Oct. 4, 1932. E. E. BERRY 1,880,689

PRESS ROLL GEARING

Filed Jan. 19, 1931 2 Sheets-Sheet 1

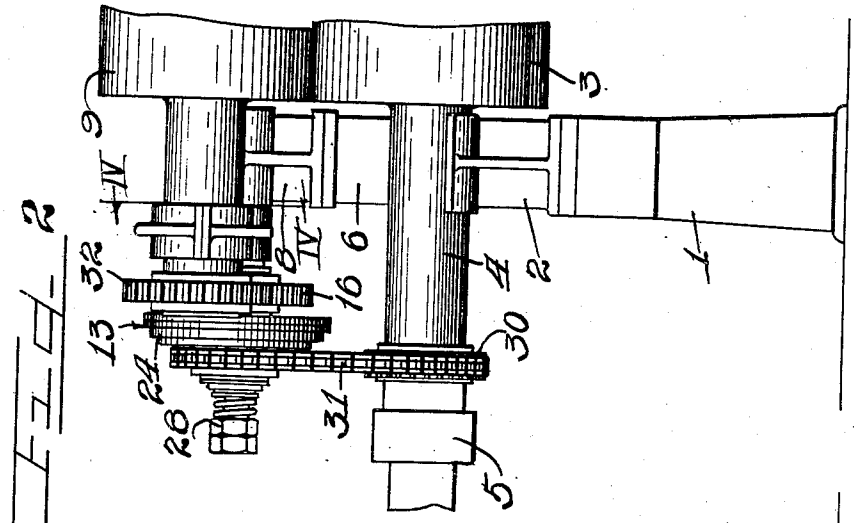


Fig. 2

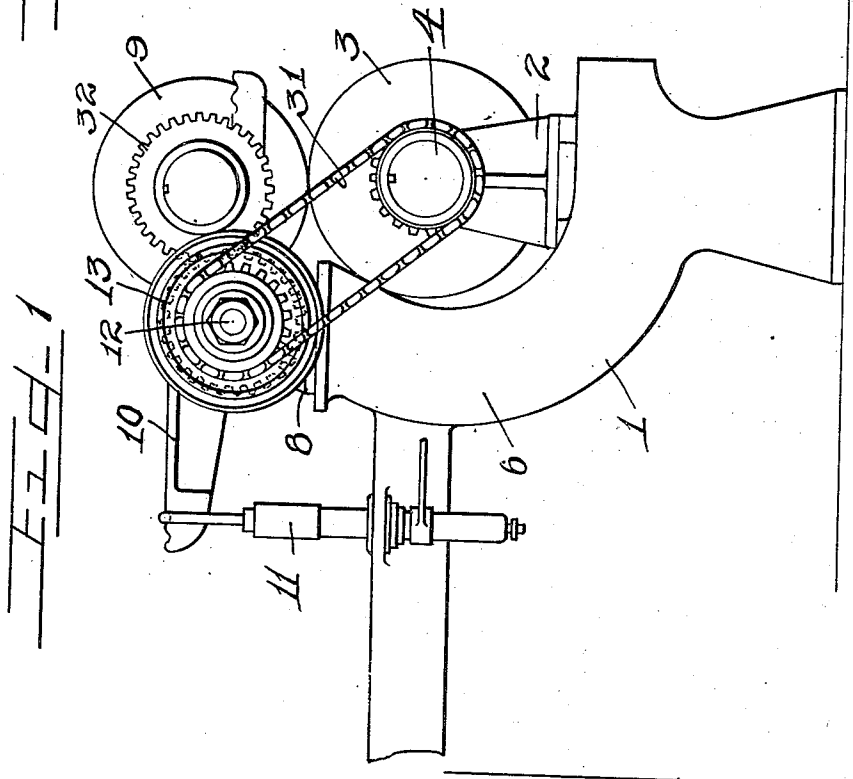


Fig. 1

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Fig. 4

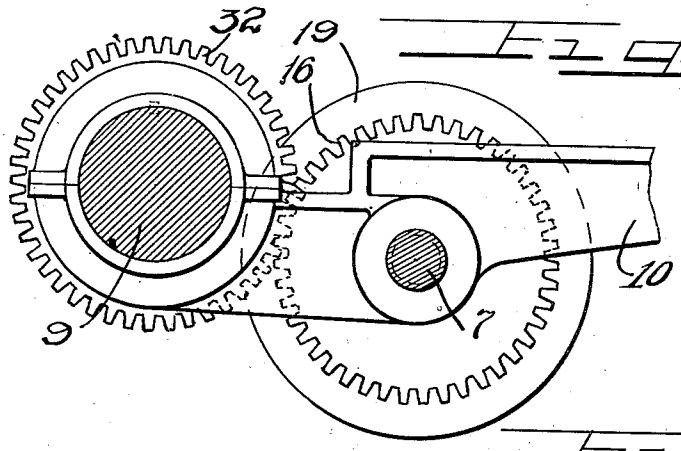
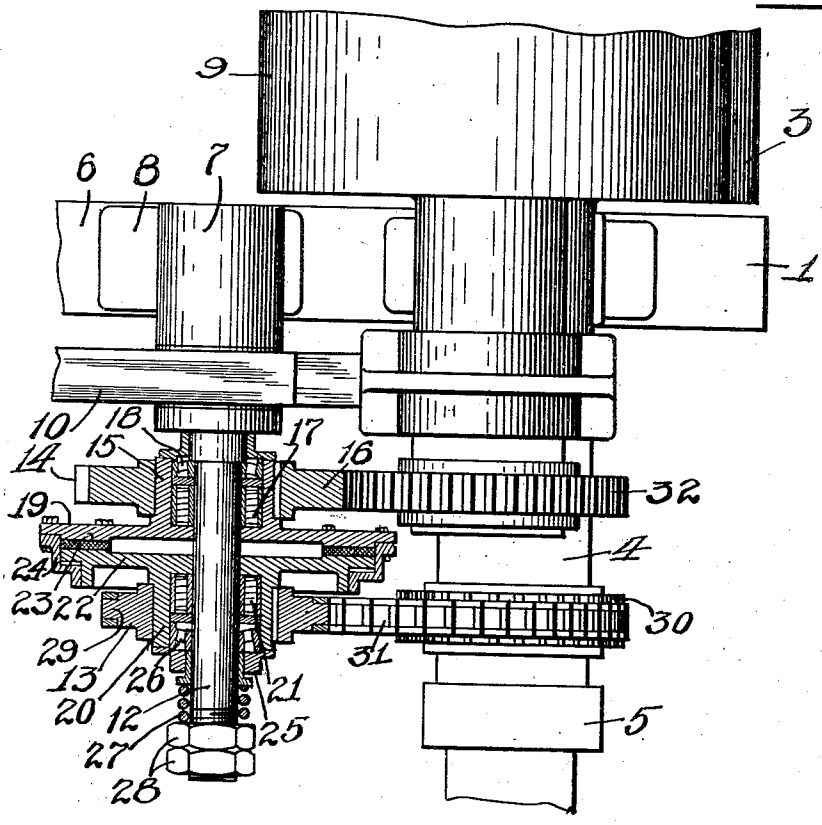


Fig. 3



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1,880,689

UNITED STATES PATENT OFFICE

EARL E. BERRY, OF BELOIT, WISCONSIN, ASSIGNOR TO BELOIT IRON WORKS, OF BELOIT, WISCONSIN, A CORPORATION OF WISCONSIN

PRESS ROLL GEARING

Application filed January 19, 1931. Serial No. 509,686.

This invention relates to press roll gearing and more particularly to a press roll assembly in paper machine construction.

As is well known, in the manufacture of paper, press rolls are employed to express water from the wet web of paper after it leaves the forming part of the machine and prior to its delivery to the driers. Ordinarily, a set of press rolls comprises a lower power driven roll having a rubber or other resilient covering, and an upper press roll formed of wood, stone, or other suitable material, that is driven by surface contact with the wet web of paper or felt, or both, passing between the rolls. The lower rubber covered roll is ordinarily crowned in order to equalize the pressure exerted by the upper roll throughout its length and this is especially important in the more modern paper machines because of their great width. During its use, the lower rubber covered roll must be ground down from time to time in order to insure a smooth surface and in order to retain the proper amount of "crowning". It is obvious that in grinding down the rubber covered press roll, its diameter decreases so that if its angular speed remains the same, its peripheral speed decreases.

It is for this latter reason that it is impossible to drive the upper and lower press rolls directly through intermeshing gears and obtain satisfactory results. It will be readily understood that unless the peripheral speeds of the two rolls are the same, there is a shearing action on the moist web of paper or on the felt as it passes between the rolls, thereby occasioning unnecessary wear of the felt and a strain upon the moist web of paper that often results in faulty formation and trouble at the presses. It has heretofore been suggested to employ a differential driving connection between the lower power driven press roll and the upper press roll and such construction is, in the main, satisfactory.

I have now found, however, that the desired results of driving both the lower and upper press rolls while at the same time equalizing the perpheral speeds of the two independently of the change in diameter of the lower roll due to grinding down operations can be simply and efficiently effected by the use of a friction device in the drive between the two rolls.

It is therefore an important object of this invention to provide press roll gearing having compensating friction operated driving connections for positively driving a pair of press rolls at the same perpheral speeds independently of changes in diameter of one of the rolls.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is an end elevational view of a set of press rolls embodying the features of my invention.

Figure 2 is a fragmentary side elevational view of the same.

Figure 3 is an enlarged fragmentary top plan view of the driving mechanism, with parts in section.

Figure 4 is a sectional view taken substantially on line IV—IV of Figure 2.

The reference numeral 1 indicates one of a pair of supporting standards from which is mounted by means of supporting members 2, a lower press roll 3. The lower press roll 3 is, in accordance with usual custom, power driven and for this purpose is provided with an extended journal 4 adapted to be connected by means of a member 5 to a suitable driving means (not shown). Also as is customary, the lower press roll 3 is rubber covered and crowned, that is, turned down so as to be of larger diameter at the center than at the ends.

The supporting standards 1 are provided with arcuate shaped arms 6, on the top of each of which is mounted a stub shaft 7 carried by a bracket 8. An upper press roll 9 is journaled at its end in arms 10 pivotally supported intermediate their ends upon the stub shaft 7. Devices 11 of conventional construction engage the free ends of the arms 10 to vary the amount of pressure exerted

by the upper press roll 9 against the lower press roll 3.

The stub shaft 7 is provided with an extended reduced end 12 upon which are mounted a pair of friction coupled gear assemblies 13 and 14. Said gear assembly 14 comprises a hub 15, upon which the gear proper 16 is keyed. Said hub 15 is free to revolve about the stub shaft 12 upon antifriction bearings 17 and is held against axial movement toward the larger end of the stub shaft 7 by means of a thrust bearing 18. Said hub 15 is further provided with an enlarged disk or flange 19.

The gear assembly 13 is somewhat similar in construction to that of the gear assembly 14 and comprises a hub 20 freely rotatable upon antifriction bearings 21 about the stub shaft 12. Said hub 20 is also provided with a disk or flange 22 of slightly smaller diameter than the flange 19 and adapted to cooperate therewith. An annular friction disk 23 is positioned between the adjacent faces of the disks 19 and 22 and is held in position by means of an annular, stepped ring 24 secured to the flange 19 and enclosing the edge of the flange 22 while permitting slight relative movement of the latter flange axially with respect to the flange 19.

The amount of frictional contact between the disks or flanges 19 and 22 and the friction disk 23 is varied by means comprising a collar or bushing assembly 25 bearing against the outer end of the gear hub 20 and against a thrust bearing 26 and held thereagainst by means of a spring 27 and nuts 28. Adjustment of said nuts 28 upon the threaded end of said shaft 12 varies the resilient pressure exerted by the spring 27, thereby permitting the friction engagement referred to to be varied as desired.

The gear assembly 13 also includes a sprocket gear 29 over which and a second sprocket gear 30 secured on the end of the journal 4 of the lower press roll 3 is trained a sprocket chain 31. The chain 31 is preferably of the silent type. The gear 29 is keyed or otherwise secured on the hub 20 and the gear 30 is keyed on the extended journal 4. Consequently, rotation of the lower power driven roll 3 effects rotation of the gear assembly 13 upon the extended stub shaft end 12.

The gear 16 meshes with a gear 32 on the extended journal of the upper press roll 9. Since the press roll 9 is pivotal about the axis of the stub shaft 7, the distance between the center line of the roll and the stub shaft does not change and therefore the gears 32 and 16 are in constant mesh with a constant fixed pitch line. This fact permits the use of herring bone gears in place of the pinion gears 16 and 32 if desired and further results in much more satisfactory running conditions than where the distance between the center lines of the meshing gears varies, as would be the case were the meshing gears carried by the lower and upper press rolls, respectively, as formerly.

The operation of the press roll of my invention is substantially as follows. If it be assumed that a new lower press roll 3 has been installed that is of the same diameter as that of the upper press roll 9, it will be apparent that if these two rolls have the same angular speed, their peripheral speeds are also the same. In this case, the drive from the lower press roll 3 through the sprocket gears 30 and 29 and sprocket chain 31 is transmitted through the friction disk 23 without slippage, so that the gears 16 and 32 will serve to drive the upper press roll 9 at the same angular and peripheral speed as the lower roll 3.

After the lower press roll 3 has been in use for some little time, it becomes necessary to grind down the surface in order to reestablish the proper amount of crowning. In so doing, the diameter of the lower press roll 3 becomes less than its original diameter and therefore if the angular speeds of the two press rolls were to remain constant, the peripheral speeds would vary, the peripheral speed of the upper roll 9 being greater because of its greater diameter. As heretofore stated, however, if the rolls were to be driven at different peripheral speeds, there would be a shearing action toward the felt and web passing between the press rolls and this would produce unnecessary wear of the felt and would very probably injure the formation of the web and cause the production of poor quality paper.

It is the main purpose of my invention to obviate such conditions and to this end the nuts 28 are loosened to reduce the frictional pressure between the flanges 19 and 22 and the friction disk 23 until sufficient slippage is produced to permit the upper press roll 9 to have the same peripheral speed as that of the lower press roll 3. Obviously, since the two press rolls are in contact with each other, or at least in contact through the web or felt, or both, this condition would naturally occur, even without the use of interconnected driving means between the two press rolls, but the difficulty in driving the upper press roll solely from the lower press roll by surface contact is that it requires heavy frictional pressure between the two and this also results in excessive wear of the felt and deleterious effect toward the paper web.

By permitting a sufficient slippage between the friction disk 23 and the flanges 19 and 22, the upper press roll 9 is driven positively at the same peripheral speed as that of the lower press roll 3 without depending upon the frictional contact between the two press roll surfaces and the intermediate web or felt, or both, to produce this result. As a

consequence, in the operation of press rolls of my construction, the life of the felt is lengthened and a better formation of the paper web is obtained. It will be understood, of course, that my invention is particularly important in connection with the more modern, high speed paper machines where the press rolls are of great width and travel at peripheral speeds of 1,000 feet a minute or over. In accordance with my construction, the pressure between the two press rolls can be independently varied, as by means of the arm 10 and adjusting device 11, due to the fact that the upper press roll is positively driven through the mechanism described and frictional contact between the coacting press roll surfaces need not be relied upon for this purpose.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwises than necessitated by the prior art.

I claim as my invention:

1. A set of press rolls comprising a lower positively driven roll, an upper roll, a stub shaft, frictionally connected gears rotatably mounted on said stub shaft and means forming positive driving connections between one of said gears and the lower press roll and between the other of said gears and said upper press roll.

2. A pair of press rolls comprising a lower power driven roll, an upper roll, a stub shaft, friction connected gears freely rotatable on said stub shaft, means positively driving one of said gears from said lower roll and a gear on said upper roll meshing with the other of said friction connected gears.

3. A pair of press rolls comprising a lower power driven roll, an upper roll, a stub shaft, friction connected gears freely rotatable on said stub shaft, means positively driving one of said gears from said lower roll, a gear on said upper roll meshing with the other of said friction connected gears and adjusting means for varying the friction between the friction connected gears.

4. In a paper machine, a set of press rolls comprising a lower power driven roll, an upper roll, a stub shaft, gears freely rotatable upon said stub shaft and relatively movable axially of said shaft, friction means interposed between said gears, means adjustably and yieldingly holding said gears in frictional connection, means driving one of said gears from said lower roll and a gear on said upper roll meshing with the other of said gears.

5. In a paper machine, a pair of press rolls comprising a lower power driven roll, a stub shaft, an upper press roll pivotally supported from said stub shaft, a gear freely rotatable on said stub shaft, a gear secured on said upper roll meshing with said first gear and driving means frictionally connecting said first gear and said lower roll.

6. In a paper machine, a pair of press rolls comprising a lower power driven roll, a stub shaft, an upper press roll pivotally supported from said stub shaft, a gear freely rotatable on said stub shaft, a gear secured on said upper roll meshing with said first gear, driving means frictionally connecting said first gear and said lower roll and means for varying the amount of friction in said frictionally connecting driving means.

7. In a paper making machine, a supporting frame, a lower power driven press roll mounted thereon, stub shafts secured in said frame, an upper press roll pivotally supported from said stub shafts, a gear loosely mounted on said stub shaft a gear secured on said upper press roll in constant mesh with said first gear, a second gear loosely mounted on said stub shaft and movable axially thereof relative to said first gear, cooperating frictionally contacting flanges carried by said first and second loosely mounted gears, means driving said second loosely mounted gear from said lower roll and means for adjusting the amount of frictional pressure between said contacting flanges.

8. In a paper making machine, a supporting frame, a lower power driven press mounted thereon, stub shafts secured in said frame, an upper press roll pivotally supported from said stub shafts, a gear loosely mounted on said stub shaft, a gear secured on said upper press roll in constant mesh with said first gear, a second gear loosely mounted on said stub shaft and movable axially thereof relative to said first gear, cooperating frictionally contacting flanges carried by said first and second loosely mounted gears, means driving said second loosely mounted gear from said lower roll, resilient means urging said flanges into close contact and adjustable means for varying the amount of frictional pressure between said contacting flanges.

9. In a paper machine, a supporting frame, vertical and horizontal arcuate arms integral with said frame, a driven roll rotatably mounted between the horizontal arcuate arms, stub shafts on each of the vertical arcuate arms, supports pivoted in said stub shafts, an upper roll rotatably mounted above said driven roll from said pivoted supports near one end thereof, means coacting with the other end of said supports to control the pressure exerted between the rolls, a gear rotatably mounted on one of said stub shafts, a flange member secured to said gear, a second gear rotatable on the said stub shaft, a second flange member frictionally contacting with said first flange member secured to said second gear, a gear secured to the upper roll meshing with said second gear, means for

transmitting power from the driven roll to said first gear on the stub shaft and adjusting means to vary the pressure between the frictionally contacting flanges.

10. A press roll structure comprising a supporting frame, a lower power driven roll rotatably mounted therein, stub shafts in said frame above said lower roll, supports pivoted on said stub shafts, an upper roll rotatably mounted from said supports, means cooperating with the said supports to vary the pressure between the upper and lower rolls, friction connected gears rotatable on one of said stub shafts, means positively driving one of said gears from said lower roll and a gear on said upper roll meshing with the other of said friction connected gears.

In testimony whereof I have hereunto subscribed my name at Beloit, Rock County, Wisconsin.

EARL E. BERRY.