April 10, 1951 G. W. DODGE 2,548,425

BEATER

Original Filed Oct. 9, 1945 2 Sheets-Sheet 1

Fig. 1

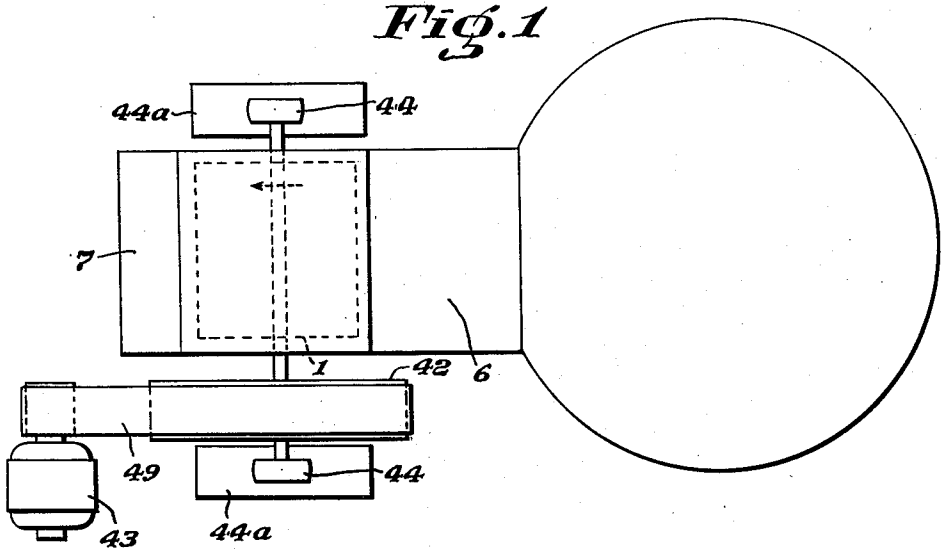
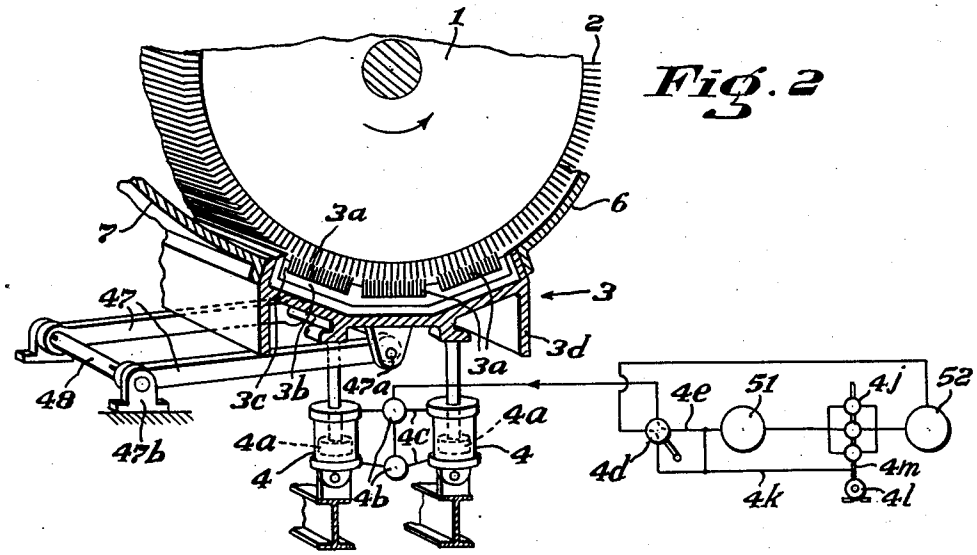


Fig. 2



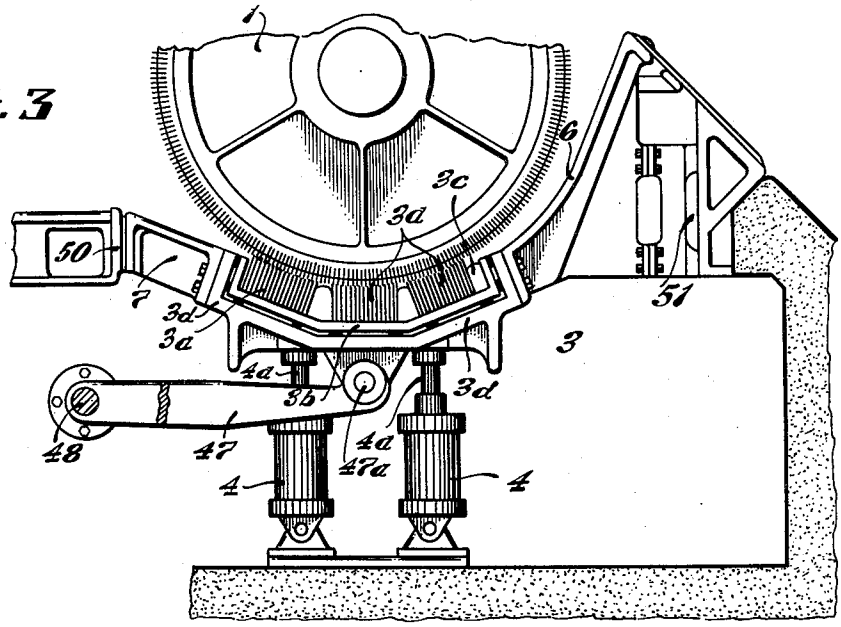
INVENTOR.
GEORGE W. DODGE
BY Geo B Rawlings
ATTORNEY

April 10, 1951 G. W. DODGE 2,548,425

BEATER

Original Filed Oct. 9, 1945 2 Sheets-Sheet 2

Fig. 3



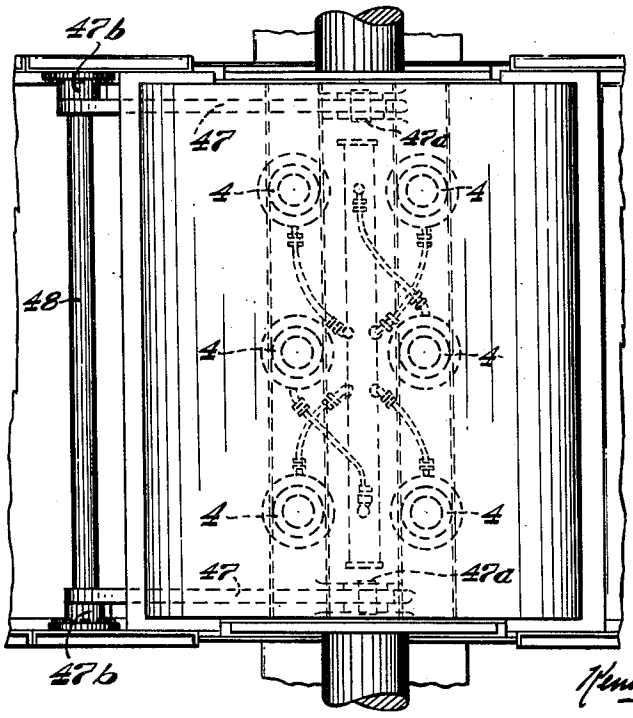


Fig. 4

INVENTOR.
George W. Dodge.
BY
Kenway, Jenney, Witter & Hildreth
Attys.

Patented Apr. 10, 1951 2,548,425

UNITED STATES PATENT OFFICE

2,548,425

BEATER

George W. Dodge, Hoosick Falls, N. Y., assignor to The Noble & Wood Machine Company, Hoosick Falls, N. Y., a corporation of New York

Original application October 9, 1945, Serial No. 621,259. Divided and this application January 15, 1947, Serial No. 722,177

3 Claims. (Cl. 92—22)

1

This invention relates to beaters for preparing raw materials for manufacturing paper and paper products and is a division of my prior application, Serial No. 621,259, filed October 9, 1945, being specifically directed to the construction of the beater roll and bed plate.

One important object of my invention is to devise equipment in which the working conditions of the beating tackle will remain constant throughout the workable life of the machine; that is, such wear as takes place will not produce any significant changes in relationship between the functional parts of the equipment during the life of the tackle and when replacement of the worn working parts becomes necessary, these relationships will be also maintained.

In my beater the discharge throat established by the roll filling and backfall is such that there is established and maintained a converging area sufficient that stock when leaving the spaces between the beater bars will have an unrestricted flow and generally a gradual change in direction without using the energy supplied to produce hydraulic pressures and thereby an uncontrolled amount of hydration. Ordinarily this feature is not sufficiently controlled and varying degrees of hydration result over the life of the roll filling and bed plates. By so arranging these members in my beater I am able to maintain substantially a uniform converging area throughout the life of the wearing parts of roll and plate, and thereby produce a uniform degree of hydration throughout extended periods of time.

This feature is new and novel and reflects in producing, at the will of the operator, a uniform product at any and all times, regardless of what wear and tear may develop in the tackle.

In carrying out my invention I provide a beater roll and bed plate of special design, and mechanism of novel design for adjusting the bed plate towards and away from the beater roll.

Unlike other beaters in which the beater roll has to be adjusted vertically towards and away from a fixed bed plate, my beater roll is stationary in a vertical plane with respect to the bed plate combination and the bed plate combination is adjustable towards and away from the beater roll and held in the desired adjustment by means of hydraulically controlled forces.

For this purpose the bed plates are contained in a solid cradle or frame beneath which is located a series of hydraulic cylinders, the pistons of which move the bed plate combination upwardly towards the stationary beater roll and

2

hold them there under uniformly controlled pressure.

This uniform control is obtained by the use of a common header mounted centrally with the pistons and provided with individual connections to each individual cylinder so as to maintain a constant pressure in each cylinder regardless of the proximity of the cylinder to the supply pump. The header is of a size which will contain a sufficient quantity of the hydraulic fluids at all times to meet the demands of any and all hydraulic cylinders.

The hydraulic pressure applied through hydraulic cylinders and bed plate filling to the beater roll may be varied, controlled and recorded in amount through a predetermined range and time period by means of a conventional cam type pressure controller in conjunction with a pressure recorder and the necessary hydraulic valves and timing equipment.

With this type of control, a constant operating condition in reference to wear of the coacting beater roll and bed plate fillings is obtained which reflects in the treatment of the pulp and provides a means of accurately duplicating this treatment periodically throughout the life of the roll fillings.

In addition to the controlled movement of the bed plate relative to the beater roll, the backfall and front approach of the beater are incorporated as a fixed structure with the bed plate cradle and move in conjunction with the bed plate, thereby assuring uniformity of stock exit areas throughout the life of the bed plate and roll fillings, and a resultant uniform flow of stock to and from the roll, which may be further controlled in direction of flow by means of gates and deflectors which can be accurately adjusted in relation to the roll because the roll is not free to move axially from the horizontal line originally established.

In the accompanying drawing wherein I have illustrated a preferred embodiment of my invention:

Figure 1 is a plan view of my beater,

Figure 2 is a fragmentary perspective view, partly in diagram, particularly illustrating the means for adjusting the bed plate towards and away from the beater roll,

Figure 3 is a view in side elevation of the beater roll and cradle assembly, and

Figure 4 is a plan view of the beater roll showin the pressure cylinders for the cradle in dotted lines.

The beater roll may be of cast iron, fabri-

cated steel or any other material or construction best adapted to the specific work and results desired, and may be provided with the usual end cover plates and banger irons for protecting the stock from contamination.

The beater roll is comprised of a body and shaft 1 and filling 2. This roll is equipped with rocker-type, self-aligning, anti-friction bearings 44 and is supported on suitable foundations 44a. These bearings are pre-loaded so as to properly function when the stress on the bearing is reversed due to the hydraulic force exceeding the dead weight of the roll 1. This method of support provides a fixed position for the roll 1 in reference to the bed plate combination 3.

Roll 1 may be driven by means of customary power transmission, which may be flat belt, V-belts, silent chain, or gearing. As here shown, it is driven by means of a wound-rotor motor 43, flat belt 49 tensioned in any suitable manner, and beater pulley 42. With this type of drive, it is possible to rotate the beater roll 1 at such speeds as may be found desirable in the preparation and beating of different grades of raw material or stock.

The bed plate assembly 3 consists of one or more groups of bars (see Fig. 2), these groups being generally called bed plates 3a which may be a combination of bars of the usual type fitted into a holder 3b and locked in by wedges 3c. Holder 3b fits into a cradle 3d. Attached to cradle 3d are backfall 6 and approach 7. Cradle 3d and bed plates 3a are supported and actuated by hydraulic pressure cylinders 4 and stabilized circumferentially by means of connecting rods 47 pivoted at 47a to the bottom of cradle 3d. These rods 47 are interconnected with a torque shaft 48 which aids in keeping the assembly 3 moving vertically in a line parallel with the face of the roll 1. Shaft 48 is supported in journals 47b which are anchored to the foundation.

Cylinders 4 contain plungers 4a for actuating cradle 3d. It will be evident that a plurality of cylinders 4 may be employed in mechanism of this sort, six being shown in this illustrative embodiment (see Fig. 4), symmetrically spaced in two rows of three beneath the bed plate assembly 3. Oil manifolds 4b interconnect with cylinders 4. Oil pipes 4c connect manifolds 4b with a four-way valve 4d. Pipe 4e connects valve 4d with a hydraulic shock accumulator 51. An atmospheric relief or discharge line 4k extends to valve reservoir 4l. A discharge line connects pressure pump 4j to accumulator 52. Pump 4j is a pressure pump driven from any suitable source. A suction line 4m extends from reservoir 4l to pump 4j.

The fluid used preferably is oil. The oil likewise assures lubrication of the component parts in the hydraulic system.

In raising the bed plate filling 3 against the beater roll, valve 4d is set by hand so that oil pressure from accumulator 51 passes through valve 4d, lines 4c, and manifolds 4b to the under side of each piston 4a in hydraulic cylinders 4. At this position, the manifold 4b which is connected to upper side of piston 4a and through line 4c to valve 4d will be open and discharge through relief line 4k to reservoir 4l.

In lowering the filling 3, valve 4d is turned by hand to its number two position. This reverses the flow and causes the pressure to be applied to the top side of the pistons 4a and relieve from their bottom side oil through manifold 4b and pipe 4c, valve 4d, and relief line 4k to reservoir 4l.

Adequate protection against shock loads is provided by means of the spring-loaded accumulator 51 installed in series with the cylinders 4, and hydraulic capacity is provided by means of the dead-weight volume accumulator 52. Both accumulators are of conventional type.

Hydraulic cylinder pistons 4a are connected to cradle 3d. Hydraulic cylinders 4 are supported on girders or other suitable supports by means of a pin connection serving to provide axial freeness of the cylinders 4 and piston 4a as related to bed plates 3a. The bed plate assembly is urged upward by the pistons 4a which by virtue of the pressure of the bed plates 3a against the beater roll 1 tend to hold the bed plate assembly from tilting. The connecting rods 47 bear the load of the circumferential force of the beater roll against the bed plates 3a, and while the bed plate assembly might tend to tilt about the point 47a as a pivot, it will be seen that the lever arm promoting tilting is measured through the center bed plate 3a while the lever arm promoting steadiness is measured from the front bed plate 3a and is considerably longer.

Further guiding the bed plate assembly 3 and attached front approach 7 and back fall 6, are two guide ways 50 and 51 abutting against the front approach 7 and back fall 6 respectively. Packing (not shown) is provided between the said guide ways and front approach and back fall to prevent loss of stock downward. It is to be noted, however, that no great force is exerted against either guide way, the circumferential thrust of the beater roll being taken up by the connecting rods 47. Therefore, the guide ways 50 and 51 provide a simple and smooth sliding fit. Adjustable side plates (not shown) serve to complete the closure between bed plate 3 and the side walls of the beater tub.

While I have shown and described a preferred embodiment of my invention, it will be understood that various modifications thereof as to construction, design and materials may be made without departing from the spirit and scope of my invention as defined by the appended claims. For instance the back fall 6 need not be of exaggerated height as illustrated but can readily be a modified discharge throat on the order of and complementary to the front approach 7. Furthermore, elements 6 and 7 may both be modified to suit the demands of design, the significant facet being the smooth sliding fit between the guide ways 50 and 51 and the movable members of the bed plate assembly with the circumferential thrust of the beater roll being borne by the connecting rods 47.

Having thus described an illustrative embodiment of my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a beater, a bed plate, a beater roll mounted above said bed plate, means for adjusting said bed plate vertically towards said roll and for holding it under predetermined pressure in operating position against said roll, and means for maintaining the bed plate in a horizontal plane relative to the roll, and for holding the bed plate against the circumferential thrust of the beater roll including a torque shaft rotatable in fixed bearings, and parallel connecting rods fast at their outer ends to said torque shaft and pivoted at their inner ends to the bed plate.

2. In a beater, a bed plate, a vertically adjustable cradle supporting said bed plate, a beater roll mounted above said bed plate, a front ap-

proach and a backfall for said beater roll carried by said cradle, means for adjusting said cradle, said bed plate, said approach and said backfall as a unit vertically towards said beater roll and for holding the bed plate under predetermined pressure in operating position against said roll and the approach and the backfall in predetermined constant relationship to the circumference of said roll, and means for maintaining the bed plate in a constant horizontal plane relative to the roll including a torque shaft, a pair of connecting rods fast at their outer ends of said torque shaft and pivoted at their inner ends to said cradle.

3. The beater of claim 2 further characterized by guide ways adapted to abut against the said front approach and backfall and to guide same in sliding relation.

GEORGE W. DODGE.

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