is a similar section showing a modified form of support for the return roller;

Fig. 7 is a plan view of the same, and

Figs. 8 and 9 are diagrammatic illustrations of other forms.

In the diagram shown in Fig. 1 a belt conveyor is trained about a head pulley 14 and a tail pulley 12 with the load carrying run of the belt supported on the rollers 13 and the return run on the rollers 14.

The preferred mounting for the return rollers is shown in detail in Figs. 2 to 5. It includes two generally V-shaped brackets 15, hanging down from the girders 16 of the main conveyor frame, to which they are secured by bolts 17. Each bracket has hollow bosses 18, which receive the corresponding ends of tubular beams 19, secured in place by set screws 20. The beams 19 span the conveyor frame work and about the middle are equipped with a central supporting bracket 21, having bosses 22, which fit over the beams 19 and are secured by set screws 23.

The bracket 24 includes spaced jaws 24 and 25, having adjacent faces machined and threaded in alignment to receive trunnions 26 and 27 arranged on an axis lying in a vertical plane through the normal center line of the conveyor belt 10. The trunnions 26 and 27 are received in bushed bearings 28 in the enlarged middle portion 29 (Fig. 3) of a hollow shaft bearing member or casing 30.

The end portions 31 of the casing 30 are enlarged to receive ball bearings 32 for the return roller shaft 33. This shaft extends through the bearings to which it is secured by set screws 34 and has projecting end portions 35 upon each of which is mounted a pulley 36 including a rim portion 37, web portions 38 and hub portions 39, the latter secured to the shaft by set screws 40.

A suitable thrust bearing 41 is inserted between the jaw 25 and the corresponding face of the enlarged portion 29 on sleeve 30.

The return run of the belt 10 rests on the aligned rim portions 37 of the two pulleys 36, which together serve as a return roller, their adjacent edges being separated slightly as shown in Fig. 3 to make room for the center bracket 21.

In operation, any displacement of the belt to one side will make a differential of weight in favor of that side which will result in a tendency to swing the corresponding pulley 36 forwardly and downwardly, the whole roller assembly rotating about
the trunnions 26. The unavoidable reaction is to swing the opposite pulley 37 upwardly and rearwardly, thus the roller formed by the two pulleys 36 is skewed and inclined upwardly towards the top of the belt and both the skewing and the inclination tend to swing the belt towards that side. As the belt approaches its normal central position the weight differential is reduced and therefore the tendency to skewing and training is reduced as it finally disappears until the belt comes back to normal position. From this it will be seen that in practical operation a tendency to creep to one side is immediately opposed by a tendency to train the belt back to proper position and, in consequence, there is hardly any noticeable departure from the normal central path of the return run. The sleeve or casing 30 is provided with limit stop arms 42 (Figs. 3 and 4) to cooperate with surfaces 43 on the bracket 21 to limit the pivotal movement about the trunnions 26 to the range indicated by the dotted lines in Fig. 4.

In Figs. 6 and 7 there is illustrated a modified construction in which the axis of swinging movement for the return roller is removed from the axis of the roller. A central bracket 44 in this arrangement replaces the bracket 21 and is fitted with an upper trunnion 45 on which a bearing arm 46 of a sleeve or casing 47 is journaled by suitable anti-friction bearings 48. The sleeve has enlargements 43 (Fig. 7) corresponding to enlargements 31 in which the anti-friction bearings for the shaft 33 are received. In this construction follows the general operation described in connection with the preferred form except that there is no tilting of the return roller. The anti-friction bearings 48 are used to make the movement sensitive to slight differences in weight and friction on opposite sides of the return run.

For those who desire tilting in this sort of structure alternative arrangements shown in Figs. 8 and 9 may be used. In each of these a central bracket 51, carried by the beams 19, is equipped with a trunnion 52 for a bearing arm 53, corresponding to the arm 46 in Fig. 6, and affording a similar support for the pulleys 36.

In each of these forms shown in Figs. 8 and 9, however, the trunnion is inclined at an angle of 30° to the vertical, corresponding with the form shown in Figs. 2 to 5. In Fig. 8 the trunnion, and therefore the axis of the swinging movement, is back of the return roller, whereas in Fig. 9 it is in front of the return roller, back and front being considered with respect to the return run of the belt. In the three forms shown in Figs. 6, 7, 8 and 9, limits to the swinging movement may be set by limit stop arms 54 on the bracket and an arm 55 on the bearing arm. With the axis of swing at 30° to the vertical, the fore and aft movement of the return roller with respect to the belt is twice the up and down motion and this enhances the tendency to corrective action.

In order to lubricate the roller bearings 32 for the shaft 33, the enlarged middle portion of the casing 30 is fitted with a suitable grease nipple 56, by which the casing may be charged with grease.

The forms here shown and described are merely illustrative and many others will be readily designed to suit personal preference or particular conditions. The framework of the conveyer has been assumed as conventional and the supporting brackets 15 and tubular beams 19 are merely one selection of those elements from many available.

I claim: 1. In a self training return roller for belt conveyers, a supporting bracket, a casing, cooperating pivot means on said casing and bracket for pivotally connecting said casing to said bracket to swing to and from a horizontal position crosswise to the return run of the belt, a shaft extending axially through the casing, bearings between said shaft and casing at the ends of said casing, and a pulley carried by the shaft at each side of the axis about which the casing swings, each of said pulleys being outwardly of said pivot means but in proximity thereto.

2. In a self-training roller for belt conveyers, a supporting bracket bifurcated at its upper end, a bearing casing between the furcations and pivoted thereto to swing about an inclined axis, a shaft extending axially through said bearing casing and journaled therein at each end of the casing, a pair of pulleys surrounding said shaft and bearing casing and supported by said shaft, said pulleys having their inner ends spaced apart a sufficient distance to clear said bracket, the axis of the pivot extending upwardly and forwardly inwardly in the direction of travel of the lower run of the belt conveyer.

3. In a belt conveyer, a conveyer frame, brackets 45 secured to and depending from said frame at the sides thereof, a pair of beams supported by said brackets and extending transversely to the axis of said conveyer, a supporting bracket slidably mounted on said beams and adjustable along the same, said supporting bracket having jaws spaced apart, aligned trunnions-carried by said jaws, a casing journaled on said trunnions to swing about an inclined axis, a shaft extending through said casing and journaled therein, and a pulley removably mounted on each end of said shaft, said pulleys being spaced just sufficient to provide clearance for said supporting bracket.

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