

Dec. 31, 1929.

E. SCHMIDT
MACHINE FOR THE MECHANICAL PRODUCTION
OF PAPER CUPS PRESSED IN FOLDS
Filed Feb. 2, 1928

1,741,884

3 Sheets-Sheet 1

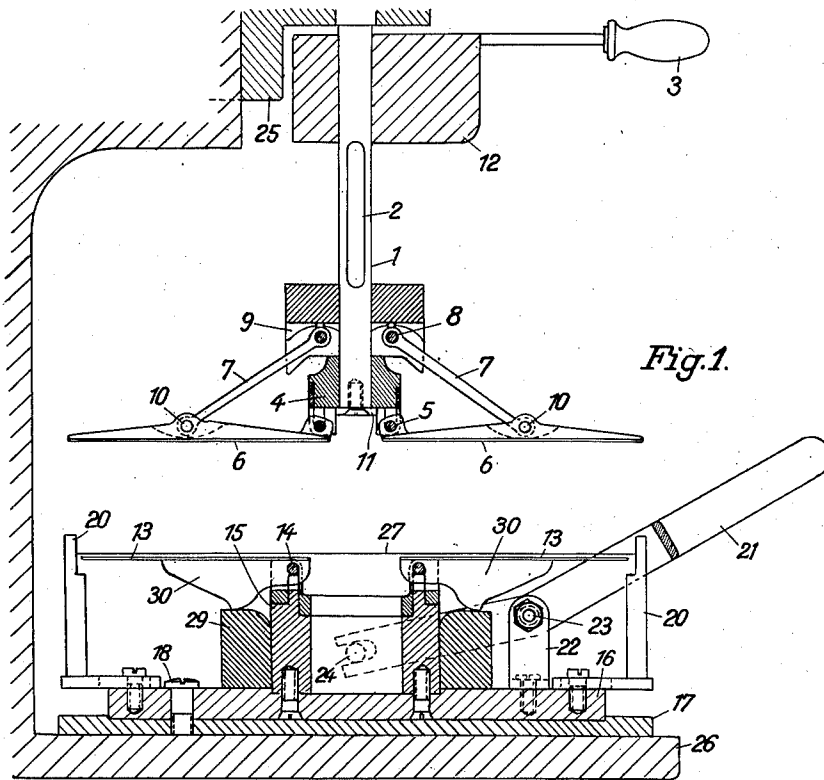


Fig. 1.

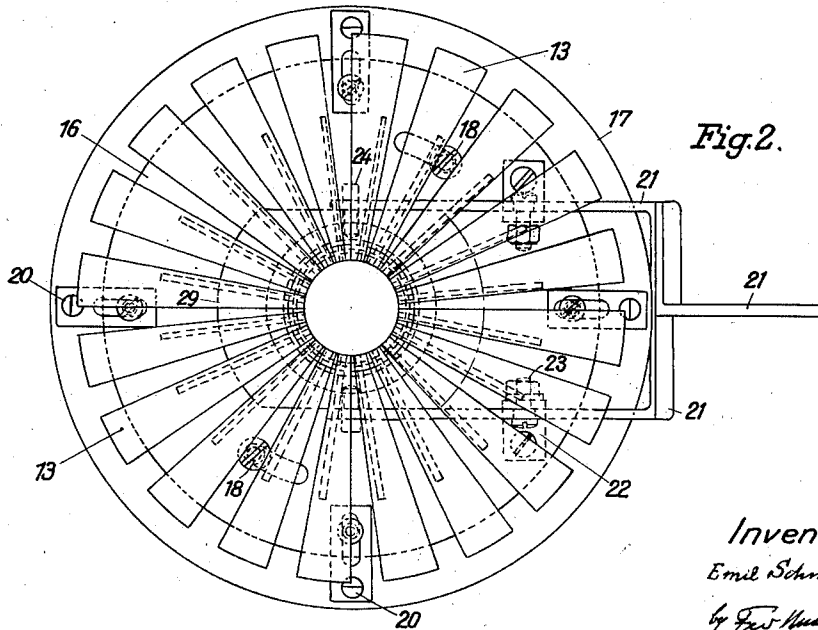


Fig. 2.

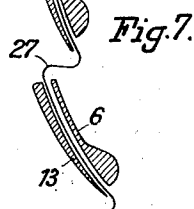
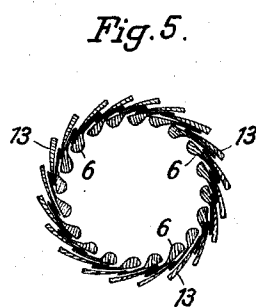
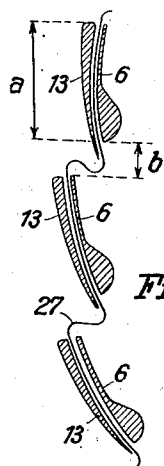
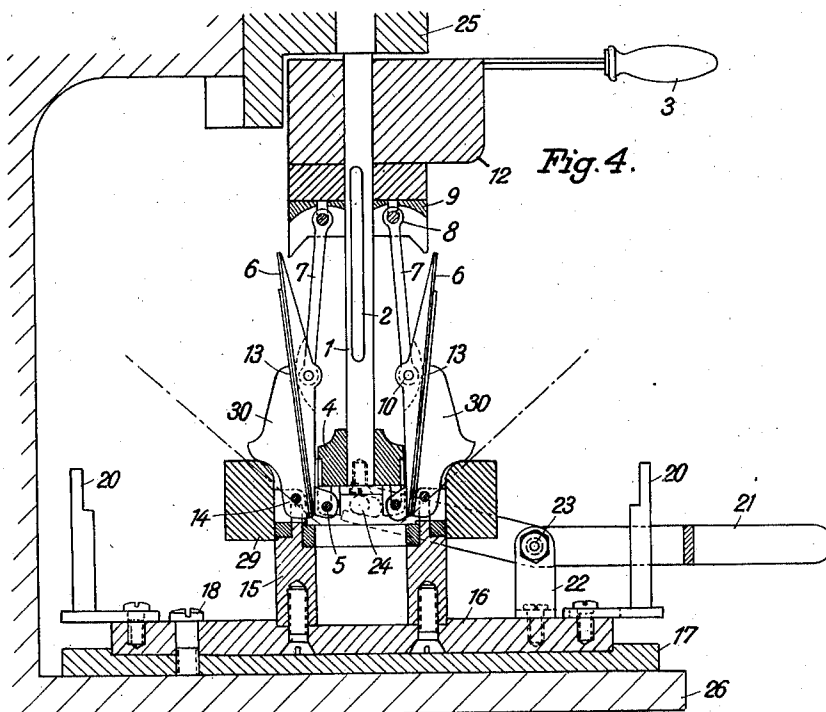
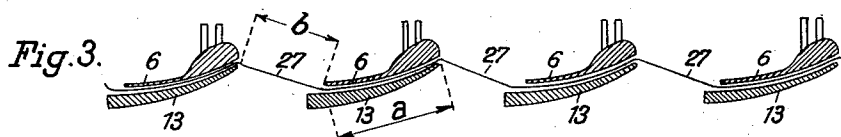
Inventor:
Emil Schmidt
by *Frederick H. H. H.*
Attorney

Dec. 31, 1929.

E. SCHMIDT
MACHINE FOR THE MECHANICAL PRODUCTION
OF PAPER CUPS PRESSED IN FOLDS
 Filed Feb. 2, 1928

1,741,884

3 Sheets-Sheet 2



Inventor:

Emil Schmidt
by [Signature]
Attorney

Dec. 31, 1929.

E. SCHMIDT
 MACHINE FOR THE MECHANICAL PRODUCTION
 OF PAPER CUPS PRESSED IN FOLDS
 Filed Feb. 2, 1928

1,741,884

3 Sheets-Sheet 3

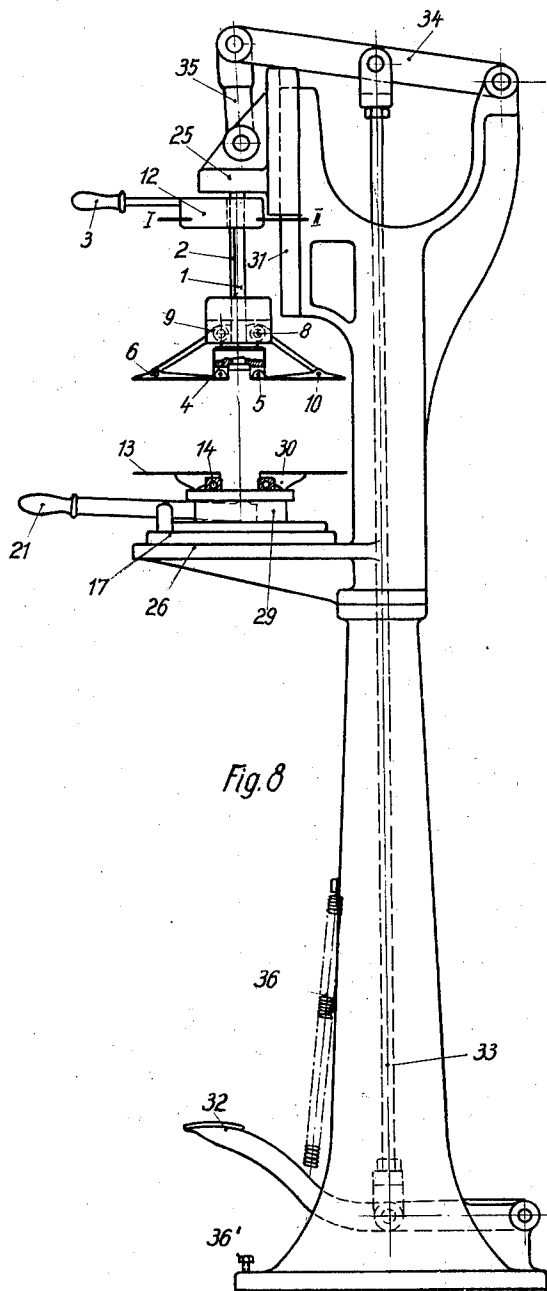


Fig. 8

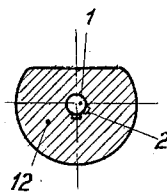


Fig. 9

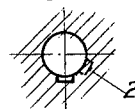


Fig. 10

Inventor
 Ernst Schmidt
 by *Frank Schmidt*
 Attorney

UNITED STATES PATENT OFFICE

EMIL SCHMIDT, OF LEIPZIG, GERMANY

MACHINE FOR THE MECHANICAL PRODUCTION OF PAPER CUPS PRESSED IN FOLDS

Application filed February 2, 1928, Serial No. 251,388, and in Germany February 3, 1927.

This invention relates to a machine for the production of paper-cups which are made from smooth paper-disks which have to be folded into regular folds.

It has become known to produce pleating-like folds in hollow bodies in one operation in which the folding is produced by folding-elements which press with a small edge the paper against a metal-piston. Herefrom resulted the inconvenience that specially in thin paper the paper was torn frequently.

It has become known to produce folded cups in such a manner, that single-paper-sheets are conducted through a folding mechanism in which the inner folding elements are fitted with oscillatably mounted levers in order to co-operate with the outer folding elements and oscillate in upward direction after the engaging with the paper sheet designed to form the paper cup, the inner folding elements engaging with the slots of a core when the paper-sheet is being pulled through the outer folding elements.

In this commonly applied working method the inner folding elements are operated in such a manner that a core having slots, which carries at the lower end the articulated bearing of the folding levers, is lowered until the levers come to bear against the paper-sheet to be folded. The inner folding levers are then suddenly struck upward through the intermediary of links, this being effected by a movement of a second core. During the striking upward of the folding levers the downward movement of the core, forming the support for the folding levers, is continued at the same time and the paper is conducted through the outer folding elements. This arrangement presents the inconvenience that for the operation of the inner folding levers alone several separate movements were required, which demand a very complicated construction of the machine. The fold-formation was further triangular in cross-section and not like pleating so that, in order to produce the pleating-like overlapping of the folds, separate rotatable moulds had to be used, which require a further operation.

From both these methods results the inconvenience that the paper-sheet is not suffi-

ciently held at the beginning of the pressing so that already at the beginning of the operation a uniform division of the folds was not ensured.

These inconveniences are avoided by the improvements which will be hereinafter described.

An embodiment of the invention is illustrated, by way of example, in the accompanying drawing in which:—

Fig. 1 shows the cup-folding machine in vertical section, the upper and lower folding elements having not yet come into engagement.

Fig. 2 shows in top-plan view the lower half of the folding-machine.

Fig. 3 illustrates how the upper folding elements 6 rest on the folding-elements 13 and the clamping of the paper-sheet 27 effected thereby. In this figure only some pairs of folding elements 6, 13 are shown at the moment at which, owing to the descending of the carriage 25, the upper inner folding elements 6 are just coming to bear against the lower outer folding elements 13.

Fig. 4 shows the folding mechanism in elevation, the folding elements 6 and 13 being oscillated upward, i. e. in the folding position.

Fig. 5 shows in top-plan-view the folding elements in the position which they assume in Fig. 4.

Fig. 6 shows some folding elements 6 and 13 in the extreme position shown in Fig. 5 in almost natural size. One can see in this figure the pleating-like course of the paper-sheet 27 between the folding elements 6, 13.

Fig. 7 illustrates some pairs of folding levers 6 and 13 in almost natural size, however before they assume the extreme position shown in Figs. 5 and 6.

Fig. 8 is a side elevation of the machine,

Fig. 9 shows in section the heavy mass on the cylindrical shaft and in end view this shaft with the feather.

The carriage 25 of the press (Figs. 1 and 4) carries a cylindrical shaft 1, having a feather 2, and to the lower end of which a disk 11 is fixed by means of a screw. On this disk 11 rests the bracket 4 which carries

the inner folding elements 6 hingedly mounted by means of a ring-bolt 5. The folding elements are slightly rounded. The bracket 4 can carry out a sliding up and down movement on the shaft 1. The inner folding elements 6 are hingedly connected at the middle by bolts 10 with the stays 7. The other ends of the stays 7 are pivotally fixed by a ring-bolt 8 in a supporting body 9, which is also adapted to slide up and down on the shaft 1. The heavy mass 12, which can also slide up and down on the shaft 1, and the weight of the supporting body 9 serve for loading the inner folding elements 6 in order that they exert a sufficient pressure on the paper-disk 27 to be held. To release the inner folding elements 6 when the finished work has to be removed, the heavy mass 12 can be held in its highest position above the feather 2 by turning around the shaft 1, the heavy mass 12 being made to sit on the upper edge of the feather 2. The handle 3 serves for carrying out this movement. The heavy mass, when released from the feather 2, descends and rests upon the member 9.

On the table plate 26 of the press the base-plate 17 is fixed. In the latter is rotatably sunk a disk 16, the rotation of which is limited by several screw-bolts 18 (Fig. 2). On disk 16 a bearing ring 15 is fixed which has slots. In each slot of this bearing ring 15 one blade 30 is oscillatably mounted by a ring-shaped bolt 14 and mounted so that it imparts to the folding elements 13 besides an oscillating movement towards the axis of the cone also a lateral rotation. The outer folding elements 13 are fixed on the blades 30. The surface of the outer folding elements 13 is shovel-shaped and slightly inclined transversely. The number of outer folding elements 13 is equal to the number of inner folding elements 6. By a fork-shaped hand-lever 21, which acts on two bolts 24 of a ring 29, the outer folding elements 30 can be suddenly lifted. Two angle-irons 22 and screw bolts 23 form the bracket for the hand-lever 21. Several laying-on pins 20, radially adjustable, are provided for the accurate laying-on of the paper-sheet 27.

In Fig. 8 the whole machine, an ordinary lever press is shown and from this figure it can be seen that the sliding piece 25 is adapted to rise and fall in a guide piece 31. The descending movement is effected by depressing of the pedal lever 32 connected by a connecting rod 33 to the lever 34 which is connected to the sliding piece 25. The upward movement of the piece 25 is controlled by a pull spring 36. On the table plate 26 of the machine the lower half of the folding mechanism shown in Figure 1 is fixed by clamps the upper part of said elements being fixed in the sliding piece 25 by means of shaft 1 clamped in this sliding piece. The paper disc is placed on the lower folding elements 13 of the fold-

ing device whereupon the upper half of the folding device is lowered by depressing the pedal lever 32 so that the upper folding element 6 presses the paper strongly against the lower folding element 13. This downward movement is limited by an adjustable screw 36' under the pedal lever 32. The paper being clamped between the folding elements 6 and 13 the hand lever is turned down in the direction of the arrow line whereby the lower folding elements 13 are upwardly oscillated around their pivot point and draw along the upper folding element 6. This position is shown in Figure 4.

The operation is as follows:—

A paper-sheet 27 is inserted into the laying-on pins 20 of the mechanism, as shown in Figs. 1 and 2, and the carriage 25 of the press with the shaft 1, carrying the inner folding elements 6, is then lowered. The inner folding elements 6 rest then, as shown in Fig. 3, on the outer folding elements 13 and securely hold the paper 27, as the heavy mass 12 is resting on the supporting body 9. The position of the paper 27 and of the folding elements 6 and 13 at the beginning of the pressing operation is accurately shown in Fig. 3.

The advantage is obtained hereby that prior to the beginning of the folding the paper sectors *a* (Figs. 6 and 7) designed to form the wall proper of the cup are clamped between the inner folding elements 6 and the outer folding elements 13, and that the free paper-portions *b* situated between these clamped paper-portions *a* may then be used for the formation of the paper-portion which after the folding overlaps on the wall of the cup. At the same time an accurate division of the folds is ensured by this clamping of the paper-portions *a*.

By a pressure on the hand-lever 21 the ring 19, and through the same the blades 30 with the outer folding elements 13, are suddenly lifted. The inner folding elements 6 are thereby lifted also and, as they pivot around the bolt 5, the clamped paper-sheet 27 is pleating-like folded by the further movement of the folding elements 6 and 13 as it is shown in Fig. 7 in an intermediate position and in Fig. 6 in the final state. At the folding operation the folding elements 6, 13 have been moved towards the cup-axis in such a manner that they form the conical shape of the cup by being shifted the one into the other.

The pleating-like folding of the paper 27 having been carried out, the heavy mass 12 is slightly turned until it sits on the upper edge of the wedge-shaped feather 2. The plate 16, together with the elements mounted thereon, is then rotated by means of the handle 21 to disengage the folding elements 13 from between the folds of the cup and the folding elements 3 are lowered to the horizontal position. The inner folding elements 6 are then returned to the initial position

shown in Fig. 1, and the cup is free to be removed from the machine.

I claim:

1. A machine for the mechanical production of drinking cups pressed in pleating-like folds from single paper sheets, comprising in combination outer folding elements carrying the paper disk to be folded, inner folding elements, means for lowering said inner folding elements to press on said paper disk, means for carrying said outer folding elements, and means for suddenly oscillating upward said outer folding elements and through the same said inner folding elements so that the paper disk held between said two sets of elements is folded pleating-like and turned upward to form a cup.

2. A machine for the mechanical production of drinking cups pressed in pleating-like folds from single paper sheets, comprising in combination outer shovel-shaped folding elements slightly inclined to the horizontal plane carrying the paper disk to be folded, inner folding elements, means for lowering said inner folding elements to press on said paper disk, means for carrying said outer folding elements, and means for suddenly oscillating upward said outer folding elements and through the same said inner folding elements so that the paper disk held between said two sets of elements is folded pleating-like and turned upward to form a cup.

3. A machine for the mechanical production of drinking cups pressed in pleating-like folds from single paper sheets, comprising in combination outer folding elements carrying the paper disk to be folded, inner folding elements, means for lowering said inner folding elements to press on said paper disk, consisting of a press carriage, a downwardly directed cylindrical shaft extending from said carriage, a wedge-shaped feather on said shaft, a disk fixed on the lower end of said shaft, a heavy mass rotatably and shiftably mounted on the upper portion of said shaft, a bracket on the lower end of said shaft carrying the hingedly mounted inner ends of said inner folding elements, a supporting body shiftably mounted on said shaft above said bracket, stays hingedly fixed at the upper end to said supporting body and at the lower end to the middle of the corresponding inner folding element, means for carrying said outer folding elements, and means for suddenly oscillating upward said outer folding elements and through the same said inner folding elements so that the paper disk held between said two sets of elements is folded pleating-like and turned upward to form a cup.

4. A machine for the mechanical production of drinking cups pressed in pleating-like folds from single paper sheets, comprising in combination outer folding elements carrying

the paper disk to be folded, consisting each of a blade oscillatably mounted at the inner end and of a shovel-shaped element slightly inclined to the horizontal plane fixed on said blade, inner folding elements, means for lowering said inner folding elements to press on said paper disk, means for carrying said outer folding elements, and means for suddenly oscillating upward said outer folding elements and through the same said inner folding elements so that the paper disk held between said two sets of elements is folded pleating-like and turned upward to form a cup.

5. A machine for the mechanical production of drinking cups pressed in pleating-like folds from single paper sheets, comprising in combination outer folding elements carrying the paper disk to be folded, inner folding elements, means for lowering said inner folding elements to press on said paper disk, means for carrying said outer folding elements, consisting of a rotatable disk in the base part of the machine frame, means for limiting the rotating movement of said disk, and of a bearing ring having radial slots in which said outer folding elements are oscillatably mounted, and means for suddenly oscillating upward said outer folding elements and through the same said inner folding elements so that the paper disk held between said two sets of elements is folded pleating-like and turned upward to form a cup said means consisting of a concentric ring enclosing said bearing ring and supporting the blades of said outer folding elements, two studs inwardly projecting from the inner surface of said connection ring, a hand lever pivotally mounted on the outer side of said concentric ring, and a fork-shaped inner end of said hand lever engaging over said studs.

In testimony whereof I affix my signature.

EMIL SCHMIDT.