Dec. 7, 1954 E. E. FIES 2,696,335

PACKAGING MECHANISM

Filed July 3, 1950 3 Sheets-Sheet 1

Fig. 1.

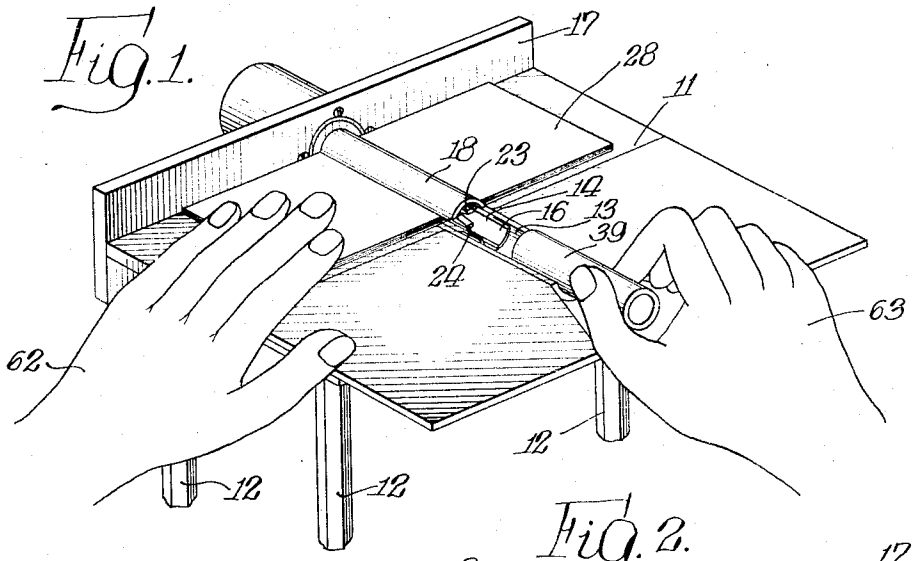

Fig. 2.

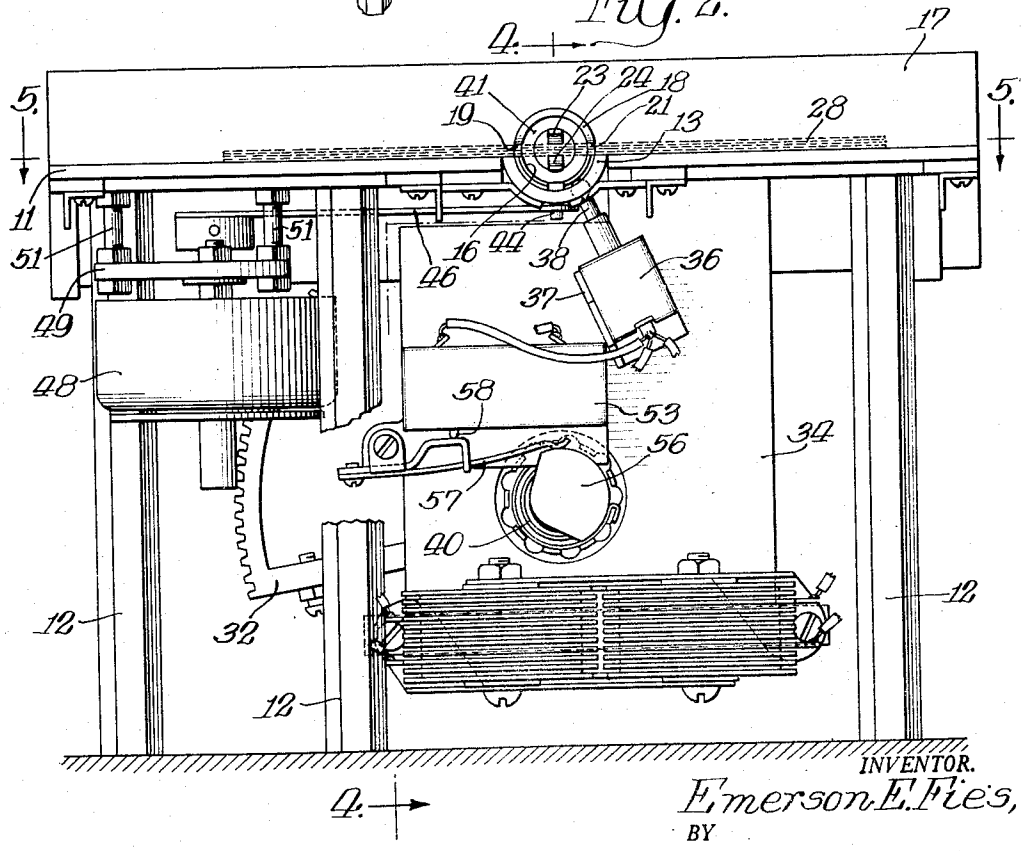

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Fig. 3.

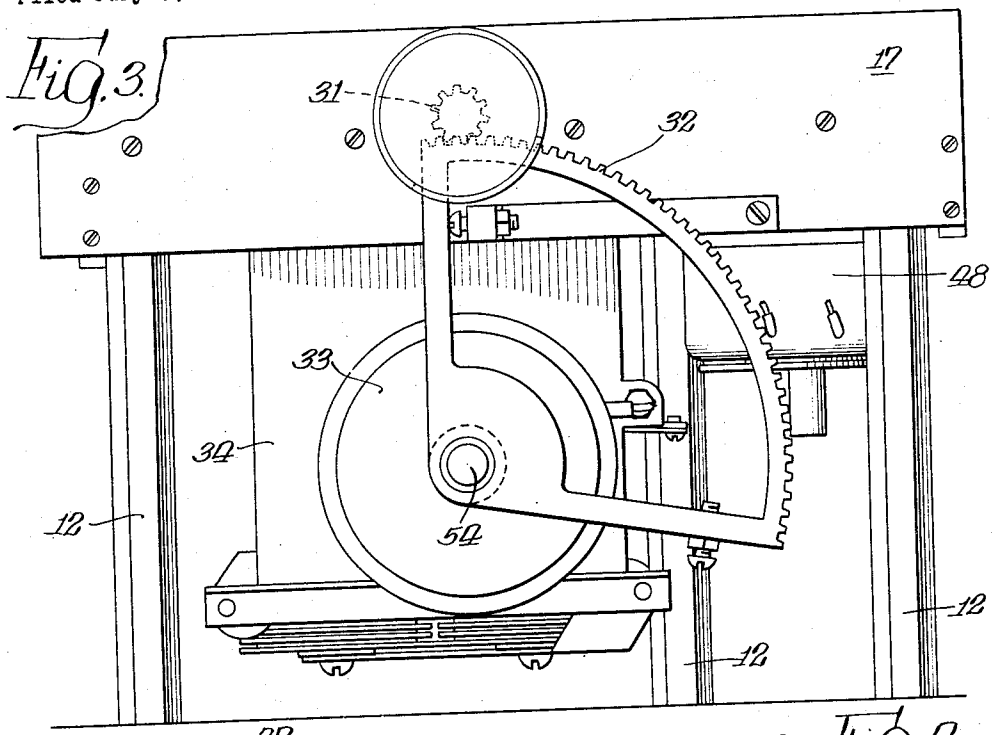

Fig. 4.

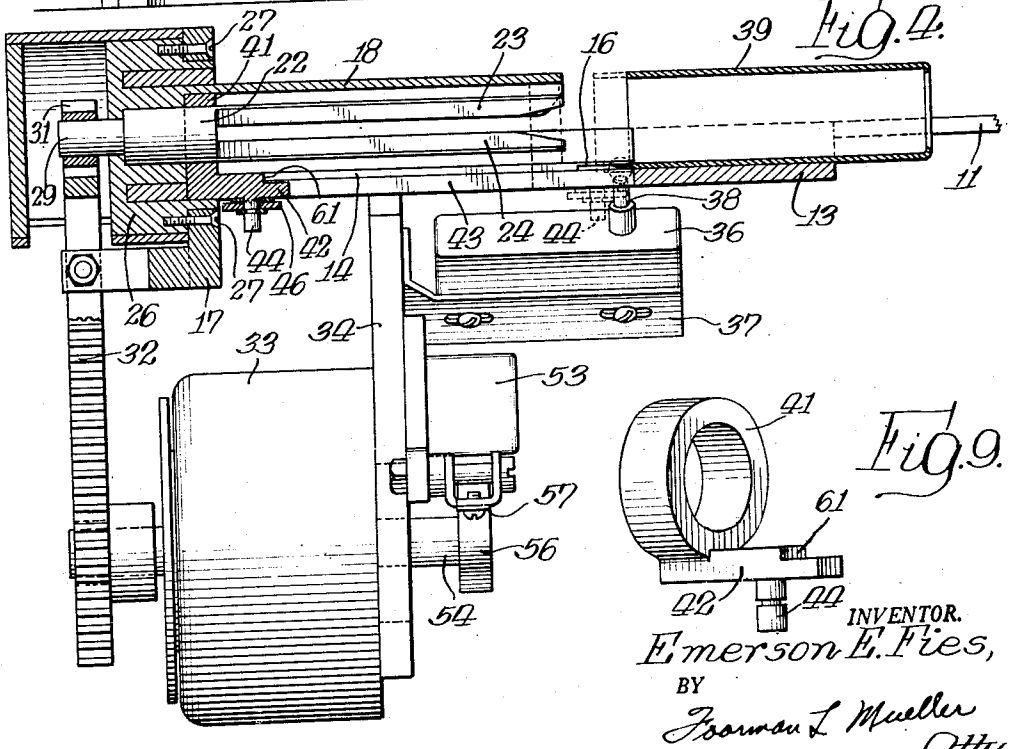

Fig. 9.

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Fig. 10.

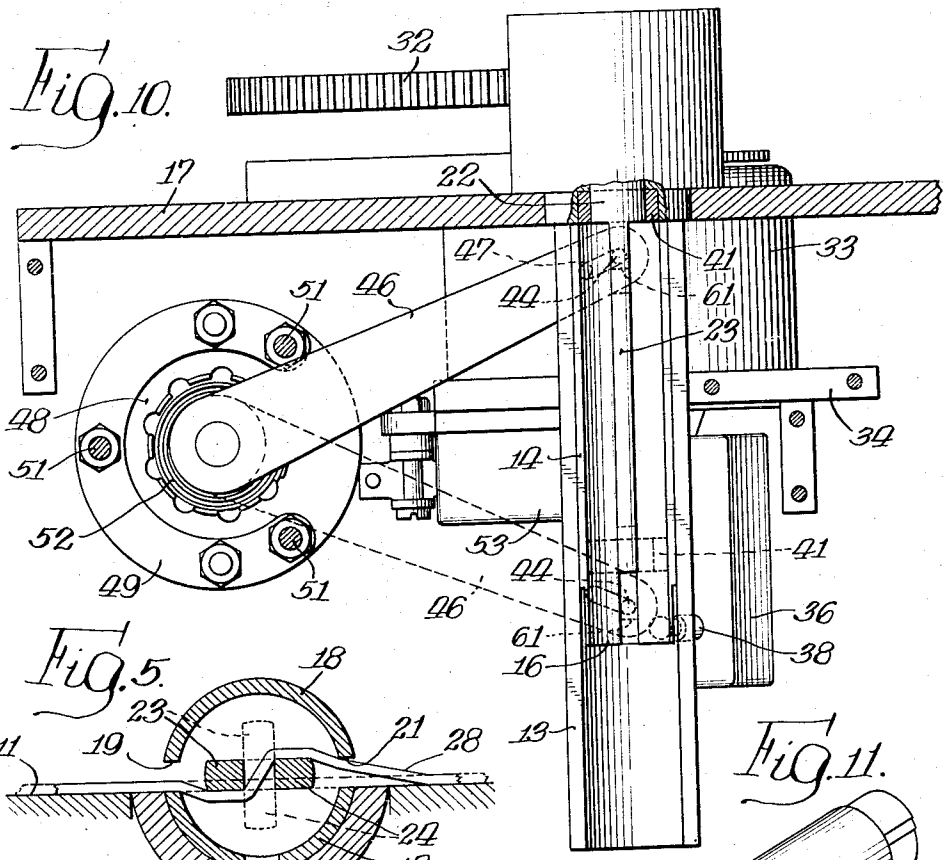


Fig. 5.

Fig. 11.

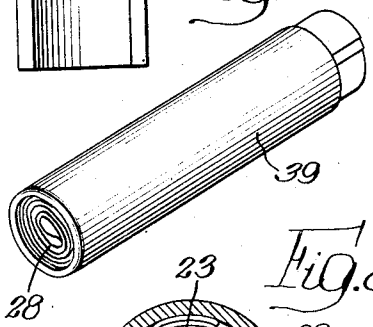


Fig. 6.

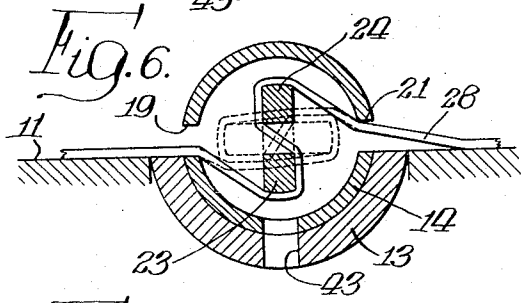


Fig. 8.

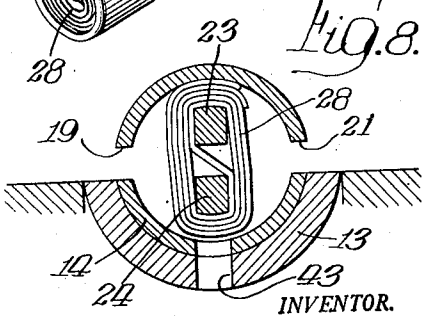
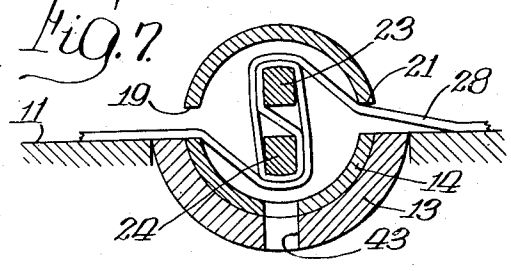


Fig. 7.



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United States Patent Office

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PACKAGING MECHANISM

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Application July 3, 1950, Serial No. 171,981

15 Claims. (Cl. 226—18)

This invention relates to a machine for packaging sheets of paper or the like.

More particularly, the invention relates to a machine for rolling sheets of paper into compact tubular form, and for inserting the rolled sheets of paper into a cylindrical cardboard container, or the like.

In the everyday activities of many business organizations, and particularly organizations having a large volume of advertising material, it is often desirable to send sheets of paper or other material, calendars, etc., to persons dealing with the organization in such a form that the paper will not be sharply bent or damaged upon arrival. Material to be sent in this form has, in the past, been manually rolled and inserted in cardboard tubes or the like, and sent to the addressee. While this method of packaging the sheets of material may be satisfactory for organizations handling only a small volume of such material, when a considerable quantity of material is packaged in this fashion, the expense in the man hours required is so great that a better method of packaging is desired. Another application for a machine for packaging sheets in tubular containers is in the packaging of paper money for use in dispensing machines. To make such machines practical, a machine for quickly and cheaply packaging the desired sums of paper money is required.

It is therefore one object of the invention to provide an automatic mechanism for simplifying the packaging of sheets of paper material.

Another object of the invention is to provide a machine for automatically inserting paper money bills into compact containers to facilitate handling the same.

A feature of the invention is the provision of a simple mechanism for rapidly rolling sheets of paper into compact tubular form.

Another feature of the invention is the provision of a mechanism for automatically rolling sheets of paper into a compact tubular form, and then ejecting the rolled sheets of paper into a container.

A further feature of the invention is the provision of a paper packaging mechanism which is automatically operated when a container for receiving the paper to be packaged is placed in a paper receiving position relative to the mechanism. The mechanism operates almost instantaneously to insert the paper in the container.

Other objects, features, and many of the attendant advantages of this invention will be appreciated as the same becomes understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of the novel paper packaging mechanism, showing the manner of its operation;

Fig. 2 is a front elevational view of the packaging mechanism shown in Fig. 1;

Fig. 3 is a rear, elevational view of the mechanism;

Fig. 4 is a cross sectional view of the mechanism taken through plane 4—4 of Fig. 2;

Figs. 5 to 8 constitute a series of cross sectional views of the rolling device illustrating the operation thereof;

Fig. 9 is a perspective view of a component part of the ejecting means of the packaging mechanism;

Fig. 10 is a fragmentary top view of the mechanism with a portion of the mechanism housing broken away to show the construction of the ejecting means; and

Fig. 11 is a perspective view of a container having a rolled sheet of paper fitted therein by the packaging mechanism.

In practicing the invention, a paper packaging mechanism is provided which includes a base member having a semi-cylindrical trough, formed on its upper surface. A semi-cylindrical shield is positioned over a part of the trough, and spaced above the surface of the base member so as to form a generally cylindrical guide having a pair of diametrically opposed longitudinal slots substantially level with the surface of the base member. Positioned within the guide thus formed, is an elongated forked member having leg portions extending along the longitudinal axis of the guide, with the open area between the leg portions normally aligned with the slots in the guide, and with the surface of the base member. The forked member is connected to rotary driving means, which may include a rotary electric solenoid, for rotation thereby. Cooperating with the paper rolling device is an ejecting ring positioned in the cylindrical guide, and movable longitudinally along the guide. The ejecting ring has an outside diameter substantialy equal to the inside diameter of the cylindrical guide, and an inside diameter substantially equal to the greatest transverse dimension of the forked member. For moving the eejcting ring, driving means is provided which may include a second rotary solenoid connected to the ejecting ring through a crank arm.

Paper to be packaged is placed on the base member in the longitudinal slots below the shield and between the leg portions of the forked member. A container is then placed in the part of the trough not covered by the shield. A switch for operating the rotary driving means has an actuating member in this part of the trough so that the forked member is rotated to roll the paper instantly when the container is positioned in the trough. The driving means for the forked member cooperates with a second switch which energizes the second rotary solenoid to eject the paper into the container as soon as it is rolled.

Referring now to Fig. 1 of the drawings, the paper packaging mechanism includes a flat base member **11** supported on a plurality of legs **12**. Base member **11** has a semi-cylindrical trough formed in its upper surface which includes a forward portion **13** of greater inside diameter than the rearward portion **14**, the juncture of the two portions being undercut to form an overhanging lip **16**. Secured to the back edge of the base member **11** is a mounting plate **17** to which a semi-cylindrical shield **18** is secured in the manner best shown in Fig. 4. As is seen in Fig. 2, semi-cylindrical shield **18** is disposed slightly above the surface of base member **11**, and together with the rearward portion **14** of the semi-cylindrical trough defines a generally cylindrical guide having a pair of diametrically opposed longitudinal slots **19** and **21** therein which are substantially level with the upper surface of base member **11**.

Positioned within the cylindrical guide formed by shield **18** and trough portion **14** (Fig. 4) is a paper rolling device which includes an elongated forked member having a pair of leg portions **23** and **24** extending along the longitudinal axis of the guide, and a base portion journalled in a mounting base **26**. The mounting base **26** may be integral with shield **18** and secured to back plate **17** by screws **27**. The forked member **22** has a normal position in which the open area between leg portions **23** and **24** thereof is aligned with slots **19** and **21** and with the upper surface of base member **11**. It is therefore seen that sheets of paper, shown at **28** in Fig. 1, may be easily slid along the base member between the leg portions and subsequently rolled in a manner hereinafter to be described.

For providing rotation of the forked member **22**, the shaft extension **29** is keyed to a spur gear **31** that meshes with, and is driven by a gear member **32**. As is best seen in Fig. 3, gear member **32** comprises a quarter section of a relatively large gear wheel, and is driven by the drive shaft of a first rotary driving means comprising a relatively powerful, rotary, electric solenoid **33**. Solenoid **33** is mounted on a supporting plate **34** secured to the underportion of base member **11**, and is controlled by a micro switch **36** mounted on a bracket **37** fixed to supporting plate **34** and actuated by a switching lever **38**. Micro switch **36** and bracket **37** are positioned on support-

ing plate 34 in such a manner that switching lever 38 protrudes through an aperture in the under surface of trough portion 13, and projects into the accessible area defined by overhanging lip 16, as is best seen in Fig. 2. Thus, upon a container, such as that shown at 39, being pushed forwardly in trough 13 to a position that its forward edge engages the switching lever 38, micro switch 36 is closed, actuating solenoid 33. Solenoid 33 is of the well known rotatable armature type having a relatively high starting torque, and contains a biasing spring 40, best shown in Fig. 2, which maintains the gear member 32 in the retracted position shown in Fig. 3. Upon micro switch 36 being closed in the above described manner, gear member 32 is rotated counterclockwise from its position shown in Fig. 3, and in turn rotates spur gear 31. Because forked member 22 is directly keyed to spur gear 31, this rotation is imparted to leg portions 23 and 24 which roll the sheets of paper 28 inserted between the leg portions, in the manner shown by the sequence of views illustrated in Figs. 5, 6, 7 and 8. Upon completion of this operation, the sheets of paper are formed into compact tubular rolls as shown in Fig. 8.

Subsequent to the rolling operation, a movable ejecting means is moved along the longitudinal axis of the cylindrical guide defined by shield 18 and trough portion 14, and serves to eject or push the rolled sheets of paper into the container 39. The ejecting means includes an annular ring 41, best shown in Fig. 9, having an outside diameter equal to the inside diameter of the cylindrical guide, and an inside diameter equal to the largest transverse dimension of forked member 22. Ring 41 may be integral with a mounting foot portion 42 which is adapted to ride in a slot 43, best shown in Fig. 4, formed in the bottom of trough portion 14. Mounting foot portion 42 is connected by a pin 44, best seen in Fig. 10, to a crank arm 46 by means of an elongated aperture 47 in the end thereof. The remaining end of crank arm 46 is keyed to the drive shaft of a second rotary driving means comprising a rotary, electric solenoid 48, which is mounted on a platform 49, best seen in Fig. 2, secured to the underportion of base member 11 by means of studs 51. Solenoid 48 is of the well known rotatable armature type having a high starting torque, and contains a biasing spring 52 which normally maintains crank arm 46 in the retracted position shown in solid lines.

For controlling the solenoid 48, a second, electric micro switch 53 is provided (Fig. 2) which is mounted on supporting plate 34 adjacent to, and immeidately above the shaft of solenoid 33. Solenoid 33 has a shaft extension 54, shown in Fig. 4, protruding through supporting plate 34. Secured to shaft extension 54 is a timing cam 56 having a cam follower arrangement comprising a cantilever assembly having a lever arm 57 cooperating therewith. Lever arm 57 has a portion engaging a switching lever 58 controlling the operation of micro switch 53, and, upon timing cam 56 being rotated, lever arm 57 moves switching lever 58 to close micro switch 53. The closing of micro switch 53 results in the actuation of solenoid 48 which then drives crank arm 46 from the rearmost position shown in solid lines in Fig. 10, to the forward position shown in dotted lines.

As shown in Fig. 4, upon the annular ring 41 reaching its forwardmost position, shown in dotted lines, the uppermost vertical face 61 of sliding foot mounting 42 contacts the leading edge of the container 39 when the container is in its forwardmost position, also shown in dotted lines. This action results in knocking the container 39 away from switch actuating lever 38 and allows the entire mechanism to be deenergized. Upon being deenergized, biasing springs 40 and 52 of solenoids 33 and 48, respectively, rotate gear member 32, and crank arm 46 back to their idle position.

When operating the machine, the operator places the sheets of paper 28 to be packaged on the surface of base member 11, and slides them rearwardly towards back plate 17 through slots 19 and 21, and the open area between the leg portions 23 and 24 of forked member 22. The operator then places the cylindrical container 39 in trough portion 13, and pushes the container rearwardly under overhanging lip 16, and into engagement with switch lever 38. This action results in closing the micro switch 36 and energizes solenoid 33. Solenoid 33 then rotates the gear member 32 counterclockwise from the position shown in Fig. 3, driving spur gear 31, and forked member 22, to roll sheets of paper 28 into tubular form in the manner shown in Figs. 6 to 9. Simultaneously, with the rotation of gear member 32, the solenoid 33 rotates timing cam 56 a predetermined distance. Timing cam 56 is shaped so that at the end of the rotation of the gear member 32, micro switch 53 is closed. Closing of micro switch 53 energizes solenoid 46, thereby causing solenoid 48 to rotate crank arm 46 from its rearmost position, shown in Fig. 10, to the forward position shown in dotted lines in Fig. 10. This action results in driving annular ring 41 forwardly, and thrusting, or ejecting the rolled sheets of paper off the leg portions 23 and 24 of forked member 22 into container 39. Upon annular ring 41 reaching the forward end of its travel, upper vertical surface 61 comes into engagement with the lower edge of container 39, and imparts sufficient motion to container 39 to drive the container off of switching lever 38. Release of switching lever 24 deenergizes each of solenoids 33 and 48, and allows the biasing springs 40 and 52 to rotate gear member 32 and crank arm 46, respectively, back to their idle positions.

From the foregoing description, it is readily apparent that the invention provides an automatically operated mechanism for forming sheets of paper into compact, tubular rolls and for then ejecting the rolls of paper into containers, immediately after rolling the same. The mechanism starts operating automatically when the container is placed in position. The mechanism is of simple and inexpensive construction and operates very rapidly to package sheets of paper. When used for packaging paper money the machine operates to place the money in the containers instantly after the money has been placed on the table and the container positioned in the groove therefor. It is obvious that both the sheets to be packaged and the containers may be fed to the machine by hand or by automatic means to further speed up the packaging operation. The rapid operation of the machine results in a great saving of time and therefore greatly reduces the cost of such packaging operations.

Obviously, other modifications and variations of the invention are possible in the light of the above teachings. It is therefore to be understood that such modifications and variations are within the scope of the invention as defined by the appended claims.

I claim:

1. A device for rolling thin sheets of flexible material including in combination, a base having a substantially horizontal surface, said base including generally cylindrical guide portions spaced to provide diametrically opposed longitudinal slots just above said horizontal surface, an elongated forked member longitudinally positioned within said cylindrical guide portions with the open area defined by the leg portions thereof normally in alignment with said slots, and rotary driving means coupled to said forked member for rotating the same, whereby a thin sheet of flexible material positioned on said horizontal surface and extending in said slots and between said leg portions of said forked member is rolled into tubular form.

2. A paper rolling device including a base member having a substantially flat horizontal surface with a semi-cylindrical trough formed therein, semi-cylindrical shield means positioned over said trough and forming a generally cylindrical guide having a pair of diametrically opposed longitudinal slots substantially level with said horizontal surface of said base member, an elongated forked member having spaced leg portions longitudinally positioned in said guide with the open area between the leg portions thereof normally in alignment with said slots, and driving means having a rotatable shaft, said forked member being secured to and driven by said rotatable drive shaft of said driving means.

3. The combination set forth in claim 2 wherein said driving means includes an electric solenoid having a rotatable armature and an electric switch mounted on said base member for actuating said solenoid, said base member having a portion for supporting a container for receiving the rolled paper, said switch having an actuating portion positioned at said supporting portion and actuated by a container placed thereon in a paper receiving position.

4. A paper packaging mechanism including in combination, a base member having a substantially flat horizontal surface with a semi-cylindrical trough formed therein, a semi-cylindrical shield positioned over said

trough and together with said trough forming a generally cylindrical guide having a pair of diametrically opposed longitudinal slots just above the level of the surface of said base member, an elongated forked member longitudinally positioned in said guide with the open area between the leg portions thereof normally in alignment with said slots, rotary driving means having a rotatable drive shaft connected to said forked member for rotating the same, ejecting means movable along the axis of rotation of said forked member, and control means for causing the sequential operation of said rotary driving means and said ejecting means.

5. The combination set forth in claim 4 wherein said rotary driving means comprises an electric solenoid having a rotatable armature, and said base member includes a container supporting portion, and further including an electric switch means mounted on said base member at said container supporting portion for actuating said solenoid, said switch means being operable by a container for receiving the rolled paper when the said container is placed on said container supporting portion on said base member.

6. A paper packaging mechanism including a generally cylindrical guide having diametrically opposed longitudinal slots formed therein, an elongated forked member longitudinally positioned in said cylindrical guide with the open area between the leg portions thereof normally in alignment with said slots, rotary driving means having a rotatable drive shaft connected to said forked member for rotating the same, ejecting means comprising an annular ring having an outer diameter substantially equal to the inside diameter of said cylindrical guide and an inside diameter substantially equal to the outer transverse dimensions of said forked member, said ring being positioned in said guide and movable along the longitudinal axis thereof, a crank arm connected to said ring, and second driving means connected to said crank arm for moving said annular ring along the longitudinal axis of said cylindrical guide, said first and second driving means being sequentially operable.

7. A paper packaging mechanism including a base member having a semi-cylindrical trough formed therein, a semi-cylindrical shield positioned over said trough and forming a generally cylindrical guide having a pair of diametrically opposed longitudinal slots substantially level with the surface of said base member, an elongated forked member longitudinally positioned in said guide with the open area between the legs thereof normally aligned with the surface of said base member, rotary driving means comprising an electric solenoid having a rotatable armature connected to said forked member, ejecting means comprising an annular ring positioned in said cylindrical guide and movable relative thereto, a crank arm connected to said annular ring for moving the same along the longitudinal axis of said guide, second electric solenoid means connected to and driving said crank arm, and electric switch means mounted on said base member for sequentially actuating said solenoids, said switch means being actuated by a container for receiving the rolled paper when the said container is placed in a paper receiving position on said base member.

8. A paper packaging mechanism including a base member having a semi-cylindrical trough formed therein, a semi-cylindrical shield positioned over said trough and forming a generally cylindrical guide having a pair of diametrically opposed longitudinal notches substantially level with the surface of said base member, an elongated forked member longitudinally positioned in said guide with the open area between the legs thereof normally aligned with the surface of said base member, rotary driving means comprising a spur gear connected to said forked member for rotating the same, a gear member driving said spur gear, a first rotary electric solenoid having the rotatable armature thereof connected to said gear member for driving the same, ejecting means comprising an annular ring positioned in said cylindrical guide about said forked member and longitudinally movable therein, a crank arm connected to said annular ring, a second rotary electric solenoid having the rotatable armature thereof connected to said crank arm for moving said ring along the axis of rotation of said forked member, an electric switch controlling said second electric solenoid and having a switching lever, a timing cam connected to the drive shaft of said first electric solenoid for operating the switching lever of said

electric switch, and a control electric switch mounted on said base member for actuating said first electric solenoid, said control switch being operable by a container for receiving the rolled paper when said container is placed in a paper receiving position on said base member.

9. A paper packaging mechanism for placing rolled paper in a container including in combination, a supporting portion for receiving a cylindrical container, a generally cylindrical guide aligned with a container on said supporting portion and having diametrically opposed longitudinal slots formed therein, an elongated forked member longitudinally positioned in said cylindrical guide with the open area between the leg portions thereof normally in alignment with said slots to receive a sheet of paper therein, driving means connected to said forked member for rotating the same for rolling the sheet of paper, ejecting means comprising an annular ring positioned in said guide about said forked member, means for moving said annular ring along the longitudinal axis of said cylindrical guide for ejecting the rolled paper from said guide into a container positioned on said supporting portion, and control means for causing operation of said driving means and said moving means in sequence, said control means including switch means having an actuating portion at said supporting portion for operating said control means in response to the positioning of the container in a paper receiving position thereon, said ejecting means including a portion movable with said annular ring and engaging the container for moving the same from said supporting portion.

10. A mechanism for rolling flat sheets of flexible material including a base member having a substantially flat surface with a semi-cylindrical trough formed therein, a semi-cylindrical shield positioned over said trough and forming a generally cylindrical guide having a pair of diametrically opposed longitudinal notches substantially level with said surface of said base member, an elongated forked member longitudinally positioned in said guide with the open area between the legs thereof normally aligned with the surface of said base member, rotary driving means comprising a spur gear connected to said forked member for rotating the same, a gear member driving said spur gear, a first rotary electric solenoid having the rotatable armature thereof connected to said gear member for driving the same, ejecting means comprising an annular ring positioned in said cylindrical guide about said forked member and longitudinally movable therein, a crank arm connected to said annular ring, a second rotary electric solenoid having the rotatable armature thereof connected to said crank arm for moving said ring along the axis of rotation of said forked member, an electric switch controlling said second electric solenoid and having a switching lever, a timing cam connected to the drive shaft of said first electric solenoid for operating the switching lever of said electric switch, and a control electric switch mounted on said base member for actuating said first electric solenoid.

11. A device for rolling flat sheets of flexible material including in combination, a base member, an elongated forked member mounted for rotation on said base member, guide means spaced about said forked member, driving means for rotating said forked member, ejecting means including a portion positioned about said forked member and within said guide means, and means for moving said ejecting portion in a direction parallel to the axis of rotation of said forked member, said driving means being operable to rotate said forked member for rolling a sheet of flexible material thereon, said portion of said ejecting means having a surface adapted to engage the rolled material at a plurality of points spaced around said forked member for sliding the rolled material therefrom.

12. A device for rolling flexible sheet material including in combination, a base structure having a sheet supporting surface, an elongated forked member mounted for rotation on said base structure and having spaced leg portions, drive means for rotating said forked member and for returning the same to a normal position wherein said leg portions are positioned so that the space therebetween is aligned with said supporting surface, said base structure including portions forming a tubular guide about said forked member, ejecting means including an annular portion positioned about said forked member and within

said guide, supporting means for said annular portion to permit movement thereof along a straight line parallel to the axis of rotation of said forked member, and means coupled to said drive means for operating said ejecting means while said forked member is rotating.

13. A device for rolling flat sheets of flexible material and placing the same in a container including in combination, a base member, an elongated forked member mounted at one end for rotation on said base member, guide means spaced about said forked member, ejecting means including a portion positioned about said forked member and within said guide means, means for moving said ejecting portion in a straight line along said forked member, means for receiving a container adjacent the end of said elongated forked member opposite said one end thereof, and driving means for rotating said forked member and for operating said ejecting means, said portion of said ejecting means having a surface adapted to engage the end of said roll of material adjacent said one end of said forked member at a plurality of points spaced around said forked member for sliding the roll of material from said opposite end of said forked member into the container.

14. A device for rolling flat sheets of flexible material including a base member, an elongated forked member having a longitudinal axis and including leg portions spaced from said axis, said forked member being mounted on said base member for rotation about said longitudinal axis, said base member having substantially flat portions extending on either side of said forked member and substantially aligned with said axis thereof for supporting flat sheets fed into the device at both ends thereof, guide means positioned about said forked member, and means for rotating said forked member including electric driving means having a rotatable armature operatively connected to said elongated forked member for rotating the same, said driving means being constructed so that said armature rotates a fixed amount at each operation thereof and including means for returning said armature to a predetermined initial position at the end of each operation thereof, said armature being connected to said forked

member so that said armature in its initial position holds said forked member in a position such that the space between said leg portions thereof is aligned with said flat portions of said base member to receive the flat sheets therein, said forked member rolling the flat sheets into tubular form as said armature rotates.

15. A device for rolling flat sheets of flexible material including in combination, an elongated mandrel having a pair of spaced legs forming an open ended and open sided slot, means for mounting said mandrel for rotation about the longitudinal axis thereof, a sheet supporting structure including substantially flat surface portions positioned on either side of said mandrel, said mandrel having a normal position in which said slot is aligned at opposite sides with said surface portions, guide means surrounding said mandrel in spaced relation thereto providing a cylindrical guide path around said mandrel and having diametrically opposite open portions normally in alignment with said mandrel slot and said surface portions, whereby a flat sheet can be fed on said surface portions into said slot in said mandrel and in said open portions of said guide means, means associated with said mandrel for ejecting rolled sheet material therefrom, and drive means for rotating said mandrel and for actuating said ejecting means, said drive means including means operating sequentially to cause rotation of said mandrel for rolling a flat sheet thereon and to cause ejection of a sheet rolled on said mandrel.

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