Nov. 18, 1930. E. S. SHEPERD 1,782,215

APPARATUS FOR PRODUCING FELTED FIBROUS BOARD

Filed Sept. 6, 1928 2 Sheets-Sheet 1

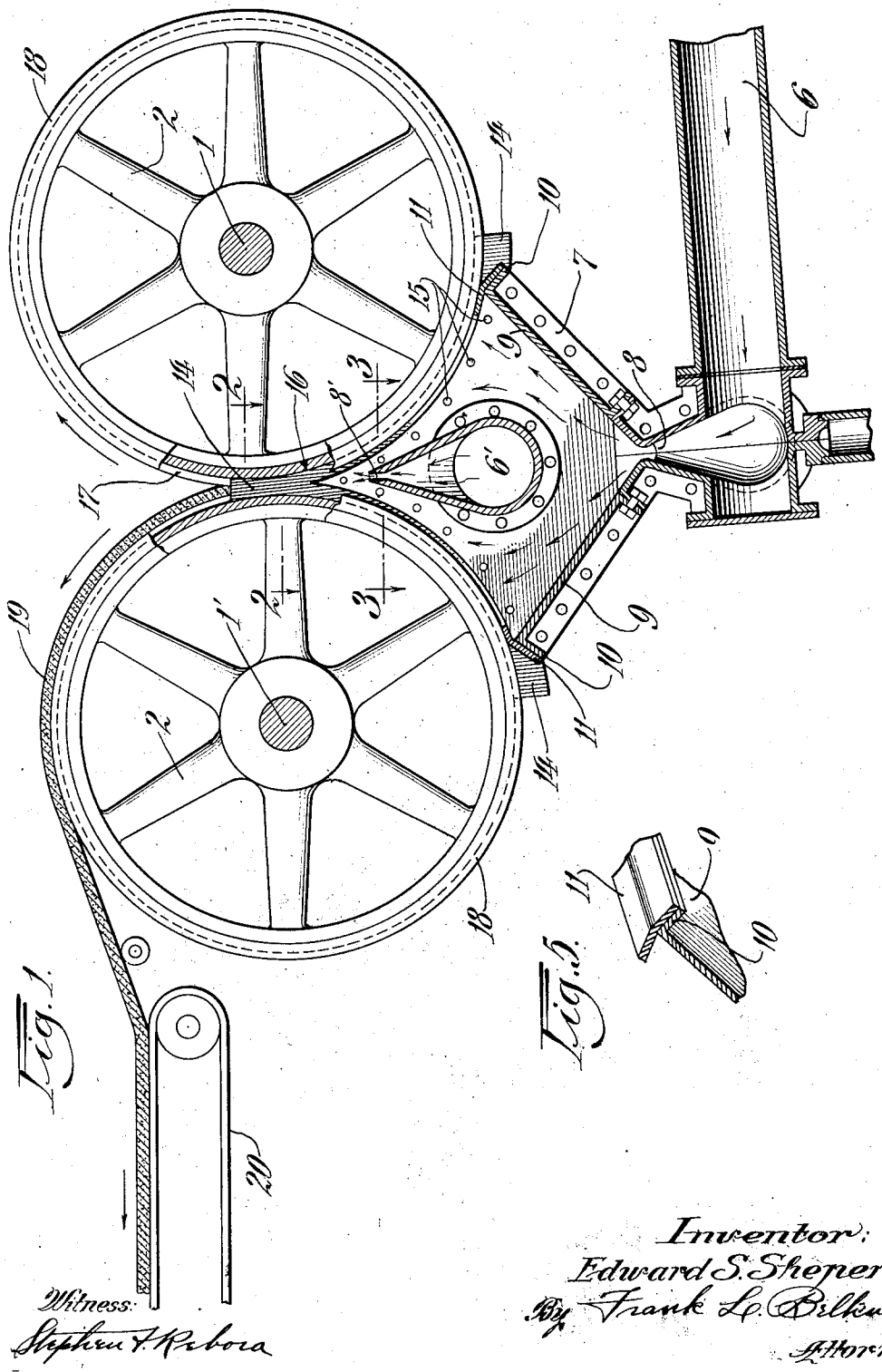


Fig. 1.

Fig. 3.

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Fig. 2.

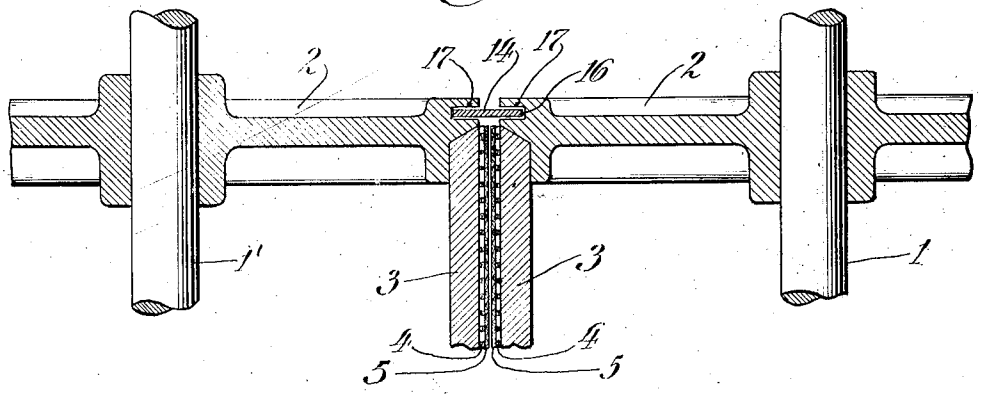


Fig. 3.

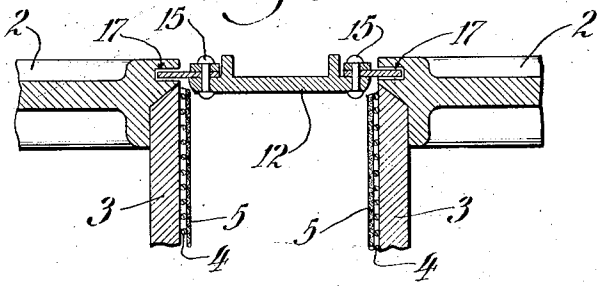
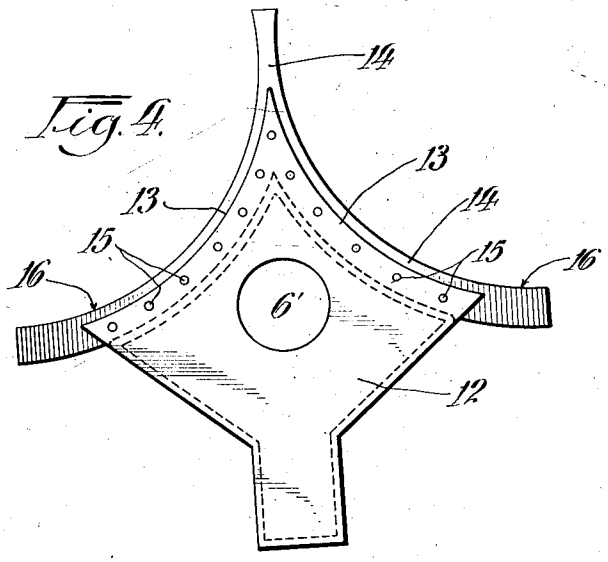


Fig. 4.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR PRODUCING FELTED FIBROUS BOARD

Application filed September 6, 1928. Serial No. 304,255.

The present invention relates more particularly to an apparatus especially designed for producing a felted fibrous board product as a continuous sheet.

One specific embodiment of the invention comprises the combination with two rotatable forming cylinders geared together to rotate in unison of stationary end seals for preventing leakage.

Among the salient objects of the present invention are to provide an apparatus making use of two rotatable forming cylinders geared together to rotate in unison, one preferably disposed on a plane slightly lower than the other; to provide an apparatus so designed as to produce a continuous sheet of board of uniform characteristics; to provide an apparatus comprising two rotatable forming cylinders disposed above, and in communication with, a specially designed forming or pulp suspension receiving chamber, characterized in that the latter is located substantially centrally between the two forming cylinders so that the board as felted or formed passes upwardly between the two cylinders, to which latter pressure is applied to secure the necessary extraction of water to produce a board sufficiently dry to allow its transfer to a carrying belt or other instrumentality leading to the press and drying parts of the machine; to provide in a construction of the character described stationary end seals attached to said pulp suspension receiving chamber to effectively prevent leakage of the pulp solution; to provide seals between the ends of the two cylinders and the ends of the adjacent forming chamber by providing grooves in each end of each forming cylinder disposed oppositely to each other, in which the edges of the seals are adapted to ride; to provide a stationary seal effectively performing its sealing function regardless of the rotation or lateral movement of the forming cylinders; to provide a stationary seal of the character described capable of automatically adjusting itself to all positions of the two cylinders; to provide in a construction of the character described longitudinal seals, in addition to the end seals, disposed between the upper outer longitudinal edges of the forming chamber and the adjacent cylinder to prevent leakage at that point; to provide a machine in which repair and replacement can be made very easily and very quickly; and in general to provide improved apparatus of the character referred to.

The utility of the invention as well as other objects and advantages will be more apparent from the following description.

In the drawings, Fig. 1 is an end elevational view, partly in vertical section, of the apparatus of the present invention.

Fig. 2 is a cross sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is an end elevational view illustrating the connection between the seal and the adjacent end wall of the pulp suspension receiving chamber.

Fig. 5 is a fragmentary perspective sectional view illustrating the connection between the longitudinal seal and the upper edge of the forming chamber.

Referring more in detail to the drawings, each of the forming cylinders comprises a central supporting shaft 1 and 1′, on which are securely mounted a number of cast steel spiders 2 specially designed to receive on their outside rim a series of longitudinally disposed heavy wooden bars 3 arranged parallel with the supporting shafts 1 and 1′, these bars being arranged with open spaces (½″ to 1½″ apart) between them to permit free and unrestricted passage of water during the formation of the desired sheet of board. Over these wooden slats 3 a heavy bronze or other metal wire 4 is wound, preferably spirally, from end to end of the cylinder as a foundation to receive a covering of one or more plies of metal cloth or screening 5 applied to complete a suitable forming surface for proper felting of the board.

The forming cylinders are journalled in suitable bearings for rotatable movement and are driven from any convenient and suitable source of power, the two cylinders being geared together to insure uniform rotation relative to each other.

Pulp suspension fed under a hydrostatic

head pressure from a suitable head box and of the consistency desired may be fed through either or both of the charging pipes 6 and 6′ into the pulp suspension receiving chamber 7. The inlet 6 may discharge into the pulp receiving chamber 7 through a longitudinal opening 8, while the upper inlet 6′ discharges through the longitudinal slot 8′ at a point immediately adjacent the point at which the two sheets being carried upwardly on the forming cylinders come together. The arrangement is such that one kind of pulp in suspension may be fed in through the lower inlet 6 while a different kind of pulp, or of different consistency, or clear water, may be fed in through the upper inlet 6′, the lower and upper inlets being independently controlled by suitable means (not shown) for permitting this. While I have shown this particular design for charging pulp suspension to the forming chamber 7, it is to be understood that I do not wish to be limited to this particular method of charging pulp to the forming chamber 7, as other means may be used within the scope of the invention.

The forming chamber proper slopes upwardly and outwardly from the inlet 8 taking the form of walls 9 terminating in turned down flanges 10. The arrangement is such that a longitudinal seal 11 which may comprise, for instance, rubber or other suitable material, may be interposed between the flanged edges 10 of the forming chamber and the surfaces of the forming cylinders. The ends of the forming cylinders may be closed by means of the end walls 12 provided with a hole to accommodate the upper inlet 6′. The end walls 12 follow the general form of the forming chamber 7 and, in addition, curve upwardly and inwardly along the lines 13 (Fig. 4) for a purpose now to be described.

As a feature of the present invention, each end of the forming chamber is sealed against leakage by means of a seal 14, which in the present instance takes the form of an inverted Y, the stem of the Y terminating at a point disposed slightly above the upper contacting point between the two forming cylinders (Fig. 1). One of these seals, which may be of rubber or metal and which may be either flexible or non-flexible, is disposed in engagement with each end wall 12 of the forming chamber through the medium of bolts or the like 15 passing through the holes provided for that purpose in the end wall and seal. The inner edges 16 of each seal are adapted to register with the forming cylinders through the medium of opposed annular grooves 17, thus preventing any water or pulp from leaking beyond the ends of the cylinders. The grooves 17 may be formed by placing annular rings 18 on the ends of the cylinders a sufficient distance away from such ends and at a depth of approximately 1½″ to 2″, more or less, to accommodate the seal.

These seals may be held securely in place against the end walls of the forming chamber in the manner described, thus holding the seals securely in registration with the grooves 17 adjacent the ends of the cylinders. Due to the fact that each groove is preferably from 1½″ to 2″ deep, more or less, and furthermore, since the edges 16 of the seals register in said grooves to the greatest possible extent when the cylinders are closest together, it is obvious that the cylinders may be adjustable laterally within a latitude of many inches without destroying the effectiveness of the seal. This feature is accomplished by the provision of a seal simple in construction and yet very efficient in use.

The operation of the machine will be obvious from the foregoing description. Pulp in suspension may be fed through either or both of the inlets 6 or 6′ and from there to the inlets 8 or 8′ into the interior of the forming chamber 7 under a hydrostatic head pressure. Fibers flowing in suspension in the water will flow toward the surfaces of the forming cylinders along the inner surfaces of the walls 9. Water passing through the perforated forming cylinders will discharge beyond the longitudinal seals 11 while the fibers are retained on the surface of each of the forming cylinders. Rotation is imparted to the forming cylinders which are geared together to rotate in unison through any suitable source of power and at the desired speed.

The fibers forming on each of the cylinders will be carried upwardly on the surface thereof to a point where the two sheets are brought together. At that point, due to the pressure imposed by the force holding the two cylinders together, sufficient water will be extracted to permit the board 19 to be carried by forming cylinder 1′ onto a belt 20 which conveys the wet sheet to suitable presses and dryers. For this purpose the following cylinder mounted on shaft 1′ is disposed about 4″ lower than the forming cylinder mounted on shaft 1.

During this entire operation water and pulp suspension will be prevented from leaking between the ends of the forming chamber and the surfaces of the forming cylinders through the medium of the effective seals 14. Scrapers (not shown) may be employed to register in each of the grooves 17 to remove any fibers or other foreign matter so that effective registration may be had between the edges of the seals 14 and grooves 17.

It is to be noted that as a feature of the invention the seals are stationary, but are capable, because of the depth of the grooves 17 in the cylinders, of forming effective seals even though the cylinders should be moved apart for a distance of as high as 2″, the

fact being borne in mind that the edges 16 of the seals contact the bases of the grooves 17 when the cylinders are closest together.

As a feature of the invention, attention is to be directed to the fact that the forming cylinders are so arranged as to rotate for a limited portion of their travel only in the forming chamber 7, in the present instance materially less than one-half. I have found it to be a distinct disadvantage in the formation of a relatively thick board of the character made on the present machine to have any large portion of the forming cylinders submerged at any one time due to the fact that water continuously dropping from the forming cylinder has a tendency to flow back down on the sheet being formed, causing thickness variation in the final product through re-floating of the individual fibers in water. As a matter of fact, in the present invention the forming cylinders are mounted over the forming chamber 7 in such a manner that the forming chamber coincides with, and is directly below the nip where the sheets carried by the two cylinders come together.

As before explained, the amount of water contained in the board after it is stripped from the lower forming cylinder carried on shaft 1′ is regulated entirely by the pressure applied by the two forming cylinders against the board by any suitable mechanism, for instance, through the medium of a compression coil spring (not shown). Normally, the two forming cylinders are separated about 1/8″ to 1/2″ when no pulp is passing between them, this separation being brought about by an adjustable means (not shown). When pulp is passing between the two forming cylinders in the formation of a sheet the tension of the spring provides proper pressure to remove the desired amount of water from the felted board.

The particular product of the present invention may have any desired thickness up to 1/2″ or more, the thicker boards being particularly adapted for insulating and sound deadening purposes.

As before described, the specific design of the forming chamber 7 tends to carry the fibers charged in suspension thereto directly to the wire covered surfaces of the two cylinders as these surfaces enter the forming chamber past the longitudinal seals 11, thus forming the two outer surfaces of the board of the particular fiber that is fed through the lower inlet 8.

As another feature of the invention it is to be noted that the stock is fed upwardly and collected on the surfaces of the forming cylinders while they are both moving upwardly, as distinguished from those machines and processes in which the pulp is fed downwardly and collects on the surface of the forming cylinders while the latter are moving downwardly.

It has always been difficult in the operation of the type of machine of the present invention to secure a perfect seal between the ends of the forming cylinders and the ends of the forming chamber. According to the present invention this sealing is accomplished in a very effective and economical manner, and while the seals are disposed to remain stationary, their simple and rugged design make them automatically water tight at all operating positions of the two cylinders.

Cross reference is made to my co-pending application Serial No. 304,254 wherein the other elements of the apparatus, i. e. forming chamber, dual inlet, etc., are reserved and claimed.

I claim as my invention:

1. An apparatus comprising in combination, forming cylinders geared together to rotate in unison, a forming chamber disposed below and in communication with said forming cylinders, means for introducing to said forming chamber pulp suspension under hydrostatic pressure, and means disposed on both sides of the forming cylinders for preventing leakage past the ends of the forming cylinders and the forming chamber, consisting of a stationary seal adapted to register with opposed grooves in said cylinders.

2. An apparatus comprising in combination, forming cylinders geared together to rotate in unison, a forming chamber disposed below and in communication with said forming cylinders, means for introducing to said forming chamber pulp suspension under hydrostatic pressure, and means disposed on both sides of the forming cylinders for preventing leakage past the ends of the forming cylinders and the forming chamber, consisting of a stationary seal adapted to register with opposed grooves in said cylinders of a depth sufficient to permit adjustment of the relation of one cylinder relative to another without disengagement of said seal.

3. An apparatus comprising in combination, forming cylinders geared together to rotate in unison, a forming chamber disposed below and in communication with said forming cylinders, means for introducing to said forming chamber pulp suspension under hydrostatic pressure, and means disposed on both sides of the forming cylinders for preventing leakage past the ends of the forming cylinders and the forming chamber, consisting of a stationary seal taking the form of an inverted Y, the stem of said Y being disposed at a point immediately adjacent to the point at which the sheet is formed and the arms of the Y conforming in contour to the circular contour of the forming cylinders.

4. An apparatus comprising in combination, a forming chamber having end walls, a

pair of forming cylinders adapted to rotate through said chamber, means for feeding pulp suspension to said chamber, and an inverted Y-shaped sealing member fixed to each of said end walls, each of said sealing members engaging the ends of both said cylinders.

5. An apparatus comprising in combination, a forming chamber having end walls, a pair of forming cylinders adapted to rotate through said chamber, means for feeding pulp suspension to said chamber, grooves in the opposite ends of said cylinders, and sealing members fixed to said end walls and fitting into said grooves.

6. An apparatus comprising in combination, a forming chamber having end walls, a pair of forming cylinders adapted to rotate through said chamber, means for feeding pulp suspension to said chamber, grooves in the opposite ends of said cylinders, and a unitary sealing member fixed to each of said end walls, each of said sealing members fitting into the adjacent grooves of both said cylinders.

In testimony whereof I affix my signature.

EDWARD S. SHEPERD.