Sept. 10, 1935. E. R. WOLCOTT 2,013,738

METHOD AND APPARATUS FOR PRINTING PICTURE STRIPS

Original Filed April 20, 1932 2 Sheets-Sheet 1

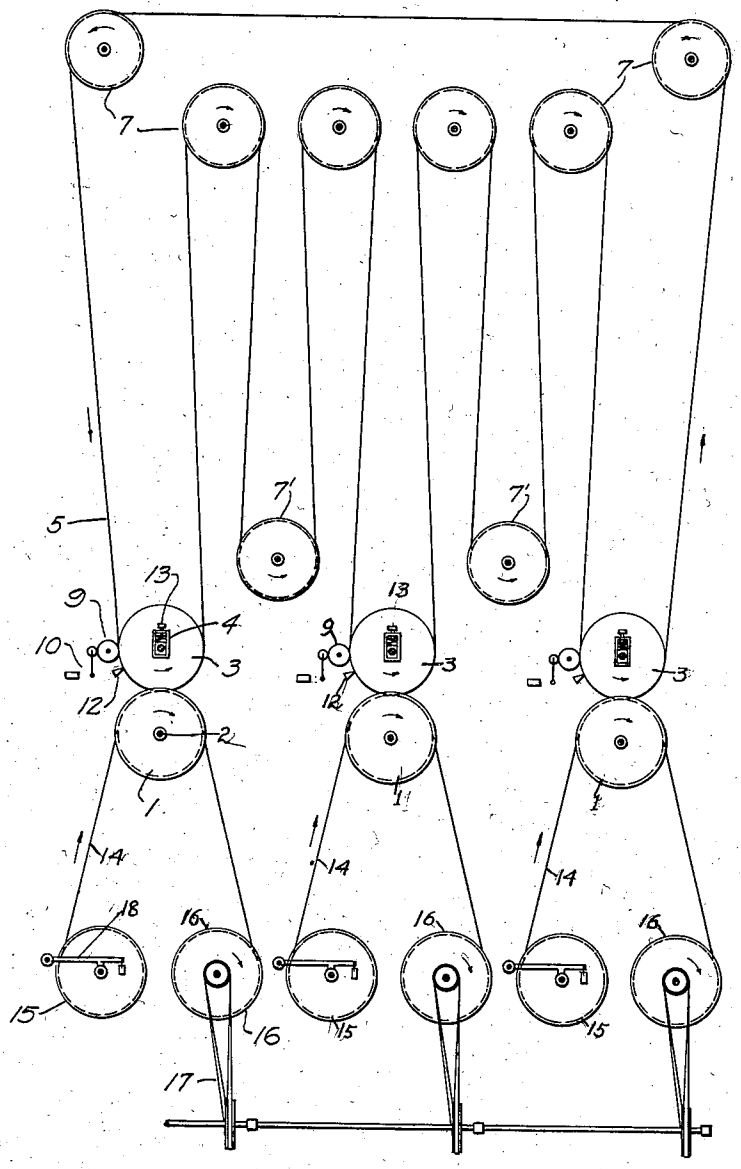


FIG. 1

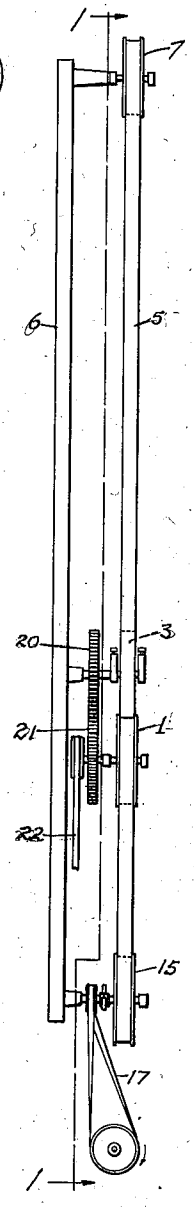


FIG. 2

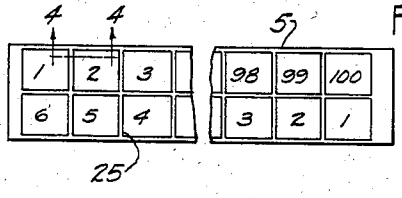


FIG. 3

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METHOD AND APPARATUS FOR PRINTING PICTURE STRIPS

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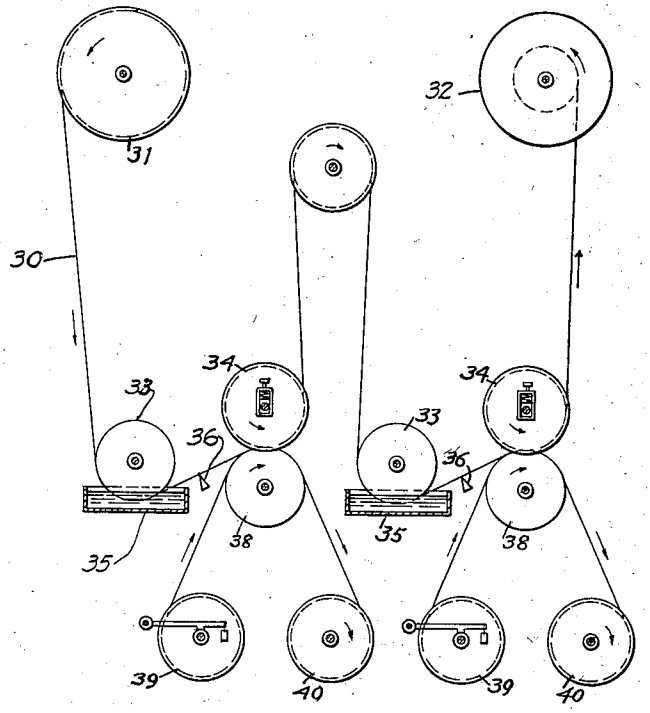


FIG. 5

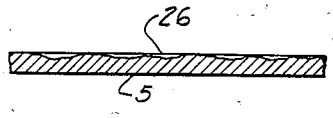


FIG. 4

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METHOD AND APPARATUS FOR PRINTING PICTURE STRIPS

Edson R. Wolcott, Los Angeles, Calif.

Application April 20, 1932, Serial No. 606,384
Renewed February 5, 1935

1 Claim. (Cl. 101—150)

This invention relates to a method and apparatus for printing on a continuous strip of paper or other medium a series of pictures suitable for projection in appropriate apparatus either for production of moving pictures or for production of projected still pictures.

The term "pictures" as herein used is intended to apply not only to black and white or colored reproductions of scenes but also visual reproductions of any visible objects, for example printed pages of a book, either textual or illustrated, or any other visual impressions which it is desired to present successively or selectively on a suitable receiving surface such as a screen. For example it may consist of one or more sound track records for sound reproduction.

The main object of the present invention is to provide for printing an extremely large number of picture impressions or "frames" on a reel of paper or other suitable medium in an expeditious and economical manner. With a printing cylinder of any practicable diameter, it is not possible to print in one revolution more than a very limited number of picture impressions. To effect such printing it has been proposed to use a printing cylinder on which the inked impression means are arranged in helical manner so that by suitable relative movement of the cylinder and the paper reel a fairly long series of impressions could be effected at one printing operation. It has also been suggested to print a plurality of series of pictures, each series being printed by means of a single printing cylinder or a single portion of a printing cylinder and then fastening the plurality of series of pictures together.

Both of the above described expedients are inconvenient and unduly expensive and an important feature of the present invention is the provision of means for effecting an extremely large number of impressions in linear series without recourse to the aforesaid expedients. For this purpose I provide for printing the series of impressions on a reel of paper or other suitable medium by means of a printing strip of suitable flexible material whose length corresponds to the length of the series of pictures to be printed, the strip or tape form of the printing means enabling it to occupy a comparatively limited space as compared to the impracticably large space which would be required by a cylinder of equivalent circumference. By means of this method of operation I am also enabled to perform the printing of the complete series of pictures on a continuous reel of paper or other suitable medium without necessity of subsequent fastening together of separately printed sections.

Another object of the invention is to provide for simultaneous printing of a plurality of reels of paper or other receiving medium.

A further object of the invention is to provide an improved printing surface for a printing strip or other printing means operating by the intaglio method so as to insure the productions of uniform and clear impressions even when operating at high speed.

The accompanying drawings illustrate my invention, and referring thereto:

Fig. 1 is a vertical section of apparatus suitable for carrying out the invention, taken on line 1—1 in Fig. 2;

Fig. 2 is an end view of the apparatus shown in Fig. 1;

Fig. 3 is a plan of a section of the printing strips; and

Fig. 4 is a section thereon;

Fig. 5 is a vertical section of a modified form of the apparatus.

The apparatus as shown in Figs. 1 and 2 comprises a series of platen rolls 1 mounted on shafts 2 which are carried by suitable bearings, impression rolls 3 adjacent the platen rolls and carried by shafts 4 mounted on suitable bearings and a printing strip or band 5 of suitable material passed between the impression rolls and the platen rolls. All of the said parts may be mounted on suitable frame means 6. The printing member 5 is preferably an endless strip or band and may consist of metal or any other material capable of having formed thereon an ink receiving and printing surface. Said strip or band is of a length corresponding to the series of pictures or frames to be printed and may therefore be several hundred feet in length and in order to provide for handling such a great length in a limited space I prefer to wind the strip or band back and forth on suitable carrier rolls 7 and 7' as well as on the impression rolls 3 in such manner that the said strip or band extends in a series or plurality of loops extending side by side.

Inking means are provided for the printing member 5, said inking means comprising for example an ink roll 9 and means indicated at 10 for transferring ink from suitable fountain means to the ink roll, the ink roll 9 being mounted adjacent the printing member 5 so as to apply the ink thereto preferably shortly before it reaches the point at which the printing impression is made. A doctor blade 12 is shown in position to engage the printing member 5 so

as to remove excess ink therefrom as it passes the inking roll 9. I prefer to provide for simultaneous printing of a number of impressions from the same printing member 5 and for this purpose a plurality of printing rolls 3 are provided, the printing strip 5 passing over said rolls successively and a platen roll 1 being mounted adjacent each printing roll so that an impression is effected at each pair of platen and printing rolls. The respective impression rolls and printing rolls for bringing the impression receiving strips in contact with the printing strip are arranged at the respective ends of different loops of the printing strips so as to provide a compact construction.

Means indicated at 13 are provided for adjusting the pressure between the printing and platen rolls.

The impression receiving medium 14 which consists of a strip or tape of paper or other suitable flexible material is supplied from a reel 15, passing from said reel over the platen roll 2 and then to a winding reel 16 which is operated by suitable means indicated at 17 so as to continuously wind the strip or tape onto reel 16, means indicated at 18 being provided for restraining the rotation of the feed reel 15 so as to take up slack. It will be understood that the described paper supply means will be provided for each of the pairs of printing and platen rolls 1.

Each pair of rolls comprising platen roll 1 and printing roll 3 are operated in any suitable manner so that said rolls rotate in synchronism, for example by interengaging gears 20 and 21 on the respective shafts 2 and 4 of said rolls and means indicated at 22 for driving one of said shafts.

My method of printing may be carried out in the above described apparatus as follows: the printing strip or band 5 having been provided with a series of ink receiving surfaces adapted to form the desired succession of pictures is mounted on the rolls 3, 7 and 7' and is operated by the driving means described so as to cause said printing strip or band to move under the rolls 3 and be thereby brought in contact with the impression medium or paper strip 14 as it passes between the rolls 1 and 3. Precedent to such passage between said rolls the printing member 5 is inked by the inking means 9 and its surface cleared except for the parts to be printed from, by the doctor blade 12, so that in its passage between the first pair of printing rolls impressions are made on the paper strip 14 corresponding to the successive printing frames on member 5. In the forward movement of the printing member 5 this printing operation is repeated at the several sets of printing rolls so that in one circuit of the printing member or strip as many impressions are made on separate strips or tapes of paper as there are sets of printing rolls and in this manner a large number of printed strips may be obtained simultaneously from one printing member. When the printing member has made a complete circuit the printing operation is repeated and thus a plurality of sequences of pictures may be printed on the same paper strip 14 until the reel supplying such strip has become exhausted.

Any desired series of impressions or impression producing surfaces can be provided on the printing strip 5 for example one or more series or rows of frames for producing moving pictures. Thus are shown in Fig. 3 two series of moving picture frames indicated at 24 may be provided on the printing member 5. In said figure the said series of frames are presented in inverse order on the printing strip so that the printed strip produced therefrom can be used in a moving picture apparatus by suitable shifting to produce a moving picture in each direction of motion of the projection strip thereby dispensing with rewinding. It will be understood that the frames referred to may either represent scenes or other visual objects such as pages of a book including either or both printed matter and pictures and whatever may be the nature of the impressions, they may be either in black and white or colored as desired. Moreover, instead of a series of frames on the printing strip it may consist of one or more continuous impressions such as sound tracks for sound reproduction such sound tracks being either of the variable density or variable area type or anything else which can be reproduced by photomechanical means.

The invention as above described is applicable to any kind of printing surface and is especially advantageous in connection with a printing surface of the intaglio type, as such formation of the printing surface lends itself most readily to use with a thin strip used as carrier means. In Fig. 3 a portion of the printing member is shown comprising the body 5 provided with a plurality of frames 25 each representing a picture or impression to be printed. The member 5 is formed, as stated, as a thin strip for example of copper and is preferably formed, by suitable photogravure or other processes, with depressions indicated at 26 in its printing surface, said depressions corresponding to the position of the lines, dots, or surfaces which are to receive ink for the printing operation. In cases where such impression portions are of considerable extent it has been found difficult to insure adherence of the printing ink, dye or other medium thereto and to avoid this difficulty I prefer to fill such impressions with absorbent material capable of taking up the printing ink and holding it from accidental dislodgment but also capable of giving up the printing ink to the impression receiving surface. By this method of operation I dispense with the use of any screen which is usually employed for subdividing the larger inked portions of the impression surface. As an example of the method of operation my invention may be carried out in this connection with printing impressions on the printing member 5, formed in the following manner:

Etch in the usual way except that no screen is used. After etching is completed and plate or cylinder is washed etc., apply an absorbent medium to same under pressure as by scraping over so that it fills all of the etched places (it may not be necessary to fill the very fine etchings). This material is then scraped off so there is none on the unetched surfaces. The function of this material is to fill the etched portions to bring up the ink and hold it as the doctor blade passes over, but giving it up to the paper or material upon which the print is to be made. There are many substances which may be used for this purpose such as pumice, finely divided, with a binder to hold it in the etched portions but which still permits it to absorb the ink as in lithography, in fact almost any finely divided substance can be used which can be made to stick to the copper so as not to come out as the doctor blade passes over. Organic matter as a resin gelatin or wax could be used and would not scratch the copper

as it was put in. I have also used gelatin with water soluble dyes. Any material not soluble in the dye or ink can be used, provided it is adherent to the printing strip, and is wetted by or receptive of the printing ink, either by absorption or otherwise, so as to give up the ink to the paper or other impression receiving medium.

The printing strip may be prepared in any other suitable manner, for example in some cases it may be desirable to use screens in photolithographic production of the printing surface to give the grain effect. Thus I may use a screen of 300 or 450 lines to the inch for the picture part of a motion picture record and no screens for the sound tracks particularly when these are of the variable area type. This gives satisfactory results for the reason that the frequency due to the screen is not imposed upon the sound tracks and since the pictures are in motion the dots or grains due to the screen do not fall in succession on the same spot of the screen on which the screen is projected.

I may also obtain the desired grain of the printing surface by using a material which becomes granular or porous upon etching, for example I may use a form of brass with zinc particles distributed therein about 400 to the inch and then etch with the solution which attacks only the copper and not the zinc, as for instance ammonium hydrate; this produces ridges or dots on the surface of the metal similar to those of the screen so that the effect would be similar to that obtained with a fine screen.

Instead of an endless belt or strip the printing member may consist of an open ended strip such as shown at **30** in Fig. 5 said strip being wound on a supply reel **31** and being unwound therefrom in the operation of the printing apparatus onto a reel **32**, the strip passing over one or more inking rolls **33** and printing rolls **34** in its passage between the reels **31** and **32**.

The inking rolls **31** are shown as adapted to dip or immerse the printing strip into ink in inking tanks **35**, doctor blades **36** being provided to remove surplus ink and the strip being then passed over the corresponding printing roll **34** so as to pass between said printing roll and the opposing platen roll **38**. The paper is supplied from paper reels **39** and passes between the platen and printing rolls and is wound on the paper reels **40**. In the operation of this form of my invention is the same as that shown in Figs. 1 and 2 except that the inking strip is wound off one reel onto another instead of passing continuously as an endless belt and also except that the inking means is shown as of the immersion type instead of the ink roll type. It will be understood however that any other suitable method of inking may be used.

I claim:

Apparatus for printing comprising a flexible printing strip, means for supporting and moving said printing strip in a plurality of loops extending side by side, means for applying printing ink to said printing strip, a plurality of impression receiving strips, and printing rolls for supporting said impression receiving strips and for bringing them respectively into impression receiving contact with different portions of the printing strip at the respective ends of different loops thereon, there being an impression-receiving strip for each printing roll and each impression-receiving strip being brought into a single impression-receiving contact at a time.

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