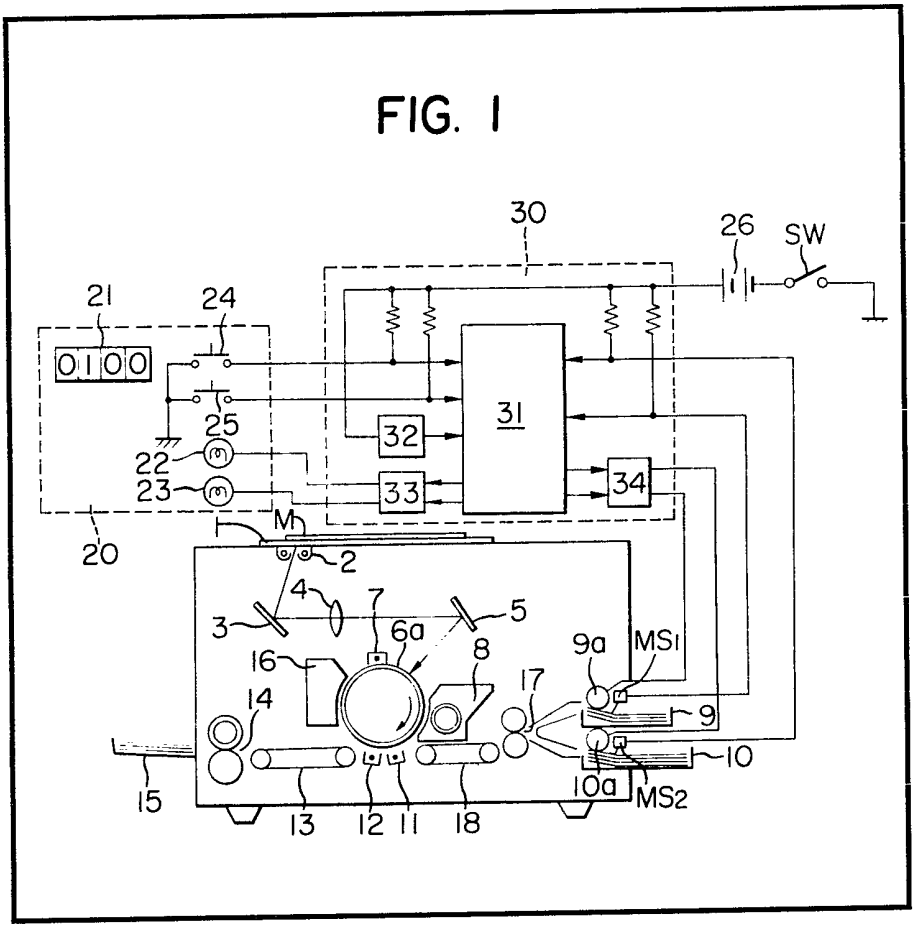
(12) UK Patent Application (19) GB (11) 2 065 611 A

(21) Application No **8037631**
(22) Date of filing
24 Nov 1980
(30) Priority data
(31) **54/151992**
(32) **26 Nov 1979**
(33) **Japan (JP)**
(43) Application published
1 Jul 1981
(51) **INT CL³ B65H 5/26**
(52) Domestic classification
B8R 402 471 475 565 572 582 601 671 681 723 AA5
(56) Documents cited
None
(58) Field of search
B8R
(71) Applicant
Konishiroku Photo Industry Co Ltd
26-2 Nishishinjuku 1-chome
Shinjuku-ku
Tokyo
Japan
(72) Inventors
Kazuho Shimoda
Shunichi Abe
(74) Agents
Michael Burnside & Partners
2 Serjeant's Inn
Fleet Street
London
EC4Y 1HL

(54) **A sheet feeding arrangement in recording apparatus**

(57) In recording apparatus, e.g. an electrophotographic copying machine, wherein recording sheets of different kinds, e.g. sizes, can be fed from alternative piles, e.g. cassettes 9, 10, upon manual actuation of a select button 25, the feed arrangement is such that when no suitable kind of sheet is available from the piles, thus necessitating insertion of a new pile, subsequent feed is automatically taken from the new pile, no matter what sheet kind may have been previously selected by the button. The sheet feeding system includes microswitches (MS_1; MS_2) for detecting when no recording sheets are provided at respective loading stations and providing a signal thereof. Also, when one kind of pile is replaced by another kind the microswitches provide a detection signal to microcomputer (31) which operates to ensure that the feed roller (9a; 10a) at the station where the new pile was inserted is selected for the next copying operation.

FIG. 1



GB 2 065 611 A

FIG. 1

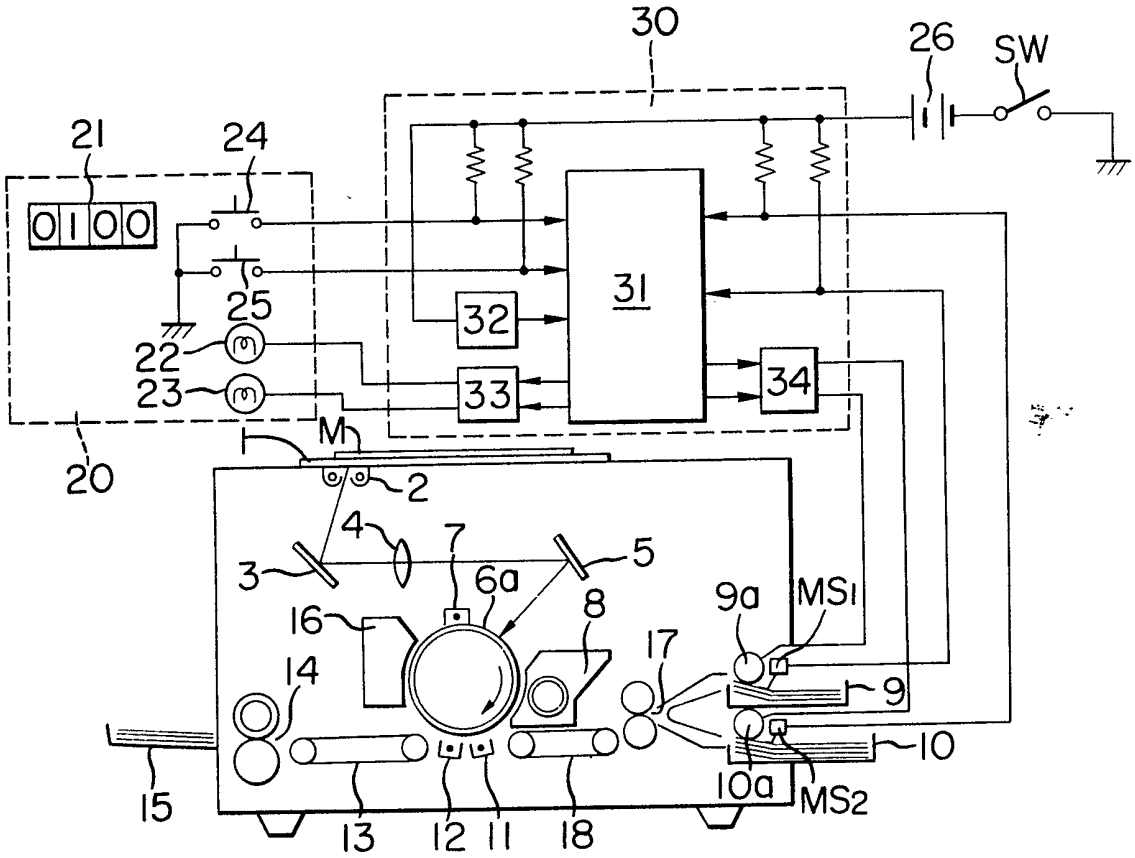
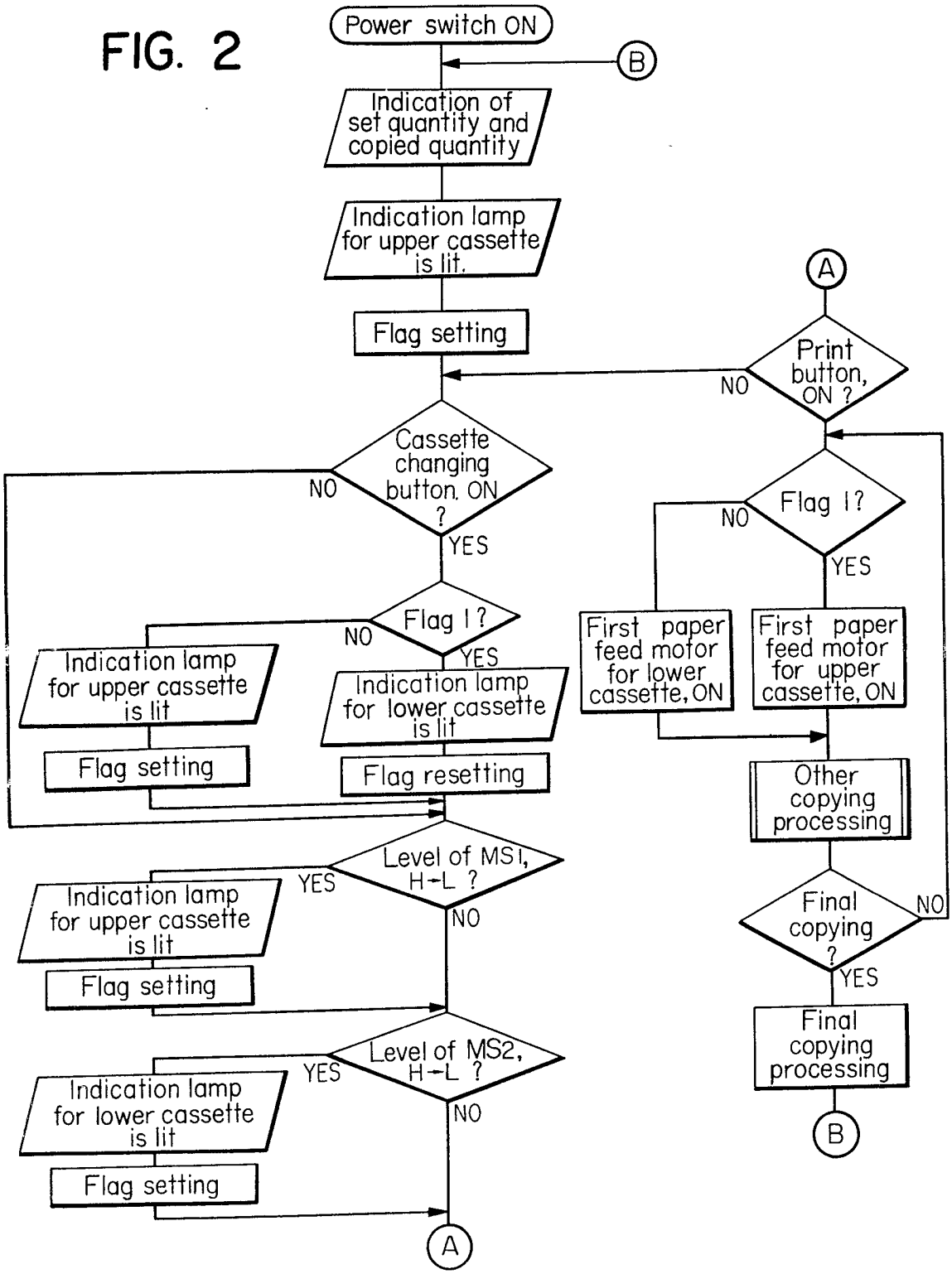

30
26
SW
21
24
0100
25
22
23
31
32
33
34
M
20
2
4
7
3
6a
5
8
16
9a
MS1
17
14
9
10
15
10a
MS2
13
12
11
18

FIG. 2



SPECIFICATION

A sheet feeding system in recording apparatus

The present invention relates to a sheet feeding controlling system for recording apparatus such as electrophotographic copying machines and printing apparatus.

An example of an electrophotographic copying machine will be described. When copying an original, it is known to load a cassette in the machine with a sheet of recording paper being fed from the cassette for each copying operation. It is also known to feed manually recording papers one by one. The cassette is loaded with many recording sheets. Recently, this type of cassette system is employed for most electrophotographic copying machines. Generally, recording papers of prescribed sizes such as B6, B5, B4, A5, A4 and A3 or such as 8″ × 13″, $8\frac{1}{2} \times 14$″, 10″ × 15″, 11″ × 17″ and 11″ × $8\frac{1}{2}$″ are used for copying and cassettes of various sizes are available to accept recording sheets of different sizes. Some of the recent electrophotographic copying machines are constructed so that a plurality of different sizes cassettes are loaded therein and on operation of the selection button, a recording sheet is fed from the desired cassette and use for copying to achieve prompt selection of the required recording sheet. Further in another type in which no cassette is used, different sized recording sheets of more than two types are loaded at fixed locations therein and on operation of the selection button, the recording sheet of the desired size is used.

Now, since it is not advisable, from the view point of the size of the apparatus and the price thereof, to load recording sheets of all sizes in the apparatus in such recording apparatus, it is conventional in the small sized machines generally used for 2 to 3 types of diferent recording sheets to be contained in the cassette for example and loaded therein. Therefore, when the recording sheet of the desired size coincides with any one size of the plurality of sizes of the loaded sheets, a simple operation of recording sheet size selection button is all that is required. However, when they do not coincide, it is necessary to change one cassette for a cassette containing recording sheets of the desired size before the copying operation and to operate the recording sheet size selection button so that the recording sheet can be fed from the newly inserted cassette. In such case, though it may be unavoidable to change the cassette, it is troublesome to operate the selection button further and if such selecting operation is carried out carelessly, there is a possibility that the recording may be done on a recording sheet the size of which had been selected by a previous operator and thus the copied material will not be useful even through a cassette containing the require size of paper had been inserted in the machine.

In view of the aforesaid points, an apparatus according to the present invention is so constructed that when the recording paper is changed, the following recording operation is automatically carried out using the newly inserted recording sheet without the necessity for a manual selection of that kind of recording sheet, namely it is so constructed that the replacing of recording sheet is detected and when the detection signal is received, the sheet feeding device for the newly loaded recording sheets is operated in accordance with the copying operation to feed such sheets. As a specific embodiment, the construction may be such that cassettes having different sized recording papers respectively are loaded at an appropriate position in the recording apparatus and a sheet feeding device is provided for each size of recording sheet and that replacement of a cassette is detected by a microswitch to produce said detection signal whereby the sheet feeding device for the recording sheets contained in the newly loaded cassette is operated for the next recording operation.

Figure 1 of attached drawings is a diagrammatic representation of an electrophotographic copying machine wherein the sheet feeding controlling system of the present invention is applied and

Figure 2 is a flow chart that explains the movements of the controlling system of the present invention.

An example of the present invention will be explained as follows with reference to the drawings.

Fig. 1 shows an example wherein the present invention is applied to the electrophotographic copying machine of a known construction and in said copying machine, the original M placed on the copy board 1 is illuminated by the illuminating lamp 2 and the reflected light is projected onto the photo-receptor 6a arranged on the surface of the revolving drum 6 through an optical system comprising mirror 3, lens 4 and mirror 5. The photo-receptor 6a is charged uniformly by the charging electrode 7 and with the projection of the reflected light from the original M, an electrostatic latent image is formed thereon. The electrostatic latent image is developed by the developing device 8 and is turned into a visible image which is transferred onto the recording sheet fed from the cassette 9 or 10 by the transferring electrode 11. After transferring, the recording sheet is separated from the photo-receptor by the separation electrode 12 and is conveyed by the conveyance device 13 to the fixing device 14 where the image is fixed and then delivered to the sheet delivery tray 15. Toner remained on the surface of the photo-receptor 6a after the separation of the

recording paper is removed by the cleaning device 16. Recording sheets of different sizes are contained in the cassettes 9 and 10 and such recording sheets are fed from the cassette 9 by the first sheet feeding roller 9a contacting the extremely top sheet therein and from the cassette 10 by the first sheet feeding roller 10a contacting the extremely top sheet therein, synchronously with the recording operation. The recording sheet fed out from the cassette 9 or 10 is transported to the transferring position by the conveyance device 18 being synchronized exactly with the recording operation by the second paper feeding roller 17. On the cassettes 9 and 10, the no-sheet microswitches MS1 and MS2 to detect that no sheet is contained in the cassette are provided respectively.

On the indication panel 20 arranged at the proper location of the copying machine, there is provided a counter 21 to indicate the set quantity and the copied quantity, an indication lamp 22 for the upper cassette (cassette 9) and an indication lamp 23 for the lower cassette (cassette 10), a print button 24 and a cassette changing button 25 are provided. Since priority is given to the upper cassette in the cassette changing button 25, the lower cassette is selected with the first push of the cassette changing button 25 and then the upper cassette is selected with the next push of said button, namely, the circuit thereof is so composed that the upper cassette and the lower cassette are selected alternately. In the controlling part 30, on the other hand, the one-chip microcomputer 31 (hereinafter referred to as microcomputer) wherein the central processor unit (CPU), the memory (RAM and ROM) and the input/output unit are formed on a single chip, the resetting circuit 32 to reset said microcomputer when the power switch SW of the copying machine is turned on, the power amplifier 33 to light the cassette indication lamps 22 and 23 and the power amplifier 34 to supply electricity to each motor (not illustrated) to drive the first sheet feeding roller 9a and the second sheet feeding roller 10a, are included. The numeral 26 is a direct current power source connected to the controlling circuit of the copying machine. The output signals of the microswitches MS1 and MS2 for the cassettes 9 and 10 are supplied to the microcomputer 31.

The controlling system for selection of recording sheet of the present invention will be explained next with the aid of a flow chart shown in Fig. 2.

When the power switch of the copying machine is turned on, the resetting circuit 32 is operated and the resetting signal is conveyed to the microcomputer 31, thus the operation of the program is started newly. Consequently, the set quantity is first indicated as 01 and the copied quantity is indicated as 00 on the counter 21 of the indication panel 20. This is because the program is prepared considering that most of the users of the copying machine make only one copy. Further in this example, since the priority is given to the upper cassette namely cassette 9, 1 to give the priority to the upper cassette is stored on the memory of the microcomputer 31 (this is expressed as "the flag is set") simultaneously with the lighting of the indication lamp 22 for the upper cassette. Next, whethere the cassette changing button 25 has been pressed by the operator or not, namely, whether the cassette changing button 25 has been pressed or not to select the lower cassette 10 in case the recording sheets of desired size are not contained in the upper cassette 9 but contained in the lower cassette 10, is checked and in case it has been pressed, whether flag is 1 or not namely whether the sheet feeding from the upper cassette 9 has been desired or not is checked and since 1 is set in flag, the indication lamp 23 for the lower cassette is lit. Concurrently, flag is reset. Next, in case the recording sheets of desired size are not contained either in the upper cassette 9 or in the lower cassette 10, either one of the upper and lower cassettes is replaced with the cassette containing the recording sheets of desired size. And for both cases of upper and lower cassettes replacing, the cassette is taken out once and the new cassette is inserted. Therefore the same state as the one wherein all the recording sheets have been used out is generated and consequently the output signal of the microswitch MS1 or MS2 is once changed from the H (High) level (the state wherein the cassette is inserted) to the L (Low) level (the state wherein all the recording sheets have been used out, namely the state wherein the cassette has been taken out). Going back to the flow chart again, whether or not the output signal of the microswitch MS1 of the upper cassette 9 has been changed from the H level to the L level is checked and if it has been changed, which means that the upper cassette 9 has been replaced, the indication lamp 22 for the upper cassette is lit and flag is set. If the upper cassette 9 has not been replaced, the output signal level of the microswitch MS2 detects whether the lower cassette 10 has been replaced or not and in case it has been replaced, the indication lamp 23 for the lower cassette is lit and flag is reset. If the lower cassette 10 has not been replaced, no action will be taken. If the cassette changing button 25 is not pressed by the operator, the replacing of the upper cassette 9 is immediately checked.

Next, whether the print button 24 has been pressed or not is checked and if it has been pressed, then whether flag is 1 or not namely whether the sheet feeding from the upper cassette is desired or the sheet feeding from the lower cassette is desired is checked and in

case of the former, the electricity is supplied to the first sheet feeding roller 9a of the upper cassette 9 and in case of the latter, the electricity is supplied to the first sheet feeding roller 10a of the lower cassette 10. Regardless of which cassette supplies electricity, a series of electrophotographic process such as charging, exposure, developing, transferring, separation and fixing are made thereafter according to the print quantity set on the copying machine and each recording operation is checked whether it is a final recording or not and if it is on the half way of the set quantity and not a final recording for example, the same electrophotographic processes are repeated and when the recording operation is final after the final copying has been completed and a recording sheet therefor has passed the fixing device 14, the final recording processes such as the release of the pressing roller 14 of the heat roller type fixing device and the cutting of the power source of the high voltage electrode such as charging electrode and separation electrode are made. Thereafter, the succeeding recording operations are prepared.

In case the print button 24 is not pressed, whether the cassette changing button 25 has been pressed or not is checked and if it has been pressed, whether flag is 1 or not namely whether the upper cassette 9 is selected or the lower cassette 10 is selected in the previous state, is checked. And when flag is 1 namely the upper cassette 9 is selected in the previous state the lower cassette 10 is selected and the lower cassette indication lamp 23 is lit and flag is reset, and when flag is not 1 namely the lower cassette 10 is selected in the previous state the upper cassette 9 is selected and the upper cassette indication lamp 22 is lit and flag is set to 1. Then it is checked whether the cassette 9 or 10 is replaced.

As explained above, the present invention enables the replaced or exchanged recording sheets to be fed without the operation for the selection of sheet size in the recording device wherein more than two types of recording sheets are loaded and the recording sheets of desired size is used after the selection. For this purpose, in the above-mentioned example, the microswitch provided for the purpose of checking the existence of the recording sheets in the cassette is used to detect the replacing of cassettes but instead of the microswitch, the magnetic sensor or photosensor can be used and in the recording device wherein no cassette is used, the recording sheet detecting sensor provided in the palce where the recording sheets are loaded can be used. In an embodiment mentioned above, description is made with relation to a case that a kinds of sheets having different size are used. But it is needless to say that the present invention can be applied to sheet having a difference thickness or the like as compared with one which has same size. In the present invention, since the recording sheets of desired kind can surely be fed only by the insertion thereof into the recording device, further selecting action of the kind of recording sheets is not necessary which simplifies the recording operation and prevents completely the inexpedience that the recording is made on the recording sheets of undesired kind and that the recording sheets are used idly.

CLAIMS

1. In a recording apparatus wherein different kinds of recording sheets are loaded at a loading position therein and one kind of recording sheet is selected before each recording operation, a sheet feeding system which is adapted such that, when one kind of recording sheet is replaced by a supply of another kind in the apparatus, the newly loaded recording sheets are always fed one by one during the subsequent recording operation.

2. Apparatus as claimed in claim 1 wherein the sheet feeding system comprises detection means for detecting replacement of a supply of one kind of recording sheets loaded, in use, in the apparatus with another kind of such sheets, sheet feeding devices for feeding sheets from respective different loading stations at said loading position of the apparatus and means to select the sheet feeding device at the station at which replacement of one kind of paper with another is detected by said detection means, for the subsequent recording operation.

3. Apparatus as claimed in claim 2 wherein said detection means comprises a microswitch at each of said loading stations and adapted to detect the signal when no recording sheet is present at that station.

4. A recording apparatus substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.