Abstract: A device, system and method of shading person large open area from large height without obstruction to view, work and play by matching shade pattern formed by shading unit (104) for the given sun position (107) and the location of the person (106) on land and building, by means shading units (104) moved by control from computer and by manually control and providing local cooling by directed, pulsed cold air jet. Shading unit (104) supported by cables (108) and at periphery shading unit on cantilever based support (105) is used and for small areas. The above devise and system is to protect people from occupational and environmental harmful effect of bright sunshine causing skin cancers and allergy and which so far has been tolerated quietly by people involved in sports, construction, agriculture, sea rigs, recreation in beach.

FIGURE 1 TOP VIEW OF STADIUM WITH DYNAMIC SHADING DEVICE
— of inventorship (Rule 4.17(iv))

Published:
— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
TITLE    A DEVICE TO SHADE PERSONS FROM BRIGHT SUNSHINE
DYNAMICALLY FROM LARGE HEIGHT BY MATCHING SHADE
PATTERN TO PRESENCE.

The following specification particularly describes the invention and the manner in
which it is to be performed
CLAIMS OF PRIORITY

[0001] This patent application claims priority from the Provisional Patent Application No.2689 / CHE/ 2012 and No 2690 /CHE/ 2012 filed on 04 JULY 2012. It also claims priority from Provisional patent applications No 3042 / CHE /2012 , No 3044 / CHE /2012 and No 3045 /CHE /2012 filed on 25th JULY 2012.

FIELD OF TECHNOLOGY

[0002] This disclosure relates generally to technical fields of Occupational Health protection, sun protection and comfort, involving mechanism and computer, and in one embodiment to a device to shade a person in large open space, from a height by means of shading units moving at large height in synchrony with the movement of the person.

SUMMARY

[0003] A device, system, and method to provide shade from bright sunshine from large height by means of shading units which moves in synchrony with the person, the animal to be shaded and with the angle of solar radiation so that the place where the person is present is always shaded and cool air applied to small local area by directed pulsed air jets, is disclosed. In one aspect, a device addresses the problem of occupational
hazard from bright sunshine for people working in large open spaces, involved in sports,
in recreational in beach etc over long periods of exposure to sun especially professional
players with long practice sessions. The devise is a recreation enabler of Sports for
Corporate executives for whom hot sunshine and high temperature is a disincentive and
discouraging thereby allowing full utilization of stadiums when not having tournaments.

[0004] In another aspect, the prior art has shading structures covering entire stadium
which is expensive to build and the natural effect of open sun light is obstructed and
diminished. The present invention maintains the beautiful natural effect of sunlight. Prior
art has devises wherein hydrogen balloons tied by string to the person to be shaded from
small height, but this obstructs the activity and the view of spectators. People have
thought of large artificial cloud and shading structures held by helicopters to shade from
great height but this is going to be expensive and high power consuming and also high
noise level, aerodynamic stability and safety problems especially when large crowds are
present below. Air conditioning of entire stadium is very expensive and a power guzzler.
The present invention is low on infrastructure cost and low on power consumption
compared to prior art while still giving the comfortable condition for work and play in
the most economical and compact manner.

[0005] The matching of the pattern of shade in small required area to the pattern of
location of people is the inventive major step in working of the device. The use of
aerodynamic control for the shading unit and split arrangement of film in shading unit is
the most essential ingredient for the proper working of the device since it is at large
height and subject to wind. Drive for the shading unit is one by means of cable and one
by on board electric motor and one by compressed air jet. The suspension of shading unit
is by cable which is ideal for most continues use conditions. For rapid and urgent deployment, the shading unit with propeller drive to lift and move, having a single cable wire to supply electrical power to the propeller drive motor, is used in spite of difficulty in stabilization under windy condition. The presence of flexible and light structure of shading unit is essential for safety, using water filled rubber bags for counter weight in cantilever suspension, along with safety cable to hold the unit.

[0006] The plurality of camera capture position coordinates of the person to be shaded selected with distinguishing color of dress and tag, based on the coordinates the right shader unit is selected as per deployment plan and shading unit is moved to the required position calculated, thereafter the persons location is tracked and predicted by software by extrapolation and velocity calculation and where needed predicted by the help of operator who sees image on monitor screen and moves cursor pointer from his experience and direction of movement of the person, taking into account sharp changes in direction as it occurs..

[0007] The scope of the Invention extends to workers in construction site and agricultural farms and sea rigs, Using clothing to cover in hot humid weather will be uncomfortable due sweat accumulation and resulting uneasiness, when shaded by the device dynamically the uncomfortable itching sensation is not there leading to improved productivity of work. Tourists in beach specially in tropical areas can enjoy the beach side at any time of the day of their choice due to the shading device. The device allows horse racing to be conducted even in hot countries. No where in the world is present a shading system as of the above device in any sports stadium where the shade pattern follows the location of the player. It is surprising, by looking at old to present books on
sports and open space activities, the way people have been tolerating blazing sun throughout history with some relief from hat and umbrella where fast activity is not involved. It is unfair that sports heroes being subjected to hot sun while the spectators of sports sit under shaded comfort. People with sun allergy will benefit from the device. Women avoiding sun to protect their fair white complexion can participate in sports.

[0008] The device, systems, and methods disclosed herein may be implemented in any means for achieving various aspects, and may be executed in a form of a machine-readable medium embodying a set of instructions that, when executed by a machine, cause the machine to perform any of the operations disclosed herein. Other features will be apparent from the accompanying drawings and from the detailed description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0001] Example embodiments are illustrated by way of example and not limitation, in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0002] Figure 1 is a aerial view of stadium with dynamic shading devise showing stadium with shading units at large height, according to one embodiment.

[0003] Figure 2 is a view of person in shaded zone, with shade from shading unit, according to one embodiment.

[0004] Figure 3 is a cross section view of shading unit, cable drive, positioning and aerodynamic wind control cable, according to one embodiment.
Figure 4 is shading unit having slot with flap for wind management, according to one embodiment.

Figure 5 is a shading unit with cantilever arm suspended from Supporting cable, according to one embodiment.

Figure 6 is a Cantilever arm with shading unit near border and camera unit on gimbal mounting, according to one embodiment.

Figure 7 is a shading unit with propeller drive and buoyancy balloon, according to one embodiment.

Figure 8 is a shading unit with on board motor drive and remote radio receiver according to one embodiment.

Figure 9 is a shading unit with pneumatic drive, according to one embodiment.

Figure 10 is a cross section view of double layer based shading unit, according to one embodiment.

Figure 11 is a side view of double layer based shading unit, according to one embodiment.

Figure 12 is a system view of a multiple cable spool drive, according to one embodiment.

Figure 13 is a system view of entire devise for race course for horses, according to one embodiment.

Figure 14 is a system view of dynamic shading with cantilever unit at curves, according to one embodiment.

Figure 15 is a system view of entire devise on the beach with floating towers based cable hold, according to one embodiment.
[0017] **Figure 16** is a system view of entire devise for shading construction workers, according to one embodiment.

[0018] **Figure 17** is a system view of dynamic shading of workers at road under construction, according to one embodiment.

[0019] **Figure 18** is a view of pulsed cold air pipe line with rotating popup nozzle, according to one embodiment.

[0020] **Figure 19** is a view of cold air nozzle with rotation drive motor and retraction solenoid, according to one embodiment.

[0021] Other features of the present embodiments will be apparent from the accompanying drawings and from the detailed description that follows.

**DETAILED DESCRIPTION**

[0022] A device, system, and method to provide shade from bright sunshine from large height by means of shading units which move in synchrony with the movement of person, animal to be shaded and the angle of solar radiation so that the place where the person is present is always shaded, is disclosed. Although the present embodiments have been described with reference to specific example embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the various embodiments.

[0023] **Figure 1** is an aerial view of stadium with dynamic shading devise showing stadium with shading units at large height, according to one embodiment. Particularly, **Figure 1** illustrates a stadium 101, spectator gallery 102, cable tower 103 which is taller than floodlights, shading unit at a high level 104, cantilever arm with shading unit near
border 105, player who is shaded 106, the bright sun 107, and cable of shading unit 108, according to one embodiment.

[0024] In example embodiment, the shading units do not obstruct the view of spectators.

[0025] Figure 2 is a view of a person in shaded zone, according to one embodiment. Particularly, Figure 2 illustrates the shading unit at large height which moves to a position calculated based on the sun’s angular position in such a way that the shade forms a zone around the person 201 with no need to wear a cap, the shaded zone 202, a shading unit 203, cable of shading unit 204, the sun 206, according to one embodiment.

[0026] Figure 3 is a cross section view of shading unit, cable drive, positioning and aerodynamic wind control cable, according to one embodiment. Particularly, Figure 3 illustrates the cable tower 301, shading unit 302, electric motor with cable spool 303, electric motor for wind control cable 304, wind control cable 305.

[0027] The cable spools and drive motor in case of stadium is on the roof of spectator gallery.

[0028] Figure 4 is a shading unit having slot with flap for wind management, according to one embodiment. Particularly, Figure 4 illustrates a shading unit 400, support cable of the shading unit 401, cable for wind control 402, slot 403 and 406 over which sits flap 407, drive cable for the shading unit 405, according to one embodiment.

[0029] Figure 5 is a shading unit with cantilever arm suspended from supporting cable, according to one embodiment. Particularly, Figure 5 illustrates the shading unit which moves on the cantilever arm 501, cantilever arm 502, counter weight 503 made of
water filled rubber bag, supporting cable 504, cable for movement and rotation of arm 505 control and stabilizer cable for shading unit 506, according to one embodiment.

[0030] Figure 6 is a cantilever arm with shading unit near border and camera unit on gimbal mounting, according to one embodiment. Particularly, Figure 6 illustrates the tower 601, cantilever arm 602, shading unit 603, camera unit on gimbal 604 for getting persons location coordinated, and shading unit position for feedback, pole for fixing camera unit 605, drive cable for shading unit 606, electric drive motor 607, person shaded 608 according to one embodiment.

[0031] The rotation of cantilever arm and movement of shading unit is by means of electric motor controlled by means of on and off instructions from computer.

[0032] Figure 7 is shading unit with propeller drive and buoyancy balloon, according to one embodiment, according to one embodiment. Particularly, Figure 7 illustrates the shading unit 701, electric motor for driving propeller 702, propeller 703, buoyancy balloon with hydrogen gas 704, slot with flap for wind pressure reduction 705, frame 706, power and control signal cable 707, micro controller for propeller and motor control 708, according to one embodiment.

[0033] Figure 8 is shading unit with on board motor drive and remote radio receiver according to one embodiment. Particularly, Figure 8 illustrates the shading unit 800, frame 801, electric motor 802 to move shading unit by winding in cable 803 on spool 804, flap for wind management and control of shading unit 805, flap moving electric motor with cable 806, radio control receiver with microprocessor 807, according to one embodiment.
Figure 9 is a shading unit with pneumatic drive using compressed air, according to one embodiment. Particularly, Figure 9 illustrates the shading unit 901, flexible hose pipe for compressed air 902, control valve 903, nozzles 904 and 905, according to one embodiment.

Figure 10 is a cross section view of double layer based shading unit, according to one embodiment. Particularly, Figure 10 illustrates the frame 1001, upper layer film 1002, lower layer film 1003, suspender through which the support cable passes 1004, according to one embodiment.

This arrangement is mainly to manage wind.

Figure 11 is a side view of double layer based shading unit, according to one embodiment. Particularly, Figure 11 illustrates frame 1101, upper layer film 1102, lower layer film 1103, drive cable 1104, wind control cable 1105, according to one embodiment.

Figure 12 is a system view of a multiple cable spool drive, according to one embodiment. Particularly, Figure 12 illustrates the drive motor 1201 for forward drive, shaft 1202, belt drive 1203, clutch unit 1204 for forward drive, brake and hold unit 1205, drive cable 1206 on spool 1207, brake control cable 1208 and clutch control cable 1209 both operated by solenoids controlled by computer, clutch for reverse drive 1210, drive motor 1211 for reverse drive, according to one embodiment.

The On and Off timing of the clutch and brake is calculated by the computer based on the next position predicted for the person. The cable spool at one end winds up while the cable spool at other end unwinds.
Figure 13 is a system view of entire devise for race course, according to one embodiment. Particularly, Figure 13 illustrates the race course with horse track 1301, horse with rider 1302, tower at border 1303, main support cable 1304, shading unit 1305, support cable for shading unit 1306, drive cable of shading unit 1307, cool air dispenser 1308, wind control cable of shading unit 1309, the bright sun 1310, according to one embodiment.

Figure 14 is a system view of dynamic shading with cantilever unit at curves, according to one embodiment. Particularly, Figure 14 illustrates the horse track at curve 1401, horse with rider 1402, tower for cantilever 1403, cantilever 1404, shading unit 1405, electric motor with cable drive for shading unit 1406, the bright sun 1407, according to one embodiment.

Figure 15 is a system view of entire devise on the beach with floating towers based cable hold, according to one embodiment. Particularly, Figure 15 illustrates the beach 1501, the sea 1502, tower near sea front 1503, main support cable 1-504, support cable for the shading unit 1505, shading unit 1506, drive cable for shading unit 1507, wind control cable of shading unit 1508, person on beach 1509, person in the sea 1510, the bright sun 1511, camera on gimbal 1512, floating platform with tower 1513 anchored by cables to sea floor, tower arm holding, the cable end support with sliding clutch 1514 to which the main support cable is connected, according to one embodiment.

The person on Beach to be shaded is identified by unique color tag.

Figure 16 is a system view of entire devise for shading construction workers, according to one embodiment. Particularly, Figure 16 illustrates the building under construction 1601, tower to hold cables 1602, main support cable 1603, support cable
for suspension of shading unit 1604 , shading unit 1605 , drive cable of shading unit 1606 , wind control cable of shading unit 1607 , cantilever unit at border 1608 , worker on the ground 1609 , worker on roof 1610 , the manager on ground 1611 , cool air pulsed jet dispenser 1612 , air cooler and pump unit 1613 , the bright sun 1614 , according to one embodiment.

[0045] The device is most useful to workers on oil rigs and large ship platform where weather condition is very harsh.

[0046] Figure 17 is a system view of dynamic shading of workers at road under construction, according to one embodiment. Particularly, Figure 17 illustrates the road being constructed 1701 , road paving by one of aspalting machine 1702 , tower with wheel base to allow shifting of the devise 1703 , main support cable 1704 , support cable for shading unit 1705 , shading unit 1706 , cable drive for shading unit 1707 , the worker 1708 , the bright sun 1709 , according to one embodiment.

[0047] The towers are mounted on wheels for mobility

[0048] Figure 18 is a view of pulsed cold air pipe line with rotating popup nozzle, according to one embodiment. Particularly, Figure 18 illustrates the cold air supply pipe 1801 , nozzle 1802 , person provided with cool air 1803 , ground 1804 , air cooler and pump along with storage tank 1805 , according to one embodiment.

[0049] Figure 19 is a view of cold air nozzle with rotation drive motor and retraction solenoid, according to one embodiment. Particularly, Figure 19 illustrates the nozzle 1901 , swivel joint 1902 , rotation drive electric motor 1903 cold air supply pipe line buried in ground 1904 detracting solenoid 1905 , power supply cable and control signal cable 1906 , ground 1907 , according to one embodiment.
[0050] The area where the person is present only is locally cooled.

[0051] Although the present embodiments have been described with reference to specific example embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the various embodiments.

[0052] In addition, it will be appreciated that the various operations, processes, and methods disclosed herein may be embodied in a machine-readable medium and/or a machine accessible medium compatible with a data processing system (e.g., a computer system), and may be performed in any order (e.g., including using means for achieving the various operations). Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.
CLAIMS:

I Claim;

A device to provide protection and comfort from bright hot sunshine in large open area and locally cool the place of persons' presence thereby prevent health hazards of bright sunshine like skin cancer and allergy and avoid just discomfort of work and play, at low infrastructure cost, by matching shading unit positions to get shade pattern on ground corresponding to pattern of presence of persons to be shaded, with the devise comprising:

1. Plurality of shading unit, drive for shading unit, support cables and support tower, cantilever arm holding the shading unit near periphery.

2. Plurality of camera on gimbal mounting to detect and capture location of person and image of shading unit for wind management.

3. Plurality of computer to control drive unit of shading units, display and control consoles for manual control and predict movement of person, control directed cold air injection and popup and pop down of air discharge nozzle;

4. Plurality of air cooler and compressor, popup and fixed rotating nozzle with solenoid controls and valves supplied with air through pipelines on surface and buried under ground.
2. The device as claimed in claim 1:
Wherein the shading unit comprises one of at least plastic film, and plastic film reinforced with fabric, and one of fabric cloth, and of paper coated with plastic, and rubber sheet, with a skeletal frame to provide shape, the plastic film being one of continuous film, one of single layer and one of being split into double layer and surface of shading being one of ribbons with flexible rubber thread at end to adjust with wind and to allow free flow of air for aerodynamic management of wind and the film having ultra violet absorption chemicals where partial shading is required, with the shading unit having slots with flaps and control flaps on frame for control when subjected to wind force.

3. The device as claimed in claim 1:
Wherein the shading unit is supported by at least one of support cables held by towers with cable being at least one of nylon and one of Kevlar, one of carbon fiber and of high strength plastic and one of metal, with support cables having pulleys for drive cables and where in the support for the shading unit is by cantilever arm held on one of tower and one of supporting cable with each tower having one and having multiple arms and shading units.

4. The device as claimed in claim 1:
Wherein the support for the shading unit by the lift force of a set of propellers driven by electric motors to keep the shading unit floating in air at great height and provide drive for movement of shading unit, and supported by hydrogen filled rubber balloon to add buoyancy and lift to the shading unit, with the propellers direction of rotation.
speed and tilt being controlled by on board micro controller under the control of computer with interface being one of wire and one of wireless radio control.

5. The device as claimed in claim 1:
   Wherein the drive for shading unit is at least by cable drive, cable being supporting cable itself and one being separate drive cable which greatly prevents cable entanglement, with drive force for cable provided by at least one of electric motor on ground, being one of alternating current, one of direct current and one of stepper motor, with driving shaft having spools for cable controlled by clutch and brake to select either to wind or unwind cable as decided by the computer and wherein the drive is by On board electric motor on shading unit which drives the spool with cable that enables movement based on winding up of cable to produce the required pull force and one by friction roller gripping and turning on support cable driven by the onboard electric motor and control of electric motor is by on board microprocessor with one of radio receiver for control interface with computer on ground to properly place the shading unit in required position and with electric power supplied by one of cable wire and by one of metallic support cable, and provided with safety parachutes at corner.

6. The device as claimed in claim 1:
   Wherein the drive is by pneumatic manner by compressed airjets through nozzles for forward and backward movement, controlled by valves is used on cantilever arm support and in other supports.

7. The device as claimed in claim 1:
   Wherein the Camera unit mounted on gimbal is oriented to fiX reference coordinated and forming grid map, captures the location coordinates of person to be shaded as point on X
and Y axis, capture the movement of person for direction and velocity vector calculation by computer and capture image of shading unit for correct positioning feedback and aerodynamic control of wind and wherein the camera captures shadow image of one of tower to calculate angle of incidence of sun rays and sun position and wherein each camera covers a selected sector of the area involved.

8. The device as claimed in claim 1:
Wherein the computer using program instructions, analyses image from camera to detect by edge, contrast and tag mark and locate the presence of person as X-Y coordinated and prediction of next move by one of extrapolation based on previous move direction, velocity vector and ball movement in game, past movement data pattern and using person coordinates, select the required shading unit and calculate its required position coordinated to give shade corresponding to the position of person taking into account angle of light incidence from sun and height of shading unit, which is Matching the shade pattern with pattern of persons presence and keeping anticipated next position shading unit ready and wherein computer calculates suns position and sun light incident angle based on camera image of one of towers shadow, and wherein computer controls image display on monitor with console and joy stick to move cursor pointer for manual prediction of movement of person and manual control of shading unit movement, and wherein the computer controls drive cables by controlling the winding and unwinding of drive cables and wind control cables by providing On and OFF signal to clutch and brake of spool with proper timing to get required position coordinates of shading unit, provide drive pulse signal to stepper motors, control signal to Cantilever arm rotation motor and its shading unit drive, analyses shading unit image for change in image shape
corresponding to wind effect and take data from wind and cable tension sensors and gives correction signal to wind control cable drive and control the operation of popup nozzle at correct time and direction to apply cool air jet, and wherein interface with computer is by one of wire and one of wireless radio control.

9. The device as claimed in claim 1:

Wherein the tower to hold supporting cable has extra cable attached to ground for resisting wind pressure, and wherein floating tower used in the sea has floating platform with tower carrying arm on which support cable is attached by moving ring with clutch to grip on arm; with floating platform tower for Beach use of device with floating tower getting encourage from sea floor by cable, and wherein tower is mounted on wheels for use in road construction for enabling mobility of the shading device, and wherein tower with cantilever arm is fixed on buildings to shade to persons below on ground.

10. The device as claimed in claim 1:

Wherein popup nozzles connected to buried and surface pipes to supply cold air from air cooler unit and compressor is used to direct cold air jet to cool only the local area where person is present there by providing the comport needed and wherein popup nozzle is rotated by stepper motor in axis perpendicular to ground and another stepper motor in axis parallel to ground to direct the jet at person and wherein cover lid to is provided to popup nozzle to avoid obstruction and safety of nozzle and operation of unit controlled by computer.
11. The device as claimed in claim 1:
Wherein person to be shaded as referred to in claim 1 also refers to animals and objects to be protected from sun and wherein shading device is used for shading and comfort of players in stadium, horses and animals in race course, shading recreating people on beach in hot climates, construction workers in building by using one of cantilever support based shading unit on building, roads and towers sea rigs and large ship platform, agriculture and farm workers on land.

12. The device as claimed in claim 1:
Wherein shading unit is put into package unit for storage and protection in very stormy weather and wherein cable assembly aiding tool to raise up side support cables and drive cables simultaneously and having connector sockets with color coding of cable and socket to enable easy assembly and correct attachment of drive cables to its correct drive spool, as large number of cables are involved.
FIGURE - 1 TOP VIEW OF STADIUM WITH DYNAMIC SHADING DEVICE
FIGURE 4: Shading Unit Having Slot with Flap

FIGURE 5: Shading Unit with Cantilever Arm
FIGURE 6: CANTILEVER ARM WITH SHADING UNIT NEAR BOARDER AND CAMERA IN GIMBAL UNIT.

FIGURE 7: SHADING UNIT WITH PROPELLERS AND BOUYANCY BALLON
FIGURE 8: SHADING UNIT WITH ON BOARD MOTOR DRIVE

FIGURE 9: SHADING UNIT WITH PNEUMATIC DRIVE
FIGURE - 13 SYSTEM VIEW OF ENTIRE DEVISE FOR RACE COURSE

FIGURE - 14 SYSTEM VIEW OF DYNAMIC SHADING WITH CANTILEVER UNIT AT CURVES
FIGURE 15 SYSTEM VIEW OF ENTIRE DEVISE AT BEACH WITH FLOATING TOWER CABLE HOLD
FIGURE 16 SYSTEM VIEW OF ENTIRE DEVICE FOR CONSTRUCTION WORKS

FIGURE 17 SYSTEM VIEW OF DYNAMIC SHADING AT ROAD UNDER CONSTRUCTION
FIGURE 18 PULSED COLD AIRPIPELINE WITH ROTATING NOZZLE

FIGURE 19 COLD AIR NOZZLE WITH ROTATION DRIVE MOTOR AND RETRACTION SOLENOID
A. **CLASSIFICATION OF SUBJECT MATTER**

IPC: A45B 23/00 (2006.01); E04H 15/02 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC.

B. **FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A45B, E04H

Documentation searched other than minimum documentation but in the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

EPDOC, WPI, TXT

C. **DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>A</td>
<td>US 2693230 A (BURK LOWELL) 02 November 1954 (02.11.1954) fig 6; description, column 2, lines 68 - 77</td>
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