Aug. 27, 1963 F. W. SAWTELLE 3,101,666

ROTARY PRINTING APPARATUS EMPLOYING STRAIGHT LINE TYPE

Filed March 15, 1961 2 Sheets-Sheet 1

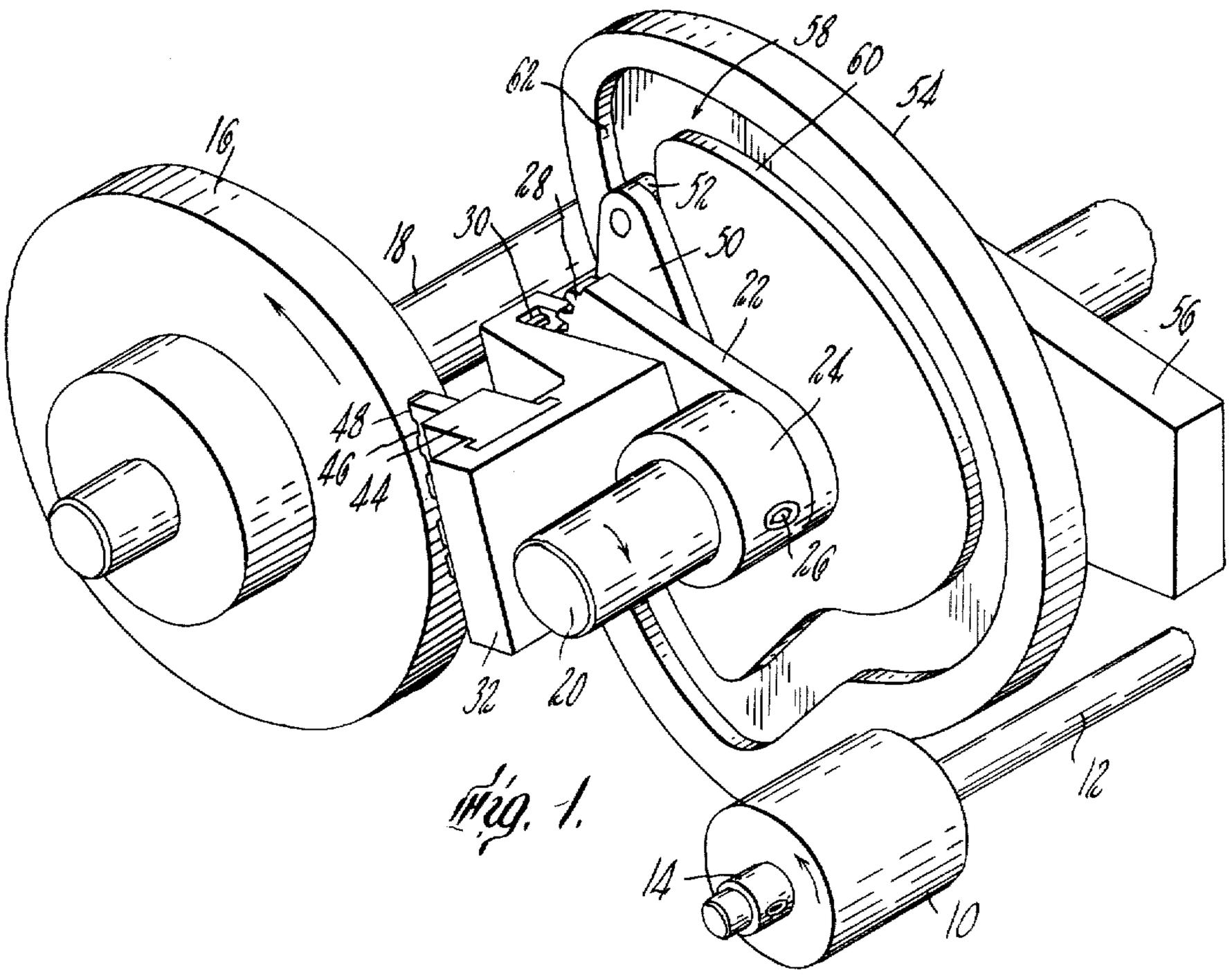

Fig. 1.

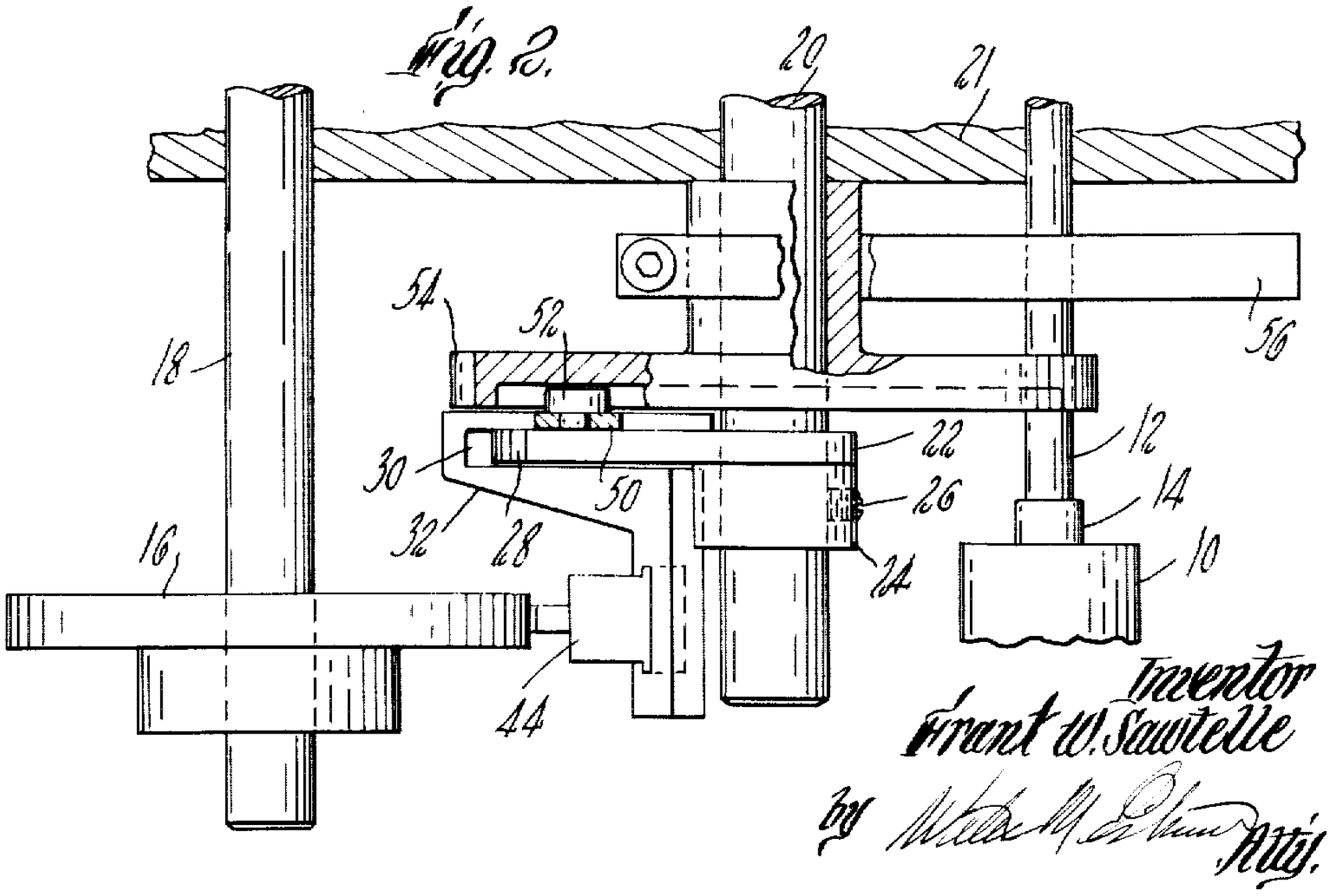

Fig. 2.

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ROTARY PRINTING APPARATUS EMPLOYING STRAIGHT LINE TYPE

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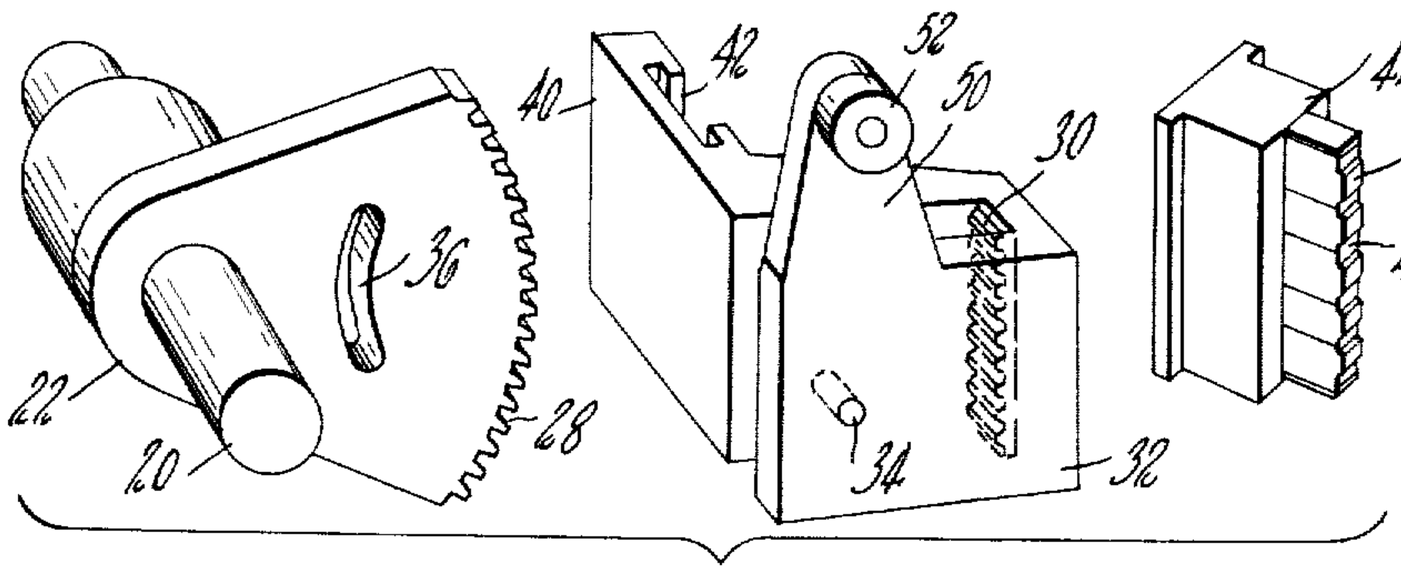

Fig. 3.

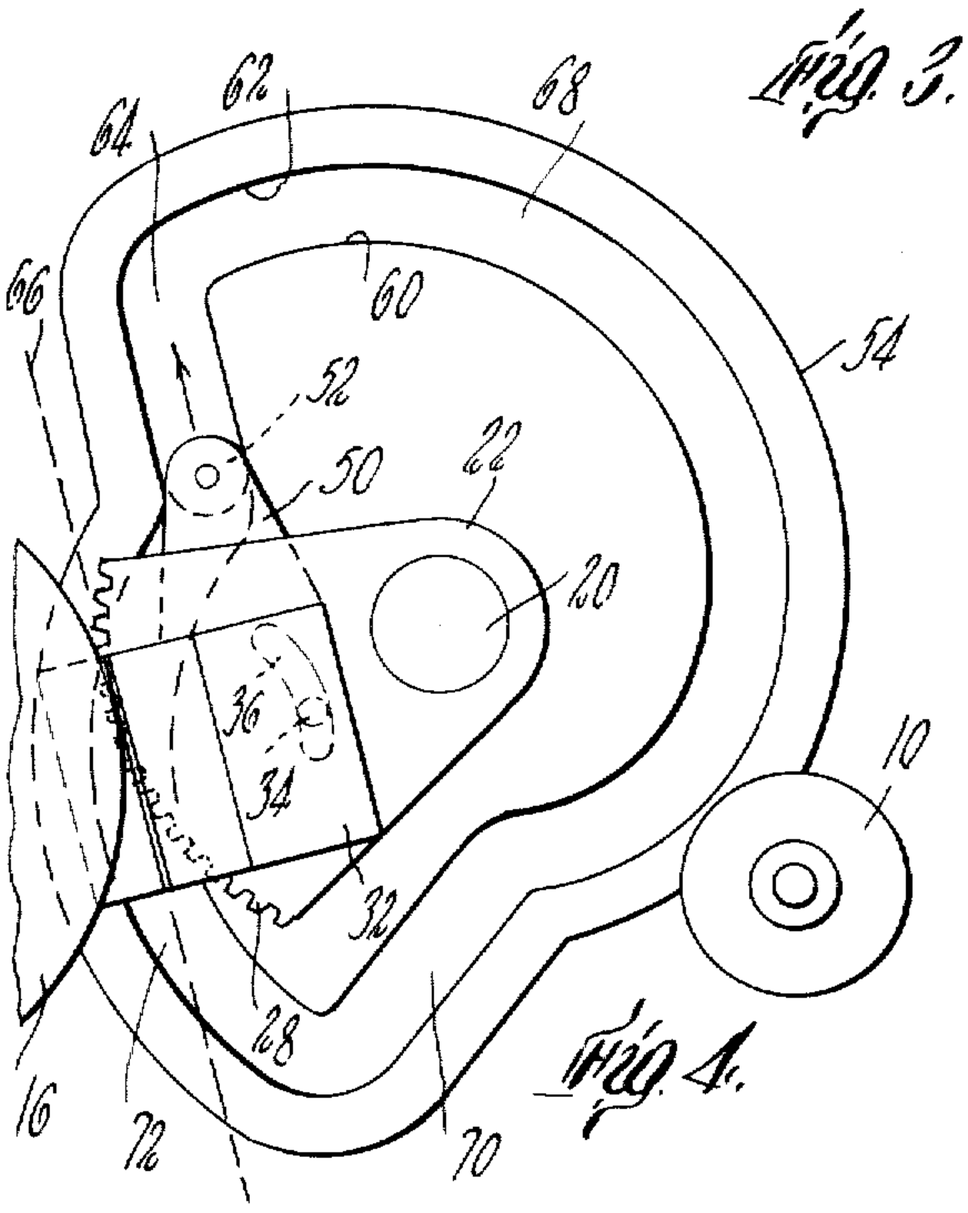

Fig. 4.

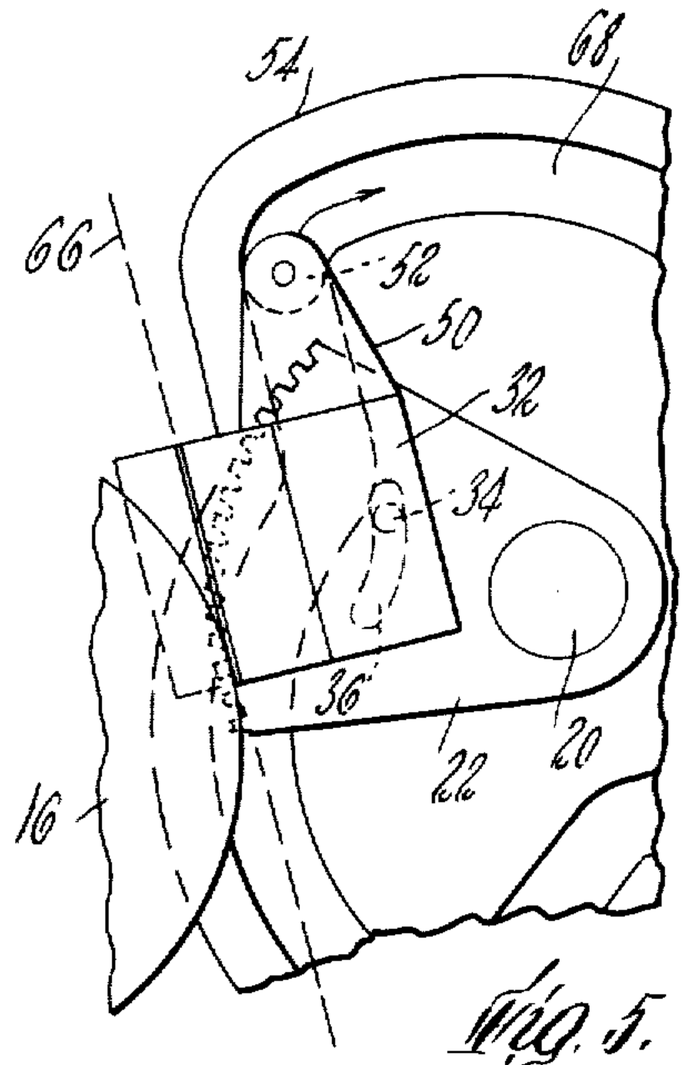

Fig. 5.

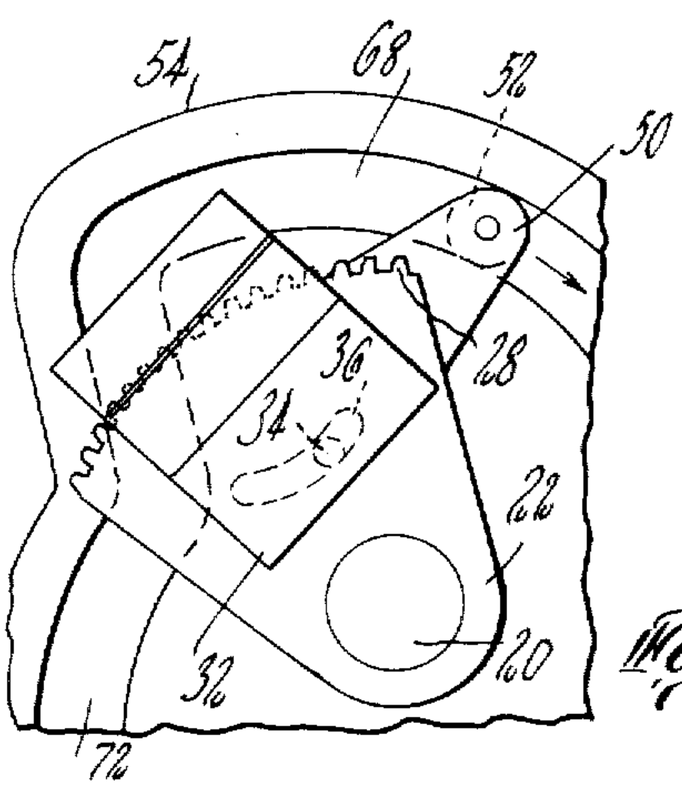

Fig. 6.

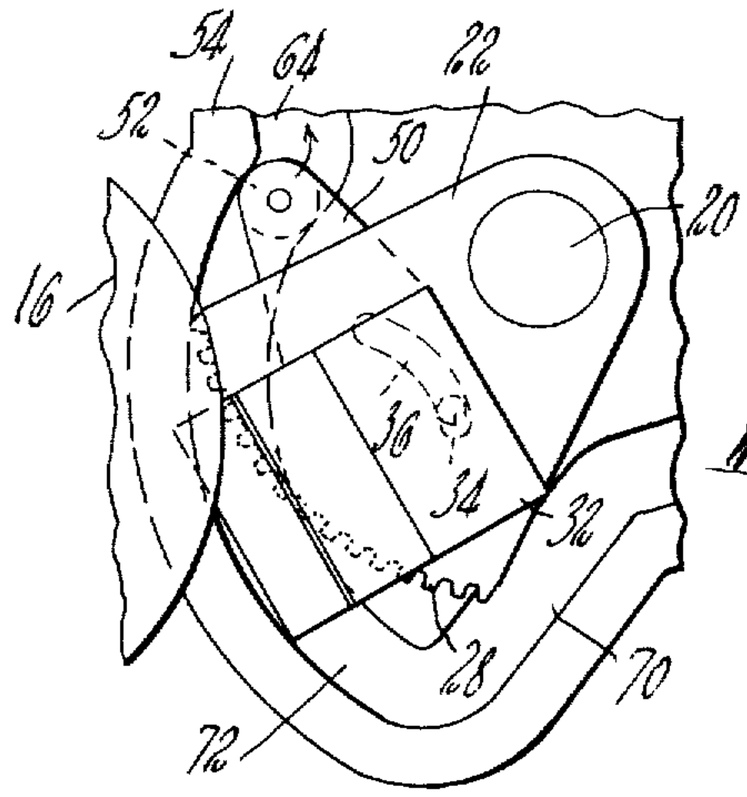

Fig. 7.

United States Patent Office

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3,101,666
ROTARY PRINTING APPARATUS EMPLOYING STRAIGHT LINE TYPE

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10 Claims. (Cl. 101—212)

This invention relates to printing apparatus and more particularly to an improved rotary printing mechanism.

In rotary printing mechanisms of the type particularly adapted for applying legends or other suitable indicia to small articles such as gelatin capsules for pharmaceutical products and electrical components there is typically provided a cylindrical member which may include cylindrically arranged type or an engraved cylindrical surface. This member transfers ink from a suitable ink fountain mechanism to an offset pad in a configuration as determined by the type surface or the engraving and then the ink configuration on the offset pad is applied to the article in a printing operation. The type arrangement configuration involves the securing of individual (loose) type elements in the cylindrical arrangement and in order to avoid a stepped surface and to obtain the proper spacing the individual elements must have accurately formed wedge-shaped sides which are dimensioned as a function of the radius of the cylinder. In order to achieve the necessary quality of printing the type must be painstakingly formed and assembled—a difficult, expensive and time consuming operation. The engraved cylinder must be manufactured in a manner so that its polished cylindrical surface may be accurately and precisely engraved with the configuration of the legend that is to be applied to the article. Whenever the legend is to be modified in any respect or if a different legend is to be applied an entirely different engraved cylinder generally must be employed. The limitations of these legend defining configurations often necessitates the maintenance of a large inventory of cylinders, each of which is expensive and must be carefully handled to avoid damaging the legend defining surface. Further where a change in legend is required often a substantial amount of time is required to produce a cylinder suitable for the desired operation.

It is an object of this invention to provide a novel rotary printing apparatus mechanism which incorporates a less expensive form of indicia configuration determining means than that of prior art rotary printing apparatus.

Another object of the invention is to provide an improved rotary printing mechanism which utilizes a linear legend configuration determining means adapted to cooperate with rotary ink transfer mechanisms for transfer of ink configurations between those mechanisms without smearing, or otherwise impairing the transferred ink configuration.

Still another object of the invention is to provide a rotary printing mechanism in which a straight line of conventional type may be employed in conjunction with a rotatable transfer mechanism and cooperating ink supply and offset members so that whenever the type is in contact with either member it is moving in a straight line and at a coordinated rate and the ink transfer is properly accomplished.

In accordance with the principles of the invention there is provided a rotatably driven carrier which is arranged to carry a determining structure. The legend determining structure is arranged so that it may be easily changed to accommodate various different styles and types of legends for applying different indicia to the articles being printed. In the preferred embodiment this structure is a straight line arrangement of loose type such as that produced by the well known Linotype machines, for example. A drive

mechanism, positioned between the inking mechanism and the transfer mechanism, rotates the carrier between those two mechanisms. The movement of the legend determining structure is controlled so that the operative portion of its surface remains in contact with either the inking mechanism or the transfer mechanism over its entire operative length for receiving ink for the inking mechanism or transferring an ink configuration to the transfer mechanism. The path along which the legend determining structure is driven during ink transfer operations from the inking mechanisms and to the transfer mechanism deviates from its normal driven path so that that path corresponds to the shape of the structure surface. Thus even though the principal motion is rotative and the legend determining structure is being cyclically moved between the inking mechanism and the transfer mechanism the motion of the structure surface is modified at two points during each cycle and the ink is transferred in a uniform and unsmeared manner so that a well defined ink configuration is transferred for the printing operation.

In the preferred embodiment of the invention the legend determining structure is a straight set of type, as indicated above, which has a flat ink receiving surface. The surface of the type defines the legend configuration for the ink that is to be transferred from the ink applying roll to the offset roll for application to the articles in a printing operation. The type is secured in a holder which in turn is mounted on a rotatable carrier member. The type holder includes a slot portion at the bottom of which is a rack gear which meshes with a segment of a spur gear formed in the periphery of the carrier so that the type holder is driven by the carrier through the engagement of the two gear portions. An arcuate slot in the carrier segment cooperates with a pin, which is secured to the type holder and passes through that slot, so that the type holder is allowed oscillatory motion relative to the carrier. A cam groove structure is fixed in position relative to the printing machine structure and a cam follower, secured to the type holder and driven by the carrier, cooperates with the cam groove. The cam groove has two straight line portions which are positioned relative to the ink roll and the offset roll so that when the cam follower enters these straight line portions the type head is initiating contact with either the ink roll or the offset roll. The cam follower remains in the straight line portion of the cam groove during the interval that the operative length of the type head surface is in contact with one of these cooperating rolls. During these intervals the type head is rocked relative to the carrier but continues to be positively driven through the cooperation of the rack gear portion with the spur gear segment and by suitable design of the structures and the drive the type head is moved at the same speed as the surface it contacts so that a sharp ink configuration is transferred. The apparatus of the invention thus provides an improved mechanism for use in rotary printing apparatus particularly useful for placing legends on small articles such as capsules and electrical components in a rapid and economical manner and enables the use of conventional forms of type or other legend determining structures which are less expensive and easier to manipulate than the engraved cylinder devices which have been conventionally utilized in printing mechanisms of this type.

Other features, objects and advantages of the invention will be seen as the following description of a preferred embodiment thereof progresses in conjunction with the drawings, in which:

FIG. 1 is a perspective view of a rotary printing mechanism constructed according to the preferred embodiment of the invention;

FIG. 2 is a top view of the printing mechanism of FIG.

1 showing the type head positioned in contact with the surface of the offset roll;

FIG. 3 is an exploded view showing the driving segment, the type holder and the type head utilized printing mechanism constructed according to the preferred embodiment of the invention; and

FIGS. 4–7 are diagrammatic views illustrating the movement of the type head relative to the carrier segment and the offset roll during a cycle of operation of the printing mechanism.

As shown in FIGS. 1 and 2 there is provided an inking roll **10** which is secured to a drive shaft **12** by means of a suitable collar **14** and a transfer or offset roll **16** which is also suitably secured to a drive shaft **18**. A type head drive shaft **20** is provided. All three of these drive shafts extend through a suitable printing mechanism supporting framework **21** and may be driven at suitable speeds by a conventional gear train arrangement. Mounted on the type head drive shaft is a type head carried **22** and a collar **24** which secures the type head carrier on the drive shaft **20** and is locked in position by set screw **26**. The carrier **22** is in the form of a segment, the peripheral surface of which is formed into a spur gear portion **28** having teeth therein which cooperate with a corresponding rack gear portion **30** formed in the bottom of a slot in the type holder **32**. The type holder **32** is secured to the carrier segment **22** by means of a pin **34** (best seen in FIG. 3) which is secured to the holder **32** and extends through an arcuate slot **36** in the carrier segment **22**. Thus the slot in the type holder receives the carrier segment and that segment drives the type holder through the cooperation of spur gear **28** and rack gear **30**.

Disposed laterally (away from the framework member **21**) of the slot structure is a type head receiving portion **40** which includes a grooved slot **42** into which a standard type head **44** is inserted. The type head has a series of loose type elements **46** secured therein with their surfaces **48** aligned in a straight line. Also forming a part of the type holder but disposed on the opposite side of the drive segment from the type head **44** is an arm **50** at the end of which is a cam follower portion **52** which cooperates with a fixed cam groove structure **54**. This cam groove structure is mounted over the driving shaft **20** but is secured in position by means of clamping arm **56** so that it does not rotate with the shaft. The groove **58** in the cam structure has inner and outer surfaces **60** and **62** against which the cam follower rides as the type holder is driven by the gear segment in a generally circular path. The shaft **20** is rotated at a constant speed and moves the type holder **32** and type element **46** generally in rotary motion between the inking roll **10** and the offset roll **16** but the rotary motion of the type elements and type holder is modified by the engagement of the cam follower in the cam groove. In the modified motion the rack gear portion **30** of the type holder **32** rocks on the spur gear portion **28** so that the surfaces of the type elements remain in contact with the inking roll **10** or the offset roll **16** and transfer ink in the desired manner. It will be noted that the pitch circle of the spur gear **28** is aligned with the surface of the type elements **46** and with a tangent to the peripheral surface of the offset roll but offset therefrom. The radii of the gear segment and the offset roll are equal and they are driven at the same speed. Thus there is no relative motion between the flat type surfaces **48** and the offset roll surface so that a clear ink configuration is transferred.

The type head **44**, type holder **32** and drive segment **22** are shown in disassembled form in FIG. 3.

The transfer operation movement of the type head **44** relative to the offset roll **16** is illustrated in the series of diagrams in FIGS. 4–7. The movement of the type head relative to the inking roll **10** is not shown in detail as it follows the same general principles as the movement of the type head relative to the offset roll. In FIG. 4 the surface of the first type element has just contacted

the transfer roll **16** and the cam follower **52** is entering the straight portion **64** of the cam groove **58**. In this position the pin **34** carried by the type holder **32** is in the rearward portion of the arcuate slot **36** in the drive segment **22**. As the segment **22** rotates in the clockwise direction the engagement of the cam follower in the groove portion **64** causes the type holder **32** to rock back relative to the segment **22** so that the surface **48** of the type elements is maintained in engagement with the transfer roll **16** with the surface **48** being advanced along the line **66** at the same speed as the peripheral speed of the offset roll **16**. The relationship of the several components when the type surface **48** is about to terminate contact with the offset roll is shown in FIG. 5. It will be noted that pin **34** has advanced to the forward end of the slot **36** but the effective position of the type elemens **46** are moved back relative to the driving segment **22** while the engagement of the rack gear **30** and drive gear segment **28** continue to advance the type along the plane **66** of the tangent to the offset roll transfer point. The arcuate slot **36** is complementary in form to the radius of the gear segment **28** so that a smooth rocking of the type face on the gear segment as controlled by the cam follower is permitted without impairing the uniformity of the driving rate. At the end of the straight line portion **62** the cam follower enters the curved portion **66** of the cam groove **58** and it rocks the type head forwardly in preparation for transfer of ink from the inking roll **10** to the type face. Any suitable inking mechanism may be utilized for this operation and as several are well known in the art the mechanism is not shown in detail. The transfer of ink from roll **10** to the surfaces **48** of the type elements occurs when the cam follower is in the groove portion **68** during which time the path of the type surfaces is slightly modified again so that a straight line uniform transfer of ink over the entire operative length of type surface is accomplished. Then the type enters the curved portion **70** and is again moved forward relative to the drive segment in preparation of transfer of the ink configuration from the type surfaces to the offset roll **16** as is indicated generally in FIG. 7. The ink configuration is then transferred from the offset roll to the article in the conventional printing operation.

Thus it will be seen that the invention provides apparatus in a rotary printing mechanism which enables the use of an inexpensive and easily formed straight line type configuration as a legend determining structure which operates in conjunction with a rotary drive system for forming a printing medium into a desired configuration and transferring that configuration to a transfer mechanism which applies the configuration to the article in a printing operation. The apparatus is arranged so that the legend determining structure is advanced at a uniform rate relative to the transfer mechanism and its operative surface remains in contact with the mechanism throughout the transfer operation so that the desired uniformity of legend transfer is achieved. Certain modifications may be made in the disclosed apparatus. For example, the radius of the carrier segment **22** relative to that of the offset roll **16** and their speeds may be varied to effect different spacings of the ink configuration applied to the offset roll.

Thus while a preferred embodiment of the invention has been shown and described it will be understood by those skilled in the art that various other modifications may be made therein and therefore it is not intended that the invention be limited to the described embodiment or to details thereof and departures may be made therefrom within the spirit and scope of the invention as defined in the claims.

I claim:

1. Rotary printing apparatus comprising an inking mechanism for supplying ink, a legend determining structure having a straight line surface for receiving ink from said inking mechanism in a manner to define an ink

configuration in the form of the legend to be applied in the printing operation, a transfer mechanism for receiving said ink configuration from said legend determining structure for application in the printing operation, a carrier supporting said legend determining structure, means to rotate said carrier in a coordinated manner with said inking mechanism and said transfer mechanism, and means responsive to said carrier rotating means to cyclically move said legend determining structure between said inking mechanism and said transfer mechanism in a direction parallel to said straight line surface, said legend determining structure being moved by said rotation responsive means relative to said carrier so that the path of the surface of said legend determining structure as driven by said carrier follows a straight line parallel to said surface as said surface is progressively advanced past said transfer mechanism for transferring an ink configuration from said legend determining structure to said transfer mechanism.

2. Rotary printing apparatus comprising an inking mechanism for supplying ink, a legend determining structure for receiving ink from said inking mechanism in a manner to define an ink configuration in the form of the legend to be applied in the printing operation, a transfer mechanism for receiving said ink configuration from said legend determining structure for application in the printing operations, a carrier supporting said legend determining structure, a cam structure, a cam follower secured to said legend determining structure and adapted to cooperate with said cam structure for controlling the movement of said legend determining structure relative to said carrier, and means to rotate said carrier in a coordinated manner with said inking mechanism and said transfer mechanism so that said legend determining structure is cyclically moved between said inking mechanism and said transfer mechanism, said legend determining structure being moved by the cooperation of said cam and cam follower relative to said carrier so that the path of the surface of said legend determining structure as driven by said carrier follows a straight line path when said surface is in contact with said transfer mechanism for transferring an ink configuration from said legend determining structure to said transfer mechanism.

3. Rotary printing apparatus for applying a legend to small articles in a printing operation comprising a rotatable inking roll for supplying ink, a type head having a plurality of type elements whose surfaces are disposed in a straight line for receiving ink from said inking roll in a manner to define an ink configuration on said type surfaces in the form of the legend to be applied to said articles, an offset roll for receiving said ink configuration from said type head and applying said received ink configuration to said articles in a printing operation, a carrier supporting said type head, said carrier including a gear segment which cooperates with said type head in driving relationship, a cam structure, a cam follower secured to said type head and adapted to cooperate with said cam structure for controlling the movement of said type head relative to said carrier and means to rotate said carrier in a coordinated manner with said inking roll and said offset roll so that said type head is cyclically moved between said inking roll and said offset roll, said type head being moved relative to said carrier by the cooperation of said cam structure and said cam follower so that the path of the surface of said type head as driven by said carrier follows a straight line when said surface is in contact with either of said rolls and the entire operative length of said surface may be advanced along the contacted roll for transferring ink between the contacted roll and said type head surface.

4. Rotary printing apparatus for printing indicia on articles comprising an inking mechanism, an offset roll, a rotatably driven shaft positioned between said inking mechanism and said offset roll, a drive member secured to said shaft for rotation therewith, said drive member

having a gear portion formed in the periphery thereof, a type holder mounted for rocking movement on said drive member, said type holder having a rack gear portion adapted to cooperate in driven relation with said gear portion, a plurality of type elements mounted in said type holder, the surfaces of said type elements being disposed in a plane parallel to said rack gear, and means to drive said shaft and drive member so that said type elements are cyclically moved between said inking mechanism and said offset roll for transfer of ink to the surfaces of said type elements and transfer of an ink configuration to said offset roll, said type holder being rocked on said drive member during each transfer operation so that the operative surfaces of said type elements fully contact the inking mechanism and the offset roll.

5. The apparatus as claimed in claim 4 wherein the radius of said offset roll is an integral multiple of the radius of the pitch circle of said gear portion on said drive member and said shaft and said offset roll are driven at such speeds that the peripheral surface of said offset roll and the surfaces of said type elements are moving at the same speed during ink transfer operations.

6. Rotary printing apparatus for printing legends on articles comprising an inking roll, an offset roll, each said roll being mounted for rotation on an associated shaft, a third rotatably driven shaft having an axis parallel to said roll shafts, a carrier segment secured to said third shaft for rotation therewith, said carrier segment having a gear portion formed at the outer periphery thereof and an arcuate slot located medially in said carrier segment, a type holder mounted on said carrier segment, said type holder having a straight rack portion adapted to cooperate with said gear portion, a pin secured to said type holder and extending through said arcuate slot for locking said type holder on said carrier, a type head mounted in said type holder and positioned in the plane of said inking roll and said offset roll, said type head having a plurality of type elements whose surfaces are disposed in a plane parallel to said rack, said apparatus being arranged so that said type holder is rocked relative to said carrier segment and said type surface remains in contact with each roll during each ink transfer operation over the entire length of the operative type surfaces as said type head is progressively advanced past each roll.

7. Rotary printing apparatus for printing legends on articles comprising an inking roll, an offset roll, each said roll being mounted for rotation on an associated shaft, a third rotatably driven shaft having an axis parallel to said roll shafts, a carrier segment secured to said third shaft for rotation therewith, said carrier segment having a gear portion formed at the outer periphery thereof and an arcuate slot located medially in said carrier segment, a type holder mounted on said carrier segment, said type holder having a straight rack portion adapted to cooperate with said gear portion, a pin secured to said type holder and extending through said arcuate slot for locking said type holder on said carrier, a type head mounted in said type holder and positioned in the plane of said inking roll and said offset roll, said type head having a plurality of type elements whose surfaces are disposed on a plane parallel to said rack, a cam follower structure on said type holder, and a grooved cam structure positioned to cooperate with the said cam follower and fixed in position relative to said rotary printing apparatus, the groove in said cam structure having first and second straight portions, said apparatus being arranged so that said cam follower is positioned in said first straight portion when said type surfaces are in contact with said inking roll and said cam follower is positioned in said second straight portion when said type surfaces are in contact with said offset roll, said cam follower being adapted to rock said type holder relative to said carrier segment so that said type surface remains in contact with each roll during each ink transfer operation over the entire length of the operative type surfaces.

8. Rotary printing apparatus for printing indicia on

articles comprising an inking mechanism, an offset roll, a rotatably driven shaft positioned between said inking mechanism and said offset roll, a drive member secured to said shaft for rotation therewith,

said drive member having a gear portion formed in the periphery thereof,

a type holder mounted for rocking movement on said drive member,

said type holder having a rack gear portion adapted to cooperate in driven relation with said gear portion,

a plurality of type elements mounted in said type holder,

the surfaces of said type elements being disposed in a plane parallel to said rack gear,

means to drive said shaft and drive member so that said type elements are cyclically moved between said inking mechanism and said offset roll for transfer of ink to the surfaces of said type elements and transfer of an ink configuration to said offset roll,

a cam follower structure on said type holder,

and a cam structure positioned to cooperate with the said cam follower and fixed in position relative to said rotary printing apparatus,

said cam structure having first and second straight portions,

said cam follower being positioned in said first straight portion when the surfaces of said type elements are in contact with said inking mechanism and in said second straight portion when the surfaces of said type elements are in contact with said offset roll,

said cam follower being adapted to rock said type holder relative to said drive member during each ink transfer operation so that the operative surfaces of said type elements fully contact the inking mechanism and the offset roll during the ink transfer operation.

9. Rotary printing apparatus for printing indicia on articles comprising an inking mechanism for supplying ink, an offset roll, a rotatably driven shaft positioned between said inking mechanism and said offset roll,

a drive member secured to said shaft for rotation therewith,

a type holder mounted for rocking movement on said drive member,

a plurality of type elements mounted in said type holder, the surfaces of said type elements being disposed in a straight line,

means to drive said shaft and drive member so that said type elements are cyclically moved between said inking mechanism and said offset roll for ink from said inking mechanism to the surfaces of said type elements and transfer of an ink configuration from the surfaces of said type elements to said offset roll,

and means to rock said type holder on said drive member during each transfer operation to move the surfaces of said type elements along a path parallel to said straight line throughout each ink transfer operation.

10. Rotary printing apparatus for printing indicia on articles comprising a rotatable type carrying element,

said type carrying element including a plurality of type elements having their surfaces disposed along a straight line perpendicular to the axis of rotation of said type carrying element,

means to rotate said type carrying element,

and means operative in response to the rotation of said type carrying element to move said type elements along a straight path perpendicular to said axis of rotation for successive contact of a transfer element by the type elements for transfer of ink between the type elements and the transfer element.

References Cited in the file of this patent

UNITED STATES PATENTS

1,360,063	Waters	Nov. 23, 1920
2,562,214	Root	July 31, 1951
2,981,181	Levien	April 25, 1961

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,101,666 August 27, 1963

Frank W. Sawtelle

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, lines 19 and 20, for "carried" read -- carrier --; column 4, lines 16 and 17, for "elemens" read -- elements --; column 8, line 10, after "for" insert -- transfer of --.

Signed and sealed this 31st day of March 1964.

(SEAL)
Attest:
ERNEST W. SWIDER

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents