United States Patent

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[54] **FOLDER IMPRINTER**
5 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **270/20,** 101/235
[51] **Int. Cl.** **B41f 13/56**
[50] **Field of Search** 270/20, 68; 101/235, 236; 270/20

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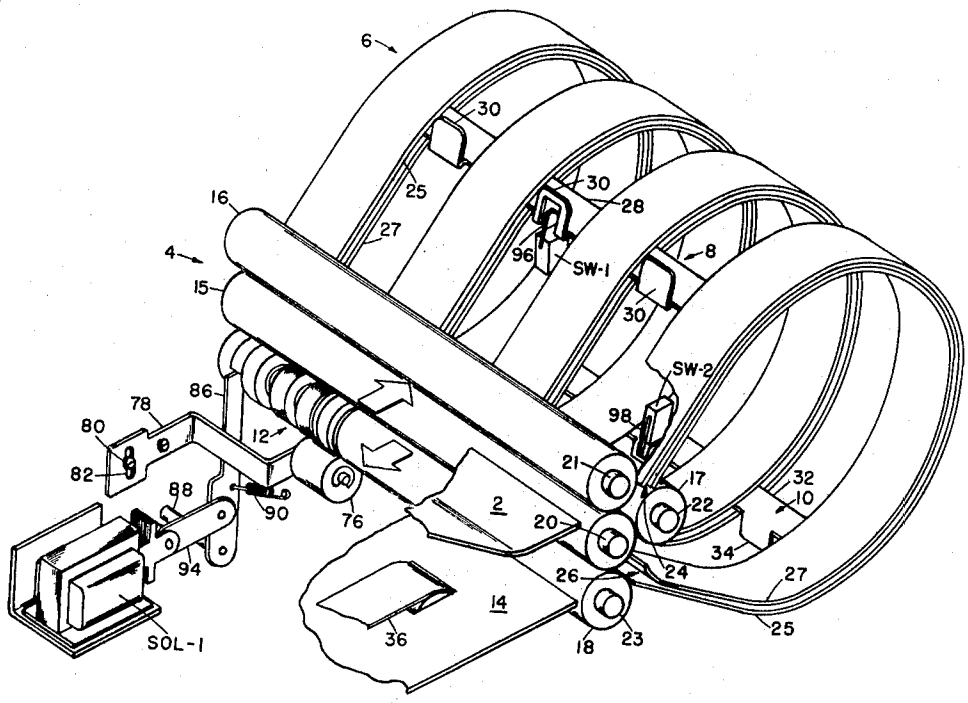
ABSTRACT: A device for imprinting information on folded sheets of paper as the latter emerge from a folding machine. The device is a rotary printer mounted on a shaft of the folding machine and driven thereby, and includes a one-revolution clutch connection with the shaft which is controlled by paper actuated switches in the folding machine so that operation of the imprinting device can be cyclically controlled to print at a preselected location on each folded sheet of paper emerging from the folding machine.



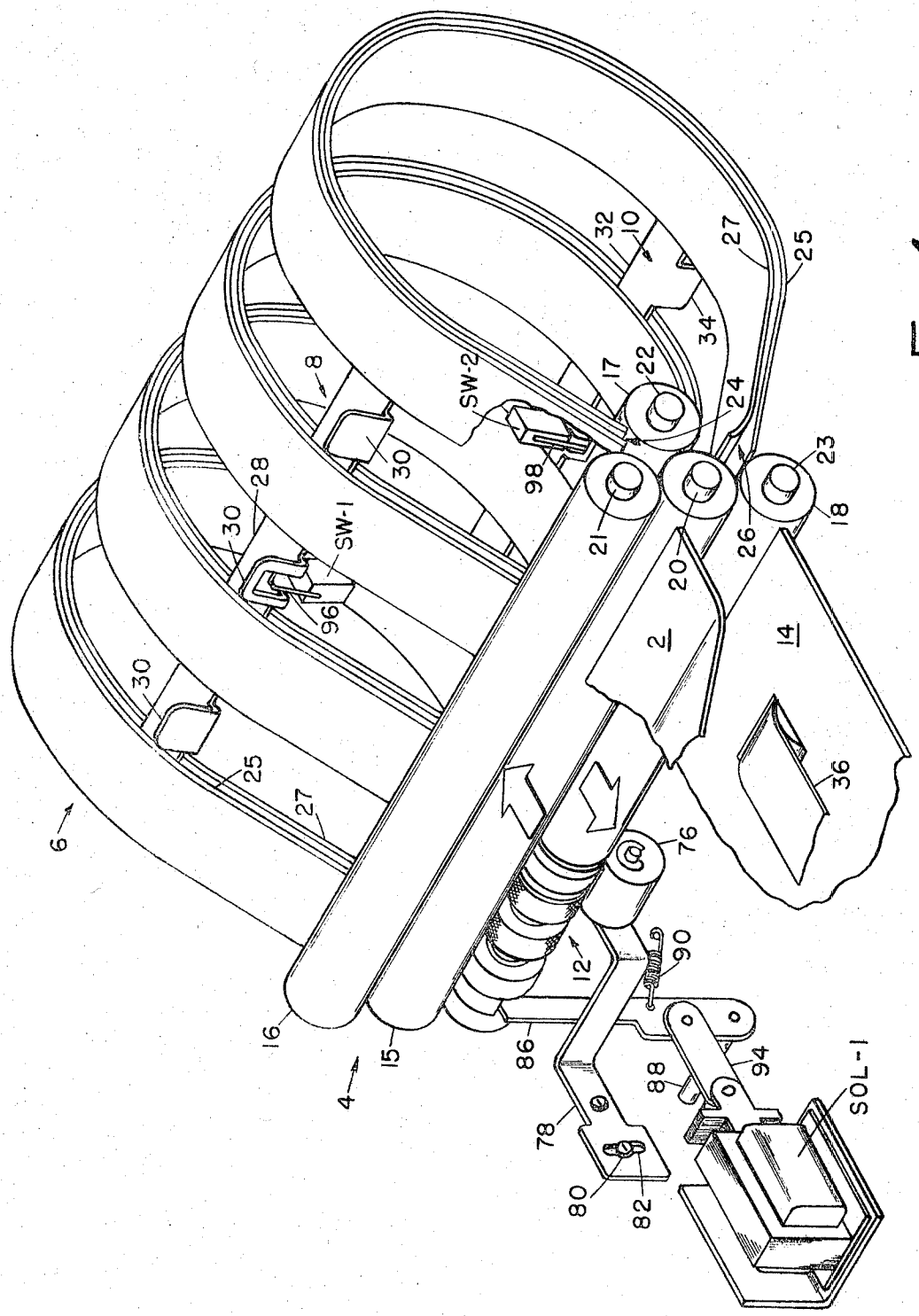


Fig 1

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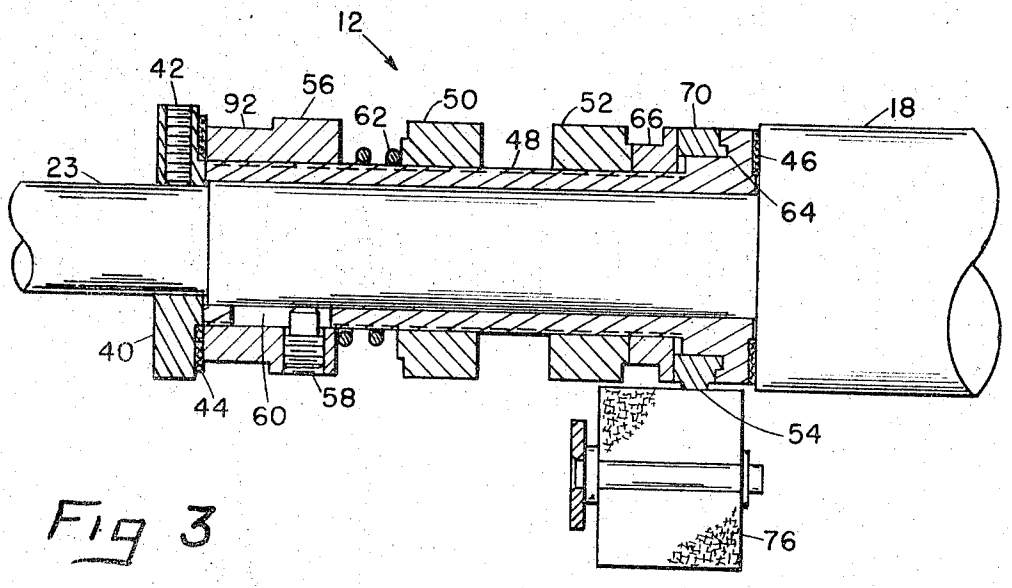

Fig 3

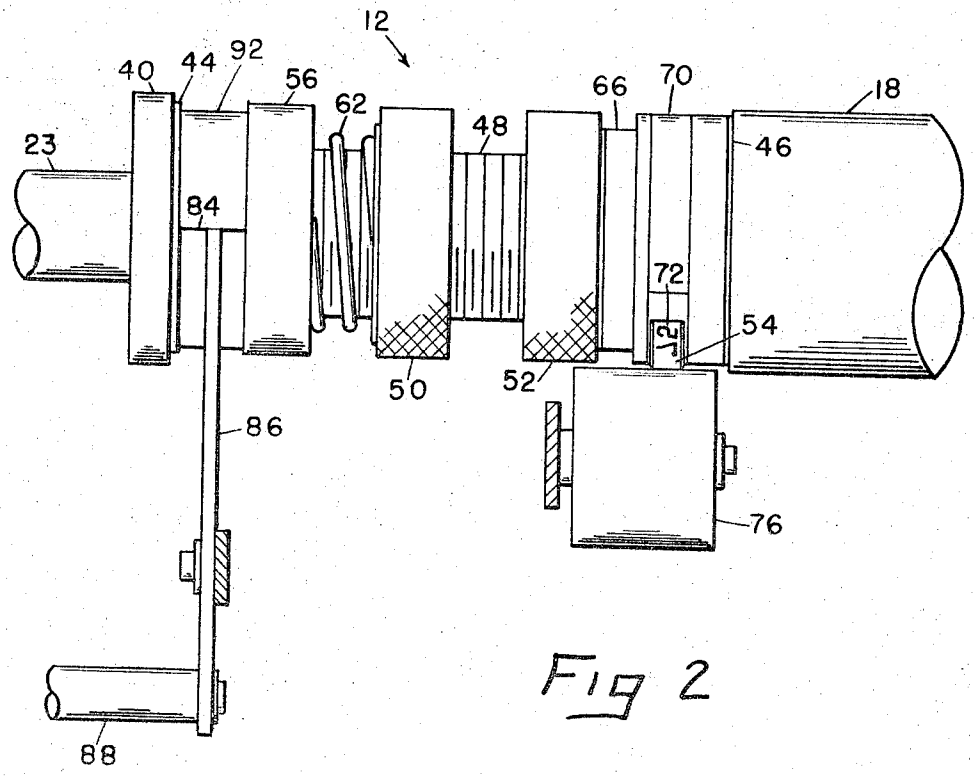

Fig 2

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FOLDER IMPRINTER

This invention relates in general to sheet folding machines and in particular to a sheet folding machine which imprints information on the folded sheets.

Sheet folding machines are conventionally used to fold letter or other sheets for subsequent distribution. It is frequently desirable to place information on the folded sheet in the form of printed identification marks or some other printed indicia. For example, when letters or bills are sent requesting a return of a document such as a questionnaire only a small portion of documents are returned. Then, after subsequent mailings of the same questionnaire and additional documents are returned it is desirable to be able to distinguish whether the document is the result of the first or subsequent mailings. This can be accomplished by imprinting identifying information on the sheets as they are folded for mailing. In many cases the same document is mailed to various locations, such as different states, and upon return there is no way to identify the area from which the document was returned. In cases of this type imprinting information on the documents as they are folded just prior to insertion into envelopes provides the distinguishing information on the sheet without altering or reprinting the document.

It is the primary object of the present invention to print information on sheet material as the sheet material is folded in a folding machine.

It is a further object of this invention to provide a simple imprinting device which will print information on sheets as the sheets are being moved through a folding machine.

Further objects of this invention are to improve sheet folding machines by combining the folding operation with an imprinting operation to provide simultaneous completion of both operations, and to provide an imprinter which is actuated through one operational cycle by a sheet in a folding machine to provide identifying information on the sheet.

These and other objects of the invention are attained by means of a rotatable indicia or print head mounted on an output roller of a folding machine and having controls actuatable by a sheet in the folder, to rotate the print head through one operational cycle as the sheet being folded passes the output roller.

The invention is disclosed in the appended drawings in which:

FIG. 1 is a perspective view of a portion of a sheet folding machine with parts broken away and which embodies the present invention;

FIG. 2 is a front view of a portion of an imprinting roller used in folding machine shown in FIG. 1; and

FIG. 3 is a partial front sectional view taken along the axis of the imprinting roller shown in FIG. 2.

Referring now to FIG. 1 of the drawings there is shown the essential elements of a typical buckle chute-type sheet folding machine. Folding machines of the buckle chute-type are well known in the art and are shown in detail in U.S. Pat. Nos. 2,589,436 and 2,751,221. The essential elements of the folding machine, as shown herein, consists of a sheet feeding tray **2** adapted to position and feed individual sheets to a folding roller assembly **4** which in turn drives the sheet into a buckle chute assembly **6**. The folding roller assembly **4** then folds and creases the sheet while it is in the buckle chute assembly and drives it down into the lower portion of the buckle chute assembly **6**. The sheet is then again folded and creased by the folding roller assembly **4** and discharged onto a receiving tray **14**.

The folding roller assembly **4** is composed of two folding rollers **16** and **17**, and a discharge roller **18** clustered about, and in contact with a drive roller **15** which is driven in conventional manner by a source of power, not shown herein. The rollers **15**, **16**, **17** and **18** are mounted on shafts **20**, **21**, **22** and **23** respectively, which shafts are supported by suitable bearings and side plates of the folding machine. The shafts **21**, **22** and **23** are spring loaded so that the rollers **16**, **17** and **18** are urged into contact with the roller **15**. The buckle chute structure **6** comprises outer and inner guide members **25** and **27** respectively, which are spaced apart to permit the sheet, or folds of the sheet, to pass therebetween. Each guide member comprises a plurality of strap elements which are spaced apart, across the length of the roller assembly **4**. The support structure for the guides **25** and **27** is not critical to the present invention and is not shown herein. The guide members **25** and **27** are arranged in an upper and lower partical cylindrical formation with two straight sheet receiving ends converging tangentially from the cylindrical portions thereof, and forming a sheet receiving mouth **24** positioned adjacent the nip of the rollers **15** and **17**. A second sheet receiving mouth **26** is formed at the opposite end of the guide members **25** and **27** and is positioned adjacent to the nip of the rollers **15** and **18**. A sheet of paper fed between the rollers **15** and **16**, as indicated by the top arrow in FIG. **1**, would be fed into the mouth **24** of the guides **25** and **27**. A sheet being fed out of the mouth **24** of the guide **25** and **27** would be fed into the nip of the rollers **15** and **17**. A sheet being fed through the rollers **15** and **17** would be directed towards the mouth **26** of the lower end of the guides **25** and **27** and a sheet being fed out of the mouth **26** would extend into the nip of the rollers **15** and **18**.

A pair of document stop members **8** and **10** are positioned relative to the buckle chute assembly **6** to limit the distance that a sheet extends between the guides **25** and **27**. The stop unit **8**, which will be referred to as the first fold stop unit, comprises a supporting bar member **28** which extends across the span of the buckle chute **6**, and has a series of stop tabs **30** which extend into the lateral spaces between the individual straps of the buckle chute. The second fold stop unit **10** comprises a bar **32** and tab members **34** which likewise extend between the straps of the buckle chute **6** in the path of movement of a sheet between the guide members **25** and **27**. The fold stop units **8** and **10** are both adjustable towards and away from the roller assembly **4**. Thus, the extent to which a sheet passes between the guide chutes **25** and **27** can be limited by adjusting the position of the stop units **8** and **10**. When a sheet is to be fed through the folding machine the first fold stop unit **8** is adjusted to a position which is a distance from the nip of the rollers **15** and **17** equal to the distance from the lead end of the sheet to the first fold. The second stop assembly **10** is adjusted a distance from the nip of the two rollers **15** and **18** equal to the distance desired from the first fold to the second fold on the sheet. If the sheet is to be folded only once the second fold stop assembly **10** is moved to its forward position adjacent the roller assembly **4** and thus it deflects the sheet directly into the nip of the rollers **15** and **18** instead of into the mouth **26** of the guides **25** and **27**.

In operation a sheet of paper or the like is fed from the sheet feeding tray, in the direction indicated by the uppermost arrow in FIG. **1**, into the nip of the rollers **15** and **16**. The first fold stop unit **8** has previously been adjusted to the position which will produce the fold desired on the sheet. The rolls **15** and **16** drive the sheet forward with the lead edge extending into the mouth **24** of the guides **25** and **27**. The sheet is driven forward between the guides **25** and **27** until the lead edge encounters the tabs **30** of the first fold stop unit **8**. At this point the rollers **15** and **16** continue to urge the sheet forward while the lead edge is restrained by the tabs **30**. The sheet thus buckles downwardly into the nip of the rollers **15** and **17**. The rotational movement of the rollers **15** and **17** pull the sheet into the nip of the rollers producing a crease or fold and then drives the sheet downwardly out of both the guides **25** and **27** and the rollers **15** and **16**. The sheet with the crease or folded end forward is then driven into the mouth **26** of the guide until the lead edge encounters the tabs **34** of the second fold stop unit **10**. The second fold stop unit **10** has also been previously adjusted to the position necessary to produce the desired second fold in the sheet. When the lead edge of the sheet encounters the tabs **34** the forward motion of the sheet between the guides **25** and **27** is stopped while the rollers **15** and **17** continue to urge the sheet downwardly causing the sheet to buckle into the nip of the rollers **15** and **18**. The rotational movement of the rollers **15** and **18** produce a crease or fold in

the sheet and drive the sheet out of the guides **25** and **27** in the direction of the bottom arrow. The sheet is deposited on the receiving tray **14** and stacking belt **36**. During movement of the folded sheet between the rollers **15** and **18**, the imprinting unit **12** may be energized to imprint the desired information on the folded sheet.

The imprinting unit **12** is shown in details in FIGS. **2** and **3**. One portion of the exit roller **18** has been removed from the shaft **23** to accommodate the imprinting assembly **12**. The imprinting assembly is held in place on the shaft **23** by means of a collar **40** secured to the shaft, by means of a setscrew **42**. The collar prevents longitudinal movement of the assembly along the shaft and provides rotation for the assembly with the shaft. The inner face of the collar **40** is undercut to accommodate a friction disc **44** which, in conjunction with a second friction disc **46** at the opposite end of the assembly **12** abutting the face of the roller **18**, provides engagement of the imprinting unit **12** with the shaft **23** to provide rotation therewith. The second friction disc **46** is mounted in a hub **48** rotatably mounted on the shaft **23** and extending between the collar **40** and the roller **18**. The hub **48** is externally threaded to accommodate a knurled spring adjusting nut **50** and a knurled print head tightening nut **52**. The spring adjusting nut **50** is used to adjust the pressure of the assembly **12** against the friction disc **44** and **46** and the tightening nut **50** is used to removably secure the print head **54** to the hub **48**.

A single-revolution-type clutch mechanism **56** is mounted around the hub **48** with one end in contact with the friction disc **44** on the collar **40**. The clutch **56** is secured to the hub **48** for rotational movement therewith by means of a dog point setscrew **58** which extends through the clutch into a longitudinal slot **60** in the hub **48**. The slot **60** extends longitudinal relative to the hub so that the clutch **56** may move longitudinally along the hub **48**. A compression spring **62** is wrapped around the hub **48** and bears against the clutch **56** and the spring adjusting nut **50**. The spring **62** urges the clutch **56** longitudinally along the hub **48** into contact with the friction disc **44**. Adjustment of the pressure between the clutch **56** and the friction disc **44** is accomplished by positioning the threaded spring adjusting nut **50** along the hub **48**. Since the nut **50** engages the hub **48** the pressure exerted by the spring **62** through the clutch **56** to the friction disc **44** is also exerted in the opposite direction through the nut **50** to the hub **48** forcing the friction disc **46** against the face of the roller **18**. Therefore, absent any restraining force the assembly **12** would normally rotate with the shaft **23** through contact with the friction discs **44** and **46**.

One end of the hub **48** is adapted to receive an indicia or print slug **54**. The hub **48** as shown herein, has an L-shaped undercut portion **64** adapted to receive and hold a projection or foot on the print head **54**, though any means of holding the slug in position on the hub would be satisfactory. A mounting ring **66** is concentrically mounted on the hub **48** and longitudinally movable along the hub to bear against the side surface of the type member forcing the foot of the type member into the undercut portion of the hub **48**. The knurled tightening nut **52** is adapted to be adjusted along the hub **48** to bear against the mounting ring **66** forcing the mounting ring against the type slug **54**. With the nut **52** and the mounting ring **66** bearing against the type head **54** the projection on the type head is urged to the undercut portion **64** of the hub **48** securing the type in position wherein the face of the type is concentric with and slightly above the outer surface roller **18**. When the type slug is not equal in length to the outer circumference of the roller **18**, a spacer **70** of the same general shape as the type slug **54** is positioned between the mounting ring **66** and the hub **48** to hold the mounting ring **66** normal to the hub and thus equalize the force exerted on the slug and the spacer ring and to prevent any circumferential displacement of the type slug during printing operation.

As the printing assembly **12** rotates the print **72**, on the slug **54**, contacts an inker roller **76** prior to rotating into contact with a sheet moving between the rollers **15** and **18**. The inker **76**, as shown herein is of the type comprising a porous material saturated with ink and adapted to be rotated in contact with the type. As seen in FIG. **1** the inker **76** is suspended from a bracket **78** in a position beneath a roller **18** in contact with the type on slug **54**. The bracket **78** is mounted on a frame of the folding machine and is adjustable by means of a positioning screw **80** and a slot **82** in the bracket.

The imprinted information may be placed on a folded sheet passing between the rollers **15** and **18** by allowing the printing assembly **12** to rotate with the roller **18**. However, the imprinted information would be placed on the folded sheet once for each revolution of the roller **18** unless the printing assembly is restrained except during a desired printing cycle. The single-revolution clutch **56** has an undercut or stop surface **84** which is adapted to engage a pawl or latch **86**. The latch **86** is secured to and pivoted about a pin **88** and is urged into contact with the clutch **56** by means of a tension spring **90**. With the tension spring **90** urging the latch **86** to pivot about the pin **88** into contact with the surface **92** of the clutch **56** the clutch will rotate through one revolution until the stop surface **84** engages the end of the latch **86**. At this point the clutch **56** is restrained and the rotation of the hub **48** is also restrained by means of the setscrew **58** with the dog point extending into the longitudinal slot **60**. The collar **40** and the roller **18** continue to rotate against the action of the friction discs **44** and **46**. The clutch **56** can be actuated to allow a single revolution of the assembly **12** by means of a solenoid sol-**1** being energized to withdraw a linkage member **94** connected between the latch **86** and the core of the solenoid. When the solenoid is energized the latch **86** is withdrawn from contact with the stop surface **84** permitting the clutch to revolve through one revolution. Deenergizing the solenoid allows the tension spring **90** to draw the latch **86** back into contact with the surface **92** of the clutch **56** until the end of the latch again engages the stop surface **84**, thus allowing only one revolution of the printing assembly **12** for each energization of the solenoid sol-**1**. If it is desired to print the information more than once on each document passing between the rollers **15** and **18** then the solenoid sol-**1** may either be held in the energized position with the latch **86** withdrawn from the clutch **56** until the desired number of revolutions are completed or the solenoid may be intermittently energized to permit a series of single revolutions of the printing assembly **12** as desired.

Energization of the solenoid sol-**1** and rotation of the printing assembly **12** is timed to coincide with passage of the folded sheet over the roller **18** by means of a switch SW-**1** mounted on the first fold stop unit **8**. The actuating arm **96** of the switch SW-**1** extends into the path of movement of the sheet to be folded, as the sheet moves between the guides **25** and **27**. A second switch SW-**2** is mounted on the second fold stop unit **10** with its actuating arm **98** also extending into the path of movement of the folded sheet between the guide **25** and **27**. In order to energize the solenoid sol-**1** both switches SW-**1** and SW-**2** must be actuated to energize holding circuits or relays. When only one fold is to be made, that is when the sheet is not to be inserted into the mouth **26** of the chute assembly **6**, then the stop **10** is moved to the extreme forward position. A switch actuator, not shown herein, is positioned to engage the actuating arm **98** when the stop **10** is moved to the forwardmost position and will close the switch SW-**2** so that actuation of the switch SW-**1** by the lead edge of a sheet will energize the solenoid sol-**1** to print on the folded sheet as it passes over the roll **18**. The circuitry required to energize the solenoid in response to the actuation of the switches SW-**1** and SW-**2** is conventional and well known to one skilled in the art and therefore is not shown herein.

While the invention has been described with reference to the structure disclosed herein, it is not confined to the details set forth, and this application is intended to cover such modifications or changes or as may come within the purpose or scope of the following claims.

I claim:

1. In combination, a sheet folding machine having a buckle chute and a series of fold rollers which fold and crease a sheet of paper in accordance with the location of adjustable stops in the buckle chute and which feeds folded sheets from the buckle chute over a continuously rotating exit roller onto a receiving tray, an imprinter located on the exit roller substantially concentric with the surface thereof and comprising:

a hub member mounted for rotation with the exit roller;

printing means including a print head mounted on the hub concentric with and slightly elevated above the surface of the exit roller, means to removably secure the print head to the hub, and inking means positioned to apply ink to the surface of the print head upon rotation of the hub member;

means frictionally engaging the hub member to the exit roller for rotation therewith;

restraining means adapted to prevent rotation of the hub member with the exit roller; and

control means responsive to the movement of a sheet through the folding machine to release the restraining means to thereby allow the hub member and print head to rotate with exit roller through at least one revolution as the folded sheet passes over the exit roller.

2. The combination of claim 1 wherein the control means includes switching means positioned in the path of movement of a sheet through the folder and actuatable by the sheet to release the restraining means.

3. In combination, a sheet folding machine having a buckle chute and a series of fold rollers which fold and crease a sheet of paper in accordance with the location of adjustable stops in the buckle chute and which feeds folded sheets from the buckle chute over a continuously rotating exit roller onto a receiving tray, an imprinter located on the exit roller substantially concentric with the surface thereof and comprising:

a hub member mounted on said exit roller;

printing means mounted on said hub member including a print head located concentric with and slightly elevated above the surface of said exit roller;

friction means normally engaging the hub means with the exit roller for rotation therewith;

one-revolution clutch means operatively associated with the hub member for normally restraining rotation of the hub member and for releasing the hub member for rotation with the exit roller when the clutch means is actuated; and

control means responsive to the movement of a sheet of paper through the folding machine for actuating the clutch means in timed relation with the movement of the sheet to effect contact between the print head and the sheet of paper as the latter passes over the exit roller.

4. The combination of claim 3 wherein the clutch means includes a member mounted on and rotatable with the hub member and having a stop surface projecting therefrom, and a movable stop member operable in one position to engage the stop surface and prevent movement of said member and in another position to permit rotation of said member.

5. The combination of claim 3 wherein said control means includes a switch mounted on the adjustable stops in the buckle chute of the folding machine, said switch being actuable by the sheet being folded, whereby the timed relation of the actuation of the clutch means with the passage of the sheet over the exit roller is maintained regardless of the size of fold being made in the sheet.