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STOP MECHANISM FOR TUBE MAKING MACHINES.
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To all whom it may concern:

Be it known that we, ROBERT M. CLARK, of Newton, in the county of Middlesex and State of Massachusetts; GEORGE AMBROSE, of Needham, in the county of Norfolk, in said State, and CADWALLADER J. CLARK, of said Needham, all citizens of the United States, and ROBERT VI. CLARK, of Newton, and GEORGE AMBROSE AND CADWALLADER J. CLARK, OF NEEDHAM, MASSACHUSETTS, ASSIGNORS TO CENTRAL RAILWAY SIGNAL COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF NEW JERSEY,

have invented a new and useful Improvement in Stop Mechanism for Tube-Making Machines;

which invention they do desire to secure by Letters Patent of the United States, and to that end have filed in the Patent Office the specification thereof, in words, the title of which is

STOP MECHANISM FOR TUBE-MAKING MACHINES.

Application filed November 18, 1908. Serial No. 468,161.

Fig. 1 shows the machine in plan, the work supplying table being omitted. Fig. 2 shows the same in front elevation. Fig. 3 shows the entire machine in side elevation. Fig. 4 is a section of a portion of the machine to show in elevation the rear side of one of the clutch members in connection with the mechanism for stopping the machine as will hereinafter be explained. Fig. 5 shows mainly in vertical section but partially in front elevation the part shown in Fig. 2. Fig. 6 is a section on line 6—6 of Fig. 2 showing paper wound on mandrel. Fig. 7 is a sectional view showing the mandrel thrown out, the tube being removed.

In the drawings, A represents a frame or table. On this are mounted standards a, a', fixed to the table by a bar a² preferably integrally connecting the standards and fixed to the table by bolts a² fastened by nuts a'.

The standards a, a' support bearings a², a³ in which turns a shaft a⁴ which is the immediate instrument for operating the mandrel B on which the tubes are formed as will hereinafter be explained. On the shaft a⁴ arranged just outside the respective bearings are collars a⁵, a⁶ which restrain the shaft from longitudinal play. Arranged also on the shaft a⁴ between its bearings is a clutch comprising two clutch members a⁷, a⁸, these members consisting respectively of opposing friction disks adapted to occupy an engaging or disengaging position with respect to one another. Of the clutch members or disks the member a⁷ is fixed to the shaft a⁴ by a sleeve a⁹. The clutch member a⁸, however, is loosely arranged upon the shaft a⁴ so as to slide laterally thereon toward or away from the clutch member a⁷.

On the rear side of the member a⁷ affixed thereto and mounted loosely on the shaft is a pulley a¹⁰ run by a belt a from a pulley a¹ derived from a shaft a¹² arranged in bearings a². The pulley a¹⁰ has on the rear side thereof a hub a¹¹ in which is formed an annular groove a¹². Contained within this groove is an arm a¹³ affixed by a collar a¹⁴ to a rod a¹⁵ which extends through the standards a, a' and is loosely arranged to slide longitudinally therein in a plane parallel with the plane of the shaft a⁴.

The longitudinal movement of the rod a¹⁵ in one direction or the other acts through the arm a¹⁴ running within the grooved hub a¹¹ connected with the pulley a¹⁰ to move the clutch member a¹² into or out of engagement with its complementary clutch member a¹¹. We have arranged whereby the clutch member a¹² will be maintained in a normally inoperative position. This is accomplished by locating upon the shaft a¹⁵ outside the standard a a collar a¹⁶ which, when the rod has been moved longitudinally to a certain position, is adapted to draw against the side of the standard preventing further movement of the rod in the direction it is moved and positioning the rod.

Such position of the rod defines the normal inoperative position of the clutch member a¹² inasmuch as when the rod is moved longitudinally to a position where the collar a¹⁶ thereon engages the side of the standard a the arm a¹⁰ upon the rod will at the same time have moved the clutch member a¹² away from or into a disengaging position with respect to the clutch member a¹¹. Moreover the rod is held to normally maintain said position by means of a spring a¹⁷ arranged on the rod a¹⁵ outside the standard a⁴ and between the side of the standard and a collar a¹⁸ arranged on the end of the rod, the tension of the spring acting to normally maintain the rod in the position above mentioned.
tioned when the arm \(a^7\) secured to it will hold the clutch member \(a^{12}\) in a disengaging position.

For the purpose of moving the clutch member \(a^{12}\) out of the normally disengaging position in which it is maintained, into an engaging position with respect to the clutch member \(a^{11}\) there is provided the following mechanism: Connecting with the forward end of the rod \(a^{19}\) outside the standard \(a\) is a link \(a^3\) which connects the rod to one arm of a bent lever \(a^{21}\) pivoted at the point \(a^{20}\) to a lug \(a^{20}\) dependent from the table \(A\). Connecting with the other arm of the lever \(a^{21}\) is a link \(a^7\) secured to a foot treadle \(a^9\). The arrangement is such, in other words, that when pressure is applied to the treadle \(a^9\) it through the angular lever \(a^{29}\) and intermediate connections will act to draw the rod \(a^{12}\) in a longitudinal direction when the arm \(a^{21}\) fixed to the rod and contained in part within the grooved boss \(a^{12}\) will during the operation of the machine act to move the clutch member \(a^{12}\) into operative engagement with the clutch member \(a^{11}\) for turning the shaft \(a^3\) and operating the mandrel.

Referring now to the mandrel \(B\), it will be understood that the tubes are formed by fixing the edge of a sheet of paper to the mandrel when the same is turned. The sheet then being bent over the edge of the slot \(b\) formed longitudinally in the mandrel, the sheet becoming bent over the edge of the slot when the mandrel is turned (see Fig. 6). When so affixed the sheet will not slip on the mandrel, but will continue to wind around the same as the mandrel is further turned.

In order that the sheet may be wound upon the mandrel during the formation of the tube there is employed what may be termed a bearing roll \(E\). This roll is supported to run in bearings \(e, e^1\) and is arranged between the edge of the table \(D\) and the mandrel to bear against the mandrel or the paper wound thereon, the roll running in a direction reverse to the direction of the mandrel with the effect that after a sheet of paper has been caught onto the mandrel and the mandrel turned, the bearing roll will in the first instance act to bend the sheet over the edge of the slot in the mandrel in which the sheet is caught. The sheet will then continue to run over the bearing roll and on to the mandrel, the bearing roll acting to draw the sheet tightly around the mandrel and to press the successive windings of the sheet closely together. In order that the bearing roll may move away from the mandrel as the successive windings of the sheet give body to the tube, the bearing roll or rather the bearings \(e, e^1\) in which the roll turns are borne by yielding supports or spring wires \(e^2\). Each of these wires is borne by a plug \(e^5\) fitting into the end of a standard \(e^4\) and held therein by a screw \(e^6\).

We have arranged also whereby the bearing roll may be moved adjustably toward or away from the mandrel in order to vary the bearing tension of the roll against the mandrel or the sheet wound thereon. For this purpose each of the standards \(e^4\) is borne by a base plate \(e^9\) dovetailed to slide in a block \(e^8\) fastened to the table \(A\). Making threaded connection with each one of the standards \(e^4\) is a screw \(e^8\) having a handwheel \(e^9\) on the end thereof. The screw is supported to turn in a bearing \(e^8\) secured to the table \(A\) to the rear of the standard. Arranged upon the screw at either side of the bearing are collars \(e^{11}\) by which the screw may turn within the bearing, but cannot move longitudinally, with the effect that as the respective screws are turned the standard \(e^4\) supporting the bearing roll may be moved, whereby the tension of the bearing roll against the mandrel or against the paper wound thereon may be adjustably varied as occasion may require.

Reference will now be made to the means for stopping the machine, the tube having been formed. It is desirable that the mandrel \(B\) be stopped always in the same predetermined position, namely, with the slot \(b\) in convenient position for the introduction of the sheet. As may be seen from the drawings and especially by reference to Figs. 4 and 5, the back of the clutch member \(a^{11}\), which as before described is the member allixed to the main driving shaft \(a^5\), is made dished or hollowed out by a circular incision \(a^{20}\) gradually increasing in depth to form an abrupt edge or stop \(a^{22}\). Adapted to enter this incision made in the back of the clutch member, to engage the stop formed therein, is a dog \(F\) carried by an arm \(f\) secured to the sliding rod \(a^{19}\) by a hub \(f^0\) loosely arranged upon the rod. The arm \(f\) is properly maintained for the dog \(F\) to enter the incision made in the back of the clutch member and encounter the stop by a post \(f^0\) (attached to the standard \(a\)), against which the arm bears, the arm being yieldingly maintained to bear against the stop by a coil spring \(f\) arranged upon the rod \(a^{19}\) and at one end secured to the hub \(f^0\) of the dog-carrying arm, and the other end of the spring attached to a collar \(f^0\) fixed to the rod. The hub \(f^0\) is backed by a stop \(f^0\) fixed in the rod \(a^{19}\) so that at the same time the rod \(a^{19}\) is restored to its normal position by the spring \(a^{21}\) upon the release of pressure from the foot lever for disengaging the clutch mechanism and stopping the machine, the arm \(f\).
borne by the sliding rod will cause the dog F to enter the incision formed in the back of the clutch member a′11 and encounter the stop, thereby arresting the movement of the main driving shaft to which the clutch member a′11 is secured and stopping further turning of the mandrel. The clutch member a′11 will in the operation of the machine revolve at a relatively high rate of speed and accordingly upon engagement of the clutch mechanism, will continue to turn with a considerable degree of momentum. Under these circumstances if the dog F were introduced into the incision formed in the clutch member at a time when the clutch member was in such position that the dog would enter the incision at a point just in front of the stop, the machine would be stopped too abruptly owing to the momentum of the clutch member and the parts would be likely to become disengaged or broken. Provision is made for this, however. By reference to Fig. 4 it will be seen that by reason of the peculiar form of the incision made in the back of the clutch member the outer edge of the incision is at a varying distance from the axial center of said member. In other words that part a′21 of the outer edge of the incision just in front of the stop a′30 is nearer the axial center of the clutch member than that part a′22 of the outer edge of the incision away from the point of the stop. Now the dog F is so maintained by its bearing against the arm or guide f2 that the dog will only enter the incision along the point or points of the edge a′21 and in consequence cannot enter the incision along the point or points of the edge a′21 just in front of the stop so as to encounter the stop, but will at the point or points of the edge a′21 encounter the rear face of the clutch member and will slip by the stop entering the incision so as to encounter the stop only when the clutch member has turned so far that the dog can slip into the incision at the point or points of the edge a′22. In other words, the disposition of the dog and the arrangement or disposition of the incision formed in the clutch member is such that the dog can enter the incision to encounter the stop at all points of the incision except at or near to the point of the stop. If by chance the dog is thrown into engagement with the clutch member at the point of the stop then the member must be further turned before the dog can enter the incision and encounter the stop. Attention is also directed to the fact that by reason of the relative disposition of the dog F when maintained in its normal position with the spring-pressed arm carrying the dog bearing against the post f′7 that the dog after it has entered the incision at the point or points of the outer edge a′22 of the clutch member will be forced inwardly against the tension of its supporting spring-pressed arm, which is moved away from its bearing against the post f′7 and which accordingly acts to hold the dog hard against the outer edge of the incision at the point or points a′31 above mentioned, when the dog will act as a brake and lessen the speed of the clutch member as before described. We have taken advantage of this action by so forming the clutch member that the outer edge a′22 of the incision will lie gradually nearer the axial center of the clutch member as approach is made to the stop with the effect of gradually increasing the brake resistance, while at the very point of the stop the edge a′41 is provided with an offset a′32 into which the dog will snap when the clutch member will prevent it from being moved away in any other direction, this continuing until the withdrawal of the dog from the incision.

After the tube has been formed it is removed from the machine by drawing it off of the end of the mandrel. As was before described, one end of the mandrel or the inner end thereof is secured to the driving shaft a2. To insure proper rigidity and accuracy in turning we have found it desirable to support the outer end of the mandrel by a bearing. b5 represents this bearing supported on the end of a standard b7 secured by a block b6 to the frame or table of the machine. To release the end of the mandrel from this bearing, in order to remove the tube, it is to be observed that the bearing is an open bearing, open from the top side thereof, so that the mandrel can be lifted out of the same, and by pivoting the inner end of the mandrel to the shaft a2, as is done by a tenon b5 fitting into a slot cut in the end of the shaft and fastened therein by a pin b6, the mandrel may be very easily turned up with respect to the shaft and the outer end thereof released from its bearing, when the tube may be removed therefrom.

In order that the mandrel may be turned up with respect to the shaft a2 and released from its bearing after the machine has been stopped and in order also that the mandrel shall have been turned to a position where, having been restored to its bearing, a fresh sheet may be inserted in the slot b formed in the mandrel, it is necessary for the driving shaft and mandrel carried by it to have been turned to a certain position and this position is determined by a proper disposition of the stop a′25. In other words, by reason of the disposition of the stop a′25 the driving shaft will always be moved to stop in such position that the mandrel carried by it may be released from its bearing, or the
mandrel having been restored to its bearing, a sheet from the table D may be fixed to the mandrel without further turning or positioning of the mandrel.

The operation of the machine has already been described. It is sufficient to say, therefore, that in forming the tube a sheet of paper is first fixed to the mandrel. Pressure is then applied to the foot lever, when the clutch mechanism thrown into an engaging position will act to drive the shaft for turning the mandrel and forming the tube. After the plate has been formed pressure on the foot lever is removed when the clutch mechanism will assume its normal disengaging position and the machine become stopped.

Thereupon the mandrel is released from its bearing and the tube removed therefrom. After this the mandrel is restored to its bearing, a fresh sheet fixed thereto, when the operation is repeated.

What we claim as our invention is:

1. In a stop mechanism, in combination, a rotary shaft, a stop member fixed on said shaft, said member having in its lateral face an incision and a stop shoulder in said incision, the edge of said incision being at a different distance from the axis of said shaft at points immediately in advance of said shoulder from its distance at points angularly distant therefrom, a stop dog movable longitudinally of said shaft into said incision to a position to engage said shoulder in the rotation of said member, and means for yieldingly maintaining said dog at a distance from the axis of said shaft to prevent its entry into said incision immediately in advance of said shoulder and to permit its entry thereinto at points angularly distant from said shoulder.

2. In a stop mechanism, in combination, a rotary shaft, a stop member fixed on said shaft, said member having in its lateral face an incision and a stop shoulder in said incision, the edge of said incision being at a distance from the axis of said shaft which varies progressively from a point angularly distant from said shoulder to a point adjacent thereto to form a cam surface leading to said shoulder, a stop dog movable longitudinally of said shaft into said incision to a position to engage said shoulder in the rotation of said member, and means for yieldingly maintaining said dog at a distance from the axis of said shaft to prevent its entry into said incision immediately in advance of said shoulder and to permit its entry thereinto at points angularly distant from said shoulder, said means holding said dog in engagement with said cam surface after the entry of said dog into said incision as said shoulder approaches said dog.

3. In a stop mechanism, in combination, a rotary shaft, a stop member fixed on said shaft, said member having in its lateral face an incision of progressively varying depth forming a stop shoulder in its bottom, the edge of said incision being at a different distance from the axis of said shaft at points immediately in advance of said shoulder from its distance at points angularly distant therefrom, a stop dog, a rod on which said dog is mounted and movable longitudinally of said shaft to carry said dog into said incision to a position to engage said shoulder in the rotation of said member, yielding means for actuating said rod, a spring for turning said dog on said rod and tending normally to move said dog away from said incision with respect to the axis of said shaft, and an arm for limiting the movement of said dog under the influence of said spring and for guiding its movements longitudinally of said shaft, said arm being arranged to prevent the entry of said dog into said incision immediately in advance of said shoulder and to permit its entry thereinto at points angularly distant from said shoulder.

4. In a stop mechanism, in combination, a rotary shaft, a clutch comprising fast and loose clutch members on said shaft, said fast clutch member having in its lateral face an incision of progressively varying depth forming a stop shoulder in its bottom, the edge of said incision being at a different distance from the axis of said shaft at points immediately in advance of said shoulder from its distance at points angularly distant therefrom, a rod movable longitudinally of said shaft to move said loose clutch member and release said clutch, a stop dog carried by said rod and movable thereby when said clutch is released into said incision to a position to engage said shoulder in the rotation of said fast clutch member, yielding means for actuating said rod, a spring for turning said dog on said rod and tending normally to move said dog away from said incision with respect to the axis of said shaft, and an arm for limiting the movement of said dog under the influence of said spring and for guiding its movements longitudinally of said shaft, said arm being arranged to prevent the entry of said dog into said incision immediately in advance of said shoulder and to permit its entry thereinto at points angularly distant from said shoulder.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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